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# The spread of English language in Jordan

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## I. INTRODUCTION

This paper addresses a matter of great practical significance: the relatively recent spectacular spread of English language in Jordan, a bilingual country. This topic touches on some areas of considerable theoretical importance for the sociology of language such as language attitude. This paper is divided into three aspects: firstly, deals with the main fields affected by the spread of English language cross Jordan. Secondly, the underlines is the most significant forces affecting this sort of spreading the language cross Jordan. Thirdly, is about prospects for the future of English language in the country Jordan. The methodology adopted in this paper is based on experimental fieldwork and documentary analysis, personal observations and questionnaires submitted to sample University students as well as to a sample layman.

## II. DOMAINS AFFECTED BY THE SPREAD OF ENGLISH LANGUAGE IN JORDAN

These include education, and mass media. The first domain is the most significant one; there is a very strong connection between education and the spread of English language cross-Jordan. Both public and private educations are considered here:

## III. PUBLIC EDUCATION

Generally, English was the first foreign language to be taught in Jordan before and after the independence in 1946. Jordan was under the occupation of Great Britain from 1916 – 1946. After the independence, English is getting to be taught in all Jordanian schools at the early age of eleven, for just one hour and lecture a week. But, after the 1990s, English is getting to be taught alongside with Arabic language in all Jordanian schools at the early age of six. This has given the English language a unique position in Jordan.

Under public education, I shall begin with secondary schools and Universities in Jordan.

Secondary schools: After the independence in 1946 – 1989, Jordan chooses English language as their first foreign language. English remained one of the most significant foreign languages that a student compulsory has to be chosen, to learn during the

last three grades of high schools education. The number of a week hours allocated to English varied from one discipline to another: one hour in sciences, and two hours in humanities. But, after in 1990s the number of hours allocated to English is also varied from one discipline to another: 7hours in sciences and 9<sup>th</sup> hours in humanities. This means English is getting to be used extensively in all Jordanian schools compared to the previous years.

## IV. UNIVERSITIES

The spread of English at the secondary school level led to an even wider spread at the University level. Table 1, confirms this fact and reveals an important increase in the number of students who register every year in the departments of English. A natural development of this state of affairs led to parallel increase in the number of departments of English throughout the country. In the early 1962 there was only one English department in Jordan (at the city of Amman). In 1976 – 1985 the number of English departments in Jordan reached 3. Then, in 1986 – 2013 the number of English departments reached 30. “Steaming” became a necessity in some places as band levels in the flow of students wishing to register in English departments were often wider than administrative expectations.

As the number of University graduates in English increases, the Jordanian secondary school teaching staff grew steadily. If we consider the population of English teachers in Jordan, we shall notice that in 1962 that were not more than 22 teachers of English in secondary schools.

But, the number of English teachers has increased dramatically from 1962-2013. In other words, thousands of English teachers are currently teaching in Jordanian schools. This has increased the number of people toward learning English language as the first priority, because most jobs in Jordan required English language from their employees or candidates. Believe it or not English is getting to compete Arabic language and many sectors English is first, for instance, tourism sector, ministry of foreign affairs, higher scientific study, business, air port, etc. This has given English language a unique position in Jordan, and this also increased the spread of English cross the country.

Table 1, the number of students registered in some English University departments (first year)

	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013
Jordan University	534	585	631	672	785	967
Irbid National	167	189	243	261	297	379
Gadara	132	149	176	190	222	289
Yarmuke	519	576	612	669	765	955
Al Il beit	389	478	555	602	685	801

The number of students is varied from one University to another, because Jordan University was established 1962, Yarmuke in 1976 and Al IL Beit was also established 1990s. These Universities: Jordan University, Yarmuke and Al IL Beit belong to the state and the other Universities are private and established last decade.

Further, these 5 Universities are selected randomly among other 30 Universities state and private too. That is why; the number of students is varied from one University to another, but generally the number of the students in English departments has increased dramatically every year. This will increase the number of English teachers and increase the spread of English language cross Jordan.

#### V. PRIVATE EDUCATION

Privately sponsored education is another domain where English is spreading. Two foreign institutions can be cited here: the British council and American language center. Over the years, the British council has reinforced its position as a promulgator of English in this country. Courses are continuously supplied by this institution for learners for all ages. Similarly, the American language center and its branches throughout of Jordan register an increasing number of students every year. Here also English courses are offered to learners of various ages and levels. Private education is also available in American schools: Two such schools are worthy of note: in the capital of Amman, these schools have both primary and secondary level.

Apart from these foreign bodies, several institutions and institutions of higher education offer courses in English to their students with goal of raising their level comprehension to that required to cope with the increasing use of English textbooks, reference books and documentation. Among these we can cite, school of science and technology and business in the city of Amman. There are also many private business schools which teach English to serve the needs of secretarial training, commerce and computer science. This has increased the spread of English language in Jordan.

#### VI. THE MASS MEDIA

Along with education, the domain of the mass media is another in which English is spreading steadily. This is beneficial for the spread given the powerful role that the media are

assuming in modern times at national and international levels. I shall deal first with written and then with the oral communication media.

Cultural factors such as education, gender, age main language spoken at home, etc., are in direct relationship with the reading habits. More specifically, reading requires language proficiency. This proficiency is more and more often required, given that English written material is gradually finding its place on the newsstands of larger and smaller Jordanian cities, towns, and villages. The imported press is now plentiful in Jordan. Dailies such as Jordan times, Financial times, wall street journal etc. These Journals can easily be purchased, and censorship is seldom. Periodicals are also available. English material is not only imported but also locally produced. There is a locally published English daily, Jordan Today, whose circulation is growing steadily.

Paralleling the increase of English news paper is that of English and American books. These are provided by the British and the American language center and others, for instance, the media book service, some private English and American bookshops, and many second hand bookshops. These books are either 'seasonal' secondary school and university textbooks or books dealing with a variety of subjects ranging from scientific, political and economic subjects to literature, detective stories and children's books readers and the like.

Local English publications are mainly pedagogical. For example, the Jordanian association of teachers publishes its proceedings on yearly basis. On the other side, an increasing number of Jordanian scientists in various domains publish a broad in English. Moreover, publications in English are often cited and discussed at length owing to the fact that there is no other language in which as much is published as in English. All these facts cause the proportion of English language materials in library collections to increase.

Along with written media, the Jordanian radio station allocates every day portion two hours (from 2 -4pm) to the English broadcasting of news, songs, and other miscellaneous programs. According to the questionnaires submitted to the Irbid National university students, 41% of the Irbid National University students listen to this daily broadcast ( while are driving or sitting in the coffee shops) which looks to be enjoying increasing popularity, especially among the youth. Two factors can be given. Firstly, the time of the broadcasting is relevant. Late afternoon is usually a time for relaxation. Secondly, English modern songs seem to be appreciated even by people who do not

understand it. These songs belong to what is termed the 'international youth culture'

English language programs are also provided by the CNN, BBC world service and the voice of America. 10% of the students listen to CNN, BBC world center service and 7% to the voice of America. A few students mentioned other radio station. Overall, age, and the level of education are determining factors when we consider the role of the media in spreading English. People who are expected to be interested in English are mainly students, teachers, and people of the more educated class.

As for Jordanian television, it allocates every week at least two hour programs to the teaching of English to beginning, intermediate and advanced learners. In addition, two hour program of international culture (English and American songs in the majority of cases sung by Jordanian young men and women) is regularly offered on Thursday after noon and Saturday nights. In the recent past, the Jordanian television provided a weekly two-three times news round up in English.

English television programs and films are some translated into Arabic and some not. English plays are from time to time translated and sometimes not. Jordanian audience is expected to 'dubbed' English and through it to English and American culture. For example, the people living in all Jordanian cities, towns, have the opportunity to watch two Jordanian foreign channels and hundreds of foreign channels are also available such as Euro news, NBC, CNN, BBC, ALJAZZERA English channels, etc., and especially the American channels, world net. These channels can be easily by purchased it through local shops. Researcher is needed to determine just how much English is offered by these channels which already mentioned. Apart from this, it is not uncommon to English words in news broadcasts and advertisements. There appears to be some type of snob appeal about using English in these contexts. For instance, when an English word or phrase is given for a product in the middle of a Jordanian commercial, people tend to believe that the product is more popular abroad and hence fashionable. This usually helps sell the product. All these forms of mass media are easily accepted by Jordanians, already familiar with French culture. The mass media sometimes serve education for example, pop songs, on international hit parades, usually delivered in English, are seldom used as a means to teach vocabulary, and students appear enjoy this so much.

#### VII. FOCUSES AFFECTING THE SPREAD OF ENGLISH IN JORDAN

There is no study of language can ignore the forces that interfere with existing social patterns and create, increase or reduce the spread of a language. It is however, more difficult than one might believe to delineate clearly the relationship between society and language spread because past, more recent, and possible future events and changes play roles which are sometimes difficult to assess empirically. However, one can say that in Jordan, various linguistic and nonlinguistic changes are the root of better qualified as intervening variables. The international status of English is a significant cause.

#### VIII. THE INTERNATIONAL STATUS OF ENGLISH

Fishman et al. (1977) said that the summary of the unique position of English, thus (English) is the language of diplomacy, the predominant language in which mail is written, the principal language of aviation and radio broadcasting, the first language of nearly 300 million people and an additional language of perhaps that many more.

The fields in which English is used involve crucial intensives interaction between nations if we compare English and Chinese and Russian, for example, we will notice that on the one side, Mandarin is used by more people than English but in key domains which involve international interaction, a fact which makes it less important internationally. On the other side, given that languages are not inherently more powerful than others but their users can be, and that Russians are as powerful as Americans, it is paradoxical fact that Russians is not used in key international domains, a fact which diminishes its international strength.

#### IX. POLICY OF EDUCATION

The general policy adopted by both decision makers and educationalists in Jordan constitutes a considerable force in the spread of English in the Kingdom of Jordan. Jordan has always an open country and foreign language instruction has always been a necessary part of the schools and university syllabuses. Jordanian is exposed to English at the early age of six, since 1990s. Likewise, language departments have always existed in Jordanian universities and course designers, trainers, supervisors, assessors, that are language policy makers, have always allocated a sizeable role to English in school and university syllabuses. Policy makers in Jordan have certainly realized that international communication between Jordan and rest of the world could not be achieved by Arabic alone; they know that English is the key to communication in a very tangible sense. As there has never been any law specifying second or foreign language use, this has left the door open to the spread of English.

Overall, the policy adopted by Jordanian government is extremely influential in furthering the spread of English in this country. The fact that English has connotations greater than being simply the language of one specific state helps the process. More specifically, the policy in language planning encourages English as a language of wider communication but not at the expense of the Arabic, the national language. This trend is publically supported and results in an increase of exposure to English. On another level, a considerable number of English and American backed companies have set up in Jordan and the world economic forum which held several times at the Dead Sea in Jordan. The position of English is also enhanced by the fact that more English and American products are imported.

#### X. ATTITUDES TOWARD ENGLISH IN JORDAN

The status of English as a language of wider communication and the policy adopted by these decision makers are explicit causal factors in the spread of English in Jordan. Attitudes toward English in this country, being a reflection of a number of intergroup relationships, are a strong intervening variable. There

is no one can deny that attitudes bear directly on motivation and achievement. It is true that sociolinguistic attitudes, beliefs and overt patterns of behavior are basically subjective, but it is at least possible that they can be objectively investigated. The right context for the study of language attitudes, especially of those associated with English is the Jordanian educational sense; the attitudes of ordinary layman will also be investigated. It is hoped that these various sources will give a more valid and complete pictures than would any one source by itself. I shall begin by considering the attitudes of secondary school students.

#### XI. ATTITUDES OF THE SECONDARY SCHOOL STUDENTS

Guebel's (1976) confirmed that in his survey which was meant to elicit reactions to English among secondary school students, 73% of fourth form students believe that English is the foreign language they would like to study, after being asked to select from a set containing English, Spanish, Italian, German, French, etc. These students have already taken English but they plan to increase their knowledge to get better job in future. As to 56 and 70 from the students a result of 95% of them favoring English was obtained. With a similar goal of finding out the general attitude of secondary school students toward English, among other languages, Elbiad (1985) claimed that the used set of 13 adjectives which can be categorized as (1) esthetic for instance, romantic, (2) practical (for instance precise), (3) positive for instance useful and (4) negative for instance difficult. The results of investigation reveal that when respondents are given an alternative between English and other foreign languages they tend to select English for the better future; even English is considered as a colony language. English is perceived by these students as being more impressive, more developed and more technical, (72% of the students rank English, as being more useful for the future of Jordan, and as opposed to 28% who see Arabic as such). Moreover, more students wish they could speak and write English rather than any other foreign languages.

#### XII. ATTITUDES OF UNIVERSITY STUDENTS

In attempt to investigate the attitudes of the university students toward English, I submitted a questionnaire sample of university students. Several observations perhaps are made regarding the responses to this questionnaire. According to my investigation, 35% of university students believed that they have selected to study English because it is the most significant foreign language, 40% believed that it will secure them a better job; and 25% claim they have selected English because they are very interested in English language and literature.

The prestigious status of English is more felt in the fields of communication and research. 41% write English outside class assignments, mostly to their love one and friends in Jordan and abroad. 48% read English and 11% speak English outside the class room. Moreover, the great majority of students, 84% believe that the general attitude toward English in society at large is positive. Thus, the university students' attitude toward English is very favorable, a fact which justifies the students' choice. As far as I have been able to determine, most of these students have strong material or instrumental insensitive, for learning English.

In addition to aforementioned percentages of students who choose English in order to have a better and good job. Most of these students believe that knowledge of English enables them to read textbooks in the university, using the internet in proper way, for instance, chatting with friends on face book, twitter all over the world. They also assume that this knowledge gives them the opportunity of getting along when abroad, or else they think that knowledge of English allows them to become broadly educated.

This instrumental motivation is significant in the sense that there is a direct correlation between an instrumental view of English and English proficiency and usage. In other words, the fact English is viewed as valuable for personal ends both results in and contributions to proficiency in English confirmed by (Quakrime 1986). University students also believe that English is suitable for more uses than Arabic or other languages universally. This is reflected in their subjective evaluations of English in terms of adjectives such as 'more beautiful' 'more musical' and 'richer' than Spanish or French.

Having considered the attitudes of secondary school and university students, we can mention the following: first secondary school and university students, as two sizable portions of society, can be told to somehow reflect the overall attitude of Jordanians, given that on the one side, these learners are in constant interaction with their families, relatives, friends, etc. On the other side, the questionnaire submitted to the sample of university students shows that the latter believe that the overall attitude toward English is positive. In fact, both people and decision makers harbor positive feelings about English. This is all encouraging in the sense that attainment has consistently matched expectation. This trend has been on the rise for a number of years now.

Secondly, if we compare the attitudes of secondary school and university students, we can tell that the attitude of the previous is more of genuine guide to the general attitude than the latter, because while the younger group has the opportunity to compare English to other languages and select one, the latter are already committed to English and hence will automatically favor it. Close to 37% are in this category, that is, the percentages of secondary school who select English. This situation has now lasted for so long that only a very restricted number of students take German, French and Spanish. This is also reflected in the size of English departments compared to German, Spanish and French departments. The phenomenon can be illustrated in part by the 'aura' which appears to characterize English in this country. Jordanian children are exposed to English at the early age of six, in life that English sounds more fashionable, modern and globally use.

In attempt to investigate the attitude of ordinary layman to English, a questionnaire (in Arabic and English) was submitted to 200 people of various ages, occupations, and interests. Among the respondents, there were teachers of Arabic, Spanish, French, and German, etc., doctors, civil servants, military officers, housewives, etc. The following are some of the findings obtained from this questionnaire. The great majority of the people, 87% believe that English even have a colony connotation for them but they still like it. Among the same percentage of people 81% believe that English is very useful language for Jordanians. The reasons they give the range from the practical utility of English particularly in international affairs and contacts to its special

utility in business and traveling, 50% of the participants hold the view that in the long run, English will emerge as a main rival to other languages and not opposed to this change.

### XIII. TOURISM

Tourism can also be stated as a force in spreading English in Jordan. In fact, it is mainly due to tourism that English is more and more tolerated outside the classroom. From the early 1980s onward, flows of tourists from Western countries and North America began pouring into Jordanian, which quickly became a significant international tourist spot. Tourists, not only from English speaking countries but from all over the world at large, use English which inevitably became a sort of lingua franca serving as a communication link between tourists guide. This intensified the influence of English on the youngsters of that generation. English has always been associated with popular waves of music such as Jazz and Rock and Roll twist etc. The gradual assimilation of these kinds of song and through them English was facilitated by the acquaintance that Jordanians had with Arabic culture.

### XIV. CONCLUSION

In Jordan, English is a foreign language which is kept mainly through the system of education and to a lesser extent through the mass media. The two state channels are constantly on the rise. Jordanians do not appear opposed to this, a fact which means that the use of English is not merely transitional; its link with education, a major field and force also constitutes a significant guarantee for its future spread. English operates like any other academic school subject and the factors which promote general academic success also promote success in English. Education being an ever dynamic domain, will always enhance the role of English because it places individuals at points of entry to many cultures and countries cross the world, a major force in the spread of any language. In fact, the demographic context of any language has a profound bearing on the spread and maintenance of that language. Jordanians are now, more than ever, fully aware of the especial significance of English. Their interest in it language is undeniable growing. An increasing number of young men and women are offered the opportunity to

learn English, a fact which naturally illustrates the strong correlation between English and youth in the Kingdom of Jordan; it is also a result of the spread of the international youth culture. In any case, it is perfect that attitudes toward English are positive because language attitudes have always constituted a strong input for language competence.

The analysis of the spread of the English in Jordan suggests that it is possible to retain a language of wider communication in functions which can be qualified as 'intergroup' or 'international' with no potential threat to the official or mother tongue language of the country. Jordan has now reached a stage of development which makes it more 'secure' in the sense that 'heated' nationalism has subsided and Jordanians can view English as an advantageous means wider communication.

All in all, thus, English looks to be making an important inroads in Jordan, infiltrating into the educational, sociolinguistic, and political life of Jordanians. It is less and less characterized by contextual specificity. I do not claim that English will be used as a medium of oral communication to the extent that Arabic is, but it is certainly making steadily head way in that direction.

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# A cybernetic modeling framework in higher education administration

## (Case study: Isfahan Medical Sciences University)

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**Abstract-** The main purpose of this research was to study cybernetic modeling framework in the Isfahan Medical Sciences University administration that was in the form of three questions with regard to model indices (decision making, leadership, equilibrium) were performed. Research methods was descriptive-survey and population consisted of all faculty members of Isfahan Medical Sciences University in the 2009-2010 academic year. To do sampling, after estimating sample size, 147 faculty members were selected randomly as statistical sample. To collect data, questionnaire of cybernetic model were used. Cronbach's alfa coefficient formula was used to determine questionnaire reliability which calculated at .90. Data were analysed using two levels descriptive statistics and inferential statistics. Findings showed that faculty members of Isfahan Medical Sciences University usage patterns of Cybernetic, in organizing its activities, the appropriate place. The results also suggest that the university, have a tendency to this pattern.

**Index Terms-** Cybernetics model, higher education, Isfahan Medical Sciences University

### I. INTRODUCTION

The world of today higher education, it is not first world. Although this may be commonplace, but it is an important fact. Today, change is a necessity, not an opportunity for higher education and universities. Students were transformed, their needs have changed, society has changed, governments have changed, as well as global life style has changed (Nechansky, 2007). Several advances have been made in recent decades in the organization and environment, and managers have been faced with a multitude of processes and organizational changes. The age of accelerating change has been called severe. Various organizations, including universities are faced with, these changes that were inevitable for the durability and survival, with its rapid and unprecedented change their tune. Also, changes in management practices and organizational leadership, is inevitable. Because traditional methods of leadership and management in today's changing conditions, lack the effectiveness it is necessary that the university leadership for the newer model need to be able to adapt to unknown phenomena in the uncertainty, through the appropriate organizations to provide guidance and requirements of complicated environment. Several models have been proposed for the management of educational organizations and universities and researchers have pointed out, university relying on specific models, are attempting to organize their activities. Acquaintance of university presidents with cybernetic management style and also led their organizations to use in such a way, more complete understanding has provide of the difficulties and complexities associated with their university functions (Birnbaum, 2003; Alwani & Shahqolyan, 2009). System approach provide a useful framework for managers and students of management can be to understand the organization and its components. This approach may provide a systemic view in the organization as a whole that to unite it components. Many of systems theorists used concepts, approaches closely related to cybernetics, control, communications, and feedback. However, systems theory focuses more on the system, while the cybernetic emphasizes more on how function system.

### II. BACKGROUND

Stafford Beer is father of management Cybernetic and also is the founder and professor in the domain of management Cybernetic. He was able the natural laws to associated with control was guiding of nature to organizational environment. He describes an efficient organization of cybernetic knowledge. Theories of Stafford Beer were derived of computer science, neural physiology, communication, logic and philosophy (Yolles, 2008).

Many words that begin with "cyber" is derived from the ancient Greeke word "kybernets" meaning steersman, steering and leader. Steersman mean that a skilled sailor, brings his ship safely to harbor (Yolles & Ye, 2010). Cybernetic in ancient Greece means the art of steering the ship was first used by Norbert Wiener as the science of monitoring, control and communication in the animal, and human machine (Wiener, 1948 ; Rudall, 2000 ; Negoita, 2002 ; Pickering, 2004 ; Glanville, 2004 ; Mezey, 2004 ; Majumder &

Majumdar, 2004; Lutterer, 2005; Nechansky, 2007; Scott, Shurvell, Maclean & Cong, 2007; Sutherland, 2007; Yolles, 2008; Trietsch, 2009; Rudall & Mann, 2009; Peters, Britz & Bulut, 2009; Brier, 2010; Nechansky, 2010; Rios, 2010). Cybernetic word reminiscent of the concepts of information, communication and monitoring and sense of control and feedback loops that comprises its central core (Zouwen & Smit, 2003).

In terms of scientific, Cybernetics knowledge speaks of self-regulated systems and is related with concepts of the Self-Regulating guidance and regulation. In this part, we refer to Stafford Beer "Father of cybernetic in management" that is well-known founders and masters in the field of management cybernetic (Pickering, 2004; Yolles, 2008). He describes as cybernetic as "the efficient organization knowledge". So far several definitions of cybernetic in the field of theoretical and practical aspects are presented.

Overall, Cybernetic is a young knowledge that of scientific based on common theoretical activities disciplines of sociology, biology, medical, physiology, economy, linguistics, psychology, logic, mathematics, engineering, control and information theory and automatic machines has occurred (Khajy, 2004; Sarnovsky, 2006; Peters, Britz & Bulut, 2009).

In this regard, we can use view Robert Birnbaum (1998) in the book "How work universities". He characterizes four assumed organization to display different patterns of management in university organization:

- a. Bureaucratic university (with rational structure and decision making)
- b. Collegiality university (based on equal division of power and values in society)
- c. Political university (competition over power and resources)
- d. Anarchical university (series of autonomous actors)

Birnbaum believes that these models are correct but incomplete, and Cybernetic University pattern as a combination of these patterns has the advantages compare to other models. (Toroghi Bydabady, 2005). In this model, the university as a system that functions is controlled by vertical feedback loops that creating and strengthening of the university structure and horizontal feedback loops that are at the root in the social system. This model refers to features of the models which can organize activities for the university systems in the new age, to be used.

Cybernetic model has four main indices:

- 1) Decision making: The decision making characteristics in the Cybernetic pattern include in numerous resources of decision-making, making a gradual or stepwise, avoid impulsive action (hasty) and focus on a few new variables instead of spending great time to analyze the possible results (Birnbaum, 2003, p. 196).
- 2) Leadership: Leadership Characteristics at Cybernetics University of are awareness into the change importance and dynamics and reform in the organization, recognition of the organization and its activities, Support of university activities, participation of other members in the leadership and management of university (Birnbaum, 2003, p. 217).
- 3) Equilibrium in the management: The purpose is balance conservation between organizational systems and attention to systems that has reduced of acceptable level and generation of restrictions for other systems that are threat involving everywhere (Birnbaum, 2003, p. 241).

### III. METHODOLOGY

This study was descriptive survey. The study population included all faculty members Isfahan Medical Sciences University in 2009-2010 academic year. To do sampling, after estimating sample size, 147 faculty members were selected randomly as statistical sample. Measuring instrument was a questionnaire-based study of Cybernetics background and scientific literature related to research. This questionnaire contained 25 questions and is with range five-item Likert scale. In order to determine its validity, content and face validity were used and were determine that this questionnaire possesses content and face validity and the questions were applicable to the subject and research purposes is approved by the experts. Formula for determining the reliability of the questionnaire was Cronbach's alfa that was estimated at .90. To analyze the data, the two-level descriptive statistics (frequencies, percentages, mean and standard deviation) and inferential statistics (t-test for univariate, multivariate analysis of variance and Levine test) was performed.

### IV. FINDINGS

**First question:** How university of Isfahan is using decision making item of cybernetic model in its affair?

Also, inferential analysis to determine the significant level of testing. "t" showed that obtained results average (3.24) was greater than (3) and it can be concluded that from viewpoint of members, decision making aspect of cybernetic model is used.

**Second question:** How university of Isfahan is using leadership item of cybernetic model in its affair?

Also, inferential analysis to determine the significant level of testing. "t" showed that obtained results average (3.35) was greater than (3) and it could be concluded that from the perspective Isfahan university administration by faculty members, leadership aspect of cybernetic model is used.

**Third question:** How university of Isfahan is using equilibrium item of cybernetic model in its affair?

Also, obtained results average of (3.38) was greater than (3) and it could be concluded, that from the perspective of faculty members, of equilibrium aspect of cybernetic model in Isfahan university administration is used.

**Table 1: Test results t, amount average use of cybernetic model indices in the Isfahan Medical Sciences University administration from the perspective of faculty members**

The average level	The average	SD	t	Significant level
3	3.24	0.81	5.55	0.001
3	3.35	0.82	7.90	0.001
3	3.38	0.81	8.47	0.001

## V. CONCLUSION

Results concerning the implementation of Cybernetic model aspects at Isfahan Medical Sciences University administration showed that based on view point the faculty members, the model of Cybernetic at the University is present. The results of decision making based on the model of Cybernetics at Isfahan Medical Sciences University showed the status of faculty members in decision making is appropriate. In the other words, items such as decisions based on a predetermined process, to determine the necessary measures to deal with environmental challenges, to gather information before making decision, managers make decisions independently, clear decision making, immediate solving problems in the sub-units, numerous sources and references at decision making. Decision making is one of the most important management practices. Yolles & Ye (2010) argue that group decision-making in the cybernetic systems is an intelligent factor in solving problems. Findings of the present research findings is coordinate to Bazrafshan Moghaddam (2006) findings because in the aforesaid research was also reported that Ferdowsi University of Mashhad in the decision making component is consistent with the pattern of Cybernetic.

The results of the status leadership indice based on the model of Cybernetics at the Isfahan Medical Sciences University indicates that these components are implemented in university based on the pattern of cybernetic. In other words, items such recognition manager of university activities, Support of scholarship and quality research, manage the activities of work unit, Intelligent interventions to address existing problems in current operations, led to processes that the release of information in the university.

The results of the equilibrium in the management of status based on models of cybernetic at the University of Isfahan indicates that the balance in university based on cybernetic system. In other words, from the perspective of faculty members in cases such as the managers advocating of the bureaucratic, political, collegiality elements, being appendix president to the complex network of universities, the growing restrictions on some units that are extreme, being aware university president the variability of the University, to strengthen activities in areas where there is no acceptable level of support and commitment to shared values and interests of minority groups in the university. The in the equilibrium management of properties and the subject of Cybernetics Systems. Rios(2010) has also been reported.

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# “Kinetics and mechanism of oxidation of mandelic acid by N-bromoanisamide”

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## Abstract

The kinetics of the oxidation of the mandelic by N-bromoanisamide has been studied in 40% acetic acid medium in the presence  $\text{HClO}_4$  and of  $[\text{Hg}(\text{OAc})_2]$ . The reactions exhibit a first order rate dependence with respect to oxidant and fractional order with respect to substrate. The reaction rate decreases slightly with increasing the concentration of  $[\text{H}^+]$  and retarded by the addition of anisamide, (as one of the oxidation product of oxidant). The decrease in dielectric constant of the medium decreases rate of the reaction. Increase in ionic strength, by the addition of sodium perchlorate has no effect on the rate constant. The effect of temperature on the reaction has been investigated in the temperature range 308-323 K. The activation parameters were calculated and a possible operative mechanism was proposed.

Keywords: mandelic acid; oxidation; mechanism; N-bromoanisamide.

## Introduction

N-halo compounds are commonly used for oxidation of various organic compounds such as alcohols, aldehydes amino, acids keto-acids and hydroxy acids etc. The kinetics of  $\alpha$ -hydroxy acids has been studied with N-halocompounds like N-bromoacetamide<sup>1,2</sup> N-bromosucciniamide<sup>3</sup>, N-bromophthaliamide<sup>4,5</sup> N-bromobenzamide<sup>6</sup> N-Chlorosaccharin<sup>7,8</sup> N-halosulphonamides<sup>9-11</sup> (brommine-B chloamine-B, chloramine-T) and other oxidants<sup>12-16</sup>. As similar to other N-halo compounds, N-bromoanisamide also a potent oxidant. Only few works have been done on N-bromoanisamide as an oxidant in acidic medium. We now report the kinetics and mechanism of oxidation of mandelic acid by N-bromoanisamide. Mandelic acid is the smallest  $\alpha$ -hydroxy acid among compounds which have aromatic group. It is excreted well in urine & used as antiseptic ingredient particularly against urinary tract infections. Mandelic acid and its derivatives are used to apply the dual activities as an antibacterial agent and as antiaging agent.

## Materials and Method

All the reagents employed in the kinetic investigation were of analytical grade. Double distilled water employed in kinetic run. To prevent photochemical effect, the freshly prepared solution of N-bromoanisamide was stored in brown colored bottle and its strength was checked iodometrically.

### Kinetic Measurement:-

The reaction was studied at constant temperature  $35^\circ\text{C}$  ( $\pm 0.1^\circ\text{C}$ ) under the pseudo-first order condition  $[\text{MA}] \gg [\text{NBA}]$  in 40% aqueous acetic acid medium. The reaction was initiated by addition of requisite amount of NBA to reaction mixture containing substrate, mercuric acetate, perchloric acid. The Progress of reaction was monitored by measuring unconsumed NBA iodometrically using 1% starch as an indicator.

**Stoichiometry And Product Analysis:-**

The stoichiometry of the reaction was ascertain by equilibrating the reaction mixture containing an excess of [NBA] >> [MA], HClO<sub>4</sub>, mercuric acetate in 40% acetic acid at 35<sup>0</sup>C for 48h. The unconsumed oxidant (NBA) was determined iodometrically, and it was found that one mole of mandelic acid consumed one mole of NBA. Thus the ratio of consumption of substrate to oxidant is 1:1



Bezaldehyde was found as the end product of oxidation, and identified by the spot test and 2:4 dinitrophenylhydrazine method.

**Results and Discussion**

The oxidation of mandelic acid by N-bromoanisanide was kinetically probed at several initial concentrations of the reactants in acid media. The salient features obtained are discussed. The rate constant k<sub>1</sub> calculated, under the pseudo-first order condition [MA] >> [NBA] at constant HClO<sub>4</sub>, [Hg(AcO)<sub>2</sub>], solvent composition and temperature, results are given in (Table-1) Plots of log(a-x) vs. time were linear, indicating a first order dependence of rate on [NBA]. The values of k<sub>1</sub> calculated from these plots are unaltered with variation of oxidant, conferring the first order dependence on [NBA].

**Table-1: Effect of NBA on the reaction rate at 35<sup>0</sup>C in presence of 40% acetic acid**  
 HClO<sub>4</sub> = 0.01 M; Mandelic Acid = 3.5 x10<sup>-2</sup> M; Temp. = 308K  
 [Hg(AcO)<sub>2</sub>] = 0.002M; Solvent; AcOH-H<sub>2</sub>O = (v/v) 40%

NBA × 10 <sup>-3</sup> M	k × 10 <sup>-3</sup> min <sup>-1</sup>
2.5	4.055
3.5	4.055
4.5	4.053
5.5	4.057
6.5	4.051
7.5	4.052

The rate constants (k<sub>1</sub>) have been found to increase with increase in the concentration of mandelic acid and plots of k<sub>1</sub> vs. [MA] was linear with slope less than unity, indicating fractional order dependence with respect to mandelic acid. (Table-2)

**Table-2: Effect of Substrate, HClO<sub>4</sub>, CH<sub>3</sub>COOH on the reaction rate**  
 NBA = 4.5 x10<sup>-3</sup> M; [Hg(AcO)<sub>2</sub>] = 0.002M; Temp. = 308 K

Substrate × 10 <sup>-2</sup> M	HClO <sub>4</sub> × 10 <sup>-2</sup> M	CH <sub>3</sub> COOH % (v/v)	k × 10 <sup>-3</sup> min <sup>-1</sup>
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1.5	1	40	2.630
2.5	1	40	3.345
3.5	1	40	4.053
4.5	1	40	4.828
5.5	1	40	5.178
6.5	1	00	5.577
3.5	0.50	40	5.253
3.5	0.75	40	4.549
3.5	1.00	40	4.053
3.5	1.25	40	3.716
3.5	1.50	40	3.061
3.5	1.75	40	2.182
3.5	1	40	4.053
3.5	1	50	3.345
3.5	1	60	2.630
3.5	1	70	1.961

The rate constant  $k_1$  decreased with increase in the concentration of  $\text{HClO}_4$  (**Table-2**) this may due to protonation of the substrate. The plot of  $\log k_1$  vs.  $[\text{HClO}_4]$  is linear with negative slope. The slope being less than unity indicates inverse fractional order dependence on  $\text{HClO}_4$ .

Addition of mercuric acetate to the reaction mixture showed an insignificant effect on the rate of reaction, suggesting that mercuric acetate act as a bromide ion scavenger only, in the form of  $[\text{HgBr}_4]^{-2}$

Successive addition of anisamide (as one of the oxidation product of oxidant) to the reaction mixture showed decreasing effect on the rate of oxidation of mandelic acid. Addition of  $\text{NaClO}_4$  (to study the effect of ionic strength) in the reaction mixture showed an insignificant effect on the rate of oxidation.

In order to find the effect of dielectric constant (polarity) of the medium on the rate, the reaction was studied in aqueous acetic acid mixture of various compositions (**Table-2**). The data clearly reveal that the rate of reaction increase with a decrease in the percentage of acetic acid, i.e., increasing dielectric constant or polarity of the medium leads to the inference that there is a charge development in the transition state involving a more polar activated complex than the reactants. (Laidler KJ 1965 Tata Mc. Graw Hill, New Delhi pp 229)

### Effect of Varying Temperature:-

The rate constant was measured at four different temperature and the results are summarized in (**table-3**). Using Arrhenius equation the energy of activation for substrate has been calculated and this value subsequently utilized in computing various activation parameters. (**Table-4**)

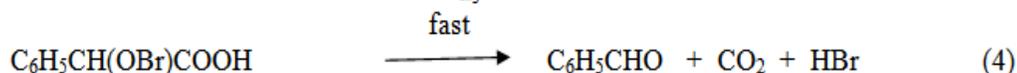
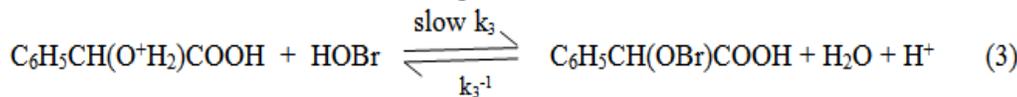
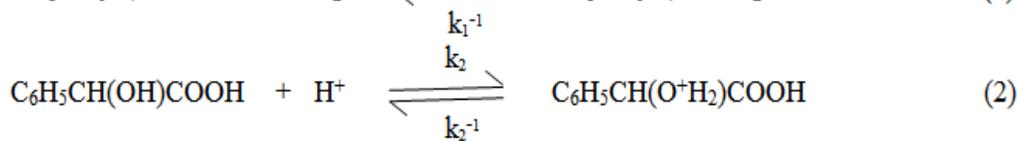
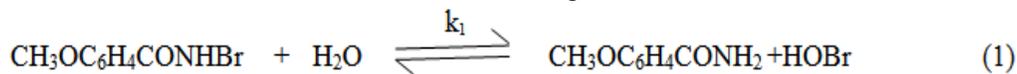
**Table-3** Effect of Temperature, on the reaction rate  
 NBA =  $4.5 \times 10^{-2}$  M; Mandelic Acid =  $3.5 \times 10^{-2}$  M;  $\text{HClO}_4 = 0.010$  M;  
 $[\text{Hg}(\text{AcO})_2] = 0.002$  M; Solvent; AcOH- $\text{H}_2\text{O} = (\text{v/v}) 40\%$

Temperature K	$k \times 10^{-3} \text{ min}^{-1}$
308	4.053
313	5.866
318	8.176
323	12.039

**Table-4:** Activation Parameters for the oxidation of mandelic acid  
 NBA =  $4.5 \times 10^{-2}$  M; Mandelic Acid =  $3.5 \times 10^{-2}$  M;  $\text{HClO}_4 = 0.010$  M  
 $[\text{Hg}(\text{AcO})_2] = 0.002$  M; Solvent; AcOH- $\text{H}_2\text{O} = (\text{v/v}) 40\%$

Reaction In	Substrate	Ea (kJ mol <sup>-1</sup> )	ΔH* (kJ mol <sup>-1</sup> )	-ΔS* (J K <sup>-1</sup> mol <sup>-1</sup> )	ΔG* (kJ mol <sup>-1</sup> )	Mechanism view of these
	Mandelic Acid	57.16	54.60	105.45	87.08	

observations, a probable mechanism for the oxidation can be given as shown in scheme -1



**Scheme-1**

From the above mechanism, the following rate equation is derived.

$$k_{\text{obs}} = \frac{k_1 k_2 k_3 [\text{H}^+] [\text{Substrate}]}{[\text{Anisamide}][k_2^{-1} + k_3]}$$

Above rate equation is in good agreement with the experimental result.

### Conclusion

Kinetic studies demonstrate that the complex between substrate and oxidant decompose to give product. The experimental stoichiometry is in good agreement first order to oxidant and fractional order to substrate at higher concentration is supported by derived rate equation.

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# Software Project Tracking and Oversight and Its Different Measures

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**Abstract-** Software Process Improvement is one of the most crucial step that the software organizations need to follow. The software process improvement is dynamic. Different software process models have been developed and have different process areas that help an organization to produce a quality product. The software project tracking and oversight is a process area that is common to most of the software process improvement (SPI) models and plays a great role in order to produce a quality product and deliver it on time. This paper introduces the various measures that is used for software project tracking and oversight and the percentage of use of these measures in different small and medium enterprises (SMEs) of India.

**Index Terms-** Activities, Performance, Quality, Resource, Software Project Tracking and Oversight

## I. INTRODUCTION

Different software process models are developed to help different software organization to produce a quality product and compete with the changing market demands. The different software models that are studied are CMM[1], PSP[2], TSP[3], CMMi[4], Six-Sigma[5][6], P-CMM[7], Malcolm Balridge National Quality Award (MBNQA)[8], SE-CMM[9], ISO 9000[10][11], Trillium model[12], SPICE[13], BOOTSTRAP[14], ISO/IEC 12207[15], SECAM[16], SDCE[17], TickIT[18], IEEE 1220[19], IDEAL model[20], PRISMS[21], K-model[22] and TRISO[23].

## II. SOFTWARE PROJECT TRACKING AND OVERSIGHT

The main objective of software project tracking and oversight means to have an accurate visibility over actual project development progress and the management can take action when the project development progress is not according to software project plans. The software project tracking and oversight are measured in terms of activities, resource information and performance and quality information. It's the foremost preliminary step for proceeding with any research work writing. The software project tracking and oversight process area is included CMM, CMMi, PSP, TSP, Six-Sigma, TRISO, ISO 9000, BOOTSTRAP, SECAM, SDCE, and TickIT. The process areas of different software process models are identified and the location of software process tracking and oversight in the different SPI models. The TRISO model process areas consist of 3 levels. The first level consist of process areas from CMMi and is known as Process Capability Maturity (PCM) and the second level process areas consist from the P-CMM and is known as Human Capability Maturity (HCM)[23]. The Bootstrap model integrates process areas from CMM, ISO 9000, ISO/IEC 12207 and ISO/IEC 15504[24]. ISO 9000 contains the process areas of CMM and SE-CMM [25].

Table I: Process areas of CMM, PSP, TSP

Maturity Levels	Key Process Areas
5. Optimizing	Process Change Management (CMM, PSP, TSP) Technology Change Management (CMM, PSP, TSP) Defect Prevention (CMM, PSP, TSP)
4. Managed	Software Quality Management (CMM, PSP, TSP) Quantitative Process Management (CMM, PSP, TSP)
3. Defined	Peer Reviews (CMM, PSP, TSP) Intergroup Coordination (CMM, TSP) Software Product Engineering (CMM, PSP, TSP) Integrated Software Management (CMM, PSP, TSP) Training Program (CMM, PSP) Organization Process Definition (CMM, PSP, TSP) Organization Process Focus (CMM, PSP, TSP)
2. Repeatable	Software Configuration Management (CMM, TSP)

	Software Quality Assurance(CMM ,TSP) Software Subcontract Management(CMM) Software Project Tracking and Oversight(CMM,PSP,TSP) Software Project Planning(CMM,PSP,TSP) Requirement Management(TSP)
1.Initial	

Table 1 shows the process areas of CMM, PSP and TSP.The Software Project Tracking and Oversight is located in the Repeatable maturity level.

Table II:Process areas of CMMi,SS and TRISO

Maturity Levels	Key Process Areas
5.Optimizing	Organizational Innovation and Deployment(CMMi ,SS,TRISO) Causal Analysis and Resolution(CMMi,SS,TRISO)
4.Quantitatively Managed	Organizational Process Performance(CMMi ,SS,TRISO) Quantitative Project Management(CMMi ,SS,TRISO)
3.Defined	Requirements Development(CMMi ,SS,TRISO) Technical Solution(CMMi,TRISO) Product Integration(CMMi,TRISO) Verification(CMMi,SS,TRISO) Validation(CMMi,SS,TRISO) Organizational Process Focus(CMMi,SS, TRISO) Organizational Process Definition(CMMi,SS,TRISO) Organizational Training(CMMi,SS,TRISO) Integrated Project Management(CMMi ,SS,TRISO) Integrated Supplier Management(CMMi,TRISO) Risk Management(CMMi,TRISO) Decision Analysis and Resolution(CMMi,SS,TRISO)
2.Managed	Requirements Management(CMMi ,SS,TRISO) Project Planning(CMMi,SS,TRISO) Project Monitoring and Control(CMMi,SS,TRISO) Supplier Agreement Management(CMMi,TRISO) Measurement and Analysis (CMMi,SS,TRISO) Process and Product Quality Assurance(CMMi,TRISO) Configuration Management(CMMi,TRISO)
1.Performed	

Table 2 shows the process areas of CMMi, and SS.The function of Software Project Tracking and Oversight process area is done by Project Monitoring and Control process area.The process area is located in the Managed maturity level.Thefirst level of TRISO contains the process areas of CMMi.

Table III:Process areas of SECAM

1.Management	2.Organization	3.Systems Engineering
1.1.Planning 1.2.Tracking and Oversight 1.3.Sub-Contract Management 1.4.Inter-group Coordination 1.5.Configuration Management 1.6.Quality Management 1.7.Risk Management 1.8.Data Management	2.1.Process Management and Improvement 2.2.Competency Development 2.3.Technology Management 2.4.Environment and Tool Support	3.1.System Concept Definition 3.2.Requirement and Functional Analysis 3.3.System Design 3.4.Integrated Engineering Analysis 3.5.System Integration 3.6.System Verification 3.7.System Validation

Table 3 contains the process area of SECAM.The Software Project Tracking and Oversight is named as Tracking and Oversight in Management category.

Table IV:Process areas of SDCE

1.Program Management	1.1.Management Authority, Responsibility and Accountability 1.2.Program Planning and Tracking 1.3.Sub-Contractor Management 1.4.Legal and Contracting Issues 1.5.Risk Control	2.System Engineering	2.1.System Requirement Development,Management and Control 2.2.Computer System Architecture Design and Review Process 2.3.Supportability 2.4.Intergroup Coordination 2.5.System Engineering Planning 2.6.System Integration and Test 2.7.Reuse
3.Software Engineering	3.1.Software Development Planning 3.2.Software Project Tracking and Reporting 3.3.Software Requirements Management 3.4.Software Design 3.5.Software Coding and Unit Testing 3.6.Software Integration and Test	4.Quality Management and Product Control	4.1.Software Quality Management 4.2.Software Quality Assurance 4.3.Defect Control 4.4.Metrics 4.5.Peer Reviews 4.6.Internal Independent Verification and Validation 4.7.Software Configuration Management 4.8.Documentation
5.Organizational Resources and Program Support	5.1.Organizational Standards and Procedures 5.2.Facilities 5.3.Training 5.4.Human Resources 5.5.Technology Assessment and Transition 5.6.Organizational Process Management 5.7.System/Software Engineering Environment	6.Program Specific Technologies	6.1.Artificial Intelligence 6.2.Safety Critical Digital Systems 6.3.Complex Hardware Development 6.4.Database Management

Table 4 contains the process area of SDCE.The software project tracking and oversight process area is named as software project tracking and reporting in software engineering category.

### III. SOFTWARE PROJECT TRACKING AND OVERSIGHT AND ITS MEASURES

A survey is made in different software development small and medium enterprises(SMEs) in India.The survey is all about the use of different process areas in SMEs.A questionnaire consisting of 22 software process improvement models and 278 process areas are surveyed.The names of different SMEs where the survey is conducted are FutureSoft,IT Pyramid,Zaloni Technologies,DZ Engineering,Aon Hewitt,CGI Technologies,IAG Automation,SIQUES,Vacpic Technologies Pvt Ltd,Aris Global Software Pvt Ltd,Yodlee Pvt Ltd,Roma Think Soft,Exilant Technologies Pvt Ltd,Xixom Technology,IQ Systems India Pvt Ltd,Globrin Technologies,Targus Technologies and Verschaska Infotech Pvt Ltd.

The percentage of use of different measues are

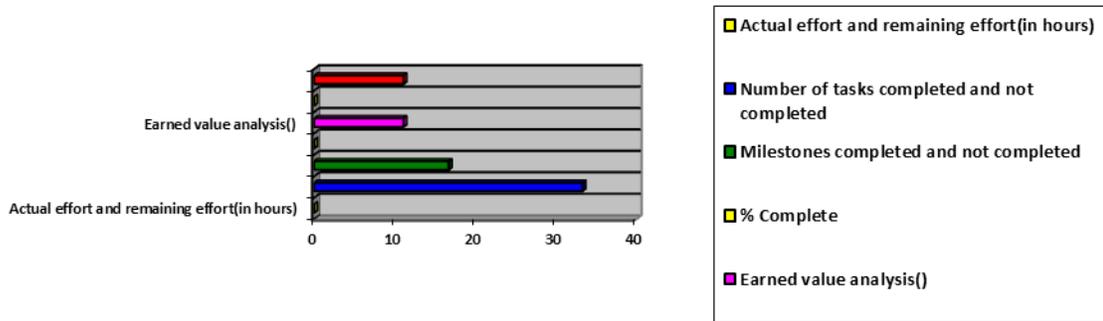


Fig 1: Percentage of use of Software Project Tracking and Oversight Measures (in terms of activities)

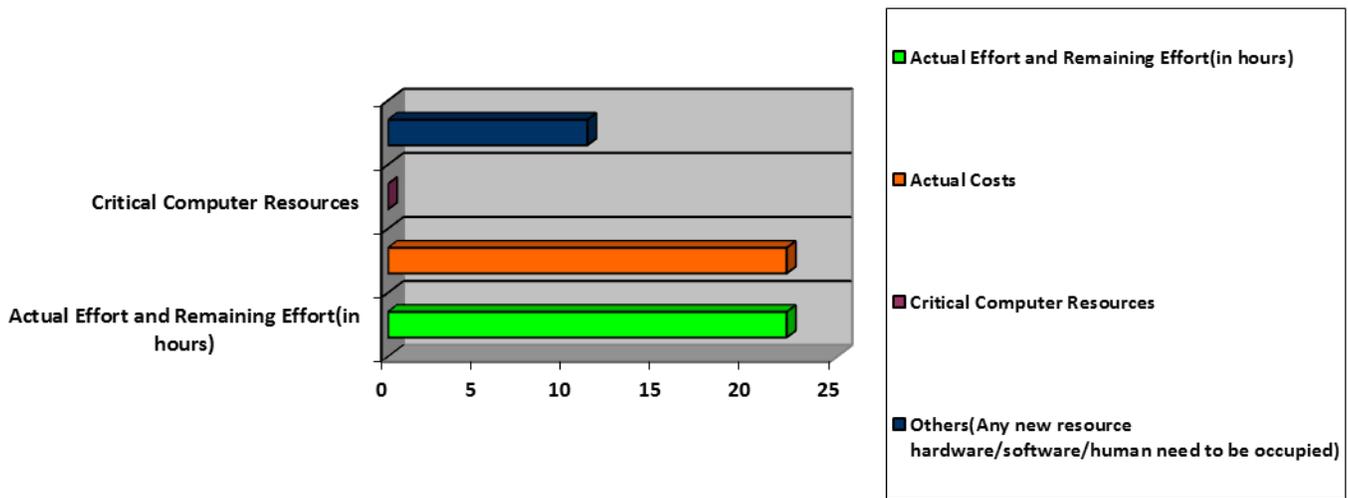


Fig 2: Percentage of use of Software Project Tracking and Oversight Measures (in terms of resource information)

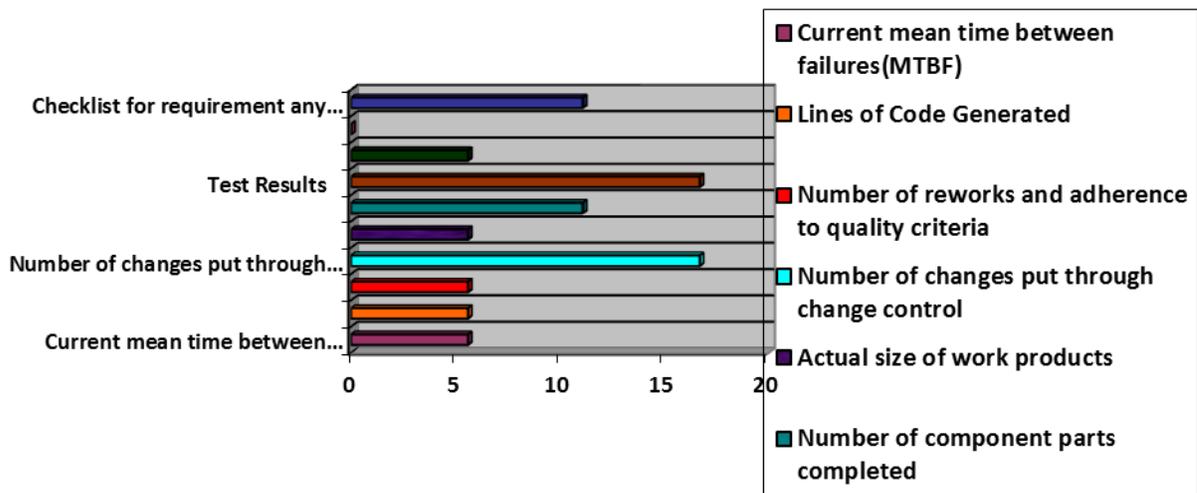


Fig 3: Percentage of use of Software Project Tracking and Oversight Measures (in terms of performance and quality information)



even if you have many acknowledgments.

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# In-vitro effect of lead and temperature in blood of broiler chicken (Hybro hisex)

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**Abstract-** Environmental pollution as a result of anthropogenic activity has raised the possibility of pollution with heavy metals. A serious threat in general for health of living organisms is pollution with lead, because lead has a wide range of use and it is listed after iron, copper and zinc. The level of inhibition of ALA-D activity in erythrocyte is used as a biological index for exposure to lead not only in human population but also in wild species, which are environmentally exposed to lead. The aim of current research is to investigate in-vitro effect of lead in different concentration (2-10 $\mu$ % and 20-100 $\mu$  %) in activity of ALA-D in blood hemolysate of broiler chicken (Hybro hisex). It is also analyzed the effect of higher temperature in activity of ALA-D (37°C, 42°C, 50°C and 60°C). The research was performed in broiler chicken blood which were grown in a professional farm and feed with commercial food. It was demonstrated that in all concentration of lead, ALA-D is slightly inhibited. The high temperature (50°C and 60°C) has increased activity of enzyme compared with activity of enzyme in 37°C and 42°C.

**Index Terms-** blood, lead, ALA-D, chicken

## I. INTRODUCTION

Pollution with lead in general is a serious threat for health of all living organisms. Hence, lead is one of the limited class of elements that can be described as purely toxic. Lead is distributed in environment because it has wide range of use and it is listed after iron copper and zinc. Lead has multiple negative effects in all living organisms affecting nervous system, hematological system, reproduction system and their behavior (Demay et al, 1982, Eisler, 1988).

In living organisms, lead enters through inhalation (by breathing), or by ingestion (during feeding) and blood is the main carrier of lead from gastrointestinal system in all other systems of the body (Anders et al, 1982).

Inhibition of ALA-D activity has become as standard method to verify intoxication with lead not only in human population but also in animals. In avian lead is found to be more potent inhibitor of ALA-D activity than copper, cadmium or mercury (Scheuhammer, 1987). Chickens are also very sensitive in lead intoxication and amount of 1.0 mg/kg of lead in their food regime can cause depression of growth and reduction of ALA-D activity. Clinical signs of lead intoxication in chicken include muscle weakness anorexia followed with body weight lose and eventually with interruption of egg production. Young chickens are found to be more sensitive in lead intoxication than older.

Ingested lead in chicken is deposited in bones, in soft tissues and egg, and results with high lead level in blood (Vengris and Mare, 1974). Eggs accumulate lead in shell, albumins and in egg yolk (Trampel et al, 2003).

Investigation of Stone et al (1976) done in Japanese Quail showed that consume of 25 ppm of lead does not show any effect in body weight, size of kidneys or lung, but ALA-D activity was inhibited for 45 % compared with the control group.

Many reports (Ohi et al; 1974, Huton and Goodman, 1980; Gonzales and Tejodor, 1992), confirm hypothesis that avian are sensitive indicator of environmental pollution with lead and they respond with inhibition of ALA-D quickly than other species.

The aim of current investigation is to verify in-vitro effect of lead in different concentrations (2-10 $\mu$ % and 20-100 $\mu$  %) in ALA-D activity in blood hemolysate of chicken and effect of high temperature (50°C and 60°C) in the reactivation of the enzyme.

## II. MATERIALS AND METHODS

Blood samples were taken from chickens which were grown in professional farm and feed with the commercial food. Experiments were performed with more than one individual. The age of individuals was not taken in consideration. The blood lead level was determined in advance. Blood was treated with lead acetate, and for that purpose lead acetate stock solution was prepared and was diluted twice with destilated water in portion 1:9.

With heparinised syringe by punctuation, blood was taken directly from hart and then is carried into test tubes which were wrapped with aluminium folio and heprinized with 0.002 ml heparin/ml blood. For different lead concentration, two series of test-tubes were prepared with nine tubes for each series. In a first experiment, blood was treated with lead in cocntrations from 2-10 $\mu$ % and in second experiment blood was treated with lead from 20-100 $\mu$ %, after lead treatment, blood was stored in refrigerator till day of analyses.

In each of two experiments, blood hemolysate was incubated in different temperatures (37°C, 42°C, 50°C and 60°C) for sixty minutes.

Blood lead level was determined with flame atomic absorption spectrometry, method by Milic (Milic, 1985).

The activity of D-ALA (EC.4.2. 1.24) was estimated according to the European standardized method of Berlin and Schaller (1974):

$$ALA - D (U / LE) = \frac{A_{555} \text{ corrected}}{\% Hct} \times 1881,7$$

Statistical software Sigmapstat was used for processing results of investigation and presented as average values with corresponding standard deviations.

### III. RESULTS

Effect of low concentration of lead (2-10 $\mu\text{g}\%$ ) and influence of different temperatures (37 $^{\circ}\text{C}$ , 42 $^{\circ}\text{C}$ , 50 $^{\circ}\text{C}$  and 60 $^{\circ}\text{C}$ ) in activity of ALA-D activity in blood hemolysate of chicken is presented in Fig. 1.

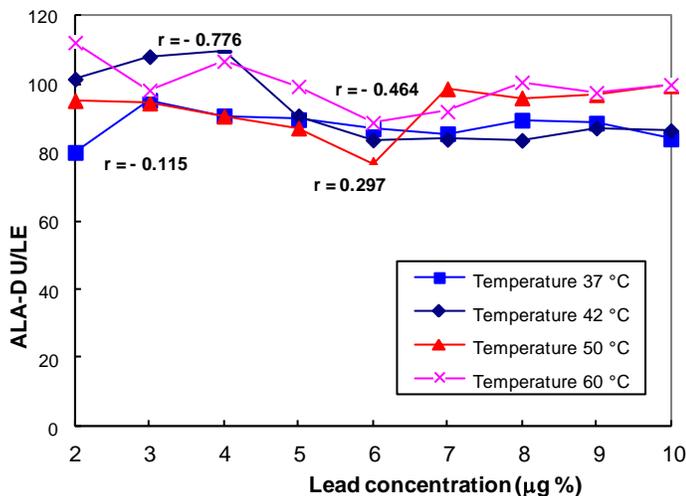


Fig. 1: Correlation between ALA-D activity and lead concentration (2-10  $\mu\text{g}\%$ ) in different temperatures (37 $^{\circ}\text{C}$ , 42 $^{\circ}\text{C}$ , 50 $^{\circ}\text{C}$  and 60 $^{\circ}\text{C}$ )

Figure 1 shows that lowest activity of ALA-D is marked in 37 $^{\circ}\text{C}$  and it is 80 - 95 ALA-D U/LE. In 42 $^{\circ}\text{C}$  which is normal body temperature of avian in beginning enzyme activity is higher than in previous temperature but after concentration of 5  $\mu\text{g}\%$  until 10 $\mu\text{g}\%$  of lead it fall down and it remains almost unchanged. Enzyme activity is shown to be lower in 50 $^{\circ}\text{C}$  than in 42 $^{\circ}\text{C}$  and it is almost same in all concentrations of lead. An increase of ALA-D activity is marked in 60 $^{\circ}\text{C}$ .

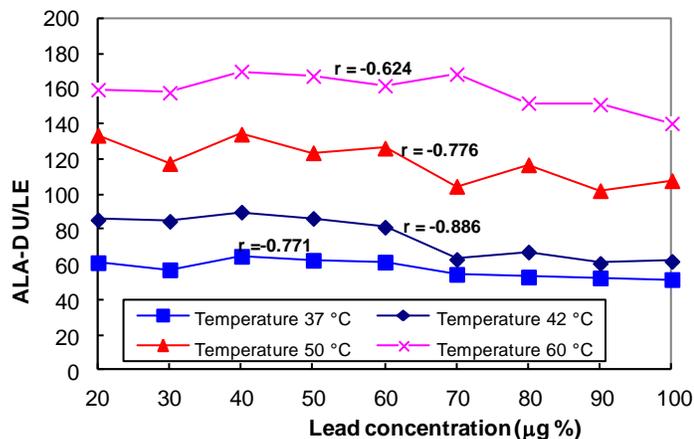


Fig. 2: Correlation between ALA-D activity and lead concentration (20-100  $\mu\text{g}\%$ ) in different temperatures (37 $^{\circ}\text{C}$ , 42 $^{\circ}\text{C}$ , 50 $^{\circ}\text{C}$  and 60 $^{\circ}\text{C}$ )

Effect of high lead concentration in activity of ALA-D is presented in Fig.2. It is shown that in temperature of 37 $^{\circ}$ , activity of ALA-D is very low and almost same in all concentration. In temperature of 42 $^{\circ}\text{C}$  activity of ALA-D is in negative correlation with lead concentration. Further fig. 2 indicates that in 50 $^{\circ}\text{C}$  activity of enzyme is higher than in 42 $^{\circ}\text{C}$  but with the same trend of ALA-D inhibition in both temperatures. The highest activity of ALA-D activity is marked in temperature of 60 $^{\circ}\text{C}$ .

### IV. DISCUSSION

The level of inhibition of ALA-D activity in erythrocyte is used as a biological index for exposure to lead not only in human population but also in wild species, which are environmentally exposed to lead. Test of ALA-D inhibition as index of lead exposure has many advantages than other biochemical tests because:

1. ALA-D is inhibited before any other effect appears.
2. In human population ALA-D is inhibited even in low concentration.
3. Inhibition is indirect proportional with lead level.
4. Spontaneous regeneration of inhibited ALA-D is very slow.

In current investigation in which in-vitro effect of lead was investigated is demonstrated that the test of inhibition of ALA-D is not reliable.

Results of the present study has shown slight inhibition of ALA-D activity in all concentration of lead (2-100 $\mu\text{g}\%$ ) after incubation of hemolysate in different temperatures ( $^{\circ}\text{C}$ , 42 $^{\circ}\text{C}$ , 50 $^{\circ}\text{C}$  and 60 $^{\circ}\text{C}$ ). These results are compatible with results of Pauza, et al (2005) obtained from their investigation in chicken embryo treated with lead.

High activity of ALA-D after incubation in high temperatures obtained in current research is in harmony with the results of Scheuhammer, (1987), who has observed increase of activity for 20% in 42 $^{\circ}\text{C}$  compared to 37 $^{\circ}\text{C}$ , and also observed that lead is 10-100 times more potent inhibitor of ALA-D activity than Cu, Cd or Hg.

However many reports of different authors showed that lead is more inhibitor of ALA-D activity in-vivo than in in-vitro in different living organisms.

Elezaj et al (2004) has observed negative correlation of ALA-D activity and lead in blood of pigeon (*Columbia livia*) collected in three different areas (Mitrovica, Prishtina and Zatriq).

The research done by Bakalli (1990) with chicken (*Hybro hisex*) exposed to lead in region of Mirtovica shows negative correlation of ALA-D activity and lead compared to the control group.

In current investigation use of ALA-D activity as index of lead exposure in context of environmental studies could not be reliable because the ALA-D shown to be not sensitive in in-vitro exposure with lead. Results shows lower activity of ALA-D in blood hemolysate of chicken treated with lead than ALA-D activity of human blood hemolysate in same condition.

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# Access Control in Cloud Computing

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**Abstract-** Cloud computing is an advanced emerging technology. In this world the storage of data is a big headache for all. Cloud computing is an efficient solution for the easiest and fastest storage and retrieval of data. The main issue in cloud computing is security. Here I am trying to introduce a new method for providing secured access control in cloud computing. This model provides a secure access control in cloud computing. To provide more secured access control it adopt a hierarchical structure and it uses a clock. Using this we can easily upload, download , delete files from and to the cloud.

**Index Terms-** Access Control, Cloud Computing, Privacy in Cloud.

## I. INTRODUCTION

Cloud computing is one of the emerging technologies. It represents a real paradigm shift in the way in which systems are deployed [8]. As per National Institute of Standards and Technology [3], it is defined as,

*“Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.”*

This cloud computing has a lot of advantages especially in ubiquitous services where everybody can access computer services through internet. With cloud computing, you can develop a device which contains a small display, processor and RAM. There is no need of other hardwares such as secondary memory. It will reduce the size of our new technology devices. Also it reduces the expences of our system.

Cloud computing incorporates virtualization, on-demand deployment, Internet delivery of services, and open source software [1].The following figure shows the cloud computing model.

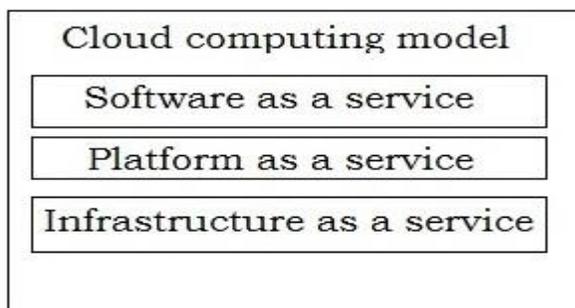


Figure 1: Cloud Computing Model

- SaaS- To use the provider’s applications running on a cloud infrastructure and accessible from various client devices through a thin client interface such as a Web browser.
- PaaS- To deploy onto the cloud infrastructure consumer-created applications using programming languages and tools supported by the provider ( java, python, .Net)
- IaaS- To provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications

Along with the development of cloud applications, the cloud computing attacks are also increased. The main attacks on cloud are [1],

- Denial of Service (DoS) attacks
- Side Channel attacks
- Authentication attacks
- Man-in-Middle cryptographic attacks
- Inside-job attacks

Due to this attacks, we need a better security policy in cloud computing. Access control is generally a policy or procedure that allows, denies or restricts access to a system [7]. It may also identify users attempting to access a system unauthorized.

Access Control allows one application to trust the identity of another application [8].The traditional model for access control is application-centric access control [1], where each application keeps track of its collection of users and manages them, is not feasible in cloud based architectures. Because in this method we need a lot of memory for storing the user details such as username and password. So cloud requires a user centric access control where every user request to any service provider is bundled with the user identity and entitlement information.

The main types of access control models are,

- Mandatory Access Control (MAC)
- Discretionary Access Control (DAC)
- Role Based Access Control (RBAC)

Now we have a lot of techniques for access control in cloud computing. But these are not secured and efficient. Due to this problem, we are try to propose a new secured and efficient method for access control in cloud computing.

II. RELATED WORK

In this section, we review the different existing techniques for access control which are proposed by others. After that we will explain our proposed technique for access control in cloud computing.

One of the other main method for access control is FADE which is introduced by Y.Tang and team [5]. The method in [5] provides fine-grained access control and assured deletion for outsourced data on the cloud. But this scheme is not effectively applicable. If the data owners and service providers are in the same domain, then only it act as an effective scheme. One of the other scheme for access control is HASBE which is introduced by Z.Wan, J.Liu and R.H.Deng [2]. The main drawback of the scheme in [2] is that it is not flexible compared to other schemes.

In [10], S.Yu and team introduce a method for access control in cloud computing. In this method [10], they using KP-ABE (Key Policy Attribute Based Encryption) and PRE(Proxy Re-Encryption). Due to the overhead of encryption and decryption, this method is not scalable.

Y.Zhu and team in [6] introduce a method for temporal access in cloud computing. In [6] these schemes are only applicable to systems in which data owners and the service providers are within the same trusted domain. The other main scheme is explained in [4], which is introduced by M.Li and his group. But it is very costly scheme.

In an International Joint Conference of IEEE TransCom-11, M.Zhou and his colleagues introduce a method for privacy-preserved access control for cloud computing [9]. This method [9] also has some drawbacks. But here, in this scheme, lack of flexibility and scalability make it as ineffective.

III. PROPOSED SCHEME

A. Structure of our proposed model.

Our proposed model have a hierarchical structure as shown in the figure 2.

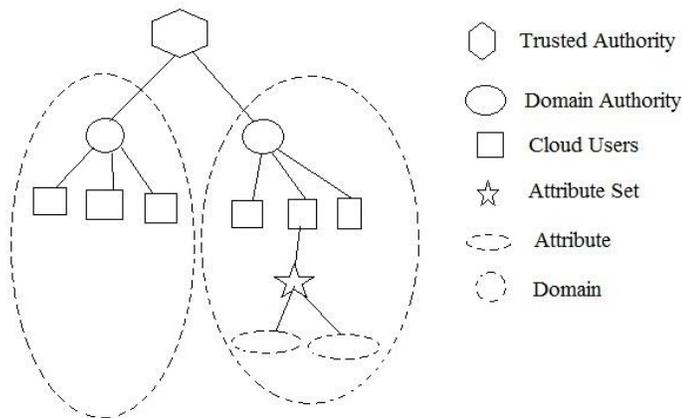


Figure 2 : System Structure

In this hierarchical structure, the trusted authority act as the root of trust and authorizes the top level domain authorities. And this top level domain authorities authorizes the cloud users. Here

we consider both the owners and the users as cloud user. For each cloud users, our system keeps an attribute set which contains a set of attributes corresponding to each user. It may vary with the user. A domain contains many number of cloud users and a single domain authority. Also we use a clock to generate the key with time.

B. System Model.

The actual model of our system is shown in the figure 3. In this model total four parts are there. Cloud owner, untrusted cloud, clock and cloud user.

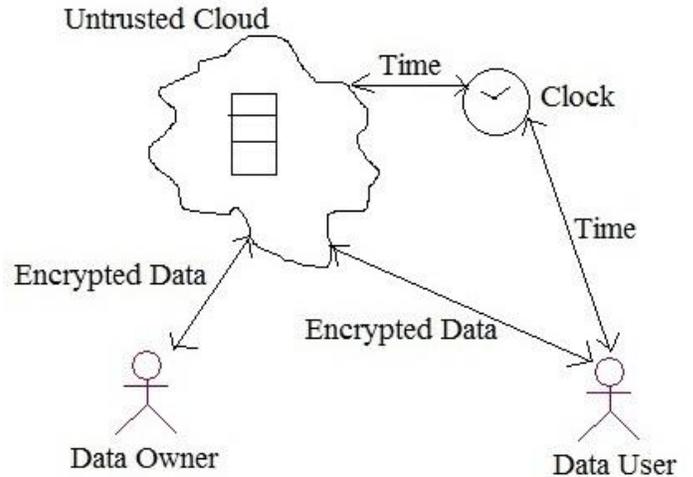


Figure 3 : System Model

Here the data owner can upload his file to the cloud. To make his file as more secured, firstly he will encrypt that file and then upload to the untrusted cloud. Only the data owner knows that the key to decrypt the files. So the uploaded files are safe in the untrusted cloud. When a data user wants to access any file from the cloud, then it send a request to the cloud. Then the cloud will forward that request to the owner. Then the owner will check the attribute set of that user. If the user have a valid attribute set, then the owner send a key to the user. When the owner send a key to the user then the clock will start counting. After a certain time period, that key becomes an invalid one. So the user should access the requested file within that time limit.

C. Basic operations of the proposed model

1. Registration

To do any operation in cloud, the user and the owner should register there. For registration the user and the owner will send a registration request to the corresponding domain authority. Then the domain authority verifies that is the new member accepting there terms and conditions. If they are ready to accept the terms and conditions, then the domain authority will forward that request to the trusted domain. Then the trusted authority will provide a permanent id to each of the owners and users. Then they can set a password for them.

2. File Upload

To upload a file, first the data owner will encrypt the file using his private key and send it to the next higher level. That is domain authority. Then the domain authority will check that the owner is a registered one or not. If he is a registered owner, then the domain authority will forward that encrypted file to the trusted authority.

### 3. File Download

To download any file from the cloud, firstly the data user send a request to his corresponding domain authority. Then the domain authority will verify the user. If it is a valid user, then it will forward that request to the trusted authority. Then the trusted authority will forward this request to the corresponding data owner. Then the owner will check the attribute set of that user. If the user have a valid attribute set, then the owner send a key to the user. When the owner send a key to the user then the clock will start counting. After a certain time period, that key becomes an invalid one. So the user should access the requested file within that time limit.

### 4. File Deletion

Only the data owner can delete his file from the cloud. During the registration time of the data owner, the trusted authority will provide an id number to each of the data owners. These id numbers are permanent for them. Also each of them have a password, which is not permanent. To delete a file, the data owner firstly send a request to his corresponding domain authority. This request contains the owner id and the file name. Then the domain authority will ask password to the owner. If the owner gives the correct password, then the domain authority will forward the deletion request to the trusted authority. After that the trusted authority will delete the file from cloud.

## IV. CONCLUSION

It is a highly efficient model for provide access control in cloud computing. It is in a hierarchical structure and it using a clock for providing decryption key based on time. This model ensure both security and access control in cloud computing. The main operations in this model are registration, file upload, file download and file deletion.

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# A Comparative Study of the Effects of Ambient Air Pollution on Ventilatory Functions Tests in Urban and Rural Populations

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**Abstract- Background:** Motor vehicle fumes and exhausts are the major source of ambient air pollution in Bangalore city. Healthy people who breathe polluted air, over a prolonged period of time, can present with a significant impairment in the results of their ventilatory function tests. **Materials and methods:** 292 healthy male aged between 20-60 years was taken, 144 from urban area as study group and 148 as control group from rural area of Bangalore city. Height and weight measured. Ventilatory function tests were done using a computerized spirometer COSMED. Ambient air pollutants were analyzed using Envirotech's APM 451 – Respirable Dust Sampler and APM 411 – Gaseous Sampling Attachment. **Result and analysis:** there was no significant difference in age, height and weight between control and study group. However there was significant decrease in ventilator parameters like FVC; FEV<sub>1</sub>; FEV<sub>1</sub>/FVC%; PEF; FEF<sub>25-75%</sub>; Vmax25%; Vmax50% & Vmax75% in study group compared with control group. There was an increase in ambient Air Pollutants like SO<sub>2</sub>, NO<sub>x</sub>, SPM, RPM concentrations in urban and rural area. **Conclusion:** This study concludes that, a long-term exposure to high concentrations of ambient air pollutants is indeed responsible for the decline in the results of the ventilatory function tests.

**Index Terms-** ventilatory function tests, ambient air pollutants, FVC, Urban and Rural area.

## I. INTRODUCTION

Earth's atmosphere has a composition and pressure which is unique in the solar system. It has evolved by a complex chain of circumstances in which biological influences have been of major importance. Atmospheric air pollution is largely the result of modern industrial technology and transportation.<sup>1</sup> Atmospheric air pollution has been defined as the contamination of both outdoor and indoor air by one or more natural or manmade sources in such a way that air becomes less acceptable for its intended use i.e. sustenance of life and maintenance of health.<sup>2</sup>

Motor vehicle fumes and exhausts are the major source of ambient air pollution in Bangalore city. The ambient air pollutants are classified into primary pollutants which are directly released into the atmospheric air by stationary or mobile sources includes sulphur di oxide[SO<sub>2</sub>], oxides of nitrogen[NO<sub>x</sub>], carbon monoxide[CO], carbon di oxide[CO<sub>2</sub>], polyaromated hydrocarbon[PAH] including benzene, lead etc..and secondary pollutants which are formed by chemical reactions among the primary pollutants and the normal atmospheric constituents includes PAN (peroxy acetyl nitrate) Ozone (O<sub>3</sub>) & Smog.<sup>1</sup>

Healthy people who breathe polluted air, over a prolonged period of time, can present with a significant impairment in the results of their ventilatory function tests.

Among the ambient air pollutants, particulate matter [PM<sub>10</sub>] having an aerodynamic diameter of 10µm or less is in the respirable range and is potentially responsible for the health ill-effects.<sup>1</sup> It is known to produce a significant impairment in the results of the ventilatory function tests and a long term exposure causes permanent damage to the lung tissue which contributes to chronic respiratory diseases, premature illness and death.<sup>3,4,5</sup> The present study is undertaken to evaluate and compare the ventilatory functional status of the respiratory system in an urban population residing in an polluted area with a rural population.

## II. MATERIALS AND METHODS

This study was done in Bangalore. 292 subjects of age group 20 – 60 years a healthy, male individual of ethnic South-Indian origin, a non-smoker, free from any respiratory tract infections were included in this study.

The individual with past or present history of any respiratory diseases like Tb or COPD or with any form of respiratory allergies to any substance, cardiac disorders, connective tissue disorder, endocrinological disorders, rheumatoid arthritis and those with any forms of thoracic cage deformities, spinal cord deformities or any other forms of congenital abnormalities were excluded from the study.

Procedure was explained to subjects and informed consent was taken from them.

Subjects were divided in to two groups on the basis of their exposure to high concentrations of ambient air pollutants present in their respective working environments. The 142 people in study group included coolies and shop workers, working for 8 – 10 hours a day in the K.R. market area of Bangalore city where they are exposed to a high concentrations of ambient air pollutants .and The 148

people in control group included farmers from the rural areas of Bangalore (in and around Magadi taluk) who were exposed to minimum concentrations of ambient air pollutants in their working environment for 8 – 10 hours a day.

Ventilatory function tests were done using a computerized spirometer COSMED. Each subject was given a detailed instruction and demonstration of the method of performing this test (forced vital capacity maneuver). After which he was asked to perform it himself. A minimum of three to five repetitions were allowed and the test with the maximum values was selected as the “best test”. The results of the ventilatory function tests are calculated from the “best” maximal expiratory flow-volume curves. The ventilatory parameters included in this comparative study are Forced Expiratory Vital Capacity (FVC); Forced Expiratory Volume in 1 second (FEV<sub>1</sub>); FEV<sub>1</sub> as a percentage of FVC (FEV<sub>1</sub>/FVC%); Peak Expiratory Flow (PEF); Forced mid-expiratory flow (FEF<sub>25-75%</sub>); Maximal Expiratory Flow when 75% of the FVC remains to be exhaled (Vmax25%); Maximal Expiratory Flow when 50% of the FVC remains to be exhaled (Vmax50%) & Maximal Expiratory Flow when 25% of the FVC remains to be exhaled (Vmax75%).

Ambient air pollutants were analyzed using Envirotech’s APM 451 – Respirable Dust Sampler and APM 411 – Gaseous Sampling Attachment.

Data was analyzed using appropriate statistical method.

### III. RESULTS AND ANALYSIS

**Table – 1 Comparison of the Mean Values of Age, Height &Weight between Study Group & Control Group**

	<i>Control</i>	<i>Study</i>	<b>p value</b>
<b>AGE(In years)</b>	29.96 ±7.90	31.03±8.28	>0.05
<b>Height(in Cms)</b>	167.6 ±6.91	168.4±5.89	>0.05
<b>Weight(in Kgs)</b>	57.16 ±7.06	58.52±6.51	>0.05

Table 1 shows no significant difference in age, height and weight between control and study group.

**Table – 2 Comparison of the Mean Values Of Ventilatory Parameters Between Study Group & Control Group**

	<i>Control</i>	<i>Study</i>	<b>p value</b>
<b>FVC(LITERS)</b>	3.88±0.51	3.62±0.59	**
<b>FEV<sub>1</sub>(LITERS)</b>	3.30±0.43	2.78±0.44	**
<b>PEF(L/SEC)</b>	9.11±1.26	7.56±1.55	**
<b>FEV<sub>1</sub> / FVC %</b>	85.23±4.3	77.25±7.10	**
<b>FEF<sub>25 - 75%</sub> (L/Sec)</b>	4.28±0.88	2.49±0.67	**
<b>FEF<sub>25 - 75%</sub> (L/Sec)</b>	4.28±0.88	2.49±0.67	**
<b>Vmax25% (L/Sec)</b>	7.63±1.17	5.49±1.44	**
<b>Vmax50% (L/Sec)</b>	4.83±0.96	2.97±0.80	**
<b>Vmax75% (L/Sec)</b>	2.07±0.57	1.10±0.39	**

\*\* P value <0.001

Table 2 shows that all the ventilatory parameters had statistically significant difference between the study group & control group.

Table 3: comparison of Ambient Air Pollutants concentrations in urban and rural area

	<b>Normal limits µg/m<sup>3</sup></b>	<b>Urban area µg/m<sup>3</sup></b>	<b>Rural area µg/m<sup>3</sup></b>
<b>SO<sub>2</sub></b>	30	31	2
<b>NO<sub>x</sub></b>	30	51	2
<b>SPM</b>	100	172	50
<b>RPM</b>	75	44	30

Table 3 shows the comparison of ambient Air Pollutants concentrations in urban and rural area.

#### IV. DISCUSSION

Rising levels of ambient air pollutants in cities has been attributed to increased rates of mortality & morbidity in the developed and developing countries.<sup>6</sup> It is been found that the prevalence of health morbidity was higher in the urban people when compared to their rural counter-parts. Respiratory morbidity was higher in those areas, where SO<sub>2</sub> and SPM levels in the ambient air were high and cardiac morbidity was higher in those areas, where NO<sub>x</sub> & SPM levels in the ambient air were high.<sup>7, 8, 9</sup>

Similar to other studies In this present cross-sectional study, the extent of damage ambient air pollution has done to the lung parenchyma and airways is estimated by comparing the results of the ventilatory function tests of the urban populations with those of the rural populations in and around Bangalore city.

The factors that affect the normal values for ventilatory lung function are ethnic variation, physical activity, altitude of the dwelling, environmental conditions, and tobacco smoking.<sup>10</sup> In our study, both the groups included subjects from the same ethnic South-Indian origin, undergoing strenuous physical activity, residing at the same altitude, besides being non-smokers but differing only in the environmental exposure to varying concentration of ambient air pollutants. This difference in exposure to varying concentrations of ambient air pollutants is the only factor, which may be responsible for the decline in the results of the ventilatory function tests of the study group.

The ventilatory function tests like FEF<sub>25-75%</sub> and Vmax75% are indicators of medium and small airways patency,<sup>11</sup> which was declined in the urban population compared to rural population. The pollutants which act as irritants stimulate the receptors under the tight junction of bronchial epithelium resulting in an increased parasympathetic discharge to the bronchial smooth muscle via the vagus nerve. Through the release of acetylcholine, which acts on the muscarinic receptors present in the bronchial smooth muscle, resulting in an enhancement of the bronchoconstrictor tone of the smooth muscle in the small airways.

As showed in other studies, there is also decline in Ventilatory parameters like FVC and FEV<sub>1</sub> in study group which may be due to changes in the airway size or in the elastic recoil of the lungs, produced by the damaging effects of ambient air pollution.<sup>10,12,13</sup>

Peak expiratory flow rate is an indicator of the patency of the large airways,<sup>14</sup> is also reduced in study group which heralds the onset of a mild form of Chronic Obstructive Pulmonary Disease (C.O.P.D.) in proportion of such subjects.<sup>12,15</sup> The role of genetics in this is yet uncharacterized.<sup>16</sup>

Rise in the ambient air pollutant levels is associated with an increase in the number of (1) emergency room visits for asthma (2) hospitalization for chronic obstructive pulmonary disorders (3) hospitalization for cardio-vascular diseases (4) elementary school absenteeism and (5) low birth weight, pre-term birth & other adverse birth outcomes.<sup>17,18</sup>

#### V. CONCLUSION

Thus the study concludes that, a long-term exposure to high concentrations of ambient air pollutants is indeed responsible for the decline in the results of the ventilatory function tests. This calls for an enactment of new legislations like the 'Clean Air Act' of 1956, which brought about a tremendous change in the health status of the London population, besides proper enforcement of the existing laws. In addition to all these, people should be made aware of the dangerous consequences of ambient air pollution, and should be motivated to prevent its occurrence in all stages.

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# Analysis of Masonry Infilled R.C.Frame with & without Opening Including Soft Storey by using “Equivalent Diagonal Strut Method”

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**Abstract-** Infilled frame structures are commonly used in buildings. Masonry infilled RC frames are the most common type of structures used for multi-storeyed constructions in the developing countries, even in those which are located in seismically active regions also. Masonry infill walls are mainly used to increase initial stiffness and strength of reinforced concrete (RC) frame buildings. In the present study, it is attempt to highlights the performance of masonry infilled reinforced concrete (RC) frames including open first storey of with and without opening. This opening is express in terms of various percentages here, in this paper, symmetrical frame of college building (G+5) located in seismic zone-III is considered by modelling of initial frame. According to FEMA-273, & ATC-40 which contain the provisions of calculation of stiffness of infilled frames by modelling infill as “Equivalent diagonal strut method”. This analysis is to be carried out on the models such as bare frame, strut frame, strut frame with 15% centre & corner opening, which is performed by using computer software STAAD-Pro from which different parameters are computed. In which it shows that infill panels increase the stiffness of the structure.

**Index Terms-** Masonry infilled frame, Stiffness, Equivalent Diagonal Strut Method, RC Frame, Opening percentage.

## I. INTRODUCTION

The behaviour of masonry in filled frame structures has been studied in the last four decades in attempts to develop a rational approach for design of such frames. Present code of practice does not include provision of taking into consideration the effect of infill. It can be understood that if the effect of infill is taken into account in the analysis and design of frame, the resulting structures may be significantly different. Again when a sudden change in stiffness takes place along the building height, the storey at which this drastic change of stiffness occurs is called a soft storey. Many urban multistorey buildings in India today have open first storey as an unavoidable feature. This leave the open first storey of masonry infilled reinforced concrete frame building primarily to generate parking or reception lobbies in the first stories. It has been known for long time that masonry infill walls affect the strength & stiffness of infilled frame structures. There are plenty of researches done so far for infilled frames, however partially infill frames are still the topic of interest. Though it has been understood that the infill's play

significant role in enhancing the lateral stiffness of complete structures. Infills have been generally considered as non-structural elements, although there are codes such as the Eurocode-8 that include rather detailed procedures for designing infilled R/C frames, presence of infills has been ignored in most of the current seismic codes except their weight. However, even though they are considered non-structural elements & their influence was neglected during the modelling phase of the structure leading to substantial inaccuracy in predicting the actual seismic response of framed structures. The performance of the structure can be significantly improved by the increase of strength and dissipation capacity due to the masonry infill's even if in presence of an increasing in earthquake inertia forces. the presence of infills in the reinforced concrete frames can substantially change the seismic response of buildings in certain cases producing undesirable effects like torsional effects, dangerous collapse mechanisms, soft storey etc. or other favourable effects of increasing the seismic resistance capacity of the building. As per Indian standard 1893 (part -I) 2002 code (BIS-2002) some design criteria are to be adopted after carrying out the earthquake analysis, in which the columns and beams of the soft stories are the designed for 2.5 times the storey shears and moments calculated under seismic loads. The infill components increase the lateral stiffness and serve as a transfer medium of horizontal inertia forces. From this conception the floors that have no infill component has less stiffness regarding other floors. This paper discusses top and bottom moment for a 5 storey RC college building designed for load cases considering the three revisions of IS: 1893-2002, IS: 456-2000 & IS13920-1993 codes.

## II. ANALYTICAL METHOD

Static or dynamic analysis can be classified into three broad categories, namely elastic analysis, plastic analysis and nonlinear analysis. Elastic analysis refers to the analysis where a linear elastic behaviour is assumed for the frame and the infill, and geometric and material nonlinearities are not included. In the case of a plastic analysis, an elastic-plastic stress-strain relationship is assumed for the materials, and the failure load of the infilled frame corresponding to collapse stage is determined. In the nonlinear analysis, the different sources of nonlinearity are included, and the response of the structure is traced in the entire loading range, from precracking to collapse.

For most applications, codes of practice recommend an elastic analysis, because of the inherent complexity of a nonlinear analysis. The different models available for the elastic analysis of infilled frames can be classified into four groups based on their complexity. They are the stress function method, the equivalent diagonal strut method, the equivalent frame method and the finite element method.

III. EQUIVALENT DIAGONAL STRUT METHODS

Type of structure	COLLEGE BUILDING (G+5)
ZONE	III
FOUNDATION LEVEL TO GROUND LEVEL	1 M
FLOOR TO FLOOR HEIGHT	4M
EXTERNAL WALL	230 MM
INTERNAL WALL	230 MM
LIVE LOAD	5 KN/M <sup>2</sup>
MATERIAL	M20 AND Fe415
SEISMIC ANALYSIS	EQUIVALENT STATIC METHOD (IS 1893 (Part I) - 2002)
SIZE OF COLUMN	C1= 300X700 C2= 400X750
SIZE OF BEAM	B1=300X500 B2=300X400
DEPTH OF SLAB	140 MM
DESIGN PHILOSOPHY	LIMIT STATE METHOD CONFORMING (IS 456-2000)
DUCTILE DETAILING CODE	IS 13920-1993

The simplest equivalent strut model includes a single pin-jointed strut. Holmes who replaced the infill by an equivalent pin-jointed diagonal strut made of the same material and having the same thickness as the infill panel suggest a width defined by,

$$\frac{w}{d} = \frac{1}{3} \dots\dots\dots (3.3.1)$$

Paulay and Priestley [32] suggested the width of equivalent strut as,

$$w = 0.25d \dots\dots\dots (3.3.2)$$

Where,

- d = Diagonal length of infill panel
- w = Depth of diagonal strut

However, researchers later found that this model overestimates the actual stiffness of infilled frames and give upper bound values. Another model for masonry infill panels was proposed by Mainstone in 1971 where the cross sectional area of strut was calculated by considering the sectional properties of the adjoining columns. The details of model are as shown in Fig. 4.2. The strut area *as* was given by the following equation..

$$A_e = W t$$

$$W = 0.175 (\lambda H)^{-0.4} D$$

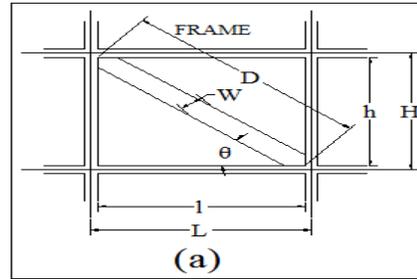


Fig.1 Brick Infill Panel as Equivalent Diagonal Strut

$$K = \sqrt[4]{\frac{E_i t \sin(2\theta)}{4 E_f I_c h}}$$

Where,

- E<sub>i</sub> = the modulus of elasticity of the infill material, N/mm<sup>2</sup>
- E<sub>f</sub> = the modulus of elasticity of the frame material, N/mm<sup>2</sup>
- I<sub>c</sub> = the moment of inertia of column, mm<sup>4</sup>
- t = the thickness of infill, mm
- H = the centre line height of frames
- h = the height of infill
- L = the centre line width of frames
- l = the width of infill
- D = the diagonal length of infill panel
- θ = the slope of infill diagonal to the horizontal.

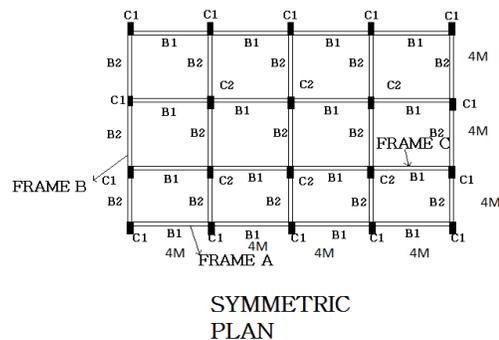
**Infills frame with Opening:** Area of opening, A<sub>op</sub> is normalized with respect to area of infill panel, A<sub>infill</sub> and the ratio is termed as opening percentage (%).

$$\text{Opening percentage (\%)} = \frac{\text{Area of opening (A}_{op}\text{)}}{\text{Area of infill(A}_{infill}\text{)}}$$

IV. ANALYSIS EXAMPLE

STRUCTURAL DETAIL

Symmetrical View of Building



The above mentioned frame has been designed by using STAAD-Pro software. For getting results some column has been selected for getting results and they are as column no.1,2 the results shown in the form of

- ❖ DEFLECTION
- ❖ AXIAL FORCE
- ❖ MOMENT
- ❖ AST

V. ANALYTICAL MODELS CONSIDERED

- 1) Model I. Bare Frame (RC frame with infill Masonry, but effect of masonry infill not considered)
- 2) Model II. Open Ground Storey of Complete Strut Frame.
- 3) Model III. Open Ground Storey of Strut Frame With 15% Centre Opening (RC Frame with Masonry Infill S.M.R.F. Frame)
- 4) Model IV. Open Ground Storey of Strut Frame With 15% Corner Opening (RC Frame with Masonry Infill S.M.R.F. Frame)

VI. MATERIALS

a) Concrete:

Concrete with following properties is considered for study.

- Characteristic compressive strength (fck) = 20 MPa
- Poissons Ratio = 0.3
- Density = 25 kN/m<sup>3</sup>
- Modulus of Elasticity (E) = 5000 x √ fck = 22360.67 MPa

b) Steel:

Steel with following properties is considered for study.

- Yield Stress (fy) = 415 MPa
- Modulus of Elasticity (E) = 2x10<sup>5</sup>MPa

c) Masonry infill

- Clay burnt brick, Class A, confined unreinforced masonry
- Compressive strength of Brick, fm = 10 MPa
- Modulus of Elasticity of masonry (Ei) = 550 x fm = 5500MPa
- Poissons Ratio = 0.15

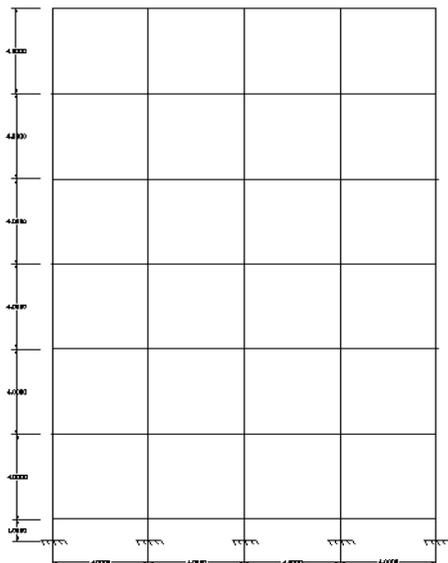


Fig6.1; MODEL I: BARE FRAME

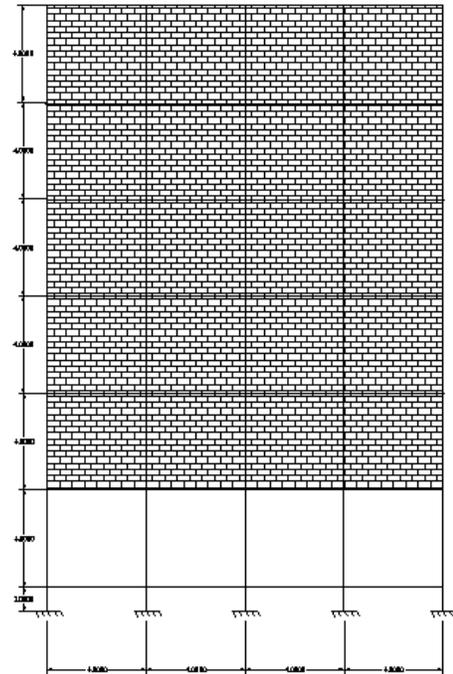


Fig6.2; MODEL II: WITH FULLY INFILLED FRAME

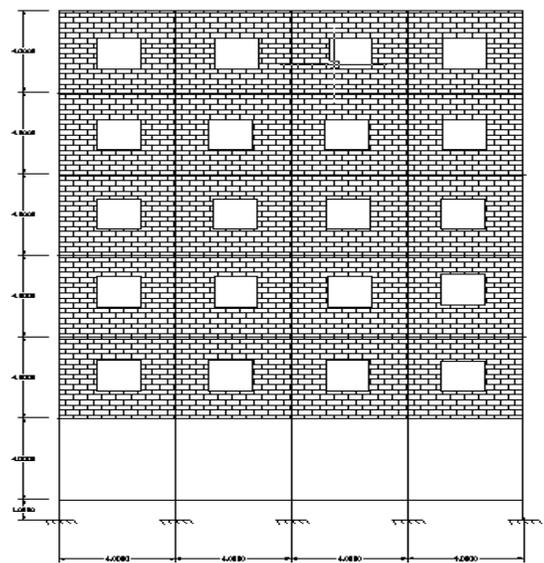
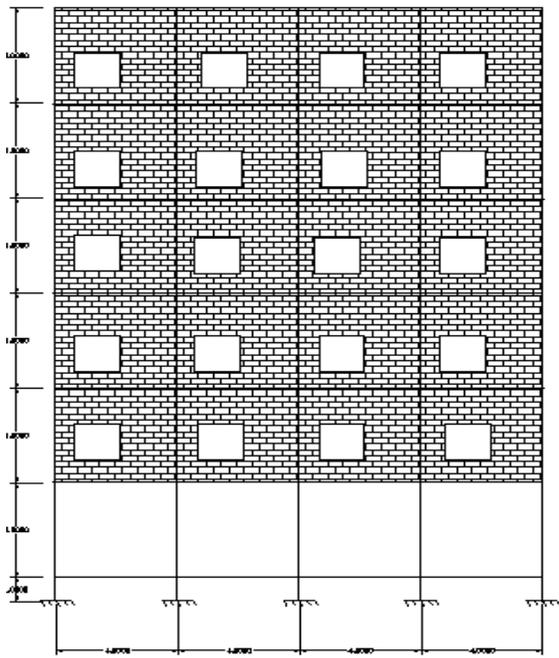
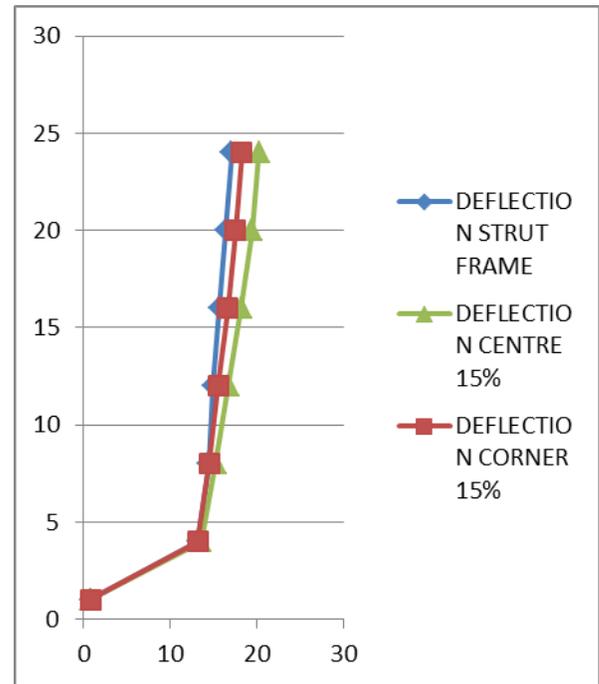


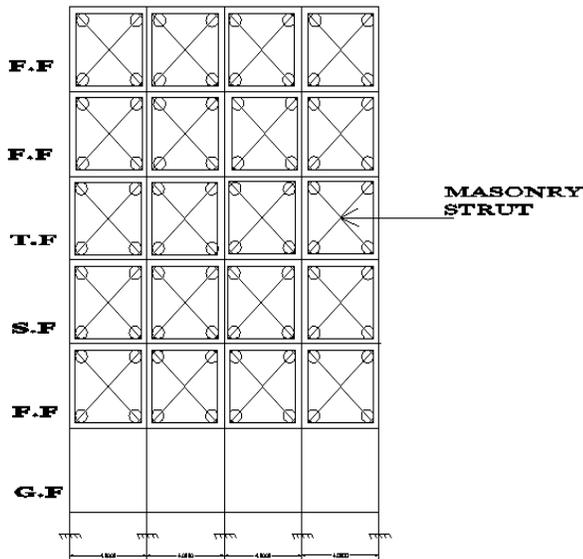
Fig6.3; MODEL III: INFILLED FRAME WITH CENTRE OPENING



**Fig6.4; MODEL IV: INFILLED FRAME WITH CORNER OPENING**



**Fig7.1: Deflection in (mm) for column No.1**



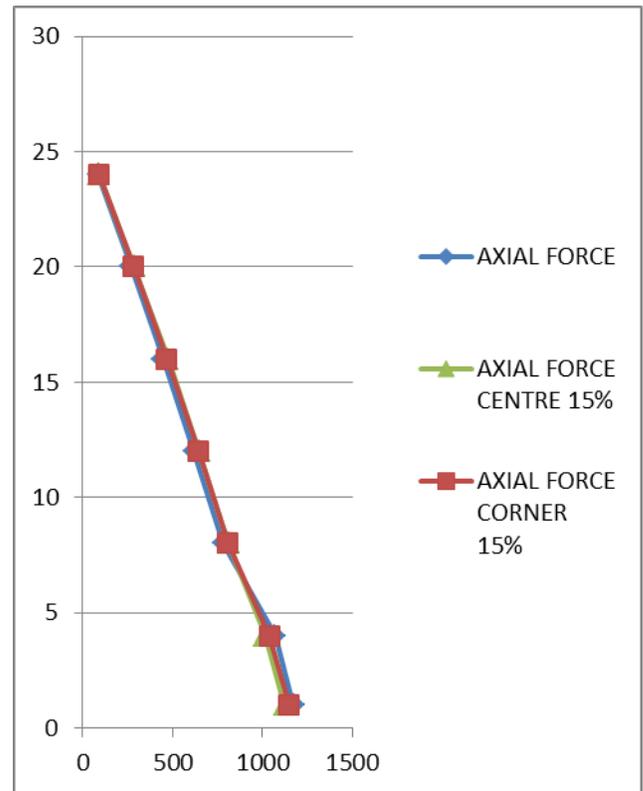
**Fig6.5; EXAMPLE OF STRUT FRAME MODEL**

**VII. COMPARISON OF RESULTS**

Here, Comparison is done in between bare frame and centre and corner opening only. And it is shown with the help of graph.

**GRAPH FOR STRUT FRAME WITH 15% CENTRE AND CORNER OPENING COLUMN-1(300X700)**

On X-Axis there is a different parameter of Deflection, Moment, Axial Force; Area of steel and on Y-Axis Height of building is fixed in all cases.



**Fig 7.2: Axial Force in (kN) for column No. 1**

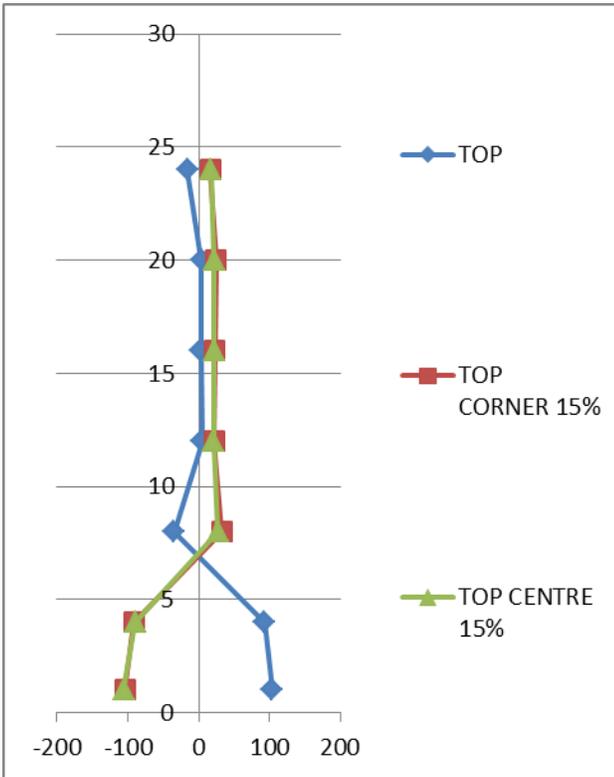


Fig7.3: B.M (Top) in (kN-M) for column No.1

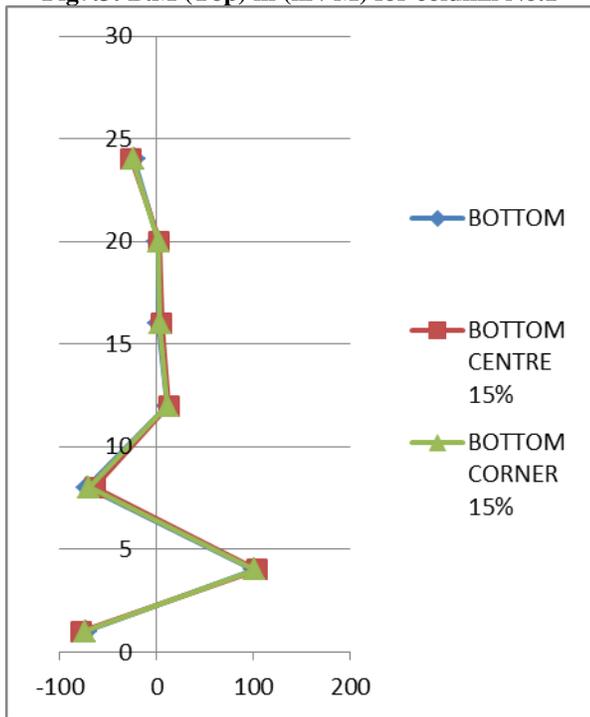


Fig7.4: B.M (Bottom) in (kN-M) for column No.1

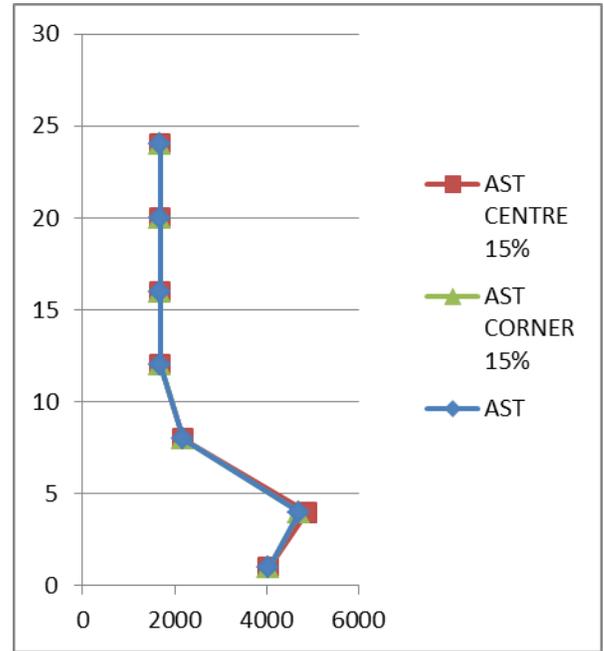


Fig7.5: Area of steel in (mm2) for column No.1

**GRAPH FOR STRUT FRAME WITH 15% CENTRE AND CORNER OPENING COLUMN-2(300X700)**

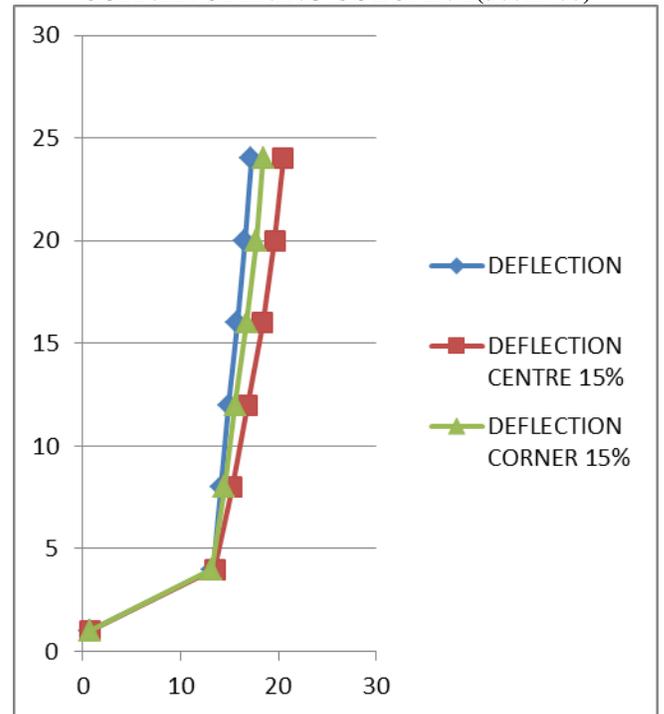
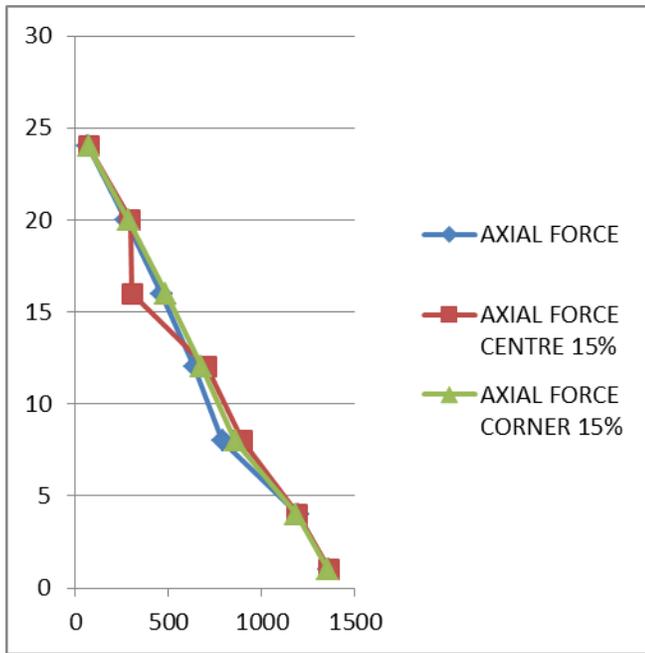
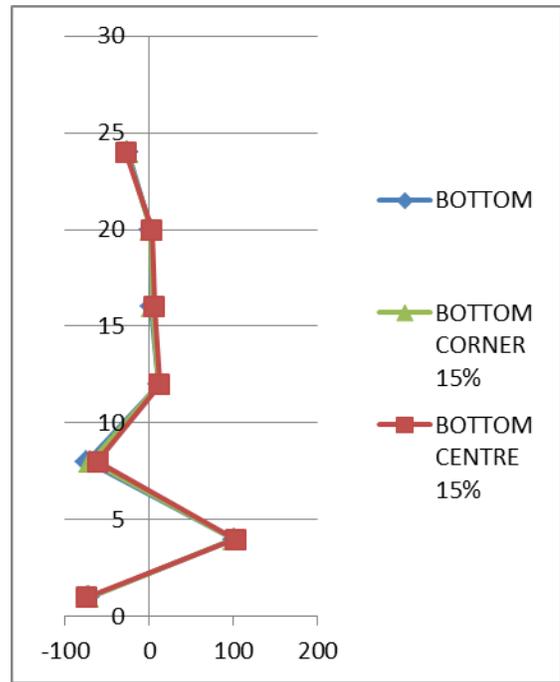


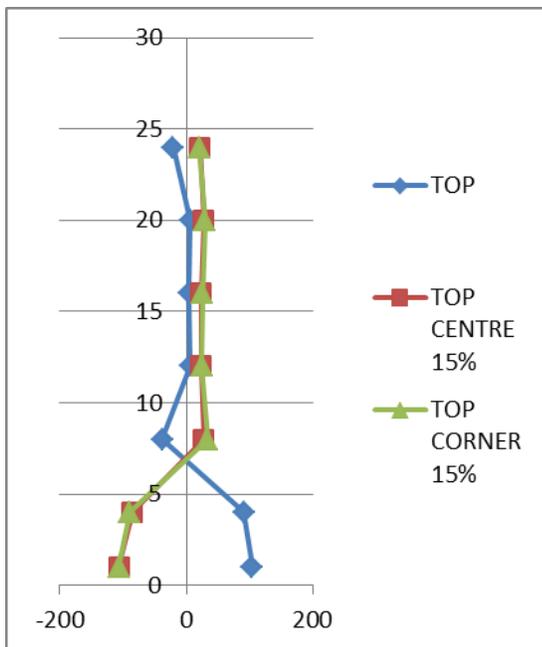
Fig7.6: Deflection in (mm) for column No.2



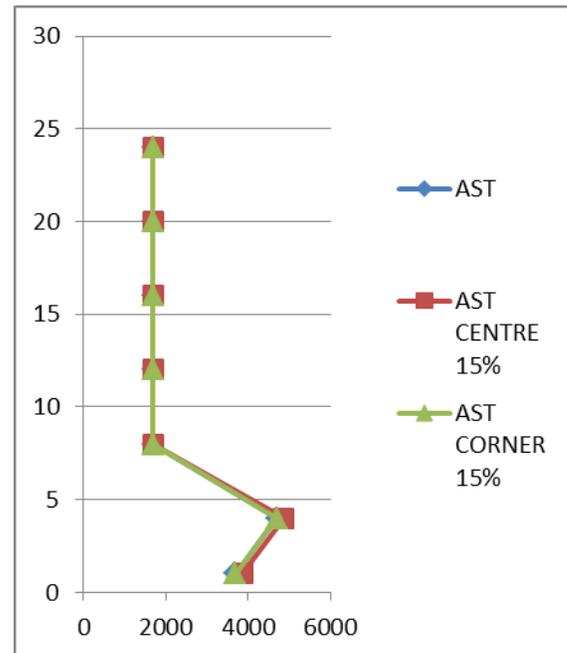
**Fig7.7: Axial Force in (kN) for column No.2**



**Fig 7.9: B.M (Bottom) in (kN-M) for column No.2**



**Fig 7.8: B.M (Top) in (kN-M) for column No. 2**



**Fig 7.10: Area of steel in (mm2) for column No.2**

VIII. CONCLUSION

1. Infill panels increase stiffness of the structure.
2. The Maximum Deflection in infilled frame for (G+5) with 15% centre opening is 21.05 mm and 18.44mm in 15% corner opening. Thus the deflection in centre opening is more than the corner opening.

3. Axial force in case of strut frame is 2159.40 KN and in Infilled Frame with 15% centre opening is 2217.03kN. because of infill wall effect, there is drastic decrease in the value of axial force in column.
4. The Maximum Deflection in bare frame for (G+5) is 105.05 mm and infilled frame with 15% centre opening is 21.05mm. Thus the deflection in bare frame is more than the infilled frame.
5. The increase in the opening percentage leads to a decrease on the lateral stiffness of infilled frame.
6. From this present result it shows that, deflection is very large in case of bare frame as compare to that of infill frame with opening. If the effect of infill wall is considered then the deflection has reduced drastically. And also deflection is more at last storey because earthquake force acting on it more effectively.
7. In columns, without considering infill wall effects the value of, B.M and Ast are maximum above 1m height because of soft storey present.
8. Deflection in case of centre opening is large compare to corner opening.

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# A nonlinear mathematical model of the mammary carcinoma-immune system: An analytical approach

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**Abstract-** The mathematical modeling of the mammary carcinoma-immune system by an external stimulus is discussed. This model is based on a system of six ordinary differential equations which contains a nonlinear term related to various parameters and cell populations. Approximated closed analytical expressions for cell populations have been derived for all values of parameters for steady and non-steady state conditions. As time tends to infinity, the analytical expressions corresponding to the cell populations for non-steady state conditions approach the steady state values. These analytical results are of great interest both in the applied and theoretical sciences. Furthermore, in this work the numerical simulation of the problem is also reported using Matlab program.

**Index Terms-** Mathematical biology, Non-linear ODE, Tumors, Mammary carcinoma, Homotopy perturbation method

## 1. Introduction

The global challenge of the mathematicians around the world is the formation of mathematical models of real life complex occurrences that are qualitatively and quantitatively consistent with experimental results. Also the aim of mathematical models is to offer outlook to biologists and physicians on the suitability of experimental data and they in turn can help to improve the mathematical models. Thus mathematical modeling provides the opportunity of improving both the understanding and prediction of biological phenomena. The most well-known approach is the ordinary differential equation-based model and this approach views the particles (human cells, molecules) in the model as homogeneous and ignores the spatial structure of the biological system in the microscopic scale. The interactions are performed through ordinary differential equation based on parameters, populations and sub populations.

This paper compacts with the theoretical advance of an ODE-based model as simple as possible in order to explore the competition among the immune system, the vaccine cells, and the mammary carcinogenesis. The mathematical model, which is realized upon the same theoretical scheme used for the computational model [1] takes into account both the humeral and cellular branches of the immune response and includes the following entities: vaccine cells (V), cancer cells (C), natural killer cells (NK), thymus cytotoxic cells (Tc), thymus helper cells (Th) and antibodies (AB) release by the bone (B) cells.

Mammary carcinoma, also known as breast cancer, is the cancer of the breasts or the lymph nodes under the armpits. Though it can affect both genders, breast cancer is considered the second most common type of cancer diagnosed in women, and is also considered the second deadliest female cancer. The triplex vaccine developed by [2] for effective treatment against mammary carcinoma, adopts a common approach in oncology by combining different stimuli. Simtriplex is a multi-agent model of the immune system whose major feature is given by the possibility of reproducing different individuals simply by changing the seed of the random number generator.

To analyze the role of the parameters in the competition dynamics and to explore the phenomena depicted by the model in order to identify an optimal vaccine protocol by considering the constant injection case. Recently researchers [3] have been found the concentration profiles of V, Tc, Th, and AB cells.

Finally, they depict the competition among the cells populations and emerging behavior by means of numerical simulations after setting the magnitude of the parameters properly. So far no general analytical expressions for the steady and non-steady concentrations of the cancer cells for all values of the parameters had been found. The purpose of this paper is to derive approximate analytical expression for the concentrations of cancer cells by Homotopy perturbation method.

## 2. THE MATHEMATICAL MODEL

The mathematical model [3] proposed in the present paper taken into account simplified biological assumptions. This model involves six ordinary differential equations for six types of cells by using generic function interaction forms. The intent is to reproduce the qualitative behavior observed [4],[5] by constructing a model as simple as possible and with a limited number of parameters. The cell populations involved in this model are natural killer (NK) cells, vaccine (V) cells, thymus helper (Th) cells, antibodies (AB) released by bone cells, thymus cytotoxic (Tc) cells and cancer cells (C). Particularly the number of natural killer (NK) cells is assumed as a constant in time. To analyze the competition dynamics between vaccine cells and cancer cells by considering the case of vaccine that is injected continuously and with constant magnitude  $k > 0$ . The proposed mathematical model is the system of following six ordinary differential equations

$$\frac{dNK}{dt} = 0 \quad (2.1)$$

$$\frac{dV}{dt} = -\beta_1 V - \beta_2 NK V + k \quad (2.2)$$

$$\frac{dTh}{dt} = -\beta_3 Th + \alpha_1 V \quad (2.3)$$

$$\frac{dAB}{dt} = -\beta_4 AB + \alpha_2 Th \quad (2.4)$$

$$\frac{dTc}{dt} = (\alpha_4 - \beta_8) Tc \quad (2.5)$$

$$\frac{dC}{dt} = \left( \alpha_3 - \frac{C}{C_{\max}} \right) C - (\beta_5 NK + \beta_6 Tc + \beta_7 AB) C \quad (2.6)$$

The initial conditions for the above equations are as follows:

$$NK(t=0) = NK \neq 0 \quad (2.7)$$

$$V(t=0) = Th(t=0) = AB(t=0) = 0 \quad (2.8)$$

$$Tc(t=0) = T_0 \neq 0 \text{ and } C(t=0) = C_0 \neq 0 \quad (2.9)$$

Where the parameters  $\alpha_i$  for  $i \in (1,2,3,4)$  denote proliferation rates due to natural birth and interactions. The parameters  $\beta_i$  for  $i \in (1,2..8)$  represent destruction rates due to natural death and competition. The interactions of the cell populations and the related parameters are given in the Table-1.

### 3. ANALYTICAL EXPRESSION OF CELL FUNCTIONS FOR STEADY STATE CONDITIONS

The solutions of (2.2) – (2.6) for the steady state conditions (derivatives taken as zeros) are as follows:

$$V_s = \frac{k}{\beta} \text{ where } \beta = \beta_1 + \beta_2 NK. \quad (3.1)$$

$$Th_s = \frac{\alpha_1 k}{\beta \beta_3}. \quad (3.2)$$

$$AB_s = \frac{\alpha_1 \alpha_2 k}{\beta \beta_3 \beta_4}. \quad (3.3)$$

$$Tc_s = 0 \text{ when } (\alpha_4 - \beta_8) \neq 0. \quad (3.4)$$

$$C_s = C_{\max} (\alpha_3 - \beta_5 NK + \beta_6 Tc_s + \beta_7 AB_s). \\ = C_{\max} \left[ \alpha_3 - \beta_5 NK - \frac{\beta_7 \alpha_1 \alpha_2 k}{\beta \beta_3 \beta_4} \right]. \quad (3.5)$$

### 4. ANALYTICAL EXPRESSION OF CELL FUNCTIONS FOR NON-STEADY STATE CONDITIONS

This section deals with the non-steady state analysis of the mathematical model. The aim of this section is to analyze the role of the parameters in the competition dynamics and to explore the phenomena depicted by the model in order to identify an optimal vaccine protocol and depict the competition among the cells populations and emerging behavior by means of

analytical solution after setting the magnitude of the parameters properly. In addition we analyze the competition dynamics between vaccine cells and cancer cells by considering the case of vaccine that is injected continuously and with constant magnitude  $k > 0$ . A qualitative analysis of the solutions of the model is achieved by furnishing an exact solution for V, Tc, Th, AB cells functions. The approximate solutions for the cancer cells function C are obtained through three cases and two of them by Homotopy perturbation method. The exact solutions of (2.2) and (2.3) are

$$V(t) = \frac{k}{\beta} (1 - e^{-\beta t}) \quad (4.1)$$

$$Th(t) = A[\beta_3(1 - e^{-\beta t}) - \beta(1 - e^{-\beta_3 t})] \quad (4.2)$$

$$\text{where } A = \frac{k \alpha_1}{\beta \beta_3 (\beta_3 - \beta)}$$

We have obtained the following solution for (2.4)

$$AB(t) = A \alpha_2 \left[ \left( \frac{\beta_3 - \beta}{\beta_4} \right) (1 - e^{-\beta_4 t}) + \left( \frac{\beta_3}{\beta_4 - \beta} \right) (e^{-\beta_4 t} - e^{-\beta t}) + \left( \frac{\beta}{\beta_4 - \beta_3} \right) (e^{-\beta_3 t} - e^{-\beta_4 t}) \right] \quad (4.3)$$

Carlo Bianca and Marzio Pennisi have derived a solution [3] for (2.4) which is not a correct one. The solution (4.3) is the new corrected solution against the solution obtained by Carlo Bianca and Marzio Pennisi [3]. The general solution of (2.5) is

$Tc(t) = T_0 e^{\alpha t}$  where  $\alpha = \alpha_4 - \beta_8$  (4.4) The cell function C(t) can be obtained by solving the nonlinear ordinary differential (2.6) for the following three limiting cases.

**Case I:** We consider the interaction between cancer cells C and NK cells only. In this case  $\beta_6 = 0$  and  $\beta_7 = 0$  now (2.6) becomes

$$\frac{dC}{dt} = (\alpha_3 - \beta_5 NK) C - \frac{C^2}{C_{\max}} \quad (4.5)$$

The solution of (4.5) is [3] as follows

$$C(t) = \left[ e^{-\gamma t} \left( \frac{1}{C_0} - \frac{C_1}{\gamma} \right) + \frac{C_1}{\gamma} \right]^{-1} \quad (4.6)$$

where  $C_1 = 1/C_{\max}$  and  $\gamma = (\alpha_3 - \beta_5 NK)$ .

When the proliferation rate  $\alpha_3$  of the cancer cells is greater than of the destruction rate  $\beta_5$  due to the interactions between cancer cells and natural killer cells, the number of cancer cells increase towards its plateau; vice versa cancer cells are totally depleted by natural killer cells. In this case from the (4.6), the maximum number of cancer cells C(t) is  $\gamma C_{\max}$  and minimum number is  $C_0$ .

**Case II:** We consider the action of Tc cells and NK cells only. In this case  $\beta_6 \neq 0$  and  $\beta_7 = 0$ , now (2.6) becomes

$$\frac{dC}{dt} = \left( \alpha_3 - \frac{C}{C_{\max}} \right) C - (\beta_5 NK + \beta_6 Tc) C \quad (4.7)$$

By taking  $C(t) = 1/Y(t)$  and using (4.4) and (4.7) becomes

$$\frac{dY}{dt} + (\gamma Y - C_1) + (\beta_6 T_0 e^{\alpha t}) Y = 0 \quad (4.8)$$

The equation (4.8) is a non-linear differential equation. Recently; many authors have applied the HPM to various problems and demonstrated the efficiency of the HPM for

handling non-linear structures and solving various physics and engineering problems [6],[7],[8],[9]. This method is a combination in topology and classic perturbation techniques. Ji Huan He used the HPM to solve the Lighthill [10] equation, the Duffing equation [11] and the Blasius equation [12]. The idea has been used to solve non-linear boundary value problems, integral equations and many other problems [13],[14]. The HPM is unique in its applicability, accuracy and efficiency. The HPM uses the imbedding parameter  $p$  as a small parameter and only a few iterations are needed to search for an asymptotic solution. The basic concept of HPM is given in Appendix- A. Using this method (Refer Appendix-B), we can obtain the following solution to the Eq. (4.7).

$$C(t) = \left\{ \frac{C_1}{\gamma} + \left( \frac{1}{C_0} - \frac{C_1}{\gamma} \right) e^{-\gamma t} - \frac{\beta_6 T_0 C_1}{\gamma} \left[ \frac{e^{\alpha t}}{\alpha + \gamma} + \left( \frac{1}{C_0} - \frac{C_1}{\gamma} \right) \frac{e^{(\alpha - \gamma)t}}{\alpha} \right] + \frac{\beta_6 T_0 C_1}{\gamma} \left[ \frac{1}{\alpha + \gamma} + \left( \frac{1}{C_0} - \frac{C_1}{\gamma} \right) \frac{1}{\alpha} \right] e^{-\gamma t} \right\}^{-1} \quad (4.9)$$

This equation (4.9) is the new analytical expression of cancer cell  $C(t)$  when  $\beta_6 \neq 0$  and  $\beta_7 = 0$ . In this case the action of NK cells prevail the action of Th cells when the death rate of Th cells is greater than the birth rate of Th. Also the proliferation rate of C cells is less than the interaction destruction rate between NK cells and C cells. When the birth rate of Th cells is greater than the death rate of Th cells the action of NK can be neglected. Also competition occurs among the immune system cells and cancer cells, but there is a partial depletion of C cells and then need the injection of the vaccine. From (4.9) we can obtain the maximum number of cancer cells  $C(t)$  is  $\gamma C_{\max}$  and minimum number is  $C_0$ .

**Case III:** We consider the action of the NK cells, Tc cells, and AB cells. That is  $\beta_6 \neq 0$  and  $\beta_7 \neq 0$

Now the (2.6) becomes

$$\frac{dC}{dt} = \left( \alpha_3 - \frac{C}{C_{\max}} \right) C - (\beta_5 NK + \beta_6 Tc + \beta_7 AB) C \quad (4.10)$$

By taking  $C(t) = 1/Z(t)$  and replace the values of Tc and AB, the above (4.10) becomes

$$\left[ \frac{dZ}{dt} + (\gamma - E)Z - C_1 \right] + \left[ -\beta_6 T_0 e^{\alpha t} - Fe^{-\beta_3 t} - He^{-\beta_4 t} - Ge^{-\beta_3 t} \right] Z = 0 \quad (4.11)$$

where  $F = \frac{A\alpha_2\beta_3\beta_7}{\beta_4 - \beta}$ ,  $G = \frac{A\alpha_2\beta\beta_7}{\beta_4 - \beta_3}$  and  $H = -(E - F + G)$ .

Homotopy perturbation method (Refer Appendix-A) gives the approximate solution of (4.10) as

$$C(t) = \left[ P + Qe^{-(\gamma - E)t} + P \left[ \frac{\beta_6 T_0 e^{\alpha t}}{(\alpha + \gamma - E)} + \frac{Fe^{-\beta_3 t}}{(-\beta + \gamma - E)} + \frac{He^{-\beta_4 t}}{(-\beta_4 + \gamma - E)} + \frac{Ge^{-\beta_3 t}}{(-\beta_3 + \gamma - E)} \right] + Q \left[ \frac{\beta_6 T_0 e^{(\alpha - \gamma)t}}{\alpha} - \frac{Fe^{(-\beta - \gamma)t}}{\beta} - \frac{He^{(-\beta_4 - \gamma)t}}{\beta_4} - \frac{Ge^{(-\beta_3 - \gamma)t}}{\beta_3} \right] - \left[ PR + QSe^{-(\gamma - E)t} \right] \right]^{-1}$$

$$(4.12)$$

Where the constants P, Q, R and S are defined as follows

$$P = \frac{C_1}{\gamma - E}; Q = \frac{1}{C_0} - \frac{C_1}{\gamma - E}$$

$$R = \frac{\beta_6 T_0}{(\alpha + \gamma - E)} + \frac{F}{(-\beta + \gamma - E)} + \frac{H}{(-\beta_4 + \gamma - E)} + \frac{G}{(-\beta_3 + \gamma - E)} \text{ and}$$

$$S = \frac{\beta_6 T_0}{\alpha} - \frac{F}{\beta} - \frac{H}{\beta_4} - \frac{G}{\beta_3}$$

This equation (4.12) is the new analytical expression of cancer cell  $C(t)$  when  $\beta_6 \neq 0$  and  $\beta_7 \neq 0$ . In this case the action of AB cells modifies the competition dynamics and increases the complexity of the biological scenario of the emerging phenomena. Specifically the relation among  $\beta_3$  (the natural death rate of Th cells),  $\beta_4$  (the natural death rate of AB cells), and  $\beta$  (the natural death rate of V cells) influences the lower bound for the number of cancer cells at infinity and their partial or total depletion. In this case the maximum number of cancer cells  $C(t)$  is

$$C_{\max} \left[ \alpha_3 - \beta_5 NK - \frac{\beta_7 \alpha_1 \alpha_2 k}{\beta \beta_3 \beta_4} \right] \text{ and minimum number is } C_0.$$

## 5. NUMERICAL SIMULATIONS

Simulations are to show the typical phenomena of the mammary carcinoma-immune system competition and can be technically addressed to analyze how different values of the parameters may be inserted into the model to describe phenomena of interest in biological and medical sciences. The time length of the simulations is fixed from 0 to 400 days according to Simtriplex simulations.

In order to investigate the accuracy of the Homotopy perturbation method with a finite number of terms, the system of differential equation was also solved numerically. To show the efficiency of the present method, our problem is also compared with the numerical solution (MATLAB program). We have used the function pde1 in MATLAB software to solve numerically the initial-boundary value problems for the nonlinear differential equation. The MATLAB programs are also given in Appendix C.

The default parameters employed in [3] and in this work are given in Table-2. The numerical solution is compared with our analytical results in Figures 5(a)-5(d). Comparison reveals that the relative difference between the analytical result and numerical is very small for all values of the parameters considered in the simulations.

## 6. Discussion

When  $t \rightarrow \infty$ , the non-steady solutions (4.1) – (4.4) become steady solutions (3.1) – (3.4). The vaccine cells function  $V(t)$ , thymus helper cells function  $Th(t)$ , antibodies function  $AB(t)$ , thymus cytotoxic cells function  $Tc(t)$  versus time (days) with various values of  $k$  are plotted in Figs. 1-4. From these figures, we can infer that the values of the  $V(t)$ ,  $Th(t)$ ,  $AB(t)$  decrease

when the value of the parameter  $k$  increase. Also  $T_c(t)$  increases when  $k$  increases. The functions  $(\beta/k)V(t)$ ,  $(\beta\beta_3/k\alpha_1)Th(t)$ , and  $(\beta\beta_3\beta_4/k\alpha_1\alpha_2)AB(t)$  has attained the maximum value one on 30, 50, 60 days respectively. Thymus cytotoxic cells function  $T_c(t)$  value decreases when time increases and reaches the steady value ( $=0$ ) when  $t = 100$  days for all values of  $k$ . In Figs 5(a)-5(c) Comparison of exact and approximate solutions with simulation are made. Fig 5(d) exhibits comparison of growth rate of cancer cells against time for all the three cases. From these figures it is inferred that, when  $0 \leq t(\text{day}) \leq 200$ , the growth rate of cancer cell is less against  $200 \leq t(\text{day}) \leq 300$ , in that period the cancer cells growth rate rise rapidly and attain the peak value (steady state) above 300 days for all cases. Therefore the growth rate of the cancer cells is under control for a period of 200 days.

**7. CONCLUSION**

This paper reports a mathematical treatment for analyzing mammary carcinoma-immune system. A theoretical expression of cell functioning in triplex vaccine has been evaluated. The novelty of this article is the application of Homotopy perturbation method to the first-order nonlinear ordinary differential equations. Moreover, analytical expressions corresponding to the non-steady states current response are also presented. The approximate analytical expressions of all cell functions for all values of parameters will be useful to the cancer immunologist for upcoming research and medical treatment. Hence this work contributes significantly to the proper understanding of carcinoma-immune interaction in an appropriate mathematical language and to the development of immunological medicine.

**7.1. Appendix-A. Basic concepts of the Homotopy perturbation method.**

The HPM method has overcome the limitations of traditional perturbation methods. It can take full advantage of the traditional perturbation techniques, so a considerable deal of research has been conducted to apply the homotopy technique [7],[8] to solve various strong non-linear equations. To explain this method, let us consider the following function:

$$D_0(u) - f(r) = 0, r \in \Omega \tag{A1}$$

$$\text{with the boundary conditions of } B_0(u, \frac{\partial u}{\partial n}) = 0, r \in \Omega \tag{A2}$$

where  $D_0$  is a general differential operator,  $B_0$  is a boundary operator,  $f(r)$  is a known analytical function and  $\Gamma$  is the boundary of the domain  $\Omega$ . Generally speaking,  $D_0$  the operator can be divided into a linear part  $L$  and a non-linear part  $N$ , (A1) can therefore be written as

$$L(u) + N(u) - f(r) = 0 \tag{A3}$$

Construct a homotopy  $v(r, p) : \Omega \times [0,1] \rightarrow \mathbb{R}$  that satisfies

$$H(v, p) = (1-p)[L(u) - L(u_0)] + p[D_0(v) - f(r)] = 0 \tag{A4}$$

$$H(v, p) = L(v) - L(u_0) + p[L(u_0) + p[N(v) - f(r)]] = 0 \tag{A5}$$

where  $p \in [0,1]$  is an embedding parameter and  $u_0$  is an initial approximation of Eq. (A1) that satisfies the boundary conditions. From Eq. (A4) and (A5), we have

$$H(v, 0) = L(u) - L(u_0) = 0 \tag{A6}$$

$$H(v, p) = D_0(v) - f(r) = 0 \tag{A7}$$

When  $p = 0$ , (A4) and (A5) become linear equations. When  $p = 1$ , they become non-linear equations. The process of changing  $p$  from zero to unity is that of  $L(u) - L(u_0) = 0$  to

$D_0(v) - f(r) = 0$  We first use the embedding parameter  $p$  as a "small parameter" and assume that the solutions of (A4) and (A5) can be written as a power series in  $p$

$$v = v_0 + pv_1 + p^2v_2 + \dots \tag{A8}$$

Setting  $p = 1$  result in the approximate solution of (A1)

$$u = \lim_{p \rightarrow 0} v = u_0 + u_1 + u_2 + \dots \tag{A9}$$

This is the basic technique in Homotopy perturbation method.

**7.2. Appendix-B. Approximate analytical solutions of the Case II and Case III**

$$(1-p)\left(\frac{dY}{dt} + (\gamma Y - C_1)\right) + p\left(\frac{dY}{dt} + (\gamma Y - C_1) + \beta_6 T_0 e^{\alpha t} Y\right) = 0 \tag{B1}$$

$$(1-p)\left(\frac{dZ}{dt} + (\gamma - E)Z - C_1\right) + p\left[\left(\frac{dZ}{dt} + (\gamma - E)Z - C_1\right) + \left(-\beta_6 T_0 e^{\alpha t} - Fe^{-\beta t} - He^{-\beta_4 t} - Ge^{-\beta_5 t}\right)Z\right] = 0 \tag{B2}$$

Assume the approximate solution of (B1) is

$$Y = y_0 + py_1 + p^2y_2 + \dots \tag{B3}$$

Assume the approximate solution of (B2) is

$$Z = z_0 + pz_1 + p^2z_2 + \dots \tag{B4}$$

Substituting (B3) into (B1) and arranging the coefficients of  $p$ - powers, we have  $p^0 : \frac{dy_0}{dt} + (\gamma y_0 - C_1) = 0$  (B5)

$$p^1 : \frac{dy_1}{dt} + (\gamma y_1 - C_1) + (\beta_6 T_0 e^{\alpha t}) y_0 = 0 \tag{B6}$$

Substituting (B4) into (B2) and arranging the coefficients of  $p$  powers, we have

$$p^0 : \frac{dz_0}{dt} + (\gamma - E)z_0 - C_1 = 0 \tag{B7}$$

$$p^1 : \frac{dz_1}{dt} + (\gamma - E)z_1 - C_1 + \left\{ -\beta_6 T_0 e^{\alpha t} - Fe^{-\beta t} - He^{-\beta_4 t} - Ge^{-\beta_5 t} \right\} z_0 = 0 \tag{B8}$$

With the initial approximations  $y_0(0) = C_0, y_1(0) = 0$  and

$z_0(0) = C_0, z_1(0) = 0$  for all  $i=1,2,\dots$

Solving (B5) we get

$$y_0 = \frac{C_1}{\gamma} + \left(\frac{1}{C_0} - \frac{C_1}{\gamma}\right) e^{-\gamma t} \tag{B9}$$

Solving (B6) we get

$$y_1 = -\frac{\beta_6 T_0 C_1}{\gamma} \left[ \frac{e^{\alpha t}}{\alpha + \gamma} + \left(\frac{1}{C_0} - \frac{C_1}{\gamma}\right) \frac{e^{(\alpha - \gamma)t}}{\alpha} \right] + \frac{\beta_6 T_0 C_1}{\gamma} \left[ \frac{1}{\alpha + \gamma} + \left(\frac{1}{C_0} - \frac{C_1}{\gamma}\right) \frac{1}{\alpha} \right] e^{-\gamma t}$$

(B10)

Adding (B9) and (B10) and  $C(t) = \frac{1}{Y(t)}$ , we get C(t) for the case II.

$$C(t) = \left[ \frac{C_1}{\gamma} + \left( \frac{1}{C_0} - \frac{C_1}{\gamma} \right) e^{-\gamma t} - \frac{\beta_6 T_0 C_1}{\gamma} \left[ \frac{e^{\alpha t}}{\alpha + \gamma} + \left( \frac{1}{C_0} - \frac{C_1}{\gamma} \right) \frac{e^{(\alpha - \gamma)t}}{\alpha} \right] + \frac{\beta_6 T_0 C_1}{\gamma} \left[ \frac{1}{\alpha + \gamma} + \left( \frac{1}{C_0} - \frac{C_1}{\gamma} \right) \frac{1}{\alpha} \right] e^{-\gamma t} \right]^{-1} \quad (B11)$$

Solving (B7) we get

$$z_0 = \frac{C_1}{\gamma - E} + \left( \frac{1}{C_0} - \frac{C_1}{\gamma - E} \right) e^{-(\gamma - E)t} \quad (B12)$$

Solving (B8) we get

$$z_1 = \frac{C_1}{\gamma - E} \left[ \frac{\beta_6 T_0 e^{\alpha t}}{(\alpha + \gamma - E)} + \frac{F e^{-\beta t}}{(-\beta + \gamma - E)} + \frac{H e^{-\beta_4 t}}{(-\beta_4 + \gamma - E)} + \frac{G e^{-\beta_3 t}}{(-\beta_3 + \gamma - E)} \right] + \left( \frac{1}{C_0} - \frac{C_1}{\gamma - E} \right) \left[ \frac{\beta_6 T_0 e^{(\alpha - \gamma - E)t}}{\alpha} - \frac{F e^{(-\beta - \gamma - E)t}}{(-\beta_4 - \gamma - E)} - \frac{\beta}{\beta_4} \frac{e^{(-\beta_3 - \gamma - E)t}}{(-\beta_3 - \gamma - E)} \right] - \left\{ \frac{C_1}{\gamma - E} \left[ \frac{\beta_6 T_0}{(\alpha + \gamma - E)} + \frac{F}{(-\beta + \gamma - E)} + \frac{H}{(-\beta_4 + \gamma - E)} + \frac{G}{(-\beta_3 + \gamma - E)} \right] + \left( \frac{1}{C_0} - \frac{C_1}{\gamma} \right) \left[ \frac{\beta_6 T_0}{\alpha} - \frac{F}{\beta} - \frac{H}{\beta_4} - \frac{G}{\beta_3} \right] \right\} e^{-(\gamma - E)t} \quad (B13)$$

Adding (B12) and (B13) and  $C(t) = \frac{1}{Z(t)}$  we get C(t) for the case III.

### 7.3. Appendix-C. MATLAB programs for numerical simulation of (4.5), (4.7) and (4.10)

#### For Case-I

```
function xamfile1
options= odeset('RelTol',1e-6,'Stats','on');
Xo = 1000;
tspan = [0,400];
tic
[t,X] = ode45(@TestFunction,tspan,Xo,options);
toc
figure
hold on
plot(t, X(:,1))
return
function [dx_dt]= TestFunction(t,x)
a3=0.06695;
cmax=(149365*10^6);
b5=5*10^-7;
NK=1176;
b6=5*10^-6;
a=-0.04142857143;
T0=400;
dx_dt(1)=(a3-b5*NK)*x(1)-x(1)*x(1)/cmax;
dx_dt = dx_dt';
```

#### For Case-II

```
function xamfile2
options= odeset('RelTol',1e-6,'Stats','on');
Xo = 1000;
tspan = [0,400];
tic
[t,X] = ode45(@TestFunction,tspan,Xo,options);
toc
figure
hold on
plot(t, X(:,1))
return
function [dx_dt]= TestFunction(t,x)
a3=0.06695;
cmax=(149365*10^6);
b5=5*10^-7;
NK=1176;
b6=5*10^-6;
a=-0.4142857143e-1;
T0=400;
dx_dt(1)=(a3-x(1)/cmax)*x(1)
-(b5*NK+b6*T0*exp(a*t))*x(1);
dx_dt = dx_dt';
```

#### For Case-III

```
function xamfile6
options= odeset('RelTol',1e-6,'Stats','on');
Xo = 1000;
tspan = [0,400];
tic
[t,X] = ode45(@TestFunction,tspan,Xo,options);
toc
figure
hold on
plot(t, X(:,1))
return
function [dx_dt]= TestFunction(t,x)
a3=0.06695;
cmax=(149365*10^6);
b5=5*10^-7;
NK=1176;
b6=5*10^-6;
a=-0.04142857143;
T0=400;
E=0.006295557853;
F=0.0070613111736;
G=0.03930566480;
H=-0.3853991092e-1;
b3=1.5/15;
b4=1.5/21;
b=0.1667842667;
dx_dt(1)=(a3-x(1)/cmax)*x(1)-(b5*NK+b6*T0*exp(a*t)
+E+F*exp(-b*t)+H*exp(-b4*t)+G*exp(-b3*t))*x(1);
dx_dt = dx_dt';
```

Table-1: The interactions of the cell populations and the related parameters

interactions		V	C	AB	Th	Tc	NK
V	External injection	k					
	Natural death	$\beta_1$					
	Destructive					$\beta_2$	
Th	Proliferative	$\alpha_1$					
	Natural death				$\beta_3$		
AB	Proliferative				$\alpha_2$		
	Natural death			$\beta_4$			
Tc	Natural birth					$\alpha_4$	
	Natural death						$\beta_8$
C	Natural birth		$\alpha_3$				
	Destructive		$C_{max}^{-1}$	$\beta_7$		$\beta_6$	$\beta_5$

Figure 2 : Sensitivity analysis of the thymus helper cells function  $(\beta\beta_3/k\alpha_1)Th(t)$  on the parameter k, using(4.2)

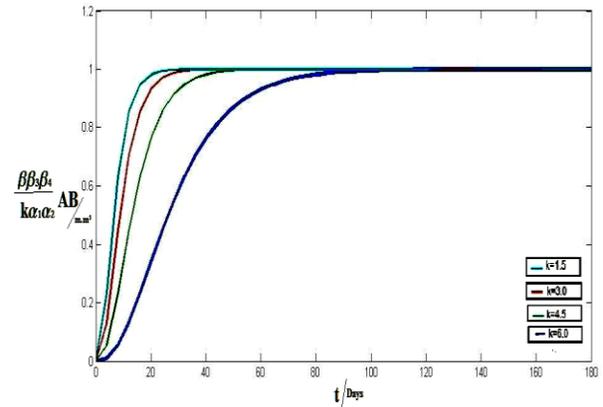


Figure 3: Sensitivity analysis of the Antibodies function

$(\beta\beta_3\beta_4/k\alpha_1\alpha_2)AB(t)$  on the parameter k, using (4.3).

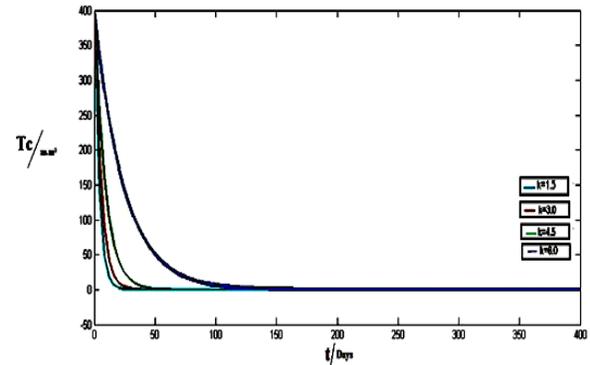


Figure 4: Sensitivity analysis of the Thymus cytotoxic cells  $Tc(t)$  on the parameter k, using (4.4).

Table-2: Numerical values of all parameters used in this work.

$\beta_1$	$\beta_2$	$\beta_3$	$\beta_4$	$\beta_5$	$\beta_6$	$\beta_7$	$\beta_8$
k/9	$1*10^{-7}$	k/15	k/21	$5*10^{-7}$	$5*10^{-6}$	$5*10^{-5}$	k/21
$\alpha_1$	$\alpha_2$	$\alpha_3$	$\alpha_4$	$C_{max}$	k	NK	$T_0$
0.05	2	0.06695	0.03	$49,365*10^6$	1.5	1176	400
							$C_0$
							1000

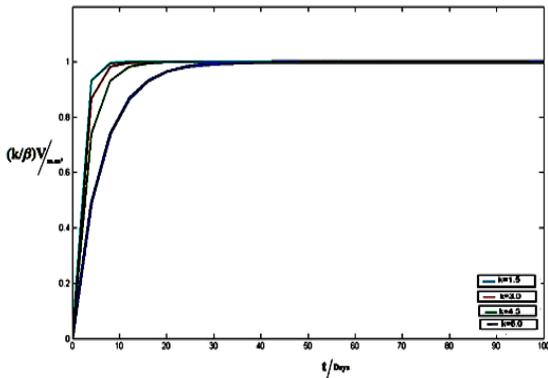
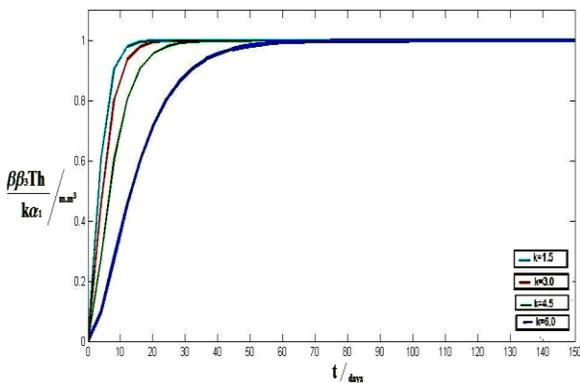


Figure 1: Sensitivity analysis of the vaccine cells function  $(k/\beta)V(t)$  on the parameter k using (4.1).



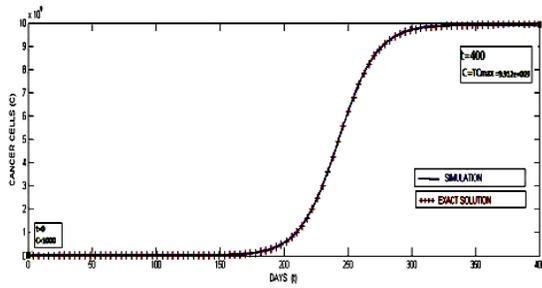


Figure 5(a): Graphical comparison of exact solution with simulation for case I using (4.6).

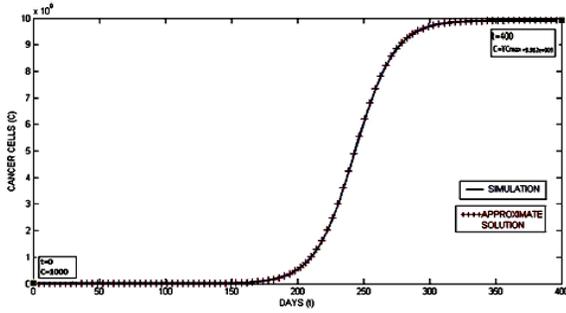


Figure 5(b) : Graphical comparison of approximate solution with simulation for case II using (4.9).

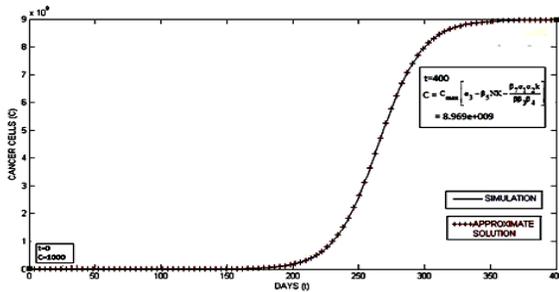


Figure 5(c) : Graphical comparison of approximate solution with simulation for case III using (4.12).

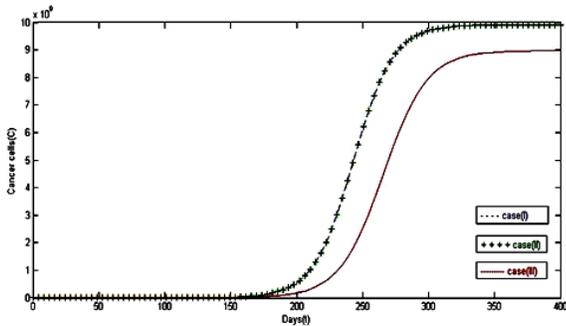


Figure 5(d): Graphical comparisons of growth rate of cancer cells against time for all the three cases using (4.6, 4.9, 4.12)

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# To Assess the Nutritional Status and Morbidity Patterns Among Non-Pregnant Non-Lactating Rural Women of Reproductive Age Group (18-40 Years)

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**Abstract:** The study was undertaken to assess the nutritional status, dietary intake and morbidity patterns among 100 non-pregnant non-lactating rural women of reproductive age group (18-40 years) in the village Bashahpur, Gurgaon. A cross-sectional survey was conducted using both qualitative and quantitative data-collection methods. The study involved interviews using a questionnaire, measurement of food/nutrient intake, anthropometry, observations of clinical signs of morbidities and assessment of their general knowledge and awareness about health, nutrition and sanitation. The mean BMI of the women was found to be 21.12 ( $\pm 3.7$ ) kg/m<sup>2</sup> with 25% of them being underweight and 16% being overweight or obese. The overall quality of food and nutrient intake was poor as the intake of all the food groups (except fats, sugars and milk and milk products) was found to be much lower than their RDAs. The mean energy and protein intake was found to be 983.60 ( $\pm 309.6$ ) kcal and 27.33 ( $\pm 8.2$ ) g, respectively which met only 50% of the nutrient requirements. Similarly, the intake of micronutrients was also found to be inadequate particularly of iron and folic acid which met only 37.8% and 11% of the RDAs, respectively. Dietary deficiencies were also present in NPNL women of Badshahpur reflecting their effects in the clinical signs like pale conjunctiva, menstrual problems and pregnancy complications, etc. The mean general knowledge score was found to be 12 ( $\pm 3.2$ ) out of 24 which reflected that subjects possessed average knowledge about health, nutrition and hygiene. Efforts are needed to improve diet quality and education for rural women so that they rise in economic status and are better nourished.

**Index Terms:** Nutritional status, Rural women, Non-pregnant non-lactating, Morbidity pattern, General practices

## INTRODUCTION

India has 17.5% of the world's population (UN World Population Prospects, 2008) but only 2.4% of its landmass, resulting in great pressures for resources. As per 2012 census, the total population of India is 1.2 billion out of which 655.8 million are males and 614.4 millions are females. It is a country where 70% of the population resides in a rural area and males significantly outnumber females, an imbalance that has increased over time. The typical female advantage in life expectancy is not seen in India and this suggests there are systematic problems in women's health care.

Indian women have high mortality rates, particularly during childhood and in their reproductive years. India's maternal mortality rates in rural areas are among the world's highest. From a global perspective, India accounts for 19% of all live births and 27% of all maternal deaths (NFHS-3 data). The health of Indian women is intrinsically linked to their status in society, especially for those living in a rural area. Research into women's status in society has found that the contributions Indian women make to families are often overlooked. Instead they are often regarded as economic burdens and this view is common in rural areas of the northern belt. There is a strong preference for sons in India because they are expected to care for ageing parents. This son preference and high dowry costs for daughter results in the mistreatment of daughters. Indeed, Indian women have low levels of both education and formal labour-force participation. They typically have little autonomy, living first under the control of their fathers, then their husbands, and finally their sons. These factors have a negative impact on the health status of Indian women. Poor health has repercussions not only for women, but also their families. Women in poor health are more likely to give birth to low weight infants. They are less likely to be able to provide food and adequate care for their children. Finally, a woman's health affects the household's economic wellbeing because a woman in poor health will be less productive in the labour force. In rural areas where women are less educated and economically deprived, their health condition is worse. In the context of health as defined by WHO - 'a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity' - one must ask how can this be achieved for Indian women.

Health status is an outcome of a large number of factors:

- Poverty, food security, food pricing and malnutrition
- Environmental pollution and degradation
- Occupational health problems

- Reproductive health problems
- Household economy and wages
- Economic development; represented by per capita income, urbanization and industrialization
- Social development; especially literacy rates
- Prices of private health care system
- Public health care delivery system

About 75% of health infrastructure, medical man power and other health resources are concentrated in urban areas where 28% of the populations live and only 25% of medical facilities are concentrated in rural areas where rest 72% people live (NFHS-3 data). Contagious, infectious and waterborne diseases such as diarrhoea, amoebiasis, typhoid, infectious hepatitis, worm infestations, measles, malaria, tuberculosis, whooping cough, respiratory infections, pneumonia and reproductive tract infections dominate the morbidity pattern, especially in rural areas. However, non-communicable diseases such as cancer, blindness, mental illness, hypertension, diabetes, HIV/AIDS, accidents and injuries are also on the rise.

According to NFHS III data, more than a third (36%) of women has a BMI below 18.5, indicating a high prevalence of nutritional deficiency. Among women who are thin, 44% are moderately or severely thin. More than half of the women (55%) are anaemic as depicted by NFHS III survey. Less than one-third of women in the lowest wealth quintile consume milk or curd at least once a week, as do less than half of women in the second wealth quintile. More than half of women in the three highest wealth quintiles consume milk or curd at least once a week. In the highest wealth quintile, three-quarters of women consume milk or curd at least once a week. The differentials in food consumption are even sharper for the consumption of fruit. Weekly consumption of fruit increases from 16 percent in the lowest wealth quintile to 72 percent in the highest wealth quintile.

The health status of Indians, is still a cause for grave concern, especially that of the rural women. This is reflected in the life expectancy (62.5 years), infant mortality rate (57/1000 live births), maternal mortality rate (230/100 000 live births) (NFHS-3 data); however, over a period of time some progress has been made. To improve the prevailing situation, the problem of rural health is to be addressed both at macro (national and state) and micro (district and regional) levels. This is to be done in a holistic way, with a genuine effort to bring the poorest of the population to the centre of the fiscal policies. A paradigm shift from the current 'biomedical model' to a 'socio-cultural model', which should bridge the gaps and improve quality of rural life, is the current need. A revised National Health Policy addressing the prevailing inequalities, and working towards promoting a long-term perspective plan, mainly for rural health, is imperative.

Diet and nutrition are important factors in the promotion and maintenance of good health throughout the life cycle. Income, prices, individual preferences and beliefs, cultural traditions, as well as geographical, environmental, social and economic factors all interact in a complex manner to shape dietary consumption patterns and affect the morbidity and clinical status of women. A normal balanced diet must include daily foods from the various food groups in sufficient amounts to meet the needs of an individual and to increase immunity.

### **Importance of study**

As is seen above, more than 50% of women are anaemic and more than 36% are severely undernourished, we intend to make an effort to investigate the nutritional status, dietary intake and the morbidity pattern among rural women.

The rural women population contribute significantly to our country in every sphere, be it census count, agriculture, economy, society or development. It has been very rightly said that the developmental status of a country shall be adjudged by the development of its countryside. Hence it should be a matter of prime concern that the rural population, particularly women shall be taken care of in terms of healthcare and other infrastructure

As responsible future health professionals, we chose to have an insight about the commonly existing health problems in rural population. We aim to find the nutritional status of a sample rural female population and relate it to the health problems occurring among them. Females have been singled out giving regard to their importance and role in the development and welfare of a family, society and a country as a whole.

The data from our study will also provide insight to policy makers/programmers to design/develop interventions for this group for health, life style etc.

### Research objectives

The main objectives of the research study were:

- To assess the nutritional status of non-pregnant non-lactating rural women of reproductive age group (18-40 years)
- To study the dietary intakes of rural women.
- To study the morbidity pattern among rural women.
- To assess the general awareness and practices of rural women regarding nutrition, health and sanitary practices

## LITERATURE REVIEW

India is the second most populous country of the world and has changing socio-political demographic and morbidity patterns that have been drawing global attention in recent years. Despite several growths orientated policies adopted by the government, the widening economic, regional and gender disparities are posing challenges for the health sector.

In order to obtain a detailed insight on the theme, researcher reviewed the existing literature from various sources. The reviewed studies are reported in the following sub-categories:

- Dietary intakes and nutritional status of rural women
- Morbidities among rural women
- General awareness and health practices among rural women regarding health, nutrition and sanitation

### A. Dietary Intakes and Nutritional Status of rural women

Diet and nutrition are important factors in the promotion and maintenance of good health throughout the life cycle. Income, prices, individual preferences and beliefs, cultural traditions, as well as geographical, environmental, social and economic factors all interact in a complex manner to shape dietary consumption patterns and affect the morbidity and clinical status of women. A normal balanced diet must include daily foods from the various food groups in sufficient amounts to meet the needs of an individual and to increase immunity. But the dietary intake and nutritional status of our rural women is found to be poor as a result of various studies conducted on them.

The Recommended Dietary Allowances (RDAs) for adult females are given in the Table 1.1.

**Table 1.1: Recommended Dietary Allowances**

<b>NUTRIENTS</b>	<b>RDA</b>
Energy (kcal)	1900
Protein (g)	55
Fat (g)	20
Carbohydrate	55-60% of total energy
<b>NUTRIENTS</b>	<b>RDA</b>
Calcium (mg)	600
Iron (mg)	21
Vitamin A (retinol –mcg)	600

Beta-carotene (mcg)	4800
Thiamine (mg)	1.0
Riboflavin (mg)	1.1
Niacin (mg)	12
Vitamin B6 (mg)	2
Vitamin C (mg)	40
Folate (mcg)	200
Vitamin B12 (mcg)	1

Source: ICMR (2010)

Various studies have been undertaken to find out the dietary intakes and nutritional status of rural women in India as well as the neighbouring countries. Some of the studies carried out among women are listed in Table 1.2.

**Table 1.2: Studies showing dietary intakes and nutritional status of Indian rural women**

S.No.	AUTHOR & YEAR	MAJOR FINDINGS
1.	NNMB & INP (1975-2005)	Decrease in energy, protein & Fe intake and increase in fat intake over three decades
2.	Khetarpal (2007)	Low intake of vegetables, fruits & milk products; adequate intake of oil, sugar & jiggery
3.	Johansson & Anderson (1998)	Low fruit, vegetable & calorie intake; 60% women were anaemic
4.	Mallikharjuna <i>et al.</i> (2010)	Low intake of all food groups except other vegetables, roots & tubers; micronutrient deficiency prevalent were Fe, Vitamin A & free folate
5.	Srivastava <i>et al.</i> (1998)	50% of women were undernourished
6.	Tanuja <i>et al.</i> (1995)	23.9% women had <145cm height; 95.9% had <45kg weight
7.	Mittal & Srivastava (2006)	Severe deficit of pulses, green leafy vegetables, flesh foods, milk & fruits; Energy intake is 52-53% of RDA
8.	Singh (2006)	18% & 43% of females consume milk daily & once a week, respectively
9.	Verma <i>et al.</i> (2003)	Calorie, Fe, Ca, Vitamin C, Vitamin A intake <RDA; protein intake >RDA
10.	Pant (1998)	Low dietary & nutrient intake; 42.54% women suffered from CED; >56% were underweight; Mean BMI was 19.26

NNMB surveys (2005) provided data on time trends in dietary intake (by 24 hours dietary recall) and nutritional status of the population in eight states from 1975 to 2005. NNMB surveys indicated that during the past three decades diets continued to be cereal based and monotonous; among poorer segments fruit, vegetable and animal food intake continues to be low. There had been

- a progressive reduction in already low pulse intake
- small increase in fats and oil intake in urban slums
- increase in dietary diversity among rural high income group

There had been reduction in energy and protein intake except among the poor; over all there had been a small decrease in total energy and protein intake in both urban and rural areas. There had also been some increase in dietary energy derived from fat and a reciprocal reduction in %age of dietary energy derived from carbohydrate.

Intakes of most micronutrients continued to be low. Iron intake was low; this coupled with poor bio-availability of iron from Indian diets was responsible for high prevalence of anaemia.

In another study conducted by Khetarpal (2007) on Health and Well-Being of Rural Women, it was found that only 10 per cent of the studied women were consuming a balanced diet. The women showed a poor intake of vegetables, fruits and milk products however, the intake of oil, sugar and jaggery was nearly adequate.

Johansson and Anderson (1998) in their study on nutritional intake by rural females reported that most people had an intake of fruits and vegetables below recommended level. The diet was deficient in minerals and vitamins. The calories obtained were also less than the minimum amount required by an adult woman. The study also revealed that 60% of them had anaemia as they consumed inadequate amounts of iron, B complex vitamins and vitamin C. 40% of the subjects had poor eyesight and 10 % had goiter.

Similar findings have also been presented in a study conducted on diet and nutritional status of women by Mallikharjuna Rao *et al.* (2010). Their study revealed that the intake of all the foods except for other vegetables and roots and tubers was lower than the suggested level among rural as well as tribal women. The study revealed inadequate dietary intake, especially micronutrient deficiency (hidden hunger) during reproductive years. The study showed that the intake of cereals and millets was 402 g and 365 g, respectively in tribal and rural NPNL women. Except for other vegetables and roots and tubers, the intake of all the other foods was lower than the suggested level in both rural and tribal areas. The intake of income elastic foods such as milk, oils and fats was higher in rural than in tribal NPNL. The intakes of all the nutrients were lower than the recommended levels suggested by ICMR in all the physiological groups in both the areas. The deficit was more with respect to micronutrients such as iron, vitamin A, riboflavin and free folic acid.

Srivastava *et al.* (1998) in their study on nutritional status of rural non-pregnant non-lactating women in reproductive age showed that the mean age, family size, gravida, parity, mean pregnancy interval and socio-economic index were comparable in the selected women of two blocks. The socio-economic and environmental characteristics of study women showed that 64.6% of the study women belonged to backward class followed by 24.2% in scheduled caste and only 11.1% belonged to upper class. The average income of these women was found to be Rs. 169.0±1.3 per month. As many as 67.5% women were still using well-water for domestic use. Only 33% of the households had electrification, remaining used kerosene lamp as a source of light. Illiterate women comprised 87.0% of the total and their main occupation was domestic activities (housewives). The means for height, weight and mid-arm circumference (MAC) in the ICDS were higher as compared to the non-ICDS by 0.8 cm, 1.1 kg and 0.2 cm, respectively. These differences were significant in view of large sample size. However, the 50th centile values for height and mid arm circumference did not differ >3% and for weight >6% for both the blocks at any point as compared to the corresponding 50th percentile of the pooled data. It was felt that study women in two blocks are not varying much and therefore data were pooled to have a larger sample for calculation of percentiles in pre-pregnancy state.

A study on nutritional status of tribal women in Bihar (Tanuja *et al.* 1995) indicated that the tribal women of Singhbhum district were highly undernourished. The study reported 23.9% tribal women as having height <145 cm and 95.9% having weight <45 kg. If <38 kg was taken as cut-off for weight, then 36.0% of these women could be termed as low weight. This was quite high when compared to studies reported from other parts of India. Thus majority of the tribal women in Bihar were found to be at risk of delivering low birth weight babies and have pregnancy complications. Some of the reasons for under nutrition among tribal women could be poor diet intake, ignorance, early marriage, and high morbidity due to unhygienic practices and surroundings. Under-nutrition of mothers may be carried over to their children. Hence it was stressed that there was a need to provide special

attention to this group in improving their nutritional status by intervening appropriate health and nutrition programmes like nutrition education, iron supplementation and de-worming both during adolescence and during adulthood.

Another study on diet, nutritional status and food related traditions of Oraon tribes of New Mal, West Bengal (Mittal and Srivastava 2006) found that the intakes of all groups are deficient in all food groups to a similar extent. The deficit of pulses and flesh foods was most severe in the diet of the Oraon women. The consumption of green leafy vegetables was also very deficient, and it consisted mostly of little known locally available greens. Large deficits in intake of protective foods such as milk, vegetables including green leafy vegetables, and fruit were found. Also, it was noteworthy that the mean BMI of women fell in the normal range, despite energy intakes of the order of 52-53% of ICMR RDA.

Singh (2006) in his study conducted in Haryana revealed that milk intake was so poor that only 18 per cent reported taking milk daily, once in a week(43%) and majority had never taken during the lactation.

A study conducted by Verma *et al.* (2003) on 320 female subjects representing rural population of selected areas of district Shimla of Himachal Pradesh found that wheat and maize were the main cereals consumed by the respondents. Among pulses, black gram dal was most commonly consumed. Desi ghee was consumed in good amounts with almost every food preparation. The calorie intake was below and protein intake was above the recommended levels but this difference was not statistically significant. The iron consumption was below the recommended levels. The intake of calcium, vitamin C and vitamin A was lower when compared with recommended levels. The BMI calculations suggested that majority of were of normal nutritional status.

Another study on women and nutrition in Himalayan region (Pant 1998) revealed that 49.26, 27.94 and 15.44 % women had milk, curd and ghee daily while the rest consumed occasionally. Likewise daily pulse intake accounted for only 5.15% of the total sample women while 17.64, 34.56, 36.77 and 5.88%, respectively were taking pulses four times per week, twice, weekly and monthly. Pulses are another source of nutrients particularly for protein. Out of total 136 sample women, 32.35 and 61.65% were vegetarian and non-vegetarian, respectively. Out of total non-vegetarian 16.30, 48.91 and 34.79% women consumed flesh products respectively weekly, bimonthly and occasionally. It was very considerable that 96.32% women consumed green vegetables monthly. Only 2.21 and 1.47% took green vegetables weekly and daily, respectively. Green vegetables are important source of vitamins, the deficiency of which causes various nutritional deficiency diseases. It is also worth to mention that in the rainy and winter seasons people consumed green vegetables twice even thrice in a day but not regularly. Taking together all the 136 samples, approximately the per capita per day cereal intake was 389.29 grams which was 11.53% less than the standard requirement of 440 grams. Per capita daily intake of pulses was only 23.18 grams which was 49.49% less than the standard requirement of 45 grams. The per capita daily vegetable consumption in the region was 41.21 grams which is 78.31% lower than the standard requirement of 190 grams (including root, leafy and other vegetables). The consumption of ghee and cooking oil per capita per day was found to be 17.58 grams which was 56.05% less than the 40 grams standard requirement. The average intake of milk products per capita per day was found to be 81.01 grams, which was 46% lower than the 150 grams standard requirement. In the entire sample, the average energy intake per capita per day was found to be 1942.2 kcal, which was 21.78% below the standard requirement. The average per capita, per day protein intake was found to be 49.25 grams which was 20.56% below the standard requirement of 62 grams. The average fat intake per capita per day was found to be 29.81 grams which was 6.84% below the standard requirement of 32 grams. On average carbohydrates intake was found to be 363.37 grams per head per day which was 15.5% below the standard requirement (430 grams). The average per capita daily calcium intake was found to be 544.52 mg in the region which was 31.94% below the standard requirement of 800 mg. The average iron intake per capita per day was found to be 33.59 mg, which was 1.79% above the standard requirement of 33 mg. In the sample villages of the region, the average phosphorus intake per capita per day was found to be 1299.38 mg, which was 7.19% below the standard requirement of 1400 mg.

Using BMI 18.5 as the criteria (optimum) for Chronic Energy Deficiency (CED), 42.54% of the total 136 surveyed women were found suffering from various degrees of CED. Among them 1.47%, were suffering from CED grade III (severe), 11.76% from CED grade II (mild), and 29.41% from CED grade I (moderate) form of mal- nutrition. More than 56% of total women were suffering low weight categories. Only one case (0.74%) of the total was found in the obese grade I. The mean BMI was 19.26.

Similarly, various studies undertaken in the other parts of the world also showed similar findings. The studies on dietary intake and nutritional status of rural women conducted in other countries are listed in Table 1.3.

**Table 1.3: Studies showing dietary intakes and nutritional status of rural women in other countries**

S.No.	AUTHOR & YEAR	MAJOR FINDINGS
1.	Ahmed (2008)	Mean age: 30.2 ( $\pm 2.9$ )y; weight: 46 ( $\pm 8.5$ ); height: 149 ( $\pm 5$ ) cm & BMI: 20.5 ( $\pm 3.5$ ); 52% & 65% had Vitamin A & B-complex deficiencies, respectively
2.	Islam <i>et al.</i> (2004)	Energy intake < RDA
3.	Ene-Obong <i>et al.</i> (2001)	More educated women had higher incomes, had significantly better health and nutrition knowledge, food habits, nutrient intakes, health, self-concept
4.	Kobati <i>et al.</i> (2012)	Poor dietary intake & nutritional deficiency
5.	EDHS (2000 & 2005)	2000: 19.4% & 11.1% women were moderately & severely undernourished, respectively; 2005: 18% & 8.9% women were moderately & severely undernourished, respectively

A study on nutritional status, hypertension, proteinuria and glycosuria amongst the women of rural Bangladesh (Ahmed 2008) found that of 501 women participants, 30.3% were illiterate. Almost all of them had supply of tube-well water and 68% had sanitary latrines. Their mean ( $\pm$ SD) age was 30.2 ( $\pm 2.9$ ) y, weight was 46 ( $\pm 8.5$ ) kg, height was 149 ( $\pm 5$ ) cm and BMI was 20.5 ( $\pm 3.5$ ). The poor women had significantly lower BMI than the rich [20.0 (2.93) vs. 21.2 (4.1), ( $p < 0.05$ )]. Regarding nutritional deficiency, about half of the rural women (52%) had some form of signs relating to vitamin A deficiency and 65% had signs of vitamin B complex deficiency either in the form of glossitis or of angular stomatitis or both.

Islam *et al.* (2004) in their study on nutritional status of women in Bangladesh: comparison of energy intake and nutritional status of a low income rural group with a high income urban group conducted study on premenopausal women ( $N = 191$ ) aged 16–40 years found that socio-economic status had a significant effect on body weight, height, biceps and triceps skinfolds, BMI, TBF (total body fat), FFM (fat-free mass) and BF% (body fat). These variables were significantly higher in group H (higher-income) than in group L (lower income). The influence of physiological status on most of these variables was not significant. EI (energy intake) was, however, influenced by both socio-economic and physiological status. The mean EI was significantly lower in group L than in group H. The contributory sources were different in high and low income groups. In both groups, EI was lower than the recommended level. Based on the dietary and anthropometric results, it was concluded that malnutrition is a common feature among low income rural women.

Based on the data presented in the paper ‘determinants of health and nutritional status of rural Nigerian women’, it can be said that education influences the health and nutritional status of rural women in Nigeria. As expected, the more educated women had higher incomes, had significantly ( $p < 0.05$ ) better health and nutrition knowledge, food habits, nutrient intakes, health, self-concept, and less adherence to detrimental cultural practices, and had a higher mean age-at-marriage and age-at-first birth. Poor

education of the women was attributed to lack of money from parents, sex discrimination, and marriage while in school, among other reasons.

Another study on dietary intakes and body mass indices of non-pregnant, non-lactating (NPNL) women from the coastal and guinea savannah zones of Ghana (Kobati *et al.* 2012) showed that more women in the Coastal zone had significantly fewer births and were heads of their households. Cereal-based foods were consumed daily by all women during the two-day observation period. Fish was the predominant animal source food in the diet in both zones. Significantly more women in the Guinea Savannah zone did not meet their Estimated Average Requirements (EAR) for protein (81%), vitamin A (94.4%), and vitamin C (72%) compared to women in the Coastal zone (44%, 22%, and 31% respectively). The diets of both groups of women were low in calcium. Generally, women in the Coastal zone had a significantly higher BMI ( $24.2 \pm 4.6 \text{ kg/m}^2$ ) than their counterparts in the Guinea Savannah zone ( $21.3 \pm 2.4 \text{ kg/m}^2$ ). The overall quality of dietary intakes and nutritional status of women in the Guinea Savannah zone was poorer than that of Coastal women. Dietary deficiencies are also present in NPNL women in Ghana.

Similarly, a study on under-nutrition among non-pregnant non-lactating women of Ethiopia (aged 15-49 years) found that 30.5% of women in the 2000 Ethiopian Demographic and Health Surveys (EDHS) and 26.9% of the women in the 2005 survey were undernourished, of whom in the 2000 survey 19.4% were moderately undernourished and 11.1% were severely undernourished. Similarly, in the 2005 survey 18.0% were moderately undernourished and 8.9% severely undernourished.

## B. Morbidities among rural women

The health of Indian women is intrinsically linked to their status in society. Researches into Indian women's status have found that their family contributions are often overlooked and they are likely to be regarded as an economic burden, especially in rural areas. This attitude has a negative impact on their health status. Poor health has repercussions not only for women, but also for their children and other family members.

Various studies have been undertaken to find out the morbidities among rural women in India as well as the neighbouring countries. The studies carried out in India are listed in Table 1.4. depicting the outcomes of the study.

**Table 1.4: Studies showing morbidities among Indian rural women**

S.No.	AUTHOR & YEAR	MAJOR FINDINGS
1.	Sharma & Dhawan (1986)	Prevalent diseases were bronchitis, coryza, indigestion, constipation, diarrhoea, conjunctivitis, dandruff, tartar deposits on teeth, skin diseases, gynaecological diseases & some other diseases like rheumatism, arthritis
2.	Khetarpal (2007)	Major morbidities were anaemia, backache, headache & body pain
3.	Mallikharjuna <i>et al.</i> (2010)	Major diseases were goiter (4.9%), bitot's spot (0.6%), angular stomatitis (1.1%), dental caries (14%)
4.	Saha <i>et al.</i> (2010)	2%, 35% & 15% of women had severe, mild & moderate anaemia, respectively
5.	Ravindran (1995)	42% had pregnancy complications, 19% had severe backache & joint pain
6.	Ghosh & Mohanty (2005)	18% reported abdominal pain during menses
7.	Netravati (2006)	76.7% had menstrual problems like body pain, white discharge, backache, etc.
8.	Brabin <i>et al.</i> (2000)	Anaemia was the major problem

A study conducted by Sharma and Dhawan (1986) on health problems of rural women indicated the prevalence of a number of health problems among rural women and a need for their education on health aspects. A sizeable number of them were found to

have suffered from bronchitis, coryza, indigestion, constipation, diarrhoea, conjunctivitis, dandruff, tartar deposits on teeth, skin diseases, gynaecological diseases and some other diseases like rheumatism, arthritis, etc. The existence of a government hospital in village had no association of significant level with the health problems of rural women. Majority of the respondents perceived the treatment given in government hospital to be not effective and several other constraints in availing of the treatment facilities. The frequency of various diseases suffered by the females is given in Table 1.5.

**Table 1.5: Morbidity profile of rural women**

<b>DISEASES</b>	<b>PERCENTAGE</b>
<b><i>Respiratory Diseases</i></b>	
Bronchitis	53
Coryza	48
Asthma	16
<b><i>Diseases of Gastro-Intestinal Tract</i></b>	
Indigestion	29
Constipation	23
Diarrhoea	17
Enteric fever	9
<b><i>Diseases of Reproductive System</i></b>	
Irregular menstrual cycle	13
Leucorrhoea	10
Irregular menstrual flow	6
Prolapsed of vagina	4
<b><i>Diseases due to Lack of Hygiene</i></b>	
Conjunctivitis	19
Tartar deposit on teeth and molars	36
Dental caries	29
Pyorrhoea	19
Dandruff	19
Alopecia	7
Pediculosis	5
<b><i>Skin Diseases</i></b>	
Boils	9
Dermatitis	8
Scabies	7
Ring worm	3
Eczema	1
<b><i>Deficiency Diseases</i></b>	
Vitamin A deficiency	19
Anaemia	5
Osteomalacia	4
Vitamin B deficiency	3
<b><i>Other Diseases</i></b>	
Headache	55
Rheumatism	29
Arthritis	27
Malaria	25
Hysteria	5
Piles	1

*Source: Health Problems of Rural women by Sharma and Dhawan (1986)*

Similar findings were reported in another study on women's health in a rural poor population in Tamil Nadu (Ravindran 1995). The study showed that 42 per cent have suffered from one or more serious problems related to pregnancy and childbirth. 22 per cent of the women encountered problems during pregnancy or childbirth, while 32.9 per cent had complications in the postpartum period. Nineteen percent of the women complained of severe backaches or joint pains that restricted them to bed, while respiratory infections accounted for a further 15 percent. Other important problems reported include oral infections, diarrhoea, eye infections and injuries related to work and to domestic violence.

Similarly, Mallikharjuna Rao *et al.* (2010) in their study on diet and nutritional status of women in India found that the prevalence of goiter was relatively higher (4.9%) among tribal women compared to their rural counterparts (0.8%). Tribal women were particularly vulnerable to under-nutrition compared to women in rural areas. The prevalence of chronic energy deficiency was higher (56%) among tribal NPNL women compared to rural women (36%). The prevalence of bitot's spots, a sign of Vitamin A deficiency was 0.6% among tribal and 0.3% among rural women. The prevalence of angular stomatitis, a sign of B complex vitamin deficiency was 1.1% and 0.8% in tribal and rural women respectively. About 14% of tribal and 12% in rural women had dental caries.

Another study conducted by Khetarpal (2007) on Health and Well-Being of Rural Women found that majority of the women were suffering from anaemia and complained of backache, head ache and pain in the body. This may be due to considerable workload for women who spend 10-11 hours at working in fields, continue doing their work at home also and consume less food.

A study conducted on a trend in women's health in India – what has been achieved and what can be done (Saha *et al.* 2010) found that every second woman in India suffers from some degree of anaemia; 2% are severely anaemic, while 35% and 15% have mild and moderate anaemia levels, respectively. Inter-state differences were pronounced. Lack of adequate resources prevented women from poorer households using health services. Undernourished, ill-fed and overworked, most women from such households were extremely vulnerable to ailments and disease, which may not be properly diagnosed and treated. Poor sanitation, unhygienic surroundings and difficulty in procuring safe drinking water were some additional factors that affect the general health of women. The study also showed that the mother's education was highly correlated with the level of malnutrition among children. The children of illiterate mothers were twice as likely to be undernourished or stunted as were children whose mothers have completed at least high school. The differentials were even larger when severely undernourished children were considered. Children of illiterate mothers were three times as likely to be severely undernourished as children of mothers with at least a high school education.

Ghosh and Mohanty (2005) in their study found that, 18 per cent of the young married women reported abdominal pain during menses.

Likewise, a study on reproductive health of rural married adolescent girls (Netravati 2006) found that 76.7 per cent of the respondents faced one or the other menstrual problems. Irregular menses was the major problem reported by 24.7 per cent of the respondents. Pain in body and legs (18.0%), white discharge (15.3%), excessive bleeding (13.3%), lower abdominal pain (12.7%), long period of menses (12.7%) and backache (10.7%) were the other problems reported by the respondents. Regarding vaginal or uterine problems 23.3 per cent of the respondents had problems, among them 13.3 per cent had vaginal problems. Burning sensation during urination (11.3%) and itching (2.0%) were the vaginal problems reported by the respondents. 10 per cent had uterine problems, among them 5.3 per cent of them reported as pain in uterus and 4.6 per cent reported swelling of the uterus.

Another study on higher prevalence of anaemia among women in Mumbai (Brabin *et al.* 2000) showed that infertile women and women without living children had the highest haemoglobin values. The study concluded that nutritional interventions that focus on reducing fertility or iron supplementation during pregnancy were beneficial, but many women remained iron deficient. Action was needed to improve nutritional status before pregnancy - a policy that was feasibly given the interest in adolescent sexual and reproductive health programmes.

Similarly, various studies undertaken in the other parts of the world also showed similar findings. The studies on morbidities among women conducted in other countries are listed in Table 1.6.

**Table 1.6: Studies showing morbidities among rural women in other countries**

S.No.	AUTHOR & YEAR	MAJOR FINDINGS
1.	Ahmed <i>et al.</i> (2008)	Prevalence of hypertension, proteinuria and glycosuria were 16.6, 10.4 and 2.6%, respectively
2.	Rahman & Shahidullah (2005)	58.6% reported lower abdominal pain during menstruation
3.	Houdegbe (1985)	Major problems were malaria, malnutrition & placenta previa
4.	Ziauddin <i>et al.</i> (2000)	52% & 20% of women had mild & moderate anaemia

Ahmed *et al.* (2008) in their study on nutritional status, hypertension, proteinuria and glycosuria amongst the women of rural Bangladesh found that of 501 subjects studied, the mean ( $\pm$ SD) systolic and diastolic blood pressure were 116 ( $\pm$ 17) and 73 ( $\pm$ 12) mmHg, respectively. The prevalence of hypertension, proteinuria and glycosuria were 16.6, 10.4 and 2.6%, respectively. The frequencies of proteinuria and ring-worm were significantly higher among the poor than among the rich social class (both cases  $p < 0.05$ ).

Rahman and Shahidullah (2005) conducted a study on adolescent self-reported reproductive morbidity and health care seeking behaviour in Bangladesh. The results revealed that, 58.6 per cent of the adolescents reported lower abdominal pain during menstruation.

A discussion identifying some of the health problems experienced by rural women in Africa (Houdegbe 1985) found that the first of these health problems was malaria. Next on the list was malnutrition, with anaemia as its corollary. It was caused by ignorance, or lack of information on what food should be eaten; dietary customs and taboos deeply anchored in some families and which deprived women of the nutrients required by their bodies, especially after childbirth; lack of time; and financial difficulties. Since planned parenthood is "unknown" in rural areas, most women bear a great many children -- 8-10 or more. Placenta previa is a frequent condition in such women, and often results in the mother's death, since the delivery was done in a poorly equipped centre and the diagnosis was only made at the beginning of labour. In sum, these were some of the everyday problems encountered in rural areas: the lack of information on health matters; the distance from health centers; limited financial resources in the rural population; and the precariousness of means of transportation, and the absence of an emergency transferral system.

Another study on anaemia among non-pregnant women in rural Bangladesh (Ziauddin *et al.* 2000) found that anaemia was highly prevalent (73%). Most of the women had mild (52%) or moderate (20%) anaemia, but a few of them suffered from severe anaemia (1%). *Ascaris* was common (39%) while hookworm was not (1%). The anaemia prevalence had no statistically significant association with age, parity or *Ascaris* infestation. Women with less than 1 year of schooling, who were landless or who reported having an economic deficit in the household had significantly higher prevalence of anaemia. There was a significantly increasing trend in anaemia prevalence with decreasing socioeconomic situation. However anaemia was common in all social strata.

### **C. General awareness and health practices regarding health, nutrition and sanitation among rural women**

Nutrition education activities in any developing country, without a simultaneous educational process for better personal and food hygiene and the control of diarrhoeal disease would have no impact. Education for the promotion of immunization is needed an indirect nutrition promotes. It has been rightly pointed out that nutrition education should be so designed as to promote desirable practices in all aspects of human life which have direct or indirect effects on nutritional status. In recent time combination of mass media mix approach is an appropriate tool for technology transmission and knowledge dissemination, in the prevailing circumstances of constraints of illiteracy, and the need to achieve developmental objectives within a short span of time.

Various studies have been undertaken to find out the general awareness and health practices regarding health, nutrition and sanitation among rural women. The various studies carried out are listed in Table 1.7. depicting the outcomes of the study.

**Table 1.7: Studies showing general awareness and health practices among rural women**

<b>S.No.</b>	<b>AUTHOR &amp; YEAR</b>	<b>MAJOR FINDINGS</b>
1.	Mittal & Srivastava (2006)	Poor knowledge and awareness about health and nutrition
2.	Deshpande <i>et al.</i> (1994)	Women in rural area posses average knowledge (50%) about the health practices
3.	Dhanesekharan (2005)	Inadequate awareness regarding maintenance of sanitary latrines
4.	Abdad <i>et al.</i> (2006)	98.0% of respondents had knowledge about family planning methods
5.	Manisha kale <i>et al.</i> (1998)	52% adopted personal hygiene practices
6.	Merchant (1998)	17% of the rural women completely adopted the recommended weaning practices
7.	Manay & Farzana (2000)	21.2% of the family were found to be poor in hygiene followed by 69.9% as moderately clean
8.	Kaur & Sehgal (1995)	66.7% of the respondents had inadequate knowledge about proper cooking of foods
9.	Devi & Saroda (1997)	Knowledge of the respondents increased after the nutrition education intervention programmes
10.	Sivnarayana <i>et al.</i> (1999)	Education & knowledge were positively and significantly co-related
11.	Karpagam (2000)	Education had positive and significant relationship with the adoption level of the respondents
12.	Vani (2007)	31.33%, 49.34% & 19.33% of the respondents had high, medium & low knowledge level regarding health and nutritional practices, respectively
13.	Vinitha <i>et al.</i> (2007)	9.5 per cent of the adolescents interviewed had knowledge on safe sex
14.	Bhatnagar & Jain (2004)	90% of the subjects belonged had average awareness about their diet, general health and medicines

Mittal and Srivastava (2006) in their study on diet, nutritional status and food related traditions of Oraon tribes of New Mal (West Bengal) found that the knowledge of contraception, vaccinations, proper diet and supplements among rural females was severely deficient, indicating poor knowledge and awareness about health and nutrition.

Similarly, Deshpande *et al.* (1994) in their study concluded that women in rural area posses average knowledge (50%) about the health practices but they should receive more education through available media. The efforts by voluntary women organization should also be directed to rural women necessary practical education regarding health practices, by conducting campus and rural stay programmes.

Similar findings were reported by Kaur and Sehgal (1995) in their study conducted in the Hissar district of Haryana that 66.7% of the respondents having inadequate knowledge about proper cooking of foods before imparting nutrition education. After the education 93.2% had adequate knowledge of cooking of cereals.

Another study by Dhanesekharan (2005) conducted in Batlagundu and Dindigul district of Tamil Nadu revealed that 65% of the samples were not fully aware regarding maintenance of sanitary latrines and remaining have only partial awareness. Abdad *et al.* (2006) conducted their study in tribal areas Madhya Pradesh reported that majority (98.0%) of respondents having knowledge about family planning methods and 6% of them having the knowledge on tubectomy, and 13% of them having knowledge on vasectomy and 26% having knowledge on both.

Manisha kale *et al.* (1998) revealed that majority of the tribal women (52%) belonging the medium category of adoption of personal hygiene practices found to have the nutritional status ranging between normal, but none of them were malnourished. Marchant (1998) in her study conducted in Akola found that 17% of the rural women completely adopted the recommended weaning practices followed by 46.66% who partially adopted the recommended weaning practices. Manay and Farzana (2000) conducted study in Doddaballapur taluk of Bangalore district revealed that 21.2% of the family were found to be poor in hygiene followed by 69.9% as moderately clean.

Devi and Saroda (1997) reported in the study conducted in Timpet village of Andhra Pradesh, the knowledge level of respondents were higher after intervention than the initial mean knowledge scores. It indicated the knowledge of the respondents had increased after the nutrition education intervention programmes.

Sivanarayana *et al.* (1999) in their study in Uttar Pradesh revealed that the correlation coefficients revealed that education, and knowledge were positively and significantly related with the information output pattern of the integrated child development services (ICDS) and non-ICDS rural women of Uttar Pradesh, India. Further, the results of path analysis also explained that education, knowledge and adoption have the largest direct effects on information output pattern in descending order. Karpagam (2000) in his study conducted in Erode district, Tamil Nadu revealed that education had positive and significant relationship with the adoption level of the respondents.

A study on knowledge and adoption of selected health and nutritional practices by rural women in Belgaum district, Karnataka (Vani 2007) found that 31.33 percent of the respondents had high, 49.34 percent had medium and the remaining 19.33 percent had low knowledge level regarding health and nutritional practices. The data also revealed that, more than half of the respondents had knowledge about detailed health practices of children, immunization is must for health of the child (100%), bathing the child daily (100%), giving the child enough safe water (100%), washing hands before holding and feeding the baby is necessary (77%), regular health check up every month in baby clinic or health centers is needed (74%). With regard to the knowledge level of respondents about health practices for adults it was revealed that keeping the house clean by sweeping and swabbing daily is necessary (83%), the diseases caused by mosquitoes, bed bugs, house flies etc., can be prevented by keeping surroundings clean without water stagnation (60.00%), trimming nails reduces many food borne diseases (54.00%), taking boiled or filtered water prevents many water borne diseases (77.00%), keeping the food articles or items covered will protect food from flies and dirt (76.00%), washing vegetables before cutting them is good for health (84.00%), and the washing of utensils, hands and plates before cooking and taking meals is good (85.00%). It was found that majority (42.67%) partially adopted the health and nutritional practices, whereas, 20.66% of the respondents were fully adopted and 36.67 percent of respondents had not adopted the health and nutritional practices.

Vinitha *et al.* (2007) in their study found that only 9.5 per cent of the adolescents interviewed had knowledge on safe sex. Adolescents aged 15 years and above, belonging to an extended family with educational status of above 5th grade, working

outside home and having a high standard of living had significantly more awareness on safe sex. 79.5 per cent women aged 13-49 years knew it was unsafe to bear children before 20 years. Age, marital status and place of residence were significantly associated with awareness. Hence, this study shows that adolescents (<19 years), women who are illiterate or educated less than grade 10 and living away from basic health care services with a low standard of living are less aware of reproductive health issues and need targeted interventions for reproductive health messages.

The study was conducted by Bhatnagar and Jain (2004) in Ajmer to predict cardiovascular diseases among young adult females (20-40 years). Detailed information about the history of disease, diet and general health was obtained through a questionnaire, and general awareness of the subjects was judged by an awareness schedule. Anthropometric parameters and lipid profile of the subjects were also studied. The results of the study revealed that 90 per cent of the subjects belonged to the age group 30- 40 years. Females were found to have average awareness about their diet, general health and medicines.

### METHODOLOGY

The present research was proposed to investigate the nutritional status of rural women and its impact on lifestyle problems/diseases among them. A well-structured questionnaire was developed considering the specific objectives of the study.

**Study area:** The village 'Badshahpur' near the vicinity of Gurgaon, Haryana was selected for the study as per the feasibility of the researchers and the availability of the sample population. Badshahpur is the biggest village in the region having a population of about 18,734 people out of which 2,970 females fall under the age group 18-40 years (the study group).

**Sample size:** 100 rural women were selected as samples for the study. The inclusions were

- the women of reproductive age group (18-40 years)
- those who are willing to participate

The exclusions included

- the pregnant women
- the lactating mothers

**Data collection:** The data was collected after conducting surveys in the area and various health centres were found to be ideal places for data collection. Purposive sampling method was used to select the respondents as volunteers were welcomed. The samples for the present survey were collected mainly from the Primary Health Centre (PHC) and a Homeopath Clinic, which provides free medical services to the rural people.

**Development of Tools:** Various methods were used for the assessment of different lifestyle problems among rural women, namely, anthropometric measurements, dietary assessment using questionnaire method. In this study, these methods were used due to the ease with which these can be conducted in the field.

**A. Nutritional Anthropometry:** Nutritional anthropometry is concerned with the measurement of the physical dimension and the gross composition of human body at different age levels and degrees of nutrition. The report of the committee on Nutritional anthropometry established by the National Research Council lists the number of measurement that would indicate skeletal build and the thickness of subcutaneous fat. Body weights and heights reflect their state of health and growth rate (ICMR, 1989).

- **Height:** The height of an individual is made up of the sum of 4 components – legs, pelvis, spine and skull. For field nutritional anthropometry, usually only the total height for length is measured.

**Method:** In the present study, heights were measured using a metric measuring tape. The subjects were made to stand erect looking straight on a leveled surface with heels together and toes apart, without shoes. The moving head piece of the tape was lowered to rest flat on the top of the head and the reading was taken. Height was read to the nearest 0.5 cm. An average of three measurements was taken as the final measurement.

- **Weight:** The weight of an individual is the sum of fat and fat free mass (water + protein + glycogen + mineral).  
**Method:** For measuring body weight of subjects, bathroom scales were used. Weights were taken with the individuals under basal conditions with minimum clothing and without shoes. The zero error of the weighing scale was checked before taking the weight and corrected as and when required.

**Analysis of Anthropometric Measurements**

Many formulae have been proposed to describe the way in which weight varies with height during growth. Rao and Singh (1970) found that Quetlet’s index or Body Mass Index (BMI) – Weight/Height<sup>2</sup> was independent of age group. The samples were then categorized under undernourished, normal, overweight and obese using WHO classification given in Table 2.1.

**Table 2.1: BMI Classification**

Classification	BMI(kg/m <sup>2</sup> )	
	Principal cut-off points	Additional cut-off points
<b>Underweight</b>	<18.50	<18.50
Severe thinness	<16.00	<16.00
Moderate thinness	16.00 - 16.99	16.00 - 16.99
Mild thinness	17.00 - 18.49	17.00 - 18.49
<b>Normal range</b>	18.50 - 24.99	18.50 - 22.99
		23.00 - 24.99
<b>Overweight</b>	≥25.00	≥25.00
Pre-obese	25.00 - 29.99	25.00 - 27.49
		27.50 - 29.99
Obese	≥30.00	≥30.00
		30.00 - 32.49
Obese class I	30.00 - 34.99	32.50 - 34.99
		35.00 - 37.49
Obese class II	35.00 - 39.99	37.50 - 39.99
		≥40.00
Obese class III	≥40.00	≥40.00

Source: Adapted from WHO, 1995, WHO, 2000 and WHO 2004.

- **WHR (Waist-Hip Ratio):** WHR is the ratio of circumference of the waist to that of the hips. It was determined by using a measuring tape to measure the circumference of hips at the widest part of buttocks and waist at the smaller circumference of natural waist, usually just above the belly button. The ratio was determined by dividing waist measurement by hip measurement and the health risk was determined thereafter as given in Table 2.2.

**Table 2.2: WHR Categories**

<b>Male</b>	<b>Female</b>	<b>Health Risk Based Solely on WHR</b>
0.95 or below	0.80 or below	Low Risk
0.96 to 1.00	0.81 to 0.85	Moderate Risk
1.0+	0.85+	High Risk

## **B. Development of questionnaire**

Various questionnaires were developed to find out the socio-economic profile, dietary intake, nutritional status, morbidity pattern, general awareness and general practices about health, hygiene and sanitation of the rural females.

### **1. Background questionnaire**

It consisted of personal profile, family profile, family income and anthropometric measurements. A copy of background questionnaire is attached in Annexure I.

- **Personal profile:** It included the basic information about the sample i.e. name, age, category (general, scheduled caste, schedules tribe or other backward class), food habits (vegetarian, non-vegetarian or eggetarian), marital status (single, married, divorced or widowed), age of marriage, number of children, pregnancy wastage (number of miscarriages plus number of still births) and educational status (uneducated, primary level, secondary level, matriculation), etc. The data was analysed by calculating the frequencies of variables.
- **Family profile:** It included information about the head of the family, number of family members, types of family (nuclear, joint or extended) and occupation of the family (agriculture, milking, self-employed, job), etc.
- **Family income:** It included information about the number of earning members, principle earning member and total monthly income of the family. The data was analysed by dividing samples into various categories of income group (<10,000 pm, 10-20,000 pm, and so on) and the frequency of samples in these categories was calculated to know the economic status of individuals.

### **2. Food frequency questionnaire**

It included information about the consumption of various food groups, their amounts and their frequencies of consumption. A copy of food frequency questionnaire is attached in Annexure II. The questionnaire consisted of all the common food products that were consumed in the study area. The frequency of consumption and also the amounts of food products were collected on the basis of which nutrient consumption in a day was calculated for each sample. The data was analysed to find out:

- The frequency of consumption of all the food products,
- The minimum, maximum and mean intake of all the food products and,
- The minimum, maximum and mean intake of the various macronutrients and micronutrients including energy, protein, carbohydrate, fat, iron, calcium, vitamin A, vitamin C, vitamin B-complex, crude fibre, etc.
- Nutrient adequacy ratio (NAR) for energy, protein and various other nutrients.

**Nutrient Adequacy Ratio (NAR):** It is defined as the percent intake of RDA.

$$\text{NAR} = \frac{\text{Nutrient Intake}}{\text{RDA}} \times 100$$

NAR for energy was divided into four categories, viz. <50%, 50-75%, 75-90% and >90%, and the frequency of individuals occurring in these categories were calculated. Similarly, NAR for other macro and micro-nutrients were divided into three categories, viz. 0-66%, 66-99% and  $\geq 100\%$  and the frequency of samples occurring in these categories were also calculated to find out their nutrient intakes.

### 3. Medical history questionnaire

It consisted of a list of various commonly occurring health problems among rural women. A copy of medical history questionnaire is attached in Annexure III. The data related to the past three months of the medical history of the samples was collected and analysed to find out the mean number of diseases suffered by the females and also the frequency of each disease among the study group so as to know about the most prevalent diseases in the study area.

### 4. General awareness questionnaire

A copy of general awareness questionnaire is attached in Annexure IV. It was prepared under the guidance of an expert by first classifying the objectives into 3 major issues namely, health, nutrition and sanitation. These issues were further classified under various sub-headings e.g.

- Health was divided into 2 sub-sections, diseases and family planning and various awareness questions were framed thereafter keeping in mind the prevalence of various diseases and family planning issues among them.
- Likewise, nutrition was divided into 4 sub-headings namely, micronutrients, macronutrients, cooking practices and consumption of tea and coffee. Various nutrient deficiencies, faulty cooking practices and wrong dietary patterns were identified and the awareness questions were framed accordingly.
- Sanitation was classified under 2 sub-headings, namely cleanliness and personal hygiene and the questions were framed based on these issues.

The multiple choice questions were framed on the basis of above issues and the correct response was given a score. The data was analysed by calculating the frequency of various responses of all the questions individually and also the frequency of number of total correct responses overall to find out the general awareness status of the samples. The mean awareness score and the mean awareness quotient were calculated thereafter.

$$\text{Awareness Quotient} = \frac{\text{Number of Correct Responses}}{\text{Total Number of Questions}}$$

### 5. General practice questionnaire

A copy of general practice questionnaire is attached in Annexure V. It was also divided into 3 sections, namely nutrition, health and sanitary practices. Health was further divided into bone health and diarrhoea; nutrition was divided into meal pattern, micronutrients and cooking practices; and sanitation was divided into drinking water, cleanliness and personal hygiene. Various practice questions were framed accordingly based on the above issues. Here, the frequency of the various practices followed by the samples regarding a particular issue was calculated. Also, 11 questions were chosen to find out how many samples were following the correct general practices.

### Statistical analysis of data

Using SPSS windows software, statistical analysis including mean, frequency, cumulative percent, standard deviation and correlation was carried out. The average daily intake of foods and their nutrients was calculated and compared with RDAs suggested by ICMR.

## RESULTS AND FINDINGS

A total of 100 samples from the study area were included in the analysis. Various criteria like socio-economic profile, anthropometry, food consumption pattern, medical history, general awareness and practices were studied and analysed and the data presented herewith.

### Background profile

Various data were collected regarding personal profile, family profile, income status and anthropometric measurements and the results presented herewith.

#### A. Personal Profile

The data regarding the personal profile of the subjects is depicted in Table 3.1 and Figures 3.1, 3.2, 3.3 and 3.4. The mean age ( $\pm$  SD) of the study group was found to be 30 ( $\pm 2.5$ ) years and the mean age at marriage was 17 ( $\pm 2$ ) years. The mean number of children per subject was found to be 2.5 ( $\pm 2$ ). About 44% of females had atleast one or more abortions during their pregnancies. The data related to the category, food habits, marital status, number of children, pregnancy wastage, education, etc. is shown in the Table 3.1.

S.No.	Personal variables	Frequency (%)
1.	<i>Category</i>	
	General	24
	SC	2
	ST	12
	OBC	62
2.	<i>Food Habit</i>	
	Vegetarian	76
	Non-vegetarian	17
	Eggetarian	7
3.	<i>Marital Status</i>	
	Single	16
	Married	82
	Divorced	0
	Widowed	2
4.	<i>Educational Status</i>	
	Uneducated	19
	Primary (upto V)	19
	Secondary (VI-IX)	14
	10 <sup>th</sup> class	21
	10+2	19
	Graduate	6
	Post-graduate	2

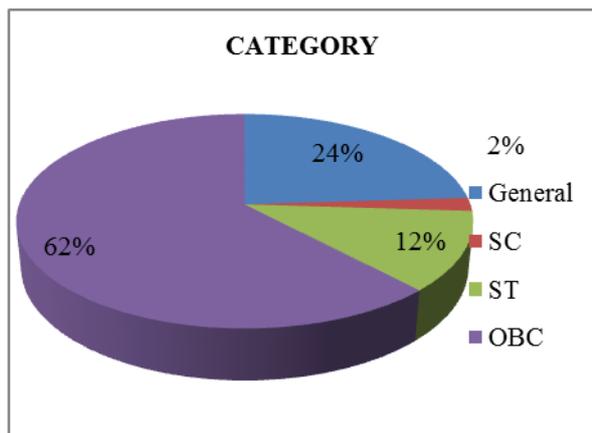


Figure 3.1: Social Category

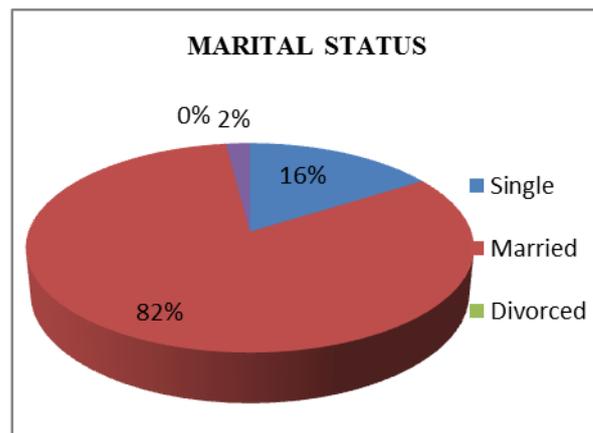


Figure 3.3: Marital Status

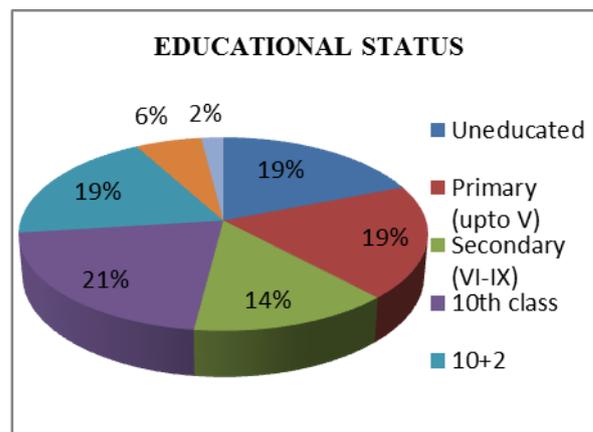


Figure 3.4: Educational Status

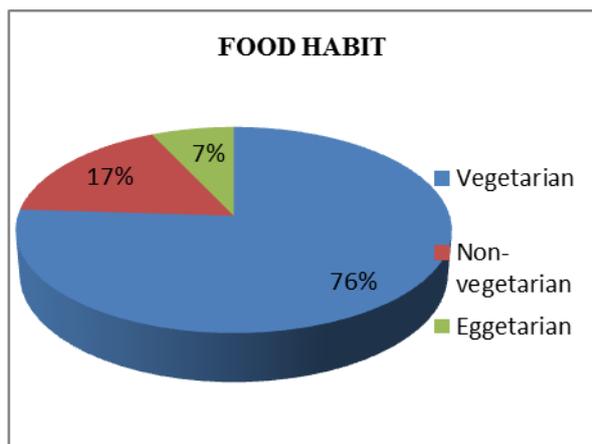


Figure 3.2: Food Habit

The data shown in Figures 3.1, 3.2, 3.3 and 3.4 depicts that majority of the samples belonged to OBC category (62%). The frequency of subjects from general, SC and ST categories were 24%, 2% and 12%, respectively. Most of the samples were found to be vegetarian (76%) while only 17% and 7% were non-vegetarian and eggetarian, respectively. 82% of the study group was married, 16% were unmarried and 2% were widowed. The educational status was found to be average with almost 50% of the samples with qualifications 10<sup>th</sup> and above, and 50% below 10<sup>th</sup> among which 19% were illiterate.

**B. Family Profile**

The data regarding the family profile of the study group is depicted in Table 3.2 and Figures 3.5, 3.6, 3.7 and 3.8. The mean number of family members was found to be 8 (±2) as majority (43%) of the subjects were living in joint family. The data related to the type of family, occupation, activity pattern and monthly income is shown in the Table 3.2.

Table 3.2: Family profile of the subjects (n=100)

S.No.	Family variables	Frequency (%)
1.	<i>Type of family</i>	
	Joint	43
	Nuclear	38
	Extended	19
2.	<i>Family occupation</i>	
	Agriculture	6
	Milking	5
	Service	59
	Self-employed	30
3.	<i>Self-occupation</i>	
	Milking	8
	Service	11
	Self-employed	2
	Housewife	66
	Any other (Student)	13
4.	<i>Activity pattern of subjects</i>	
	Sedentary	100
	Moderate	0
	Heavy	0
5.	<i>Monthly income (Rs.)</i>	
	<10,000	55
	10,000-20,000	21
	21,000-30,000	16
	31,000-40,000	3
	>40,000	5

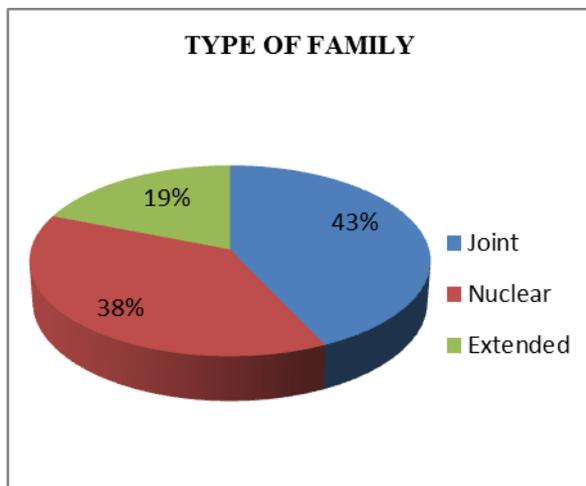


Figure 3.5: Type of Family

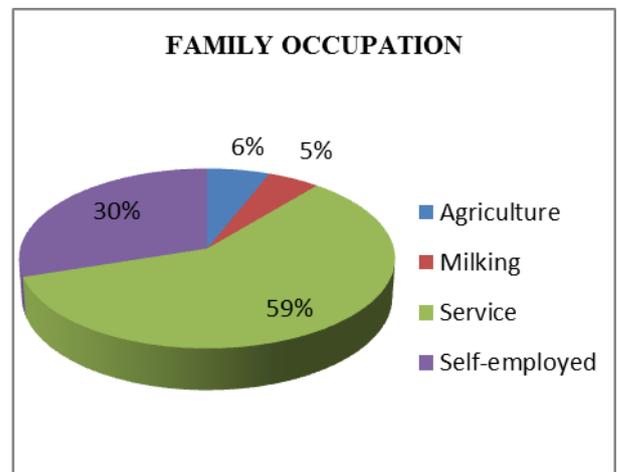


Figure 3.6: Family Occupation

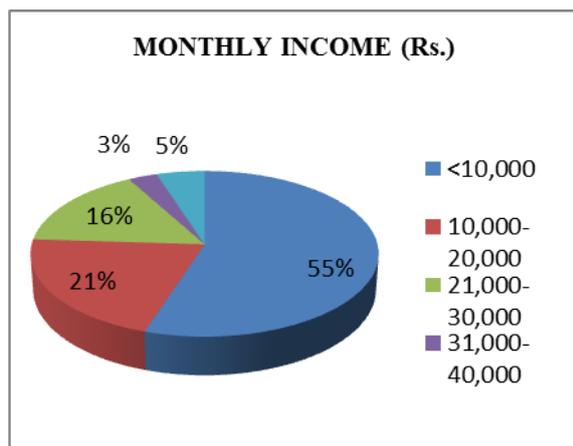


Figure 3.7: Monthly Income (Rs.)

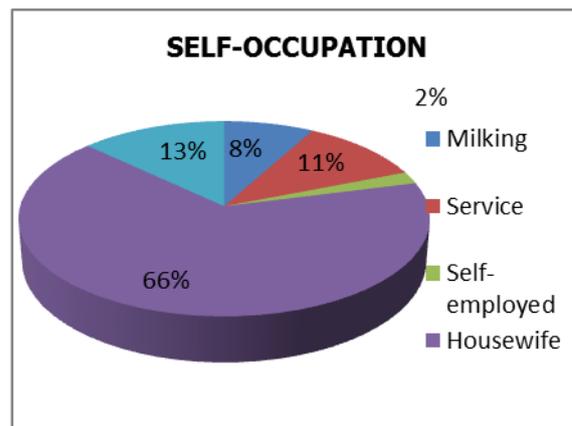


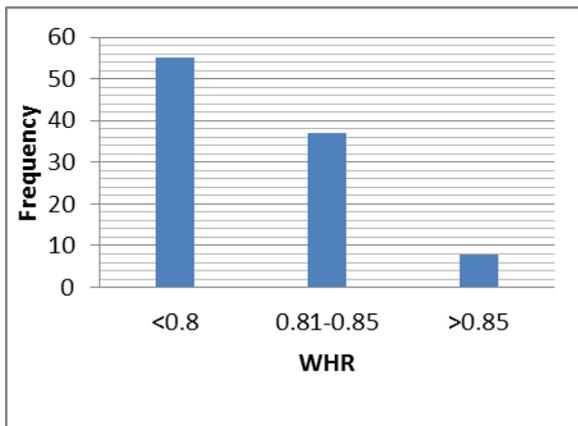
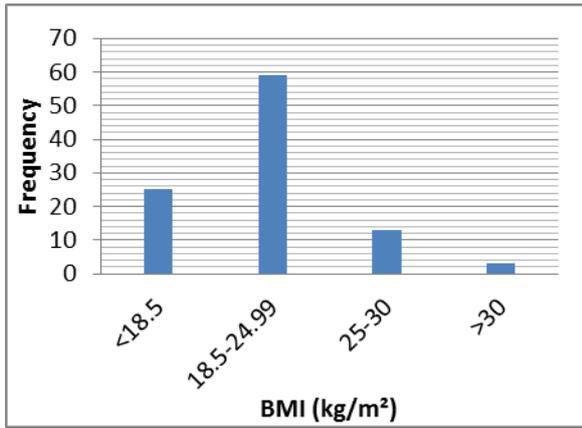
Figure 3.8: Self-Occupation

The data presented in Figures 3.5, 3.6, 3.7 and 3.8 shows that about 38% of the samples were residing in nuclear families and 19% in extended families compared to 43% in joint families, which shows the decreasing joint family trend among rural population as well. The major family occupation was found to be service/jobs (59%) and self-employment (30%) compared to agriculture (6%) and milking (5%). More than 50% of the samples belonged to lower income group, i.e. <10,000 pm.

### C. Anthropometrical Measurements

The data regarding the height, weight, BMI and WHR of the samples is shown in the Table 3.3 and Figures 3.9 and 3.10. The mean height, weight and BMI of the samples were found to be 152.5 ( $\pm 5.9$ ) cm, 49.3 ( $\pm 9.4$ ) kg and 21.12 ( $\pm 3.7$ ) kg/m<sup>2</sup>, respectively. The data shows that the mean waist, hip and WHR were 27 ( $\pm 3.2$ ) cm, 33.8 ( $\pm 3.4$ ) cm and 0.79 ( $\pm 0.04$ ), respectively.

S.No.	Anthropometry variables	Frequency (n=100)
1.	BMI (kg/m <sup>2</sup> )	
	<18.5	25
	18.5-24.99	59
	25-30	13
	>30	3
2.	WHR	
	<0.8	55
	0.81-0.85	37
	>0.85	8



**Figure 3.9: BMI (kg/m<sup>2</sup>)**

The data shown in Figures 3.9 and 3.10 depicts that more than 50% of the samples fell under normal BMI range, i.e. 18.5-24.99, 25% were underweight having a BMI <18.5 and 16% were overweight or obese. The ratio of samples with normal WHR, i.e. <0.8 was found to be 55% while 37% fell under 0.81-0.85 category and 8% were found to have >0.85 WHR indicating increased health risks for women due to excess fat in the abdominal region.

**Figure 3.10: WHR**

**Food and Nutrient Intake**

The data related to food intake and nutritional status was collected through food frequency questionnaire and presented herewith.

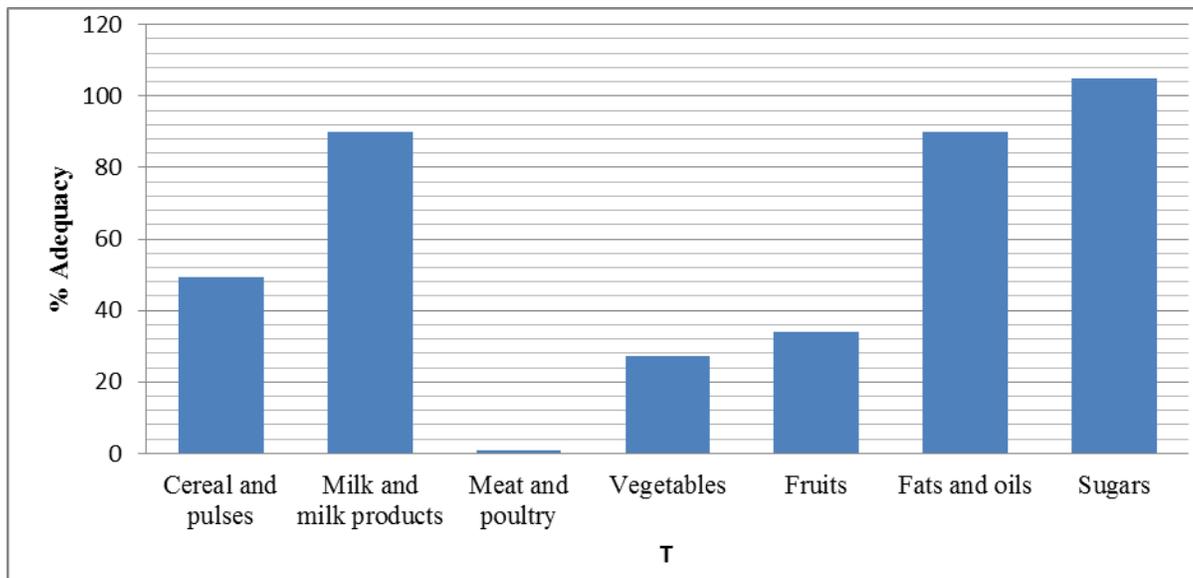
**A. Food Intake Data**

The data related to food intake for all the subjects is shown in Table 3.4 and Figure 3.11. The % adequacy of the food groups and their mean intakes are presented along with their Recommended Dietary Intakes (RDI). The mean intake of the major seven food groups, namely, cereals and pulses, milk and milk products, meat and poultry, vegetables, fruits, fats and oils and sugars are 148 (±46.8) g, 270 (± 129) g, 0.29 (±0.85) g, 82 (±50.7) g, 34 (±46.6) g, 18 (±16.4) g and 21 (±17.6) g, respectively. About 45% of the samples consumed milk and milk products daily including curd, paneer etc. In case of green leafy vegetables, only 5% were found to consume it daily, 61% consumed thrice a week and rest consumed it occasionally. Similar were the findings in case of fruits wherein only 7% of samples consumed some fruit daily, rest consumed it weekly or occasionally. Whereas the intake of tea/coffee was found to be higher as about 45% of samples consumed >2-3 servings of tea/coffee per day and 45% consumed it atleast once a day.

**Table 3.4: Food Intake Data**

Food groups	RDI (g)	Mean Intake ± SD(g)	% Adequacy
Cereal and pulses	300	148 (±46.8)	49.3
Milk and milk products	300	270 (±129)	90.0
Meat and poultry	30	0.29 (±0.85)	0.96
Vegetables	300	82 (±50.7)	27.3
Fruits	100	34 (±46.6)	34.0
Fats and oils	20	18 (±16.4)	90.0
Sugars	20	21 (±17.6)	105

*Source: Dietary guidelines for Indians- A manual, 2010, NIN, ICMR, Hyderabad*



**Figure 3.11: Food Intake Data**

The data given in Figure 3.11 reveals that the intake of all the food groups was low except for the fats, sugars and milk and milk products (almost 100% adequate) which can be attributed to the economic constraints as most of the population belonged to lower

income groups. The intake of cereals and pulses, meat and poultry, vegetables and fruits was 49.3%, 0.96%, 27.3% and 34.0% of RDAs, respectively. The consumption of meat and poultry was also low as more than 50% of the samples were vegetarian.

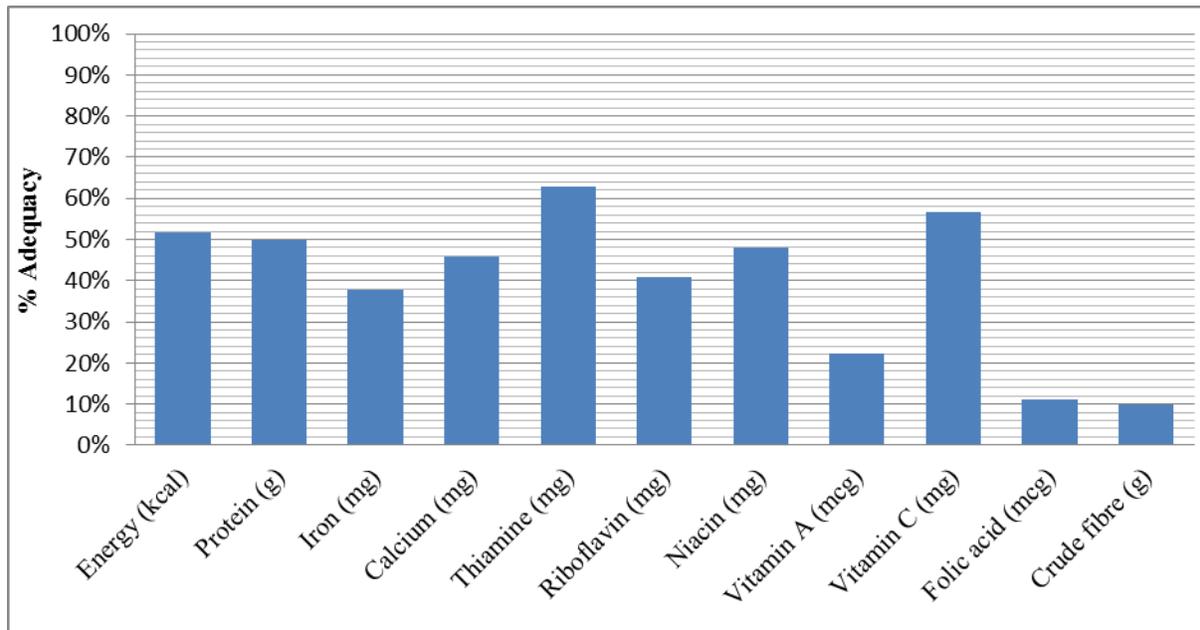
**B. Nutrient Intake Data**

The data related to the nutrient intakes of the subjects is presented in the Table 3.5 and Figure 3.12. The mean intake of all the nutrients including both macronutrients and micronutrients, is shown in the following table along with their Recommended Dietary Allowances (RDAs) and % adequacy intakes. The mean energy intake was found to be low meeting 52% of energy needs only. Similarly, the mean intake of protein also met only 50% of the requirement.

**Table 3.5: Nutrient Intake Data**

Nutrients	RDA	Mean Intake ± SD	% Adequacy
Energy (kcal)	1900	983.60 (±309.6)	51.7%
Protein (g)	55g	27.33 (±8.2)	49.7%
Iron (mg)	21	7.95 (±2.7)	37.8%
Calcium (mg)	600	275.76 (±239.9)	45.9%
Thiamine (mg)	1.0	0.63 (±0.15)	63.0%
Riboflavin (mg)	1.1	0.45 (±0.17)	40.9%
Niacin (mg)	12	5.75 (±1.47)	47.9%
Vitamin A (mcg)	600	134.74 (±163.6)	22.4%
Vitamin C (mg)	40	22.66 (±15.1)	56.6%
Folic acid (mcg)	200	22.14 (±30.5)	11.0%
Crude fibre (g)	25-40	3.27 (±1.03)	10%

*Source: ICMR (2010)*



**Figure 3.12: Nutrient Intake Data**

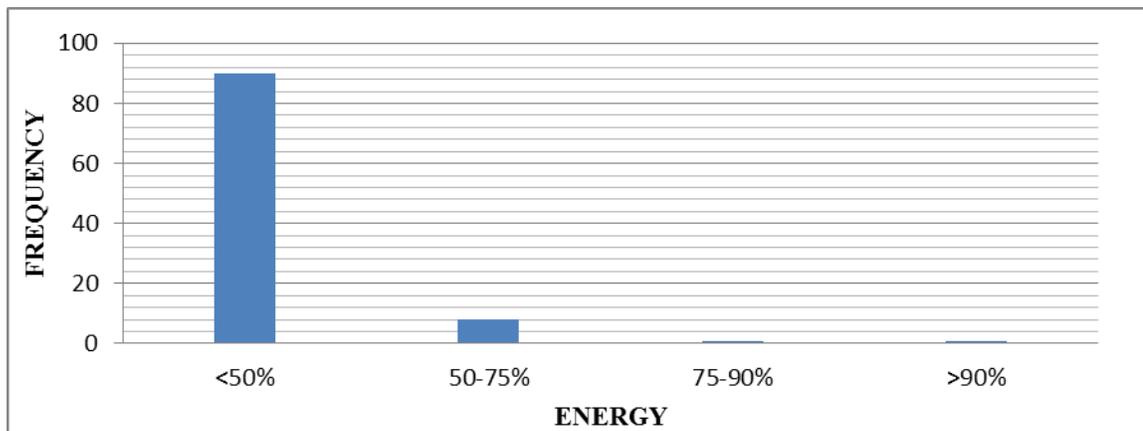
The data presented in Figure 3.12 shows that the intake of most of the nutrients was low. Dietary intake of iron in Indian dietaries has always been low which in this case is almost 40% of the RDA. The intake of B-complex vitamins including thiamine, riboflavin, niacin and folic acid was found to be 63%, 40.9%, 47.9% and 11.0% of the RDAs, respectively. The intake of other vitamins and nutrients like vitamin A, vitamin C and crude fibre was also found to be low.

**C. Nutrient adequacy ratio (%intake of RDA)**

The data regarding the nutrient adequacy ratio for energy is provided in the Table 3.6 and Figure 3.13. The energy intake has been divided into 4 categories, viz, <50%, 50-75%, 75-90% and >90% of RDA.

**Table 3.6: NAR for Energy**

S.No.	Energy	Frequency
1.	<50%	90
2.	50-75%	8
3.	75-90%	1
4.	>90%	1
Total		100



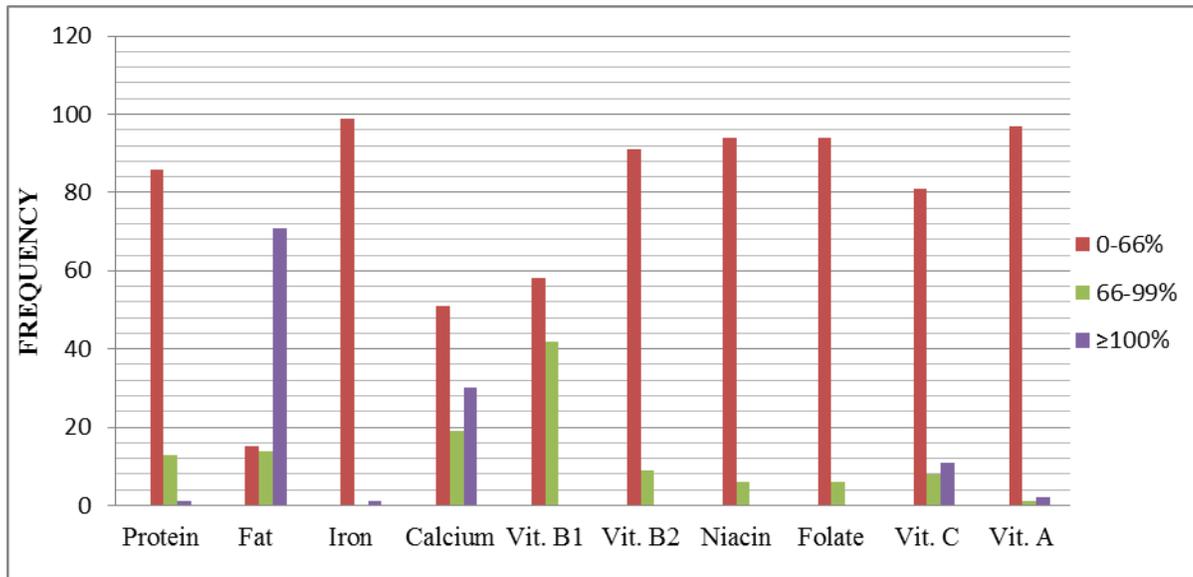
**Figure 3.13: NAR for Energy**

The data presented in Figure 3.13 reveals that 90% of the samples were not consuming even 50% of the total energy requirements. 9% were consuming marginally adequate i.e. 50-90% of total energy requirements and only 1% samples were consuming adequate amount of energy, i.e. >90% of RDA.

The data regarding the nutrient adequacy ratio for other macronutrients and micronutrients is provided in the Table 3.7 and Figure 3.14. The nutrient intake has been divided into 3 categories, viz, 0-66%, 66-99% and  $\geq 100\%$  of RDA.

**Table 3.7: NAR for Macro and Micronutrients**

% RDA	Protein	Fat	Iron	Calcium	Vit. B1	Vit. B2	Niacin	Folic Acid	Vit. C	Vit. A
0-66%	86	15	99	51	58	91	94	94	81	97
66-99%	13	14	0	19	42	9	6	6	8	1
$\geq 100\%$	1	71	1	30	0	0	0	0	11	2
Total	100	100	100	100	100	100	100	100	100	100



**Figure 3.14: NAR for Macronutrients and Micronutrients**

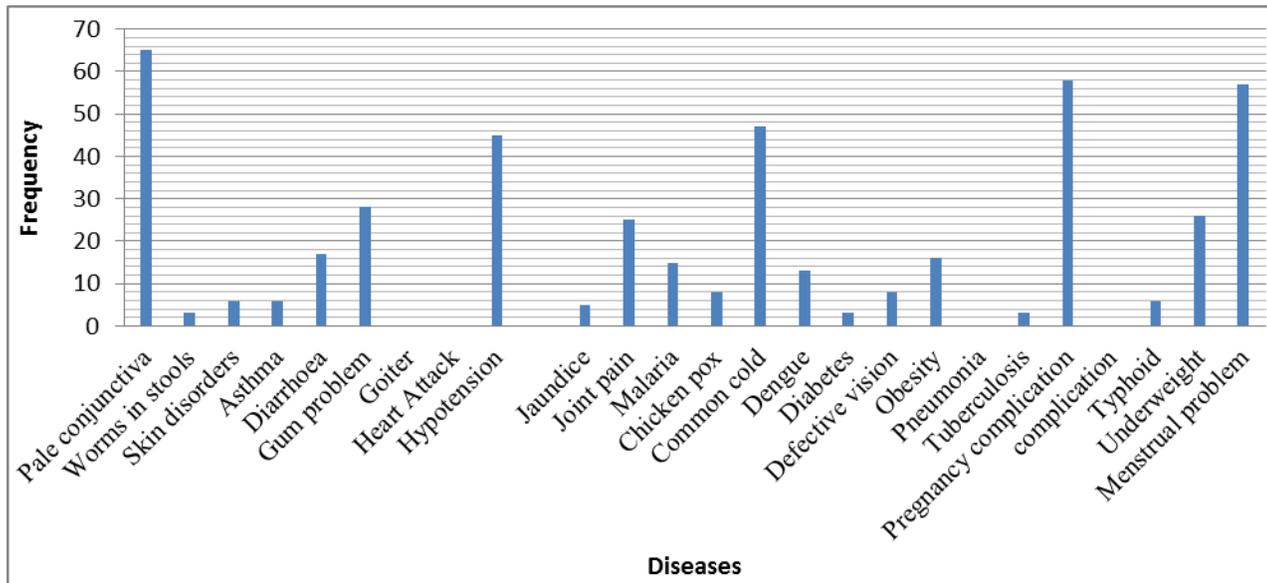
The data shown in Figure 3.14 shows that majority of the samples were consuming most of the nutrients in inadequate amounts e.g. 86% females were consuming <66% of total protein requirements, 94% were consuming <66% of niacin and folate requirements etc. None of the samples were consuming B-complex vitamins in adequate amounts. Also it was found that 99% and 97% of females were consuming inadequate amounts of iron and vitamin A respectively. Only the consumption of fat was adequate in most of the cases.

**Medical History**

The data related to the past 3 months of the medical history of the samples is shown in Table 3.8 and Figure 3.15 in which the frequency of various diseases is depicted. The mean number of diseases suffered by females was found to be 2.5 (±2.4). The frequency is more than 100 because samples were suffering from more than one disease at a time.

**Table 3.8: Medical History**

S.No.	Disease	No. & Frequency	S.No.	Disease	No. & Frequency
1.	Pale conjunctiva	65	13.	Chicken pox	8
2.	Worms in stools	3	14.	Common cold	47
3.	Skin disorders	6	15.	Dengue	13
4.	Asthma	6	16.	Diabetes	3
5.	Diarrhoea	17	17.	Defective vision	8
6.	Gum problem	28	18.	Obesity	16
7.	Goiter	0	19.	Pneumonia	0
8.	Heart Attack	0	20.	Tuberculosis	3
9.	Hypotension	45	21.	Pregnancy complication	58
10.	Jaundice	5	22.	Typhoid	6
11.	Joint pain	25	23.	Underweight	26
12.	Malaria	15	24.	Menstrual problem	57



**Figure 3.15: Medical History**

The data presented in Figure 3.15 shows that the most prevalent diseases among females were pale conjunctiva (65%), menstrual problems (57%) and pregnancy complications (58%) which could be attributed to their lower iron intake. The common menstrual problems included acne, backache, sore breasts, fatigue, constipation, irritability etc. and the common pregnancy complications included constipation, pica, nausea, vomiting, oedema, back pain etc. The other common problems were common cold, hypotension and gum problems with the frequencies 47%, 45% and 28%, respectively.

**Co-relation between Frequency of Disease and BMI**

The data related to the co-relation between the occurrence and frequency of various diseases and the BMI of samples is shown in Table 3.9.

**Table 3.9: Co-relation between Frequency of disease & BMI**

	Frequency of disease	BMI
Frequency of disease	1	-0.205*
BMI	-0.205*	1

\*. Correlation is significant at the 0.05 level (2-tailed).

The data given in Table 3.9 depicts that BMI (Body Mass Index) showed a negative relation with the no. and frequency of diseases, i.e. the frequency of diseases was found to be more among underweight females than females with normal BMIs. BMI was also found to be positively co-related with the general awareness of the females, i.e. the females with better awareness about health and hygiene had normal BMIs than the females with lesser awareness.

**General Awareness about Health, Nutrition and Sanitation**

The general awareness about the commonly occurring diseases, their symptoms, health and hygiene was found to be average. About half of the samples got 50% of the responses correct. The mean awareness score and the mean awareness quotient were found to be 12 (±3.2) and 0.54 (±0.12) respectively. The maximum score was found to be 18 out of 22. The data regarding the question-wise correct responses of the subjects is depicted in Table 3.10.

**Table 3.10: General Awareness**

Q.No.	Topic	Frequency of correct response
1.	Symptoms of T.B.	65
2.	Causes of anaemia	17
3.	Symptoms of anaemia	34
4.	Nutrient increasing bone-strength	78
5.	Synthesis of Vit. D	11

6.	Foods relieving constipation	75
7.	Oil preventing heart-disease	16
8.	Risks of high SFA intake	60
9.	Cause of night-blindness	50
10.	Minimum gap between 2 pregnancies	84
11.	Food deficiency leading to anaemia	97
12.	Foods improving vision	97
13.	Food curing goiter	66
14.	Food deficiency leading to bleeding gums	16
15.	Foods providing strength to bones	83
16.	Most nutritious flour	31
17.	Food yielding maximum energy	6
18.	Method making pulse most nutritious	73
19.	Effect of high intake of tea/coffee	39
20.	Diseases due to water-logging	58
21.	Causes of malaria	100
22.	Hand hygiene	81

The data shown in Table 3.10 depicts that 65% of the samples were aware about the symptoms of TB. The awareness about the cases and symptoms of anaemia was 17% and 34% respectively, which was very low. Most of the samples knew that calcium provides strength to the bones and also knew the food products rich in calcium. While 60% of the subjects were aware about the ill-effects of high SFA intake, only 16% knew that vegetable oil prevents heart diseases. About 75% of the samples were aware about the role of fruits and salads in relieving constipation. While 97% of the study group knew vitamin A rich sources, only 50% of them were aware about the role of vitamin A in preventing night-blindness. The awareness about cleanliness and hygiene was found to be higher with 100% samples knowing the cause of malaria and 81% knowing the importance of hand hygiene.

### General Health, Nutrition and Hygiene Practices

A total of 19 general health and hygiene practice questions were framed out of which 11 were selected to score the correct health practices and the data related to the rest health practices is shown in Table 3.11 which includes the data on the meal frequency, type of cooking oil used, type of flour used, source of drinking water, facility of drinking water, practice followed to make water safe for drinking, toilet facilities and cleanliness of coolers.

**Table 3.11: General Health and Hygiene Practices**

S.No.	Practices	Frequency
1.	<b>Meal frequency</b>	
	1-2	33
	3-4	63
	5-6	4
	7-8	0
2.	<b>Cooking oil</b>	
	Ghee	3
	Vegetable oil	1
	Mustard oil	66
	Refined oil	19
	Blend of oils	11
3.	<b>Flour</b>	
	Sieved wheat flour	67
	Unseived wheat flour	3
	Sieved mixed flour	18
	Unseived mixed flour	12
4.	<b>Source of drinking water</b>	
	Well	0

	Municipal tap	52
	Motor/hand pump	48
	Neighbours	0
5.	<b>Drinking water facility</b>	
	24X7	7
	Fixed hours	72
	No fixed hours	21
6	<b>Practice to make water safe</b>	
	Boiling	7
	Sieve through cloth	0
	Use filter	26
	Keep in pot	33
	Nothing	34
7.	<b>Toilet facilities</b>	
	In open outside house	4
	Open pits inside house	1
	Closed toilets inside house	95
8.	<b>Cleaning of coolers</b>	
	Twice a week	15
	Once a week	12
	15 days	17
	No cooler	56

Data shows that 63% of the females were consuming 3-4 meals in a day while 33% and 4% were consuming 1-2 meals and 5-6 meals respectively. The commonly used oil for cooking was mustard oil and the commonly used flour was sieved wheat flour. Almost 52% of the households were dependant on municipal taps for the drinking water and rest 48% on motor/hand pumps. Also the drinking water in 72% cases was available for fixed hours only. 26% and 7% of the samples were making water safe for drinking by filtering and boiling respectively. Rest 33% were keeping it in pots and 34% were not doing anything to make the water clean for drinking purposes. As far as toilet facilities are concerned, 95% of the households had closed toilets inside house, rest 4% and 1% people open pits outside and inside house respectively.

The data related to the rest 11 questions selected to mark the correct health practices is depicted in Table 3.12. The mean correct practices and the mean correct practice quotient were found to be  $7.5 \pm 2$  and  $0.68 \pm 0.32$ , respectively.

**Table 3.12: Correct Health Practices**

Q.No.	Topic	Frequency of Correct practices
1.	Foods for bone health	85
2.	First-aid in case of diarrhoea	52
3.	Foods for blood formation	95
4.	Cooking salt	69
5.	Foods for healthy eyes	98
6	Preliminary treatment before cooking	94
7.	Healthy cooking practice	96
8.	Cleanliness of surroundings	93
9.	Malaria prevention	93
10.	Water-logging	93
11.	Hand hygiene	100

Data shows that most of the samples were following healthy practices related to health, hygiene and nutrition. 85% and 95% of the study group was consuming the right food to keep their bones healthy and for blood formation respectively. In case of diarrhoea and vomiting, almost half of the samples were using ORS as first-aid, while others were either using some medicine or were visiting the doctor. 69% of the samples were using iodised salt for their cooking, 1% were using any salt that was available, while 30% were not even aware about the salt they were using at their households. Most of the subjects were following healthy cooking practices like

washing vegetables before cutting them and also cooking in covered vessels or pressure cookers to keep the nutrients intact. Most of them were also following healthy sanitation practices by keeping their surroundings clean and also taking care of the hand hygiene.

### Co-relation between General Awareness and Practices and other variables

The data related to the co-relations between general awareness and general practices regarding health and hygiene and various other variables like present age, age at marriage, BMI, income, frequency of diseases, pregnancy wastage etc. is depicted in Table 3.13.

**Table 3.13: Co-relation between general awareness and practices and other variables**

	General awareness	General practices
General awareness	1	0.691*
General practices	0.691*	1
Energy	0.422**	0.242*
BMI	0.337**	0.134
Present age	-0.208*	-.078
Income	0.289**	.087
Frequency of disease	-0.478**	-0.229*
Pregnancy wastage	-0.554**	-0.391**

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\*. Correlation is significant at the 0.05 level (2-tailed).

The data given in Table 3.13 shows that the age of the females was negatively co-related with the general awareness, i.e. younger females were more aware about the general nutrition and health practices as compared to the older females.

The energy consumption shows a perfect positive co-relation with the general awareness and practice quotients. This means that with better awareness and health practices, the energy status of females increased. Also the general awareness and general practices were found to be perfectly co-related. Females with better general awareness were following healthy nutritional and health practices.

The frequency and number of diseases showed a perfect negative co-relation with the general awareness. The females who were more aware about the general health and hygiene suffered from lesser no. of diseases. Also the frequency of diseases showed a negative co-relation with the general health practices, i.e. the females who were following healthy life-style practices encountered lesser no. of diseases as compared to others.

The pregnancy wastage showed a perfect negative co-relation with the general awareness quotient. The females who were less aware had more no. of abortions or still births as compared to females with more awareness. The pregnancy wastage also showed a negative co-relation with the general practices, i.e. healthier were the health practices, lesser were the abortions or still births.

### CONCLUSION

One of the foremost objectives of our nation building activity is the maintenance, sustenance and improvement of the health and nutritional status of the people. If a country is to be healthy, community or society should be healthy. So it is required to conduct the educational programmes on health and nutritional aspects. But the society heavily depends on women for its economic support and family health care.

So looking at the importance of health in our day to day life and the role of women in that, the present study was conducted to assess the nutritional status and morbidity patterns among non-pregnant non-lactating rural women of reproductive age group (18-40 years).

The specific objectives of the research study were:

- To assess the nutritional status of non-pregnant non-lactating rural women of reproductive age group (18-40 years)
- To study the dietary intakes of rural women.
- To study the morbidity pattern among rural women.
- To assess the general awareness and practices of rural women regarding nutrition, health and sanitary practices

The study was carried out in the village 'Badshahpur' near the vicinity of Gurgaon. A total of 100 rural women constituted sample for the study. The data was collected through purposive sampling and survey method. The tools used for data collection were nutritional anthropometry including BMI and WHR; food frequency questionnaire including both frequency and amount of various food groups consumed; medical history questionnaire including past three months of medical history of the samples; and general awareness and practice questionnaires related to health, nutrition and sanitation. The data were tabulated and analyzed using statistical measures like frequency, mean, standard deviation, correlation co-efficient.

The summary of major findings is:

- The mean age at marriage was 17 ( $\pm 2$ ) years and the mean number of children per subject was 2.5 ( $\pm 2$ ) with a high incidence of pregnancy wastage as 44% of females had atleast one or more abortions during their pregnancies.
- The mean BMI and WHR of the subjects were 21.12 ( $\pm 3.7$ ) kg/m<sup>2</sup> and 0.70 ( $\pm 0.04$ ), respectively. 25% of the females were found to be undernourished with a BMI <18.5 whereas 16% of females were found to be overweight or obese.
- The intake of all the food groups was low except for the fats and sugars (almost 100% adequate) and the mean nutrient intake for both the macronutrients and micronutrients was also found to be much less as compared to their RDAs. These findings could be a reflection of low socio-economic conditions in the area.
- The mean number of diseases suffered by females was found to be 2.5 ( $\pm 2.4$ ) and the most prevalent medical problem were pale conjunctiva, menstrual problems and pregnancy complications which could be attributed to their lower iron intake.
- The general knowledge and awareness about the commonly occurring diseases, their symptoms, health and hygiene was found to be average.

#### **Limitations of the study**

- The major limitation felt during the analysis of data was that the iron status of the samples was concluded solely on the presence of clinical signs and symptoms. Had some biochemical method like haemoglobin estimation been used, it would have added more value to the results.

**ANNEXURE I**  
**BACKGROUND QUESTIONNAIRE**

**1. PERSONAL PROFILE**

- a) Name : \_\_\_\_\_
- b) D.O.B : \_\_\_\_\_ (dd/mm/yy)
- c) Category : General / SC / ST / OBC
- d) Food Habits : Vegetarian / Non-Vegetarian/Eggetarian
- e) Marital Status: Single/Married/Divorced/Widowed
- f) Age of marriage (If married) : \_\_\_\_\_
- g) Pregnancy wastage
- No. Of children (if any): \_\_\_\_\_
  - No. Of miscarriages (If any): \_\_\_\_\_
  - No. Of still births (if any): \_\_\_\_\_
- h) Education:

Level	Level
Uneducated	10+2
Primary (upto class V)	Graduate
Secondary (VI-IX class) 10 <sup>th</sup> class	Post-graduate

**2. FAMILY PROFILE**

- a) Name of Head of Family : \_\_\_\_\_
- b) Type of Family : Joint / Nuclear / Any Other \_\_\_\_\_
- c) Number of Family members : \_\_\_\_\_
- d) Occupation

Occupation	Spouse/Family	Self
Agriculture		
Milking		
Service/Job		

- Self-employed
- Housewife
- Unemployed
- Any other

**3. INCOME**

- a) No. of earning members: \_\_\_\_\_
- b) Principle earning member: \_\_\_\_\_

**Monthly Household Income**

<10,000
10,000-20,000
21,000-30,000
31,000-40,000
>40,000

**4. ANTHROPOMETRIC MEASUREMENTS**

- a) Height (cm): \_\_\_\_\_ Weight (kg): \_\_\_\_\_
- BMI (kg/m<sup>2</sup>): \_\_\_\_\_
- b) Waist (cm): \_\_\_\_\_ Hip (cm): \_\_\_\_\_
- WHR: \_\_\_\_\_

**ANNEXURE II**  
**FOOD FREQUENCY QUESTIONNAIRE**

Items	+6 per day	4-6 per day	2-3 per day	1 per day	Thrice a week	Once a week	2-3 in a month	Once a month	Never
<b>MILK &amp; MILK PRODUCTS</b>									
Cow Milk (250ml)									
Buffalo Milk (250 ml)									
Mother Dairy Milk(250ml)-									
Full cream									
Toned									
Double Toned									
Amul Milk (250 ml)									
Full cream									
Toned									
Double Toned									

Curd (1 katori-125 g)  
Butter Milk (250ml)  
Khoa (25g/50g/100g)  
Paneer (50g)

**CEREALS**

Chapati (20g)  
Paratha (30g)  
Rice (¼ plate- 20g)  
Rice Flakes (¼ plate- 20g)  
Puffed Rice (1 katori- 20g)  
Semolina (¼ plate- 20g)  
Bread (1 slice/2 slices)- Brown  
White  
Fan/Rusk/Biscuit (1 pc.)

**PULSES**

Red gram, Black gram, Green  
gram, Lentil, Bengal gram,  
Rajmah, Lobia, Soyabean,  
Peas (1 katori- 30g)

**MEAT & POULTRY**

Egg (1 medium- 50g)  
Meat (lamb/Sheep) (30g)

Chicken (30g)  
Fish/Shell fish (30g)

**GREEN LEAFY  
VEGETABLES**

Cabbage, Bathua, Coriander  
leaves, Fenugreek leaves,  
Spinach (1 katori- 100g)

**ROOTS & TUBERS**

Potato, Carrot, Colocasia,  
Onion, Turnip (1 katori- 50g)

**OTHER VEGETABLES**

Bitter gourd, Bottle gourd,  
Brinjal, Beans, Cauliflower,  
Cucumber, Jack fruit, Lady  
finger, Pumpkin, Tinda (1  
katori- 50g)

**FRUIT**

Orange, Lime, Kino,  
Guava, Tomato etc.  
(quat/half/one)  
  
Banana (quat/half/one)  
Apple/Pear (40g)  
Mango/Papaya (40g)  
Melon (40g)

**SUGARS**

Table sugar (1tsp- 5g)

Honey (1tsp- 5g)

Jaggery (5g)

**FATS**

Mustard oil (1tsp- 5g)

Butter (1tsp- 5g)

Ghee (1tsp- 5g)

Refined Oil (1tsp- 5g)

**NUTS & OIL SEEDS**

Groundnuts, Cashewnuts,  
Almonds, Coconut, Raisins,  
Walnuts (25g/50g/100g)

**MISCELLANEOUS**

Tea/Coffee/Cocoa

Health drinks like Bournvita

Pickle

Any other

**ANNEXURE III**  
**MEDICAL HISTORY QUESTIONNAIRE**

**MEDICAL HISTORY (PAST 3 MONTHS)**

S.No.	Disease	Yes/No	S.No.	Disease	Yes/No
1.	Pale conjunctiva		13.	Chicken pox	
2.	Worms in stools		14.	Common cold	
3.	Skin disorders		15.	Dengue	
4.	Asthma		16.	Diabetes	
5.	Diarrhoea		17.	Defective vision	
6.	Gum problem		18.	Obesity	
7.	Goiter		19.	Pneumonia	
8.	Heart Attack		20.	Tuberculosis	
9.	Hypertension/ Hypotension		21.	Pregnancy complication	
10.	Jaundice		22.	Typhoid	
11.	Joint pain		23.	Underweight	

12.	Malaria		24.	Menstrual problem	
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**ANNEXURE IV**  
**GENERAL AWARENESS QUESTIONNAIRE**

1. दो हफ्तों से ज्यादा बलगम वाली खांसी किस बीमारी का संकेत हो सकती है?

- टी.बी.
- हैजा
- मधुमेह
- पता नहीं

2. शरीर में खून की कमी किन कारणों से हो सकती है?

- दोहराया गर्भावस्था
- हरी-पत्तेदार सब्जियां, दालें इत्यादि का सेवन न करना
- पेट में कीड़े होना
- उपरोक्त सभी
- पता नहीं

3. शरीर में खून की कमी होने के क्या लक्षण हो सकते हैं?

- थोड़ा काम करते ही थकावट व सास फूलना
- त्वचा का पीला पड़ना
- दोनों
- पता नहीं

4. हड्डियों को मजबूती देने वाला तत्व कोनसा है?

- लौह-तत्व
- कैल्शियम व विटामिन-डी
- प्रोटीन
- पता नहीं

5. हमारे शरीर को विटामिन-डी इनमे से किससे प्राप्त होता है?

- दूध, दही, हरी-पत्तेदार सब्जियां
- सूर्य की किरणों से

- उपरोक्त सभी

- पता नहीं

6. कब्ज का रोग इनमे से क्या खाने से दूर हो सकता है?

- फल व सलाद
- घी
- चीनी
- पता नहीं

7. इनमे से कौन से खाद्य-पदार्थ के सेवन से हृदय-रोगों से बचाव हो सकता है?

- घी
- वनस्पति
- रिफाइंड
- उपरोक्त सभी
- पता नहीं

8. ज्यादा घी खाने से इनमे से कौन-सा रोग हो सकता है?

- मोटापा
- हृदय-रोग
- दोनों
- पता नहीं

9. रतौंधी इनमे से किस कारण से होती है?

- विटामिन-ए की कमी से
- आँखों में इन्फेक्शन से
- लौह-तत्व की कमी से
- पता नहीं

10. माँ व बच्चे के अच्छे स्वास्थ्य के लिए दो गर्भावास्थाओं में कम से कम कितना अंतर होना चाहिए?

- 1 साल
- 2 साल
- 3 साल
- पता नहीं

11. शरीर में खून की कमी इनमे से किस खाद्य-पदार्थ का सेवन ना करने से होती है?

- दूध, दही
- हरी-पत्तेदार सब्जियां
- घी, तेल
- पता नहीं

12. आँखों की रौशनी बढ़ने के लिए इनमे से किस खाद्य-पदार्थ का सेवन करना चाहिए?

- आलू
- चीनी
- गाजर, हरी सब्जियां व पीले फल
- उपरोक्त सभी
- पता नहीं

13. घेंगा निम्नलिखित किस खाद्य-पदार्थ को खाने से ठीक हो सकता है?

- दूध, दही
- आयोडीन-युक्त नमक
- चीनी
- घी
- पता नहीं

14. मसुडों में खून आने का कारण निम्नलिखित किस खाद्य-पदार्थ को न खाने से हो सकता है?

- खट्टे फल
- हरी-पत्तेदार सब्जियां
- दूध, दही
- पता नहीं

15. हड्डियों को मजबूती प्रदान करने वाला पदार्थ इनमे से किस खाद्य-पदार्थ में पाया जाता है?

- घी, तेल
- फल व सब्जियां
- दूध, दही व हरी सब्जियां
- पता नहीं

16. इनमे से कौनसा आटा सबसे अधिक पौष्टिक है?

- गेहूं का छना हुआ
- गेहूं का बिना छना
- मिस्सा आटा छना हुआ

- मिस्सा आटा बिना छना

17. इनमें से सबसे ज्यादा ऊर्जा कौन प्रदान करता है?

- 1 चम्मच चीनी
- 1 चम्मच घी
- 1 चम्मच आटा
- 1 चम्मच दाल

18. इनमें से किस तरीके से दाल को सबसे अधिक पौष्टिक बनाया जा सकता है?

- पीसकर
- उबालकर
- अंकुरित करके
- पता नहीं

19. ज्यादा चाय या कॉफी पीना का क्या प्रभाव होता है?

- लौह-तत्व के अवशोषण में बांधा डालना
- पाचन-शक्ति बढ़ती है
- दोनों
- पता नहीं

20. घर के आस-पास पानी इकट्ठा होने से इनमें से कौन सी बीमारियाँ हो सकती हैं?

- उल्टी-दस्त
- हैजा
- दोनों
- पता नहीं

21. मलेरिया किन कारणों से हो सकता है?

- गन्दा खाना खाने से
- मच्छर के काटने से
- ज्यादा मीठा खाने से
- पता नहीं

22. हाथों की साफ सफाई इनमें से कब महत्वपूर्ण होती है?

- खाना बनाने व परोसने से पहले
- शौच के बाद
- खाना खाने से पहले

- उपरोक्त सभी
  - पता नहीं
- 

**ANNEXURE V**  
**GENERAL PRACTICE QUESTIONNAIRE**

1. हड्डियों को मज़बूत रखने के लिए आप इनमे से किसका सेवन करते हैं?

- घी, तेल
- फल व सब्जियां
- दूध, दही व हरी सब्जियां
- पता नहीं

2. उल्टी-दस्त होने पर सबसे पहले आप क्या करते हैं?

- दवा देती है
- नीम्बू-चीनी का घोल देती है
- डॉक्टर के पास ले जाती है
- पता नहीं

3. आप दिन में कितनी बार आहार लेती हैं?

- 1 -2 बार
- 3-4 बार
- 5 -6 बार
- 7 -8 बार

4. शरीर में खून बनाने के लिए आप इनमे से किसका सेवन करते हैं?

- दूध, दही
- हरी-पत्तेदार सब्जियां
- घी, तेल
- पता नहीं

5. खाना बनाने के लिए आप कौंसे नमक का प्रयोग करते हैं?

- आयोडीन-युक्त जैसे टाटा
- कोई भी
- सस्ते वाला
- पता नहीं

6. आँखों की रौशनी बढ़ने के लिए आप इनमे से किसका सेवन करते हैं?

- गाजर
- गाजरवहरीसब्जियां
- गाजर, हरीसब्जियांवपीलेफल
- पता नहीं

7. खाना बनाते समय सब्जियां

- धोकर काटती हैं
- काटकर धोती हैं
- नहीं धोतीं
- पता नहीं

8. खाना बनाने के लिए कौनसे तेल का अधिक प्रयोग करती हैं?

- घी
- वनस्पति
- सरसों का तेल
- रिफाइंड
- सब मिलाकर

9. भोजन के आवश्यक तत्वों को बनाए रखने के लिए आप खाना

- खुले बर्तन में देर तक पकाती हैं
- ढककर या कूकर में पकाती हैं
- ज्यादा पानी में पकती हैं
- पता नहीं

10. आप कौनसा आटा प्रयोग करती हैं?

- गेहूं का छना हुआ
- गेहूं का बिना छना
- मिस्सा आटा छना हुआ
- मिस्सा आटा बिना छना

11. आपके पीने के पानी का क्या स्रोत है?

- कुआँ
- मोहल्ले का नल
- घर में मोटर या हैण्ड-पम्प है
- पडोसी के घर से लाते हैं

12. नल के पानी की सुविधा कैसी है?

- 24 घंटे आता है
- नियमित समय के लिए आता है
- कोई नियमित समय नहीं है

13. पीने का पानी शुद्ध करने के लिए आप इनमें से क्या करती हैं?

- उबलती है
- कपड़े में से छानती है
- फिल्टर का प्रयोग करती है
- मटके में रखती है
- कुछ नहीं

14. घर की सफाई करके कूड़ा कहाँ फेंकती हैं?

- घर के बहार
- कूड़ेदान में
- नदी या नाले में
- पता नहीं

15. शौच करने कहा जाती है?

- घर के बहार खुले में
- घर के अन्दर खुले-गड्डे में
- घर के अन्दर ही शौचालय है

16. मलेरिया से बचाव के लिए आप क्या करते हैं?

- घर व आस-पास की सफाई
- मच्छरदानी या आल-आउट का प्रयोग
- दोनों
- पता नहीं

17. घर के आस-पास गन्दा पानी इकट्ठा होने पर आप क्या करते हैं?

- उसकी सफाई करते हैं
- उसमें मिट्टी का तेल डालते हैं
- दोनों
- पता नहीं

18. कूलर की सफाई कितने दिनों में करती है?

- सप्ताह में दो बार
- सप्ताह में एक बार
- 15 दिन में
- कूलर नहीं है

19. खाना बनाने व परोसने से पहले हाथों की साफ सफाई का कितना ध्यान देती है?

- हमेशा हाथ साफ करती है
- कभी-कभी करती है
- कभी नहीं करती

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# Business Ethics and its Impact in the Activation of Accounting Responsibility in Light of the Contemporary Global Challenges

Nahed Habis Alrawashdeh

**Abstract-** Accounting responsibility emerged as a sub-system of management accounting system in order to provide accounting information in operating performance reports on the work of officials in the control sections and departments and evaluates their performance within the framework of responsibility assigned stemming from the powers granted by the senior management. In this context, focusing on the above link it to business ethics and supposed to be displayed by the accountant and shall be obligated so, clarify and educate and carrots in this morality and that because of their implications in raising the quality of accounting information and therefore its effects on administrative decisions taken.

## I. INTRODUCTION

Accounting responsibility emerged as a sub-system of management accounting system in order to provide accounting information in operating performance reports on the work of officials in the control sections and departments and evaluates their performance within the framework of responsibility assigned stemming from the powers granted by the senior management.

On the basis of the powers generate responsibility, the control and performance evaluation will be confined within the limits of authorizations granted to any within the decisions can be taken in each administrative level and including the preparation of performance reports are made by humans and aims to measure the performance of Annan last Therefore, there are several elements and behaviours control how and effectiveness of these reports It is these behaviours work ethics that govern the work of Management Accountant in the preparation and performance that determines are the ethics of professional control principles and rules of accounting and legal and reliability, neutrality and timeliness that must be available in the accounting information and ethics of self-control principles and religious belief and customary stems from personal factors related to Environment and society within the concepts of justice and sense of responsibility, faith and devotion and considerate of others, but this does not prevent the existence of a conflict between the ethics of professional business and there are acts of self-legal but not ethical

A business immoral but illegal Nevertheless, business ethics within the framework of personal and professional to be wiped out important and necessary as a motive stimulates achieve the goal of accounting responsibility by raising the quality and

reliability and fairness of the accounting information contained in the reports of performance.

### **The importance of research:**

The importance of research stems from the large role played by ethics in general and business ethics, in particular in support of the efficiency and effectiveness of the accounting work in the business, especially on reports that in the light of the performance is measured by the performance of managers in the departments and branches in the facility.

### **Research problem:**

Insufficient attention to business ethics and supposed to be displayed by the accountant and shall be obligated so, clarify and educate and carrots in this morality and that because of their implications in raising the quality of accounting information and therefore its effects on administrative decisions taken.

### **Research hypothesis:**

The carrot business ethics through the style of reward and punishment and through awareness and clarification and establish rules of these principles to the accountant working on activating the role of responsibility in the accounting oversight and evaluation.

### **Objective of this research:**

The research aims to show illustrate business ethics in general and the role they play in the activation of accounting ethics accounting if it was the accountant prepared for administrative performance reports.

### **Research Methodology:**

The researcher on the descriptive approach in the formulation of research and reference to books related to the subject of scientific research.

### **The research plan:**

In order to achieve the goal of search was divided into three sections are:

First - Accounting and behavioural aspects responsibility assigned to them.

Secondly - business ethics and responsibilities of the accountant.

Thirdly - Activating the role of responsibility by accounting business ethics.

### **First - Accounting and behavioural aspects responsibility assigned to them:**

The concept of responsibility accounting

With the breadth and magnitude of the projects could not chairman of an entity or its Director-General to take all administrative decisions necessary to Adarathm and therefore must be a measure of decentralization by delegating powers to levels lower administrative and determine responsibilities, and is every manager in this case responsible for the performance of his department or administration centre or responsibility At the same time have a the special administrative decision- making poison or the administration is responsible for it (Abdul Rahim et al, 1990: 599). Hence the liability accounting method aims to control and evaluate performance by determining the responsibility of the world's economic unity in the various administrative levels from the actual performance and the consequent results of the favourite and unfavourable compared to the planned performance. (Sentinel, 2004: 423).

There are several definitions of accounting responsibility has been known as a dependent on the basic premise is that individuals should be prepared for accounting and accountability for their performance as well as the performance of Hence, the accounting responsibility requires the need to link standards and events in the responsibilities so that it can perform accounting reports and evaluate the performance of these responsibilities all on Alone (Hetjr status and Tulc, 2000: 456). And defined as a system which recognizes the various centres of decision-making about which achieves linking organizational structure accounting controls and evaluates the performance of those responsible for the so-called centres, responsibility based on factors under their control. (Abdel-Latif, 2004: 358), also known as administrative processes are subject to the provision of information that helps to control processes and performance evaluation. (Hussain, 2000: 132).

The previous definitions of responsibility accounting can be defined as a system that works to provide accounting information on the performance of the managers through categories based on performance reports compare actual performance with planned to reach the deviations (negative or positive) and connect them with the person in charge at the facility.

### **Accounting responsibility objectives:**

Achieving control over the elements of costs and revenues, assets or liabilities is a concept traditionally controlled because the main reason for achieving the goals desired of those elements is the Human Element, which is the main engine for those elements so it is logical to assume accounting responsibility controlled swearing in of the thing and not the end result the same. (Basile, 2001: 318).

The objectives of accounting responsibility in the following points: (Saleh, 2000: 451-452).

- 1 - Bind the activity officials.
- 2 - To help in the process of planning, organization and control.
- 3 - To provide an incentive plan based on an objective basis from which to prove both improve performance and achieve the rates specified in the scope of responsibility and punishment or direct all did not achieve what is specific to him.

### **Elements of responsibility accounting:**

Elements of responsibility accounting:

To apply the style of accounting responsibility required to provide the following (Ranger, 2004: 425):

A - Define the scope of authority and responsibility in a clear and specific.

B - Identify performance rates in advance.

C - Training managers to use the results of the reports.

D - Obligation of the fact that the reports in the hands of managers in a timely manner.

E - Fit the contents of the reports this style with authority and levels of managers.

And - the need to include aspects that reports should pay attention to it managers.

Based on the foregoing, the style of accounting responsibility includes introductions to accounting, administrative, organizational and behavioral common and the success of this technique, it is necessary to find the integration between these elements in a single application. (Hashem, 1988: 230) and it depends on three main elements:

### **1 - Clearly defining responsibility centres:**

Of the basic ingredients that underpin the division of responsibility accounting system established to be the responsibility centres each centre under the responsibility of the person responsible. Economic Unity any division to responsibility centres, and the status of responsibility means any organizational unit headed by a person responsible for the activity of this unit (shouted, 2000: 452), and positions of responsibility are divided into three types:

### **A - Cost centres:**

Centre cost is a circle activity which is its director responsible mainly what is happening with the cost of only a goal to reduce the cost to the lowest identified as possible, while the income and capital invested is not within the scope of responsibility and accountability, (a case and Hanan, 1997: 418) Any determined responsibility only in the side costs that could be affected by its decisions.

### **B - Profit centres:**

Profit centre is an organizational unit extends the responsibility of the administrator to cover both sides of the revenues, costs, and thus can be considered to profit centre as an economic unit can measure the results of their work. (Zamel, 2000: 515), and this can be a net gain or loss as an indicator for judging the effectiveness and efficiency of this performance validity presence to maximize profits, so profit centres are more comprehensive than cost centres.

### **C - Investment centres:**

TCI is a circle Activity Director is responsible to basically what achieve revenue and caused the costs as well as taking into account what has been invested resources and assets in the centre of responsibility. So is investing a development centre to profit centre. (A case and Hanan, 1997: 420), and is noted here that the TCI is wider with a profit centre, to add the invested capital as an additional element is followed to evaluate the performance of the section so the performance evaluation would be more accurate in the investment centres.

## II. DETERMINE THE PERFORMANCE STANDARDS

Based accounting system of responsibility in the performance evaluation centres responsibility to compare the actual performance standard specified for both costs and revenues are performance standards and measurable specifications do not come out of being indicators to judge the efficiency and effectiveness of the results of the implementation of the activity established, (Saleh, 2000: 453), so should be taken into consideration when determining the standards the following matters: (Sentinel, 2004: 428-429).

A - Selection criteria that reflect not believe a possible expression of the level of performance of responsibility canters.

B - taking into account realistic when choosing the level at which placed the standard.

C - To be precise standards and understood by all officials.

D - To be comprehensive standards for various aspects of performance.

E - The standard explains what must be the performance objectively note that the performance indicators in the previous three centres are: (a case and Hanan, 1997: 422).

A - Centre Cost: The cost depends index with a focus on cost-controlled Centre Director, which are affected by its decisions.

B - Profitability Centre: depends Index Net Profit

C - Investment Centre: Depends index rate of return on investment that results from the profit on the value of invested capital, and the remaining profit index resulting from the reduction of the cost of invested capital (invested capital x desired yield) of profit.

## III. ACCOUNTING SYSTEM IS DESIGNED TO POSITIONS OF RESPONSIBILITY

When you follow the style of accounting responsibility become canters of economic responsibility in the unit starting point in the design of the accounting system and accounting data collection and are classified and coded accounts on this basis, (Ranger, 2004: 429).

### Performance Reports

Represents Performance Reports provided by the accounting system of responsibility and means of communication between the various positions of responsibility in the context of the organizational structure of the unity of economic and used mainly for the purposes of internal management in order to assess the performance of the responsibility for the various positions of responsibility, whether cost or profit or investment where it is preparing these reports and submit to the administrative levels Supreme through a system of responsibility reports. (Abdel-Latif, 2004: 359).

And performance reports include summaries of the results of sections and analysis of trends that help management levels in the monitoring and evaluation of performance. As well as containment measure or compare individual elements under the control of the people responsible. (Saleh, 2000: 454) It should be noted cannot say that there is a ideal for reports to suit all installations there are reports preparation Reports easy, clarity and timeliness, and consistency in the format of the report,

appropriate reports for each level of administrative support him and his scope of responsibility as well as the exclusion of costs uncensored performance reports.

### Behavioural aspects Accountability and Responsibility:

The process of assessing the behavioural aspects of performance, because the performance measurement directly on the completion of the individuals within the projects, and the feedback required to cover the preparation of reports recognize individuals in advance for how to calculate performance metrics and how to distribute responsibility for costs. (Raver 2003: 190) and as an individual (man) is the essence of responsibility and accountability are tastier can detect the deviation and identify the person responsible for it, and to identify the reasons for its occurrence, and therefore the responsibility of accounting are interested in the individual causing the deviation more than one item of interest that occurred the deviation. (Ranger 2004: 424), and this explains the evacuation of the importance of controlling behavioural and performance evaluation, which is reflected in the actions of the workers supplied with attention technical factors engineering and technical in the preparation of standards, while ignoring the behavioural aspects lead to a large gap between those standards as a technician and between implementation sites as a way of humanity and behavioural. (Zamel, 2000:523), and therefore the degree of effectiveness of responsibility and accountability in monitoring and evaluating performance, especially when preparing affected by the evaluation criteria perform significantly humanitarian workers in these standards importance equivalent to the technical side of this factor standard may lose interest in work or loss of self-confidence because of the pressure is that the implementation of the standard imposed and which may lead to a clash between officials or distrust and misunderstanding, will participate Y system in a standard or will advise the elimination of most of the problems mentioned, as well as incentives and rewards moral and material working to develop behaviour towards individuals within standard established to make a greater effort and therefore a sense of responsibility towards this standard and accepted evaluation of the performance and accountability of accounting for its implementation.

### Secondly - business ethics and responsibilities of the accountant

#### The concept of business ethics.

That human behaviour for a Muslim is governed by Islamic moral values which are based on responsibility before God Almighty than necessary taking into account the human values associated with this behaviour and truthfulness, honesty, loyalty and justice. (Qntja, 2004: 91) Valokhalakiet the state of mind, not a set of rules, known as the principles of ethics related to characteristics such as honesty, integrity, and reliability, responsibility and other aspects of ethical conduct for wrongful conduct. (Hammad, 2004, 162) and known also as a morality standards of conduct and behaviour that we expect to be followed by the people and relating to personal morality effectively targeted individual's daily life. (Sabbagh, 2002: 204) is the integrity and moral values, a producer of ethical standards and behavioural loneliness and how it can be delivered and adhered to in practice and include the actions of the administration to

remove or reduce incentives and temptations that drive people to commit actions of non-straight, illegal or unethical (Lutfi, 2005: 5014) Therefore, the Business Ethics relating to the behaviour of individuals in their activities various practical and this includes the way they deal with their colleagues, customers and anyone else who deals with the economic unit, and some find it very difficult to determine where to start ethics of personal and business ethics, because ethics personal influence and the cover of Business Ethics, It is important to differentiate between ethical behaviour and legal behaviour Ethics is expected behaviour with individuals, either laws and questions with the required actions there is a reaction may be legal but immoral, or unethical, but illegal. (Sabbagh, 2002: 204).

Ethical behaviour includes choosing healthy behaviours that is appropriate and fair was the fact that proper behaviour or error, and may be appropriate or inappropriate, and that the decisions taken may be fair or unfair. However that individuals differ always in their views about the meaning of conventions moral values, there is a general principle is the basis for all systems moral is the belief that every member of any group bears some responsibility for the good and welfare of other members of the group as the individual's desire to sacrifice Bmsaleth self for the well-being of the group serve as the heart of the moral act. (Abu Zeid and Mari, 2004: 73), then business ethics confined within the framework of the behaviour of individuals within the economic unit or in any other activity is dealing with other colleagues, clients or management.

#### **Elements of ethical behaviour of the accountant:**

You can view the elements of ethical behaviour of the accountant through the following: (Judge limits, 1999: 43-45).

1 - moral issue: are those that appear when one has to choose between several alternatives and that the right decision is not clear and obvious absolute moral issue can be placed as one of the alternative options that affect the others, so When the face of the problem has to be for humans to return to the ethical principles that believes in it.

2 - Ethical principles: we find in practice two types of ethical principles that represent a theoretical background for each behaviour:

A - Type I: It is mandatory principles that lead the decision-maker to work according to the requirements of the rules of professional conduct without the balance between good and evil as the ethics according to this concept is tolerate rules or not taking them.

B - Type II: are utilitarian principles and the basis of this criterion principles is the results of the balance between good and evil, the output of each decision.

3 - Results ethical decision: that the decision result in the greatest good is the better decision and that any moral rule must be beneficial to the people but if this rule were harmless may not be applied to them, knowing that the ethical decision goes several steps:

A - Examine alternative business, clarify and identify the appropriate capabilities to work in these circumstances and search for all available alternative business.

B - Focus on thinking about the results of each action or every decision that can be made by predicting future status.

C - To be able to assume the decision maker situation arising from the decision-making.

D - Concerning the presumed views affected the decision.

Principles of Business Ethics for accountant

There are some basic moral values that represent a series of principles and framework determine what is right or wrong, in general terms, is this the following general principles: (Abu Zeid and Mari, 2004: 73).

- 1 – Secretariat
- 2 – Integrity
- 3 - Keeping the Promise
- 4 – Fidelity
- 5 – justice
- 6 - taking into account the others
- 7 - Respect for others
- 8 -sense of responsibility
- 9 - the pursuit of excellence
- 10 – Trust
- 11 – substantive
- 12 - legitimacy

These principles are mentioned public morality As for the business ethics of the accountant is represented in: (F, 2000: 384-385).

**1 - Confidence:** the accountant should be trusted secretary in the performance of his duties and services, professional and functional require trust in him that is characterized by integrity, honesty, behaviour, honesty and integrity and to maintain the confidentiality of the information in his establishment.

**2 - Legitimacy:** the accountant to prove the legality of everything related to his work and the performance of its duties and its functional and professional services in the light of the provisions and principles of Islamic Shari.

**3 - professionalism and mastering work:** should the accountant to be eligible for all what he is doing tasks that performs the duties and services functional and vocational ability of care and workmanship and spare no effort in order to fulfil his responsibilities towards his Lord and his community and his profession and his superiors and his client and himself.

**4 - Objective:** the accountant should be fair, impartial and unbiased and neutral to avoid placing himself in position opposed his favour with the interests of the service provides them.

**5 - Conduct Security:** You must behaviours and actions consistent with the accountant faith values derived from the provisions and principles of Islamic law.

**6 - Professional conduct and technical parameters:** the accountant must take into account the actions of professional conduct and committed in the performance of his professional duties with professional standards.

Notes from the above that there are common principles between the general principles of morality and ethics of business accountant, objectivity and ethics, and perfecting the work and other principles found in the general principles of all sense of

responsibility and the other found in the ethical principles of the accountant only, which is based on the foundations of professional and technical standards.

### **Standards of ethical conduct and responsibilities of the accountant:**

When you use the accounting information management for the purposes of monitoring and evaluation of performance may be exposed accountant to pressure from the administration to show results other than what they are, and stop the way the accountant with this pressure on his beliefs and composition of moral as well as on the extent influenced by reactions prevailing in the economic unit may face accountant behaviour of some workers or supervisors legally acceptable but unacceptable from the moral in this case may feel acceptable, if the individual is not supported by beliefs and moral values may find it difficult in the face of these pressures. (Noor et al, 2005: 25), so it falls to the accountant's moral responsibility towards himself and those around him in the economic unit in the need to take account of professional ethics on the one hand and the ethics of self-Elsewhere and consists ethics business accountant and can be represented by the standard of this ethical behaviour thus: ( Abu Zeid and Mari, 2004: 74-75).

#### **1 - Rated: accountant and bears the following responsibilities:**

A - To maintain an appropriate level of professional merit and that the continuous development of knowledge and skills.

B - The performance of professional duties in accordance with the laws and regulations and appropriate technical standards.

C - Preparation of reports and recommendations in full after an analysis of information that can be relied upon

#### **2 - Confidentiality: accountants bear the following responsibilities:**

A - To refrain from disclosing any information obtained through work, but in the case of a legal commitment to this disclosure.

B - Assistants media including the confidentiality of the information obtained in the case say so and follow up their activities to ensure confidentiality.

C - Refrain from using confidential information that is made available to them through the work so as to obtain the advantage unethical or illegal.

#### **3 - Integrity: accountant and bears the following responsibilities:**

A - Avoid situations of conflict of interest or the actual phenomenon and offer advice to all parties for any potential conflict.

B - Link to refrain from any form that could limit their decisions to carry out their duties in an ethical framework.

C - Refusal gift or advantage or a compliment would influence their actions.

D - Refrain from the bad influence of direct and indirect to achieve legal and ethical goals of the enterprise.

E - To connect the appropriate information.

And - to refrain from engaging in any activity that would detract from the amount profession.

Objectivity: The accountant fulfills the following responsibilities:

A - Communicate information fairly and objectively.

B - Full disclosure of all relevant information that can be expected with a reasonable degree it affects on the user's understanding of the information for the reports, comments or recommendations offered.

#### **Thirdly - Activating the role of accounting responsibility by Business Ethics:**

The focus of work in the accounting responsibility is an individual who participates in the development of standards and in light of which assesses the performance of an individual other in the economic unit and the preparation of reports to senior management so therefore work ethic accounting controls significantly in the output of this system of accounting information can be classified as business ethics of the accountant and control the effectiveness of the outputs of responsibility accounting system in two sets:

##### **1 - A professional work ethic:**

These are ethics degree of confidence in the information accounting produced and included neutrality and non-discrimination towards the interests opposing anyone who uses that information and sincerity of information which can visualize the content which aims to him represented an honest and objective information imposed and the ability and professional experience, technical and scientific, including Levi powerfully work entrusted to him and be the source of this Ethics legally any binding of the administrative and technical points higher, so around this recipe ethics cram in the application and representation based on the rule of law punish the violator of these properties and the rules and principles that should be taken into account when preparing performance reports.

##### **2 - Work ethic Self:**

These are ethics relationship in relative concept within the rights which faith and that pops up with him a set of principles of mind at any follow ethical behaviour and correct and integrity of any avoid actions that would generate pressures affect his actions, honesty and maintaining the promise and the transparency of any provision Image fact all that is happening and a sense of responsibility and legitimate the work being done and to maintain the confidentiality of information within the unity and justice and the moral principles strengthen or weaken within the accountant according to the degree of faith that inside each of these principles and the rule emanating from this faith is religious or customary or social set in light of the environment in which they live accountant and can be represented Business ethics and professional .

Quality Performance Reports:

Trust and objectivity, impartiality and professionalism and perfecting the work of justice and sense of responsibility, transparency and integrity.

Rules and principles of legal and professional.

Religious and customary rules and social.

Professional work ethic.

Work ethic Self.

Business Ethics for accountant.

### Activation of Quality Performance Reports:

Accounting information is the focus of what is in the Performance Reports. Therefore, in order to activate the role of Performance Reports in achieving the goals set for it and raise the quality of accounting information contained and thus achieve the highest adequacy for users of the reports and the beneficiaries of that information and support quality decision based on these reports should focus on the product this information and to control his actions and the results of the previously mentioned work ethic. business effect in raising and strengthening or reduce and weaken the quality and performance reports in order to activate the quality of performance reports is the responsibility of the administration in the economic unit to take the following steps:

- 1 - To clarify the concept of business ethics within the unit.
- 2 - CARROT accountants to represent these ethics and support incentives and rewards physical and moral integrity.
- 3 - Use the style of reward and punishment upon discovery of moral attitudes and how they have been treated.
- 4 - Develop a sense of responsibility within the accountant's report prepared for the performance through the strengthening of humanitarian feeling inside the unit, based on justice and fairness in evaluating the performance of others.
- 5 - Develop an ethical professional legal formula to ensure containment of Business Ethics resume.

#### IV. CONCLUSIONS AND RECOMMENDATIONS

##### First - Conclusions

- 1 - The responsibility accounting effective regulatory tool that can be adopted in the control and performance evaluation.
- 2 - The Business Ethics is the behaviour of individuals and their dealings with third parties and the extent of adoption of this behaviour on ethical principles.
- 3 - The Business Ethics accountant has two groups of professional ethics and Other Self.
- 4 - To strengthen the accountant's business ethics involved activating the role of responsibility in the accounting oversight and evaluation of performance and by supporting the effectiveness of performance reports and to raise the quality of accounting information contained in those reports.
- 5 - Provide Performance Reports Business Ethics framework ensures build a fence to protect from falling accountant ethical problems.

##### Second - Recommendations:

- 1 - The need to use accounting responsibility in the applicable units of a decentralized system for objective assessment and monitoring the performance of managers in departments.
- 2 - The importance of ethical norms and standards within the unit organizes the work of the accountant commits.
- 3 - The need to use the style of reward and punishment, and material and moral incentives to strengthen business ethics in the accountant's economic unit.
- 4 - The work of the accounting courses for cadres inside the unit to illustrate the economic and cajole the accountant to represent the principles of business ethics.

5 - Accountant should not be used as a means of performance reports re mistakes or blame the manager or punishment but must use these reports to identify the fundamental deviations and studied and tested and know their causes and assist the Director in taking measures and treatment adjusted.

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# Safety and Efficacy of Tiotropium Bromide in Copd Patients

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**Abstract-** Chronic obstructive pulmonary diseases (COPD) are a potentially fatal, slowly progressive respiratory disease. In contrast to Asthma, COPD is characterized by air flow obstruction that is not fully reversible. The signs and symptoms are chronic cough, excessive mucus production, wheezing and shortness of breath after mild exertion. In the USA, COPD affects more than 15 million people, with the majority of the patients being over the age of 50 years and current or past smokers. According to the World Health Organization (WHO) about 600 million people suffer from COPD although many are undiagnosed.

**Index Terms-** COPD, muscarinic receptors, anticholinergic, bronchoconstriction, hypoxemia, hypoventilation

## I. INTRODUCTION

Chronic obstructive pulmonary diseases (COPD) are a potentially fatal, slowly progressive respiratory disease. In contrast to Asthma, COPD is characterized by air flow obstruction that is not fully reversible. The signs and symptoms are chronic cough, excessive mucus production, wheezing and shortness of breath after mild exertion. In the USA, COPD affects more than 15 million people, with the majority of the patients being over the age of 50 years and current or past smokers. According to the World Health Organization (WHO) about 600 million people suffer from COPD although many are undiagnosed. In practice, COPD tends to be under diagnosed and undertreated, for a number of reasons. However, the availability of detailed and practical guidelines from the Global Initiative for chronic obstructive Lung Disease (GOLD) will be useful for improving COPD care through primary care needs to respond by developing systems to ensure these guidelines are implemented in practice. There is no cure for COPD, and treatment is aimed mainly at controlling symptoms. Inhaled anticholinergic bronchodilators are now considered to be the first line treatment for COPD and exert their pharmacologic action by blocking muscarinic receptors, particularly M3 receptors. Tiotropium bromide, long acting, inhaled anticholinergic bronchodilator, which selectively inhibits the muscarinic receptors involved in mucus secretion and bronchoconstriction. Long term clinical trials have demonstrated the efficacy of Tiotropium in patients with COPD. Tiotropium bromide is a new quaternary ammonium compound with anticholinergic properties specific for muscarinic receptors (M1, M2 & M3) in humans (7).

The primary studies available for Tiotropium bromide enrolled patients older than 40yrs of age with a diagnosis of COPD, at least 10 packs /year of tobacco use and FEV1/FVC ratio <0.70 with FEV1<65% of predicted value. Hence the purpose of the present study was to evaluate the efficacy and safety of 18mcg Tiotropium metered dose inhalation, administered once daily for 14 weeks in patients with COPD and Bronchial asthma, cross over study with placebo. Asthma prevalence in the United States is estimated at approximately 30 million, and COPD prevalence may be as high as 24 million based on the latest National Health and Nutrition Examination Survey III. COPD is clinically defined as airway disorders that individually have significant heterogeneity with regard to underlying pathogenesis and responses to therapy.

In COPD conditions, the chronic inflammation can lead to structural changes referred to as airway remodelling. These changes are believed to be irreversible and cause gradually worsening airflow obstruction and reduced response to bronchodilators and glucocorticosteroids. Bronchodilators play a central role in symptomatic relief of acute bronchoconstriction in both conditions and are the primary maintenance therapy for COPD patients. Asthmatics with any stage of persistent disease should be treated with inhaled glucocorticosteroids as their first line of control and maintenance, but the majority also benefit from use of a long-acting inhaled bronchodilator as part of their maintenance regimen. Chronic obstructive pulmonary disease (COPD) is characterized by the progressive development of airflow limitation that is not fully reversible (9). There is some epidemiologic evidence that mucus hypersecretion is accompanied by airflow obstruction, perhaps as a result of obstruction of particularly peripheral airway (10).

The primary physiological abnormality in COPD is an accelerated decline in the forced expiratory volume in one second (FEV1) from the normal rate in adults over 40years of age of approximately 30ml per year to nearly 60ml per year (11). Hyperinflation which occurs at rest and worsens with exercise is commonly seen in patients with moderate to severe COPD. It is manifested primarily by an increase in the functional residual capacity which places the muscle of respiration at a mechanical disadvantage, thereby increasing the work of breathing and reducing exercise tolerance.

Additional physiological abnormalities include a reduction in the diffusing capacity to carbon monoxide, hypoxemia and hypoventilation. Epidemiology: - It is estimated that approximately 14 million people in the United States have COPD. In the 3rd U.S. National Health and Nutrition

examination survey, airflow obstruction was found in approximately 14% of white male smokers as compared with approximately 3% of white male non smokers; The figures for white female smokers and for black smokers were slightly lower than those for white male smokers (12). The World Health Organization predicts that by 2020 COPD will rise from its current ranking as 12th most prevalent disease worldwide to the 5th and from the 6th most common cause of death to the 3rd (13).

## II. PATHOGENESIS OF COPD

The recognition of chronic airway inflammation has a critical role in producing the symptoms of asthma. It is now apparent that there is a chronic inflammatory process in COPD, but it differs markedly from that seen in asthma, with different inflammatory cells mediators, inflammatory effects and responses to treatment.(17) The basic pathophysiologic process in COPD consists of ( fig-1) :-

1. Increased mucus production and reduced mucociliary clearance leading to cough and sputum production.
2. Increased smooth muscle contraction and leading to expiratory airflow limitation and classical symptoms of dyspnea.
3. Loss of elastic recoil leading to gas exchange abnormalities producing hypercapnia.

Bronchial biopsy results are similar to the histopathological findings:-

1. Patients with severe COPD have infiltration of macrophages and CD 8 + T cells and an increased number of neutrophils (20) .
2. There is a marked increase in macrophage and neutrophil in bronchoalveolar- lavage fluid and induced sputum (21) .
3. In patients with asthma, eosinophils are not prominent except during exacerbations or in patients with concomitant COPD (22)

### Classification of COPD based on spirometry by ATS/ERS guidelines

Severity	Post bronchodilator FEV <sub>1</sub> /FVC	FEV <sub>1</sub> % Predicted.
At risk	> 0.7	> / = 80.
Mild COPD		> / = 80.
Moderate COPD		50-80
Severe COPD		30-50
Very Severe COPD		< 30

## III. CLINICAL FEATURES

Symptoms of COPD are progressive, beginning with mild dyspnea and occasional cough, followed by chronic productive

cough with clear colourless sputum. COPD causes the walls of the small airways to thicken and the alveoli to lose their elasticity.

Many older individuals experience dyspnea on exertion because of deconditioning and obesity. Cough and sputum production is so common in smokers that it may be considered normal. The clinically silent nature of early COPD and the indolent course of the disease allows patients to accommodate their growing disability with life style changes. In the past, COPD has been defined in terms of in reversible airway obstruction that is progressive over time, but more recently the fact that patterns of COPD overlap with those of Asthma has been recognized. In 1995, the American Thoracic Society stated “It may be impossible to differ differentiate patients with Asthma whose airflow obstruction does not completely from patients with chronic bronchitis and emphysema with partially reversible air flow obstruction and bronchial hypersensitivity<sup>(25)</sup>.”

The use of phenotypic characteristics (e.g. symptoms, allergy and bronchial hyperresponsiveness) may be useful to differentiate disease characteristics as well as help in understanding the similarities in the development and progression of both obstructive airway diseases. As Asthma and COPD share many common origins i.e. epidemiological characteristics and clinical manifestations, conclusions were based on a comparison of signs, laboratory findings, treatment responses and natural history.

### Characteristics of Asthma and COPD

COPD
Progressive airflow obstruction.
smaller corticosteroid response
Cellular infiltration including neutrophils, macrophages,
Cytokine, chemokines and protease responses.

## IV. DIFFERENTIAL DIAGNOSIS

In adults, the differential diagnosis of COPD includes –

1. **Asthma:** - The clinical features of COPD mostly mimic that of asthma. But the predominant clinical feature in asthma is episodic dyspnea and cough.

The typical physiological feature is variable airflow obstruction, and airway hyper reactivity is typical. The classic pathologic feature in asthma is airway inflammation, subepithelial basement membrane fibrosis, which is the diagnostic.

2. **Emphysema:** - The clinical and physiological features mimic that of the COPD but in emphysema the classic pathological feature is permanent abnormal enlargement of air spaces and destruction of alveolar wall.

3. **Chronic bronchitis:** - In this disease, the signs and symptoms are very much similar to that of the COPD but it can be differentiated it from COPD but based on the pathologic picture i.e. presence of mucus gland enlargement and airway smooth muscle hypertrophy.

**Diagnosis:** - In case of COPD, the majority of cases occur in patient who are smokers<sup>(27)</sup>. All current or former smokers should be considered at increased risk for COPD. Other risk factors which account for fewer cases include Alfa-1 antitrypsin deficiency, airway hyperresponsiveness<sup>(28)</sup> and indoor air pollution. Since symptoms may not occur until lung function is substantially reduced, early detection is enhanced by spirometric evaluation of FEV<sub>1</sub> and forced vital capacity (FVC). Guidelines from Global initiative for chronic obstructive Lung Disease (GOLD) state that the airflow limitation in COPD is characterized by an FEV<sub>1</sub> value that is less than 80% of the predicted normal value and FEV<sub>1</sub>:FVC ratio of less than 0.70<sup>(29)</sup>. There is responsiveness to be a bronchodilator in 23 to 42 percent of patients with COPD, depending on criteria used. Furthermore, data from the Lung Health Study indicate that 59 percent of men and 85 percent of woman with moderate disease (mean ( $\pm$ SD) FEV<sub>1</sub>: FVC ratio, 0.630 $\pm$ .055percent) have airway hyperresponsiveness.

Thus, although guideline-based spirometric criteria are useful starting points, differentiation of COPD from asthma requires careful integration of epidemiologic risk factors (including the patient's age, smoking status and family history), clinical status (including both the indolent and progressive nature of symptoms) and a knowledge of the distribution and potential overlap of physiological disturbances.

**Treatment:** -The major goals of COPD therapy include smoking cessation, symptoms relief, improvement in physiological function and limitation of complications, such as abnormal gas exchange and exacerbation of the disease. An integrated approach to treatment combines health care maintenance and use of drug and supplemental therapy is a step wise fashion as the disease progresses .The goals of asthma therapy are to minimise chronic symptoms that impair normal activity, to prevent recurrent exacerbation, to minimise the need for emergency department visits and maintain near normal pulmonary function. Treatment algorithms are based on both the severity of the patient's baseline asthma and the severity of asthma exacerbations. Expert panel report 2 from the NAEPP recommends a stepwise approach to therapy. Therapy should be initiated early at a higher intensity level than anticipated for chronic therapy. Pharmacotherapy can then be cautiously stepped down once asthma control is achieved and sustained. This allows for identification of the minimum medication necessary to maintain long-term control.

The measure of Health care maintenance in COPD consists of:-

(1). **Regular Assessment of Lung function:-** The spirometry may be performed in all patients at risk to detect asymptomatic airflow limitation. In patients with established disease spirometry should be performed at least annually and more frequently if needed, to assess clinical status or the response to therapy.

(2). **Smoking Cessation:-**Abstinence from smoking (Drug bupropion, a noradrenergic antidepressant used for smoking cessation) results in a sustained 50% reduction in the rate of lung function decline in patients with COPD and smoking cessation is the only intervention known to be effective in modifying the disease. Nicotine-replacement therapy (by gums, transdermal patch or inhaler) provides help to patients in quitting smoking.

(3). **Vaccination:-**Although there is little evidence of a direct benefit of vaccination in patients with COPD, but the pneumococcal vaccination and annual influenza vaccination be offered to all patients in an attempt to reduce both disease-specific mortality and mortality from all causes<sup>(30)</sup>. Drugs used in the treatment of COPD, as well bronchial asthma can be classified as bronchodilators and anti-inflammatory drugs.

(1). **Bronchodilators:-**

(A). Beta<sub>2</sub> adrenergic receptor agonists-

I. Short activity: Salbutamol, terbutaline, adrenaline, ephedrine.

II Long activity: Salmeterol, formoterol.

(B). Phosphodiesterase inhibitors: Theophylline, Aminophylline.

(C). Anticholinergics: Ipratropium bromide, Tiotropium bromide.

(2). **Anti-inflammatory drugs:-**

(A). Glucocorticoids:

I. Systemic: Prednisolone.

II. Inhalation: Beclomethasone dipropionate, Budesonide, Flunisolide, fluticasone propionate.

(3) **Leukotriene [LT] modifiers:-**

I. LT synthesis inhibitors- zileuton

II. LT receptor antagonists: Montelukast, Zafirlukast

III. Mast cell stabilizers: Sodium cromoglycate nedocromil.

(4) **Other drugs that are under clinical trials:-**

I. Anti IgE monoclonal antibodies: Omalizumab.

II. Calcium channel blockers: nifedipine, verapamil.

The medication can be administered orally or by inhalation. An inhalation method offers the advantage of delivery of high concentration of medication directly to the target organ. This results in a more rapid onset of pulmonary effects as well as fewer systemic effects compared with oral administration of the same dose. Various inhalation delivery systems are:-

1. Metered dose inhalers.
2. Dry powder inhaler.
3. Nebulizers.

COPD and Asthma medication can also be classified as:

I. Quick-Relief medication.

II. Long term control medication.

**Quick-Relief Medication:-** Short acting bronchodilators and systemic corticosteroids especially for Asthma comprise this group.

1. **Beta-adrenergic agonists:** Short acting Beta<sub>2</sub> selective adrenergic agonist includes salbutamol, terbutaline, bitolterol and pibuterol.

2. **Anticholinergics:** - These drugs reverse vagally mediated bronchospasm but not allergen or exercise induced bronchospasm. Tiotropium bromide, a quaternary derivative.

It may be useful adjunct to inhaled short acting B<sub>2</sub> agonist.

Dose - 18mcg once daily.

(3). **Phosphodiesterase inhibitors:**-Theophylline, a methyl xanthine is a commonly used drug for both COPD as well as bronchial asthma. It is not recommended for therapy of exacerbations.

Theophylline inhibits phosphodiesterase enzymes which catalyze the breakdown of cAMP and cGMP to 5'AMP and 5'GMP respectively. This will lead to accumulation of cAMP and cGMP causing relaxation of bronchial smooth muscles. Theophylline is a competitive antagonist at adenosine receptors. Adenosine causes bronchoconstriction and potentiates immunologically induced mediator release from lung mast cells. Inhibition of action of adenosine explains the mechanism of action of theophylline.

Dose- 12-16mg/kg/day.

(4). **Systemic Corticosteroids:** - These are less effective in case of COPD but these are effective in primary treatment for patients with moderate to severe exacerbations of asthma and for patients who fail to respond promptly and completely to inhaled  $B_2$  agonist therapy. Prednisolone is given at a dose of 40-60 mg/day as single dose or in two divided doses for 3-10 days. Severe exacerbations requiring hospitalization typically require 1mg/kg of prednisolone every 6-12 hrs for 48 hrs or until the  $FEV_1$  returns to 50% of predicted.

#### Long term Control Medication:-

1. **Beta-adrenergic agonists:** - Long acting  $B_2$  agonists like salmeterol are indicated for long term prevention of COPD symptoms and nocturnal symptoms and for prevention of allergen or exercise induced bronchospasm. They are used as adjuvant in inhaled corticosteroids.

Dose- 50mcg /twice daily.

2. **Mast cell-stabilizing agents:** - These are mainly used in case of asthma. Cromolyn sodium and Nedocromil prevent symptoms and improve airway function in patients with COPD and exercise induced asthma.

They act by inhibiting degranulation of mast cells, thereby preventing release of chemical mediators of anaphylaxis.

(3). **Leukotriene Modifier:** - Leukotrienes are biochemical mediators that contribute to airway obstruction. Montelukast and zafirlukast are cysteinyl leukotrienes receptor antagonists. Zileuton is 5-lipoxygenase inhibitor that decreases leukotrienes production.

These drugs can be considered as alternatives to low dose inhaled corticosteroids in the long term control of both the COPD as well as asthma.

Dose- tablet- Montelukast -10 mg daily in the evening.

(4). **Protease inhibitors:** - Neutrophil elastase inhibitors.

Alpha-1 antitrypsin- purified, by human recombinant gene transfer.

These are mainly used in advance treatment of COPD

(5). **Corticosteroids:** - These are the most potent and consistently effective anti-inflammatory agents currently available. They reduce both acute and chronic inflammation, resulting in improvement in airflow decreased airflow hyper-responsiveness, fewer asthma symptoms exacerbations and less airway remodeling. Inhaled corticosteroids are preferred for the long term control and are first line drugs for the patients of asthma eg Budesonide, Fluticasone.

(6). **Antibiotics:** - Acute exacerbations of COPD are commonly assumed to be bacterial infection, since they may be associated with increased volume and purulent of the sputum. A meta-analysis of controlled trial of antibiotic in COPD showed a statistically significant but small benefit of antibiotics in terms of clinical outcome and lung function<sup>31</sup>.

(7). **Oxygen:** - Long term oxygen therapy was justified by two large trials that showed reduced mortality and improvement in quality of life in patients with severe COPD and chronic hypoxemia. (Partial pressure of arterial oxygen < 55 mmHg)<sup>(32)</sup>. It is also effective treatment for asthma patients.

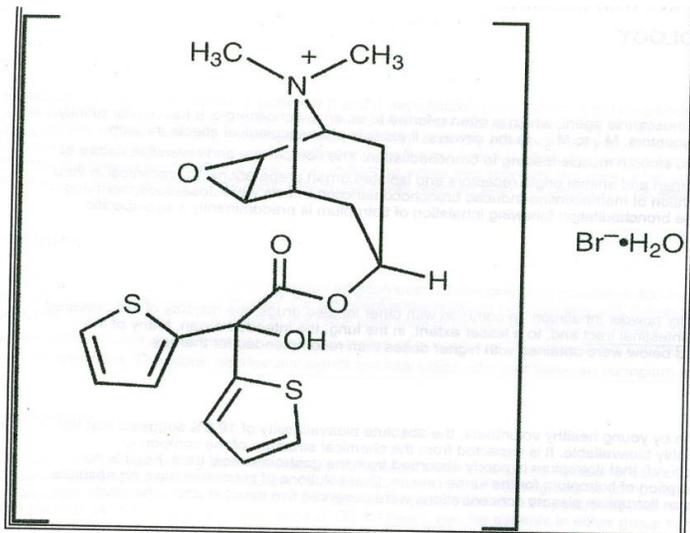
## V. DRUG REVIEW

A major advance in COPD therapy was the development of Tiotropium bromide that could be delivered to the lungs via inhalation. This drug is also effective for the patients of asthma. This allowed for the targeting of the drug directly to the relevant site of inflammation. The therapeutic index of the drugs has been gently enhanced by substantially diminishing the number and degree of side effects without sacrificing clinical efficacy.

## VI. TIOTROPIUM BROMIDE

Tiotropium bromide is long acting, specific, muscarinic receptor antagonist, in clinical medicine often called an anticholinergic. By binding to the muscarinic receptors in the bronchial smooth musculature, Tiotropium bromide inhibits the cholinergic effects of acetylcholine, released from parasympathetic nerve endings. The long duration is probably due to the very slow dissociation from the  $M_3$  receptor, exhibiting a significantly longer dissociation half life than ipratropium.

It is chemically described as 1(alpha),2(beta),4(beta),5(alpha)& 7(beta),7[c-hydroxyde-2-thienylacetyl)oxy]-9,9-dimethyl-3-oxa-9-azoniatricyclo(3.3.1.0<sup>(2,4)</sup>) Nonane bromide monohydrate.



### Chemical structure of Tiotropium bromide

It is a synthetic, non-chiral, quaternary ammonium compound. Tiotropium bromide is a white or yellowish white powder. It is sparingly soluble in water and soluble in methanol. (Fig-3)

Tiotropium bromide (monohydrate) has a molecular mass of 490.4 and a molecular formula of  $C_{19}H_{22}NO_4S_2Br \cdot H_2O$ .

As Tiotropium bromide is quaternary ammonium compound with a charge at the 5-valent nitrogen atom that renders it water and lipid insoluble, and consequently this drug has much lower systemic absorption. Thus, this synthetic compound has much less potential for causing side effects, even at levels much higher than recommended doses.

### VII. HISTORICAL ASPECTS

The medicinal properties of naturally occurring anticholinergic agents such as atropine, found in many plants in the tropics and temperate climates, have been recognized for centuries. There are reports from India dating from the 17<sup>th</sup> century that describe the use of **Datura stramonium** leaves for the treatment of asthma from the 17<sup>th</sup> century. This plant arrived in Europe by the 19<sup>th</sup> century via British colonialists and was used to treat a wide assortment of breathing disorders, the anticholinergic agents, such as atropine and scopolamine, are readily absorbed from the respiratory and GI tracts and have significant side effects newer synthesized agents, such as ipratropium bromide, oxitropium bromide and tiotropium bromide have similar but modified chemical structures compared with naturally occurring anticholinergics. The drugs have significantly reduced systemic absorption and consequently, reduced side effects. Thus they are used broadly in the treatment of airway diseases, particularly COPD, as we understand the importance of the parasympathetic pathway's role in controlling airway tone. The most recent advance has been the introduction of the long-acting antimuscarinic, Tiotropium, developed by

Boehringer Ingelheim, which included bronchodilatation lasting for several days. (Hansel & Barner, 2002).

### Pharmacokinetics:-

Tiotropium is administered by dry powder inhalation. In common with other inhaled drugs, the majority of the delivered dose is deposited in gastrointestinal tract and to a lesser extent, in the lung, the intended organ.

Tiotropium causes a relatively slower improvement in FEV<sub>1</sub> but reaches a peak between 1 and 3 h and is sustained for >24 h owing to its very long dissociation half-life of >34 hr.

(1). **Absorption:** - Following dry powder inhalation by young healthy volunteers, the absolute bioavailability of 19.5%. It is expected from the chemical structure of the compound (quaternary ammonium compound) that Tiotropium is poorly absorbed from GI tract. Food does not interfere with the absorption of the Tiotropium.

Maximum Tiotropium plasma concentrations were observed 5 min after inhalation.

(2). **Distribution:**- Tiotropium shows a volume of distribution of 32 L/kg indicating that the drug binds extensively to tissue. The drug is bound by 72 % to plasma proteins. At steady state, peak plasma levels in COPD patients were 17-19 pg/ml when measured 5min after dry powder inhalation of an 18mcg dose and decreased rapidly in multicompartmental manner. Steady state trough plasma concentration was 3-4 pg/ml. Studies in rats have shown that Tiotropium does not readily penetrate the blood-brain barrier.

(3). **Biotransformation:** - The extent of this is appears to be small. This is evident from a urinary excretion of 74% of unchanged substance after an intravenous dose to young healthy volunteers. Tiotropium an ester is non-enzymatically cleaved to the alcohol N-methylscopine and dithienylglycolic acid, neither of which bind to muscarinic receptors. In vitro experiments with human liver microsomes and human hepatocytes suggests that a fraction of the administered dose (74% of an intravenous dose is excreted unchanged in the urine, leaving 25% for metabolism) is metabolized by cytochrome P<sub>450</sub>-dependent oxidation and subsequent glutathione conjugation to a variety of phase-II metabolites. This enzyme pathway can be inhibited by CYP<sub>450</sub> 2D<sub>6</sub> and 3A<sub>4</sub> inhibitors such as quinidine and ketoconazole.

Thus CYP<sub>450</sub> 2D6 and 3A<sub>4</sub> are involved in the metabolic pathway that is responsible for the elimination of a small part of administered dose.

(4). **Elimination:** - The terminal elimination half life of Tiotropium is between 5 and 6 days following inhalation. Total clearance was 880 ml/min after an intravenous dose in young healthy volunteers with an inter-individuals variability of 22%. IV administered Tiotropium is mainly excreted unchanged in urine (74%).

After dry powder inhalation, urinary excretion is 14% of the dose, the remainder being mainly non-absorbed drug in the gut which is eliminated via faeces. The renal clearance of Tiotropium exceeds the creatinine clearance, indicating active secretion into the urine. After chronic once daily inhalation by COPD patients pharmacokinetic steady state was reached after 2-3 weeks with no accumulation thereafter.

### Mechanism of Action

Tiotropium is a long acting anticholinergic agent. It has similar affinity to the subtypes of muscarinic receptors  $M_1$  to  $M_5$ . In the airways, it exhibits pharmacological effects through inhibition of  $M_3$  receptors at the smooth muscle leading to bronchodilation.

The competitive and reversible nature of antagonism was shown with human and animal origin receptors and isolated organ preparations. In pre-clinical in vitro as well as in vivo studies prevention of methacholine induced bronchoconstriction effects were dose dependent and lasted longer than 24 hrs. The bronchodilation following inhalation of Tiotropium is predominantly a site-specific effect. The submucosa of human airways both upper and lower contain afferent irritant receptors and nociceptive C fibers that can be triggered to fire by a wide assortment of stimuli including many irritant gases i.e. cigarette smoke aerosols particles, cold dry air, mechanical irritation and various specific mediators. Once stimulated the C fibers transfer the impulse through vagal afferents up to vagal nuclei in the brainstem and then down through vagal efferents to the larger airways that receive vagal innervation (Fig-3) Parasympathetic cholinergic efferents supply most of the autonomic innervation to the human airways. They synapse in peribronchial ganglia with short postganglionic nerves that have muscarinic-1 ( $M_1$ ) receptors. These neurons in turn release acetylcholine that stimulates muscarinic-3 ( $M_3$ ) receptors found on smooth muscle and submucosal glands. This leads to bronchoconstriction and mucus gland secretion and increased ciliary beat frequency. This reflex are likely contributes to bronchospastic events that both asthmatic and COPD patients experience when exposed to various environmental triggers. Muscarinic-2 ( $M_2$ ) receptors are located on the distal terminus of the short postganglionic fibers and have an autoreceptor function of feedback inhibition to shut down acetylcholine release from post ganglionic fibers. These receptors play an important role in down regulating the release of acetylcholine in the synapses with  $M_3$  receptors on smooth muscle and consequently limit the amount of bronchoconstriction. There is also evidence to suggest that basal cholinergic tone is increased in asthma and COPD leading to tonic relative bronchoconstriction that contributes to the chronic persistent airflow limitation found in these disorders.

Anticholinergic agents compete with acetylcholine for these various muscarinic receptors and block bronchoconstriction and mucous gland secretion. Because cholinergic stimulation is only one of many contributing factors leading to bronchoconstriction, anticholinergics can only partially reverse the airflow obstruction of COPD and asthma. Furthermore, as outlined above, anticholinergic blockade of the  $M_2$  receptors may actually promote further bronchoconstriction because of their feedback inhibition role. Unfortunately, most anticholinergic agents have no selectivity when it comes to stimulating  $M_1$ ,  $M_2$ , or  $M_3$  receptors. Tiotropium, a congener of ipratropium bromide, has been reported to bind avidly to  $M_1$  and  $M_3$  receptors while dissociating rapidly from  $M_2$  receptors, thus having a relative selectivity that promotes bronchodilation. The anticholinergic agents can partially reverse the bronchoconstriction that occurs in asthma and COPD, but they have no or minimal known effect on leukotrienes and other components or mechanisms of airway inflammation. For these reasons, their greatest role and indication

has been as a primary bronchodilator in the treatment of COPD. Moreover, from the above discussion it is evident that there are reasonable grounds to consider that anticholinergic agents may have some role complementary to  $\beta$ -agonists in the treatment of atleast a subset of patients with asthma and COPD.

### Dose and Administration:-

- 18 mcg /once daily in the morning by inhalation with Rotahaler device.
- The recommended dose should not be exceeded.
- Tiotropium bromide rotacaps must not be swallowed.

**Drug interactions:-** Although no formal drug interaction studies have been performed, Tiotropium bromide inhalation powder has been used concomitantly with other drugs without adverse drug reactions. These include sympathomimetic bronchodilators, methylxanthines, oral and inhaled steroids commonly used in the treatment of COPD.

Only one study of interaction with Tiotropium with cimetidine 400 mg three times daily or ranitidine 300mg once daily was conducted, which showed no clinically significant interactions occurred between Tiotropium and cimetidine or ranitidine.

**Contraindications:** - Tiotropium bromide inhalation powder is contraindicated in patients with hypersensitivity to Tiotropium bromide, atropine or its derivatives eg ipratropium or oxitropium or to the excipient lactose monohydrate.

**Adverse Reactions:** - Several organ system and functions are under control of the parasympathetic nervous system and thus can be affected by anticholinergic agents. Possible adverse effects attributable to systemic anticholinergic effects include-dry mouth, dry throat, increased heart rate, blurred vision, glaucoma, urinary retention and constipation. In addition, local upper airway irritant phenomena were observed in patients receiving Tiotropium bromide. An increased incidence of dry mouth and constipation may occur with increasing age. The most common anticholinergic adverse reaction reported by COPD patients was dry mouth, which was mild in the majority of cases.

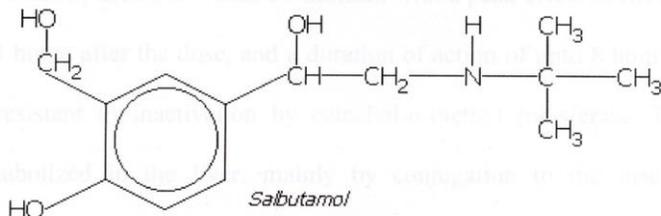
**Warnings and precautions:-** Tiotropium bromide should not be used for the initial treatment of acute episodes of bronchoconstriction i.e. rescue therapy. As with other anticholinergic drugs, Tiotropium bromide should be used with caution in patients with narrow-angle glaucoma, prostatic hyperplasia, bladder-neck obstruction. Inhaled medicines may cause inhalation induced bronchospasm. The drug should be used cautiously in renal and hepatic failure patients. Patients should avoid getting the drug powder into their eyes. They should be advised that this may result in precipitation a worsening of narrow angle glaucoma, eye pain or discomfort, temporary blurring of vision, visual haloes or colored images in association with red eyes from conjunctival or corneal congestion. Even though no clinical studies were available about the effect in pregnant and lactating mothers, but the animal studies have shown reproductive toxicity associated with maternal toxicity. Therefore Tiotropium bromide should not be used in pregnant or nursing women. Tiotropium bromide should not be used for cardiac or susceptible patient as it may produce supraventricular

tachycardia and atrial fibrillation as cases were reported in coronary artery disease patients.

**Over dose:-**High doses of Tiotropium bromide may lead to anticholinergic signs and symptoms. However, there were no systemic anticholinergic adverse effects following a single inhaled dose of up to 340 mcg Tiotropium bromide in healthy volunteers. Additionally, no relevant adverse effects beyond dry mouth were observed following 7-days dosing of up to 170 mcg of Tiotropium bromide in healthy volunteers. Acute intoxication by inadvertent oral ingestion of Tiotropium bromide capsule is unlikely due to low oral bioavailability.

### Salbutamol

It is a selective beta<sub>2</sub> adrenergic receptor agonist. It is chemically alpha-1-[(tert-butylamino) methyl]-4-hydroxyl -m-xylene- alpha -alpha-diol. Its empirical formula is C<sub>13</sub>H<sub>21</sub>NO<sub>3</sub>. It is a white crystalline powder sparingly soluble in water and freely soluble in ethanol. (Fig 5) chemical structure:-



(Fig-5)

**Mechanism of Action:-** Stimulation of beta<sub>2</sub> adrenoceptors in bronchial smooth muscle causes relaxation. These receptors are G protein coupled receptors. They bind to G<sub>s</sub> protein and stimulate adenylyl cyclase there by causing accumulation of cAMP. cAMP causes activation of protein kinase-A. Protein kinase-A phosphorylates myosin Light chain kinase there by inactivating it. This lowers intra-cellular calcium concentration resulting in relaxation of smooth muscle.

**Pharmacokinetics:-** Salbutamol can be given orally, parentally and also by inhalation. It is readily absorbed from gastro-intestinal tract. Following inhalation, the onset of action is within 5 to 15 minutes and lasts for about 3 to 6 hours. Following administration by mouth the onset of action is within 30 minutes with peak effect between 2 to 3 hours after the dose and duration of action is 8 hours. It is resistant to inactivation by catechol-o-methyl transferase. It is metabolized in the liver, mainly by conjugation to the inactive salbutamol-4-O-sulphate. Its plasma half life is 2.7 to 5 hrs after oral administration. It is 3.8 hours after inhalation. 72 % of the unchanged drug and metabolite are excreted in the urine within the first 24 hrs.

Dose: - Inhalation – 100 mcg 4 times daily.

Oral - 2 mg , 3 times daily.

**Adverse Effects:-** Salbutamol may cause fine tremors of skeletal muscle (particularly the hands), palpitations, tachycardia, nervousness, headaches, peripheral vasodilatation. Hypersensitivity reaction including paradoxical bronchospasm, angioedema, urticaria. Hypotension can occur rarely. Hypokalaemia has been reported with high doses. Inhalation causes fewer side effects than systemic administration.

**Drug Interaction:-** Concomitant administration of high doses of salbutamol with corticosteroid, diuretics, or xanthine increases the risk of hypokalaemia. When given intravenously it has been reported to enhance the neuromuscular blockade produced by pancuronium and by vecuronium. No drug interactions are noted with inhalation form.

## VIII. MATERIALS AND METHODS

The present clinical study was conducted in patients with stable as well as exacerbated COPD in Andhra Pradesh Government General and chest Hospital from May 2005 to Feb 2006.

A total of 120 patients, out of which 50 patients with mild to moderate COPD, 50 Bronchial asthma patients and another 20 patients each 10 with placebo study.

They were diagnosed based on the clinical findings and pulmonary function tests. The study was conducted for a period of 14 weeks.

### Study Design:-

This is an open label, randomized, parallel group study. The total number of patients in both COPD and Bronchial Asthma categories were randomized into 3 groups; had 50 patients bronchial asthma, 50 patients of COPD and 20 patients each disease with placebo.

Group I received - 50 patients of COPD.

Treated with 18mcg of Tiotropium. (2puffs/day)

Group II received 50 patients of Bronchial Asthma.

Treated with 18mcg of Tiotropium inhaler.(2puffs/day)

Group III – Group-IIIA, 10 patients of COPD and Group-III B,10 Bronchial asthma patients

Both groups received, Inhalation with placebo  
2 puffs / day , everyday morning

### Inclusion Criteria for COPD Patients:-

1. Patients in the age group of 40 to 70 of either sex.
2. Patients with the history of cough, productive sputum and SOB.
3. Patients with the history of smoking, 10 packs / year or more, FEV<sub>1</sub> of 65 % or less of predict for age.
4. Patients must be willing to give written informed consent and able to adhere to dose and visit schedule.
5. Patients who are stable on inhaled corticosteroids are allowed to be enrolled and to remain on the treatment throughout the study.

### Exclusion Criteria for COPD

Patients with the following criteria were excluded from the study:-

1. Patients in the age group of less than 12 and more than 80 years of either sex.
2. Pregnant or lactating woman.
3. Subjects quit smoking less than 3 months prior to the screening visit.
4. Patients have clinically significant lung disease other than COPD and Bronchial Asthma

- eg. Bronchectasis, acidosis, pulmonary fibrosis, tuberculosis etc.
5. Patients use oxygen > 2 liters per min for > 2 hrs / day.
  6. Subjects have had cancer diagnosed or treated within the 5 years.
  7. Patients require chronic or prophylactic treatment with antibiotics.
  8. Subjects with significant renal, hepatic, cardiovascular (including cor pulmonale), metabolic neurologic, hematologic, gastrointestinal, cerebrovascular or other significant medical illness or disorder which, in the judgment of the investigator, may interfere with the study or require treatment which may effect the evaluation of efficacy and safety of the drug study.
  9. Patients with chronic narrow angle glaucoma.
  10. Patients with symptomatic prostatic hyperplasia or bladder-neck obstruction.
  11. Subjects have clinically significant abnormalities on chest x-ray. (Other than evidence of COPD / Br. Asthma) at the screening visit or within the previous year.
  12. Patients with H/O Allergic rhinitis, myocardial infarction, increased total blood eosinophile count in COPD group patients.

#### Examination:-

Particulars of the patient like Name, age, address, occupation, and out patient number were taken

#### History:-

Detailed history was taken with special attention to the following points:-

- Cough; Expectoration; Haemoptysis; Breathlessness, wheezing; Nocturnal Awakening; Chest pain.
- Personal history – History of smoking, drinking.
- Allergy History – Food, house dust, traffic dust, perfumes, soaps, powders, hair dye and other.

#### Past History:-

- I. History as similar complains in the past.
  - II. History of chronic bronchitis, pulmonary T.B., tropical pulmonary eosinophilia.
  - III. Diabetis mellitus, Hypertension, Chronic renal failure.
  - IV. Malignancy.
    - Family history: - History of bronchial Asthma /COPD among 1<sup>st</sup> degree Relatives.
    - Treatment history :-
- (a). History of bronchodilator therapy , H / O Hospitalization.  
(b). Corticosteroid therapy.

After the history was taken, a detailed clinical examination was done.

#### Investigations:-

The following investigations were done:-

- 1) Blood Examination:-
  - (a) Haemoglobin
  - (b) Total count
  - (c) Differential count
  - (d) Absolute eosinophiles count
  - (e) Erythrocyte sedimentation Rate
  - (f) Peripheral smear
  - (g) Random Blood Sugar
  - (h) Serum Creatinine

- 2) Sputum Examination:-
  - a) Eosinophilic Count.
  - b) A.F.B.

- 3) Electrocardiography.

- 4) Chest x-ray PA view.

- 5) Pulmonary function test.

(Baseline, after drug administration, 5 times in the 1<sup>st</sup> day, 3<sup>rd</sup> day, 7<sup>th</sup> day and every 2<sup>nd</sup> week up to three and half months).

Blood examination, Sputum examination, chest x-ray, ECG were done to exclude other Conditions,

A written informed consent was obtained from the patient.

Patient was given study number and included in one of the group:-

Group I: - COPD patients-(50 cases).  
Drug - Tiotropium bromide inhalation.  
Dose - 18 mcg, once daily.  
Duration - 14 weeks.

Group II: - Br. Asthma Patients. (50 cases).  
Drug - Tiotropium bromide inhalation.  
Dose – 18 mcg. Once daily.  
Duration – 14 weeks.

Group III:- Gp IIIA : COPD patients treated with placebo, Gp IIIB: Bronchial asthma patients treated with placebo .  
Either cases (10 each ).

Drug – Placebo.  
Dose – 2 puffs / day.  
Duration: - 14 weeks.

All the patients were advised to take salbutamol inhalation (100-150 mcg) as needed. All the drugs were given as metered dose inhalation. Patients were shown inhalation techniques with spacers. They were advised to rinse their mouth after each inhalation. They were followed up 3 times in the 1<sup>st</sup> week after that every 2<sup>nd</sup> week till a period of 14 weeks. At each visit, they were clinically assessed and PFT was done. Screening was done for the following parameters before and after treatment:-

- 1) Cough
- 2) Wheeze
- 3) Breathlessness
- 4) Severity of nocturnal symptoms
- 5) Frequency of use of rescue Medication.

Score for Cough, Wheeze, Breathlessness and Severity of nocturnal Symptoms<sup>(33)</sup> for Br. Asthma:-

- O - No Symptoms
- 1 - Mild
- 2 - Moderate
- 3 - Severe

Score for frequency of Use of Rescue Medication <sup>(34)</sup>

- O - < 2 puffs / week.
- 1 - < 2 Puffs /day.
- 2 - 2 to 4 Puffs /day.
- 3 - > 4 Puff / day.

At each visit, patients were assessed for any adverse effects. Hence the diagnosis of COPD can be confirmed with the help of spirometry.

The differences between COPD and Asthma have an important bearing on treatment:-

COPD: - Backbone of treatment inhaled bronchodilators.

Asthma: - Backbone of treatment inhaled corticosteroids.

## IX. RESULTS AND CONCLUSION

The Present study showed Tiotropium was demonstrated to provide superior safety and efficacy relative to placebo in both COPD as well as Br. Asthma group in both clinical assessment score and spirometrically. In the spirometric assessment with Tiotropium in COPD treatment group (n-48), reports showed significant improvement in FEV<sub>1</sub> i.e. 0.22L, in FVC 0.31L and FEV<sub>1</sub>/FVC ratio was improved by 96% with respect to the baseline, which is statistically significant (P<0.001). Clinically symptomatic improvement was observed in cough, SOB, wheeze and nocturnal severity of symptoms. Frequency of rescue medication was also decreased by mean change score of 0.45(78.2%) with regard to baseline score 2.10(P<0.001) during the period of 14 weeks. In case of Bronchial asthma treatment group (n-50) reports showed significant improvement in both clinically as well as spirometrically but less effective compared with COPD treatment group.

In spirometric assessment, FEV<sub>1</sub> is improved by 0.21L, FVC by 0.31L and FEV<sub>1</sub>/FVC ratio improved by 92.14% with respect to baseline which is statistically significant (P<0.005). Clinically, the mean score reports showed 60-70% improvement when compared to baseline. These reports showed significant improvement with Tiotropium both clinically as well as spirometrically with fewer side effects i.e. mild dry mouth. Many studies are available with Tiotropium in COPD patients, which provides consistent reports of efficacy and safety of this drug but very few studies are available with Tiotropium in Bronchial asthma patients.

However, it will be important to perform further comparative studies with large sample in multi centric studies, using Tiotropium in all the stages of Bronchial asthma patients to evaluate the safety and efficacy of the drug and also to document the role of Tiotropium in Bronchial asthma.

In spirometric as well as clinically, placebo in COPD group patients (n-7) and Bronchial asthma group patients (n-10) showed very less improvement, which is statistically not significant. The improvement observed was superior to placebo

2puff/day with MDI. The over all results of our study suggests that Tiotropium in the dose of 18 mcg once daily via dry powder inhaler result in 24 hr bronchodilation as well as consistent and sustained improvement for both the COPD and the Bronchial asthma patients. It is safe and efficacious drug both clinically and spirometrically. Our study showed decrease in symptoms, decrease in rescue medication frequency and also reduce frequency of acute attacks. Patient's compliance was good in all the 3 groups of patients.

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# Woody Species Composition and Structure in a Semi – Arid Environment Invaded by *Dichrostachys Cinerea* (L.) Wight & Arn (Fabaceae)

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**Abstract-** Invasive plant species are a key factor of universal environmental change. They threaten global biodiversity and cause ecosystem degradation. The impacts of *Dichrostachys cinerea* on native woody species diversity, floristic composition and vegetation structure were determined. The study also assessed the dynamics and extent of invasion (population size, relative abundance, size class distribution and recruitment capacity) of *D. cinerea*. Forty woody species were identified in the study area. There were significant ( $P < 0.05$ ) differences in woody species canopy cover, basal area, abundance, richness, density and height classes between invaded and uninvaded sites. Height classes showed that most woody plants were saplings followed by shrubs, trees and lastly seedlings for both invaded and uninvaded sites. Significant ( $P < 0.05$ ) differences were also noted among invaded sites and among uninvaded sites in both density and abundance. Within uninvaded sites, richness also differed significantly ( $P < 0.05$ ). However, there were no ( $P > 0.05$ ) significant differences in basal area and canopy cover among the invaded sites and among uninvaded sites. Richness among invaded sites and height classes among uninvaded sites also did not ( $P > 0.05$ ) differ significantly. There is, therefore, urgent need to manage *D. cinerea* to curb its adverse effects on native woody species.

**Index Terms-** *Dichrostachys cinerea*, invasion, woody vegetation

## I. INTRODUCTION

Invasive plant species are a key component of global environmental change, and a major threat to global biodiversity (SCBD, 2010). They directly cause biodiversity loss (Hao *et al.*, 2010; Keller *et al.*, 2009), ecosystem degradation, and impairment of ecosystem functions (Yu *et al.*, 2010; Gosper *et al.*, 2010; Schooler *et al.*, 2006). Synanthropic invaders comprise of native taxa, and anthropophytes (aliens) are introduced for deliberate purposes such as forestry, agriculture or research. Recent findings in species invasion ecology cover arthropods (Perdereau *et al.*, 2010; Snyder and Evans, 2006), birds (Clavero *et al.*, 2009), mammals (Jaksic *et al.*, 2002), ferns (Kentaro *et al.*, 2007), cornifers (Richardson *et al.*, 2007), mosses (Peck and Moldenke, 2010) and other animals and plants.

However, most of these studies focus on aliens (Irigoyen *et al.*, 2010; Westphal *et al.*, 2008), yet the damage caused by native invasives, which are functionally indistinguishable from aliens, is equally important (Shen *et al.*, 2010; Davis *et al.*, 2000; Huston, 1994).

*Dichrostachys cinerea* is a semi-deciduous to deciduous shrub or low tree, characterised by bipinnate compound leaves, bicoloured flowers, yellow-brown, narrow pods, and strong, alternate thorns (SANBI, 2011). It rapidly encroaches into disturbed land, producing dense impenetrable thickets due to the density and abundance of its long, stiff and sharp thorns. Traits such as fast growth rates, rapid reproduction, high dispersal ability, and phenotypic plasticity for which an invasive displays greater ecological performance account for much of its invasiveness (Muñoz and Ackerman, 2010). Natural regeneration of *D. cinerea* is strongest by root suckers. It has lateral horizontal roots that extend extensively in all directions, supporting roots at an acute angle to the taproot, and numerous fibrous roots (PIER, 1998). In 10 years, an individual tree can produce 130 new stems in a radius of 15 m by its root suckers. A single *D. cinerea* plant produces approximately 1 million viable seeds /year. Both young and old *D. cinerea* plants produce seeds almost all year long. Germination of the seeds improves with storage. The species is highly aggressive, difficult to eliminate and has high propagule pressure. The herbivore – *D. cinerea* relationship is antagonistic through herbivory, and mutualistic through seed dispersal (Calvino-Cancela, 2010). Its seeds are capable of germination after passing through the alimentary canal of cattle or herbivorous browsers such as nyala due to increased permeability to water (van Staden *et al.*, 1994). In a study assessing shrub encroachment in Swaziland, *D. cinerea* contributed 81% of all encroachment in the lowveld savanna of Swaziland (Roques *et al.*, 2001). Its management involves frequent physical uprooting, which is heavy and expensive. Cutting down the parent plants stimulates development of fibrous roots and production of shoots (PIER, 1998).

*Dichrostachys cinerea* has formed impenetrable thickets that range from diameters of 50 meters to  $\geq 300$  meters on rangelands in the study area. Rangelands are areas of the world where wildlife and livestock graze or browse on natural vegetation, accommodating about a third of the world's people, both in cities and as producers on land (Heady and Heady, 1982). *D. cinerea* invasion has the capacity to alter woody vegetation

structure and composition of rangelands, rendering them more susceptible to shocks and disturbances, less resilient to grazing pressure, and less capable of delivering services. It also minimises visibility for wildlife and livestock when foraging. Impenetrable thickets, mainly consisting of *Acacia spp* and *D. cinerea* are one of the most serious problems in the semi-arid savanna ecosystem of Botswana (Tolsma *et al.*, 1987). They have reduced valuable fodder grasses and subsequently increased the grazing pressure on other species. They have also given rise to the browsing of trees by cattle due to reduction in grasses. By altering vegetation community structure, *D. cinerea* may affect the habitats of most animals and birds. It may also alter fire frequency and increase fire intensity by increasing the standing plant biomass. Greater flame lengths, higher temperatures and greater heat release have all been recorded or predicted for invaders of humid grassland, savannah or fire-prone shrubland ecosystems (Van Wilgen and Richardson, 1985; in Levine *et al.*, 2003). The species itself is fire – tolerant. Seedlings of *D. cinerea* survived fire through resprouting (Gambiza and Nefabas, 2007).

*Dichrostachys cinerea* fixes nitrogen. Woody plants with N-fixing symbionts may inhibit establishment and growth of later successional trees. Schulze *et al* (1991) found that along an aridity gradient in Namibia, while in *Acacia albida* nitrogen fixation was only 2%, it was 49% in *Acacia hereroensis* and *D. cinerea*. The species is also a source of food, animal fodder, firewood and medicine (Banso and Adeyemo, 2007; Smith *et al.*, 2005; Mlambo *et al.*, 2004). However, it is considered a threat to agricultural production, and is listed on the Global Invasive Species Database (Fournet, 2005), and on the invasive species list or noxious weed law in North America (CISEH, 2009). A risk assessment for *D. cinerea* in Hawaii and other Pacific Islands noted that the species was 'likely to cause significant ecological or economic harm in Hawaii and on other Pacific Islands' (PIER, 2008).

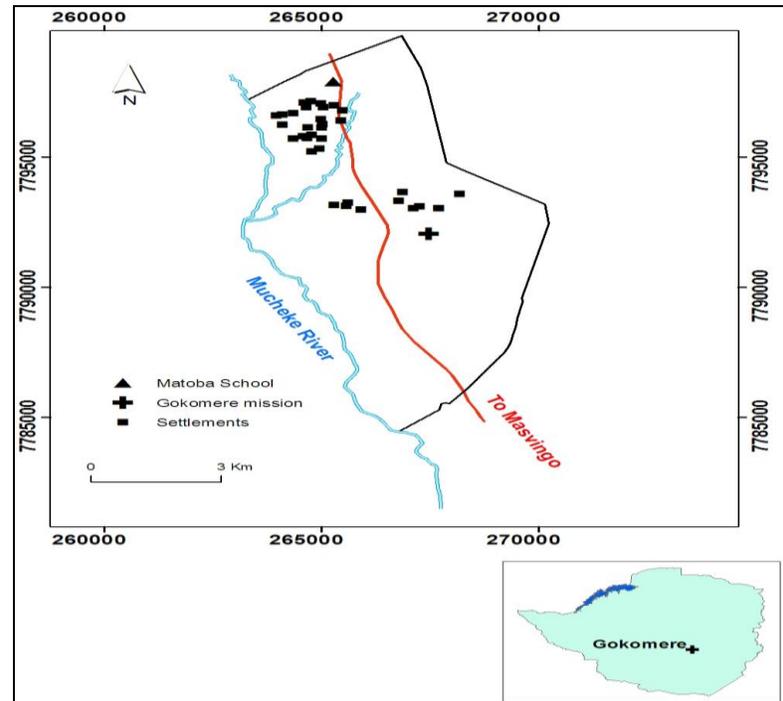
Identification and comprehension of the ecological factors that influence invasiveness is an important requirement for the management of invasive species (Perdereau *et al.*, 2010). Goal 6 of the Convention on Biodiversity (CBD) focuses on controlling invasive species as they are a threat to global biodiversity (SCBD, 2010). Therefore, a study that improves comprehension of the mechanisms behind *D. cinerea* invasion will help to curb the future economic and environmental impacts of invasive native plant species in general.

The objectives of this study are to determine the impact of *D. cinerea* invasion on native woody species diversity, floristic composition and vegetation structure; and to assess the dynamics and extent of this invasion (population size, relative abundance, size class distribution, recruitment capacity/fecundity) on the area.

## II. MATERIALS AND METHODS

### A. Site

The study was carried out in Gokomere Area located 18 km north of Masvingo town, and covering approximately 5800 hectares of land (Figure 1).



**Figure 1: A GIS map and location of the study area. Map coordinates are in meters, Universal Transverse Mercator Zone 36 South**

The area is located in Natural Region IV (NR IV) of the Zimbabwean ecological classification system (Vincent and Thomas, 1961). It is found at altitude 1163m above sea level, on latitude 19°57'45" S and longitude 30°46'34"E. On the west, it is bound by Mucheke River, and is characterised by a few small kopjes, semi-vlei areas and granite outcrops. The parent granite is of the dwala type, and the soils are sandy-loams deficient in nitrogen, sulphur and phosphorous. The area experiences mean maximum and minimum temperatures of 21.8<sup>0</sup> C in October, and 13.3<sup>0</sup> C in June respectively. Rainfall is unreliable and mainly falls between November and March. Highest monthly rainfall of 158 mm is mainly recorded in December. The main perennial cover is characterised by *Hyparrhenia spp* while *Terminalia sericea* and *Combretum spp* are most dominant woody species.

### B. Selection of the *D. cinerea* invaded and uninvaded sampling sites

The five patches of *D. cinerea* invasion studied were identified using a 2009 Google Earth Satellite Imagery of the area, then verified by ground truthing. They measured ~ 1 hectare each, representing ~10 % of the total invaded area. The first patch was randomly selected and subsequent patches were selected by considering the nearest neighbour plus one method. Patches that did not meet the area criteria were omitted, and the next nearest patch was considered. Five sites not invaded by *D. cinerea*, but adjacent and equal in size to each of the five randomly selected *D. cinerea* patches were also studied.

### C. Demarcation of plots, and woody vegetation sampling

Three 100 m transects were laid down, with one transect passing through the centre of each patch. Each of the other two

transects was laid at equi-distances from the centre and periphery of each patch. Two 10 m x 10 m plots were systematically established on each transect for woody species assessments. The plots were located 50 m from main roads and rivers to reduce road and river effects. Four wooden rods were pegged on the ground to mark the corners of each plot using a 50 m tape measure. A string was used to mark the perimeter of each plot for tree floristic composition and structure assessments. Plot sizes were adopted from Mueller-Dombois and Ellenberg (1974). A Geographical Positioning System (GPS) unit was used to record altitude and location of the plots. Woody vegetation, comprising trees and shrubs, was assessed during the rainy season. Field identification guides (van Wyk and van Wyk, 1997; Carruthers, 1997; Plower and Drummond, 1990) were used to identify woody species encountered in the plots. Canopy structure, growth habit, leaf, bark and other structures were used to differentiate closely related trees. All woody vegetation rooted within the plot, or along plot margins with at least half of the rooted system inside the plot was measured and recorded (Walker, 1976). Height classes for the woody species were modified from Chinuwo *et al* (2010) to define trees, shrubs, saplings and seedlings as: trees- rooted, woody, self-supporting plants with one or a few definite trunks of basal diameter  $\geq 0.06$  m, and a height of  $\geq 3$  m; shrubs- rooted, woody, self-supporting plants of height of 1m - <3 m; saplings - plants of height 0.15 m - <1 m in height; seedlings - individuals of height <0.15 m. Woody vegetation heights, stem circumferences and canopy diameters were recorded.

#### D. Data analysis

Basal area, canopy cover, abundance and density of species were analysed. SPSS Version 13 (SPSS, 2004) was used for one

way analyses of variance (ANOVA) of the woody variables. The data obtained from 3 of the 5 invaded sites sampled (Sites 1, 2 and 3), and their respective adjacent uninvaded site (Sites 6, 7 and 8) was tested using independent t-tests to check for significant differences in the various variables measured. The results were compared with those from one way ANOVA done on all invaded and uninvaded sites for the same variables. The two sets of results were similar. One way ANOVA was therefore used to analyse the rest of the data obtained from the field. Multiple comparisons were done to test for significant differences among the plots. Ordination techniques (Principle Component Analysis (PCA) and Cluster Analysis (CA)) were used to arrange sites along axes basing on woody species composition data (McGarigal *et al.*, 2002; ter Braak and Smilauer, 1998).

### III. RESULTS

#### A. Woody vegetation structure

##### Basal Area

A total of 40 woody species was recorded for both habitat types, 22 in the invaded plots and 34 in the uninvaded plots. These are shown on the importance curve for the woody species in Figure 2. The invaded sites significantly ( $P < 0.05$ ) differed from the uninvaded sites when compared on the basis of basal area. There were no significant ( $P > 0.05$ ) differences in basal area among the invaded sites, neither were there significant ( $P > 0.05$ ) differences among the uninvaded sites. Higher basal area was recorded on invaded sites.

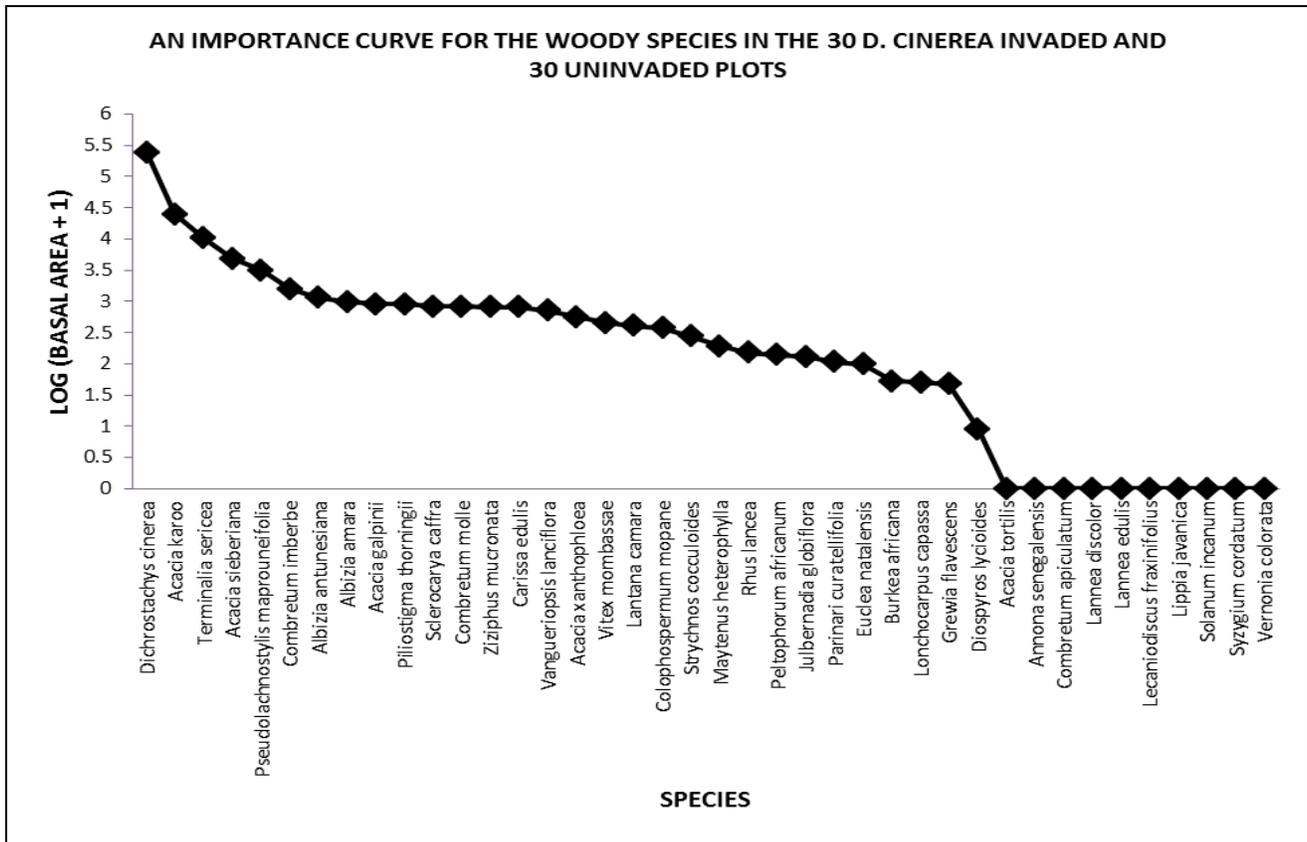
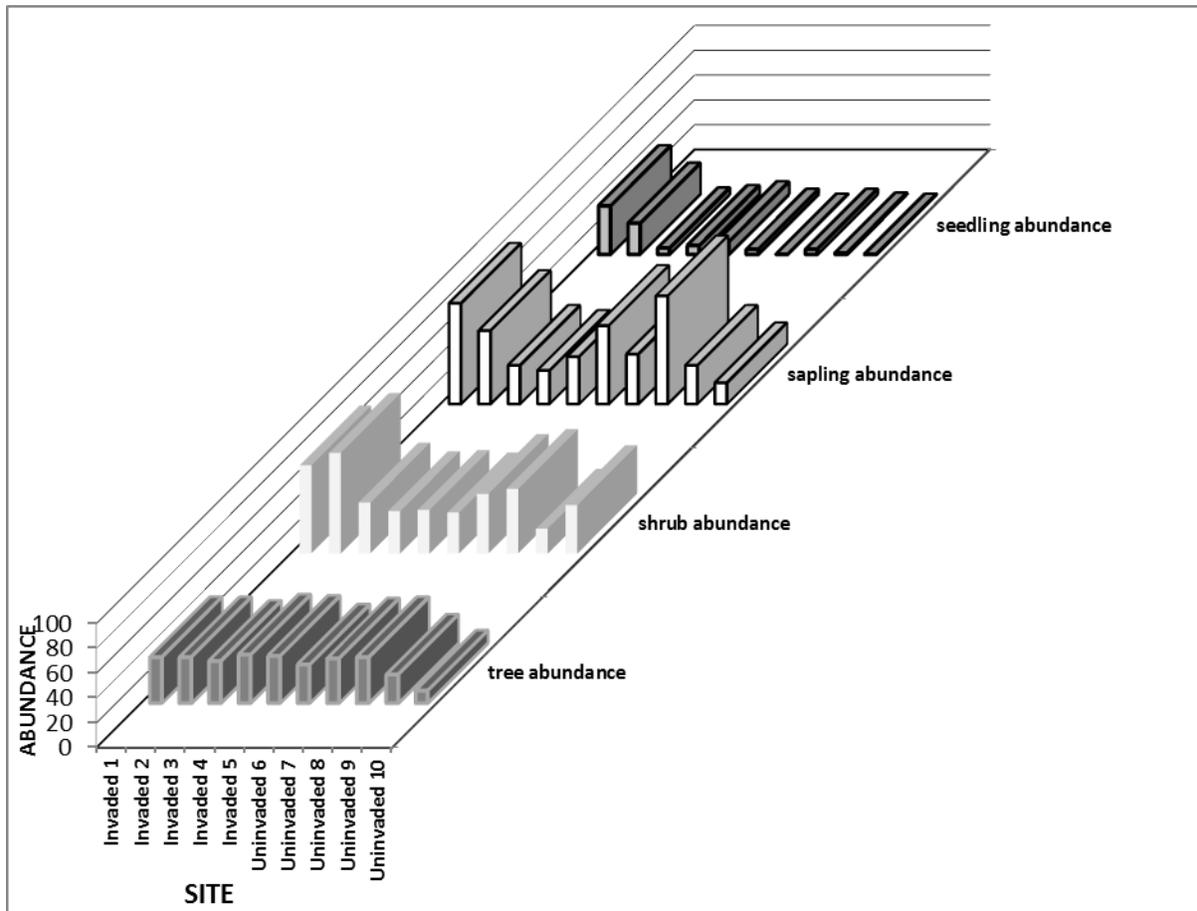


Figure 2: Species importance curve for woody species

*D. cinerea*, *A. karoo*, *T. sericea*, *A. sieberiana*, *P. maprouneifolia* and *C. imberbe* were the dominant species while *A. tortilis*, *A. senegalensis*, *C. apiculatum*, *L. discolor*, *L. edulis*, *L. fraxinifolius*, *L. javanica*, *S. incanum*, *S. cordatum* and *V. colorata* were rare species (Figure 2).

*Tree heights*

Height classes showed that most woody plants were saplings followed by shrubs, trees and lastly seedlings for both invaded and uninvaded sites (Figure 3). A two way analysis of variance showed significant ( $P < 0.05$ ) differences in height classes between invaded and uninvaded sites, and among the invaded sites. The uninvaded sites did not differ significantly ( $P > 0.05$ ) among themselves.



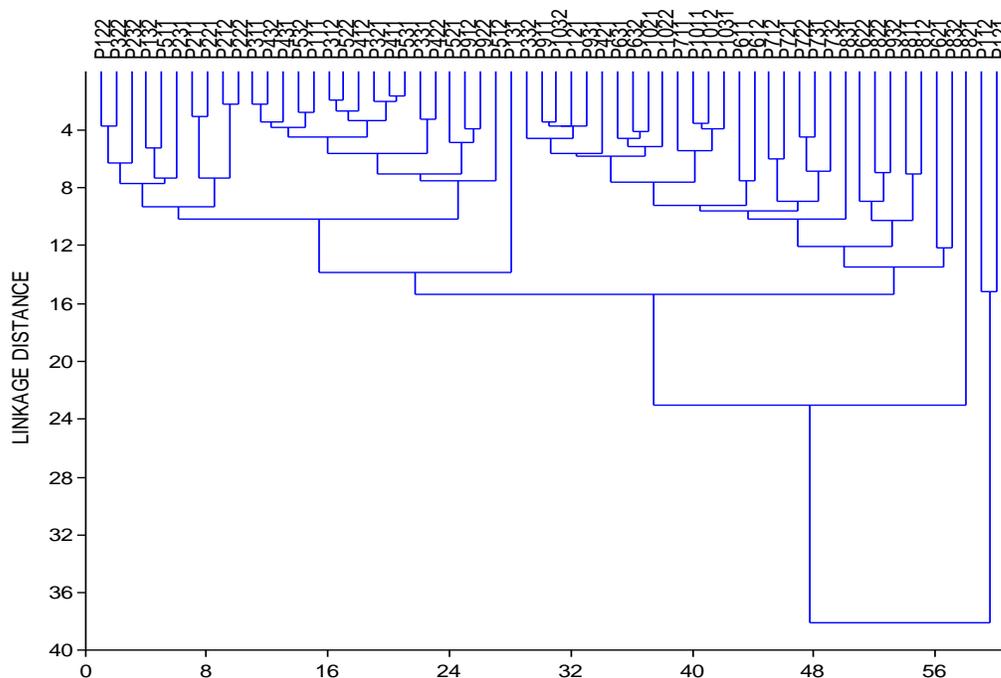
**Figure 3: Size class distribution of woody species in *D. cinerea* invaded and uninvaded sites**

*Canopy cover*

Canopy cover from invaded and uninvaded sites was significantly ( $P < 0.05$ ) different. This parameter was not

significantly ( $P > 0.05$ ) different among the invaded sites. It was also not significantly ( $P > 0.05$ ) different among the uninvaded sites. A cluster diagram based on principal component analysis of canopy cover measurements separated the invaded plots from the uninvaded plots (Figure 4).





**Figure 5: Dendrogram (single linkage, euclidean distances) from cluster analysis of *D. cinerea* invaded and uninvaded plots**

*C. Diversity indices*

Table 1 shows the evenness and diversity indices for the invaded and uninvaded sites. The invaded sites had higher evenness, Shannon Weiner indices and Simpson’s indices than the uninvaded sites. There were significant ( $P < 0.05$ ) differences in evenness, Shannon Weiner index and Simpson’s index among the invaded and uninvaded sites.

**Table 1: Species diversities among the invaded and uninvaded sites**

Diversity index	Invaded Site	Uninvaded Site
Evenness_e^H/S_S	0.351 <sup>a</sup>	0.504 <sup>b</sup>
Shannon_H	1.127 <sup>a</sup>	2.104 <sup>b</sup>
Simpson_1-D	0.493 <sup>a</sup>	0.815 <sup>b</sup>

Means in rows with different superscripts are significantly different ( $P < 0.05$ )

IV. DISCUSSION

*A. Woody vegetation composition and diversity*

Woody species richness, abundance, density and diversity in areas of Gokomere invaded by *Dichrostachys cinerea* have declined. Likewise, Hejda *et al* (2009) report approximately 90 % decreases in species numbers per plot and total number of species recorded in invaded plant communities. Invasive plant species threaten ecosystem function and community diversity, dominating natural systems through suppression of, competition with, and replacement of native species (Kelly *et al.*, 2009). They are characterized by mono-specific stands. The dominance that

*D. cinerea* achieves in invaded areas suppresses native woody species (Daehler, 2003) causing lower species richness as observed in the study plots. It is most likely that its vigorous growth characteristic is responsible for its impact on native species. The species also has an extensive and dense root system that is important in propagation and competitive exclusion of other species.

Uninvaded sites were characterized by spatial heterogeneity that resulted in significant differences among sites, hence supporting a variety of species resulting in high species richness. Compared to the dense *D. cinerea* stands, treefall gaps in uninvaded sites create spatial heterogeneity in understory light levels (Canham *et al.*, 1990) which is essential for the maintenance of species diversity. The uninvaded sites recorded higher species evenness and Shannon-Weiner and Simpson’s indices than the invaded sites. Hejda *et al* (2009) note reductions in species richness, diversity and evenness in invaded plots compared to uninvaded sites. Similarly, Hartman and McCarthy (2008) state that invasions by Amur honeysuckle (*Lonicera maackii*) are frequently linked to poor individual performance and reduced species diversity. Higher species richness in the uninvaded sites in this study resulted in higher diversities. The invaded sites were dominated by *D. cinerea*, hence they had lower diversity. Holmes and Cowling (1997) also note that invasion by *Acacia saligna* results in declines in fynbos species richness, cover and frequency.

Canham (1985) concludes that the dynamics of canopy recruitment by *Acer saccharum* and *Fagus grandiflora* depended on light penetration through gaps into the understory beneath the northern edges of gaps. Reduced abundance of seedlings of other native species shown in this study could be due to the negative impacts of increased *D. cinerea* canopy cover which may affect

shade-intolerant native species. Germination and seedling survival are likely to be affected by light deprivation. Due to higher species richness, uninvaded sites are characterized by different types of litter whose distribution and decomposition cause patchy micro-environmental conditions. These present distinct niches that support proliferation of different woody species in a given area, hence the high diversity indices calculated for uninvaded sites in this study. Most of the woody species abundant in the uninvaded sites were deciduous in nature. They included *T. sericea*, *B. africana* and *A. amara*. These species contributed to the higher litter in the uninvaded sites compared to the invaded plots which were dominated by *D. cinerea*.

The invaded plots had higher density than the uninvaded plots. *D. cinerea* is propagated through rapid root suckering. It also has high seed germination rates. Immediately after cutting down an adult tree, shoots are formed from the numerous fibrous roots. Seed dispersal of the species is facilitated by both livestock and wildlife that feed on the pods. The species is also a nitrogen fixing tree (Bein *et al.*, 1996), and this ability might be the reason for its rapid growth rate. In a study by Vitousek and Walker (1989), measurements of litter decomposition and nitrogen release, soil nitrogen mineralization, and plant growth in bioassays all demonstrate that nitrogen fixed by the invader *Myrica faya* become available to other organisms. These various biological aspects of *D. cinerea* interact to make the species a successful invader, forming dense impenetrable thickets.

#### B. Vegetation structure

This study has shown that *D. cinerea* invaded plots studied were significantly different in woody structure elements from uninvaded plots. The highest canopy cover, basal area and woody species height classes in the invaded sites had greater abundance than in the uninvaded sites. The higher basal area of the invaded sites as compared to uninvaded sites was mainly due to *D. cinerea*. Although most stems of *D. cinerea* in the studied plots had a mean diameter of 7cm each, the species is multi-stemmed. Given this multi-stem characteristic and its high density, *D. cinerea* therefore had the highest cumulative basal area. The high densities of *Acacia spp* such as *A. karroo* and *A. sieberiana* found in the *D. cinerea* plots had a similar effect. Species that dominated the uninvaded plots were *T. sericea*, *P. maprouneifolia* and *C. imberbe*. Although these are single trunked mainly (SANBI, 2008), they form thick trunks. Their high abundances in the uninvaded sites also contributed to high cumulative basal area. The insignificance in difference of basal area of the invaded and uninvaded sites was due to homogeneity in the *D. cinerea* plots, and dominance of species such as *T. sericea* in the uninvaded sites, respectively. An importance curve of the species showed that *D. cinerea* was the most dominant species, followed by *A. karroo*, *T. sericea*, *A. sieberiana*, *P. maprouneifolia* and *C. imberbe*. Rare species like *C. apiculatum*, *L. discolor*, *L. edulis*, *L. javanica*, *S. incanum* and *S. cordatum* contributed the least to basal area.

There were significant differences in canopy cover between the invaded and uninvaded sites, but not within invaded plots or within uninvaded sites. *D. cinerea* forms a heavily intertwined overhead canopy which grows faster than other native species.

This characteristic and the dominance of *D. cinerea* in the invaded plots resulted in the higher canopy cover observed unlike in uninvaded sites where differences in occurrence of woody species probably caused the observed variations. *A. karroo* which has a similar canopy to *D. cinerea* also contributed to the observed canopy cover in invaded sites as shown on the principal component analysis diagram, while canopy cover in the uninvaded sites was mostly due to *T. sericea* and *A. amara*. *Albizia amara* is a deciduous tree with a more or less domed crown while *T. sericea* is also deciduous with a light irregular crown (Wild, 1972).

The height class distribution showed the dominance of the saplings followed by the shrubs, trees and lastly seedlings. In assessments of uninvaded and invaded sites, Hartman and McCarthy (2008) note significant reductions in densities in the herb, seedling, and sapling layers and also reduced species richness in the seedling, sapling and herbaceous layers due to invasion. The higher abundance of saplings in this study was probably due to higher survival rate and better competition of saplings as compared to seedlings. Shrubs were more abundant than trees due to the fact that *D. cinerea* mainly occurs as a shrub. Plant species invasion are often associated with a decrease in the abundance of native species, particularly trees, and this is typically interpreted as evidence for direct resource competition between the invader and native species (Meiners, 2007). The higher abundance of seedlings in invaded plots compared to uninvaded plots was most probably due to the high propagule pressure of *D. cinerea* through root suckers and the high germination rate characteristic of the species. This is supported by the fact that seedling richness was lower in the invaded sites with the most abundant seedlings being *D. cinerea* seedlings. According to Lonsdale (1999), seed dispersal or propagule pressure plays a vital role in plant invasions. Forest studies have shown that light is a critical resource affecting growth and mortality, and that many plant invaders are thought to suppress native recruitment by reducing light availability. Holmes and Cowling (1997) report that the long invaded dense *Acacia* canopies intercepted more light than fynbos. *D. cinerea* forms dense canopies that intercept light to the understory vegetation.

#### V. CONCLUSION

The current study has revealed that *D. cinerea* has adverse impacts on native woody species composition and structure. It has also provided strong evidence to show the negative impact the species has on vegetation recruitment and regeneration. These changes in vegetation structure and composition may have important implications on wildlife and livestock habitat, biotic diversity and feed availability. Due to financial constraints and a shorter period of sampling, vegetation assessments were done on only 5 patches of *D. cinerea* during one season. It is recommended that a long term study on a bigger area be done to provide more information on the impact of the species. Analyses of the results compared findings from all the invaded sites against findings from all the uninvaded sites. Future studies could compare each invaded site against its adjacent uninvaded site.

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# High Literacy and Mounting Violence: A Case of Women in Kerala, India

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**Abstract-** In this paper titled 'High Literacy and Mounting Violence: A Case of Women in Kerala, India', a modest attempt has been made to discuss the forms and types of violence against women. In all societies, to a greater or lesser degree, women and girls are subjected to physical, sexual and psychological abuse that cuts across lines of income, class and culture. It has been recognized as a violation of basic human rights of women and of their exercise of fundamental freedom. Why should violence against women be distinguished from other forms of violence? Because it has a global magnitude and it is based on sex inequality. It cuts across cultural and religious barriers, impeding the right of women to participate fully in society. Kerala, one of the most developed states of the country in terms of human development indices, is unfortunately no exception in the matter of crimes against women. Government and voluntary agencies are doing their level best to protect women and wipe out this negative indicator of development yet it continues to increase day by day. The paper also suggests remedial measures for preventing violence against women.

**Index Terms-** Violence, Women, Kerala, Kerala Model of Development, Education

## I. INTRODUCTION

Women constitute almost the half of the total world population. Gender based violence is a common reality in the lives of women and girls in many parts of the world, developing and industrialised countries alike. It has been recognised as a violation of basic human rights of women and of their exercise of fundamental freedom. In all societies, to a greater or lesser degree, women and girls are subjected to physical, sexual and psychological abuse that cuts across lines of income, class and culture. The low social and economic status of women can be both a cause and a consequence of this violence. Though there were several attempts to upgrade the status of women, the condition of women remains the same but for a few changes among some sections of women. History shows that women have never had an opportunity to express their individuality, since their freedom has always been suppressed by their immediate society. It is in this backdrop, that one has to analyse the status of women. The methodology used in this study is historical and analytical in nature. The data were collected mostly from secondary sources. Available primary sources were also consulted.

## II. IDENTIFY, RESEARCH AND COLLECT IDEA

### Violence against Women: A Theoretical Framework

Male violence against women is worldwide phenomenon and can be understood as the consequence of characteristics of societal structures like class, gender, etc. Violence against women is sometimes a mechanism for subordination or sometimes women's unequal status favours their vulnerability to violence.

### Defining Violence against women

The most widely used definition of violence against women (VAW) is:

The Declaration on Elimination of Violence Against Women adopted by the UN General Assembly in 1993, defines Violence Against Women as "any act of gender based violence against women that results in or is likely to result in physical, sexual or psychological harm or suffering to women, including threats of such acts, coercion or arbitrary deprivations of liberty, whether occurring in public or private spaces".

The Centre for Diseases Control in the US has defined four different types of violence:

- Physical violence<sup>11</sup>
- Sexual violence
- Threat of physical or sexual violence, and
- Psychological or emotional abuse.

*Economic violence* is another category of violence identified by the UN Special Rapporteur on Violence against Women. This is perpetrated usually by an intimate partner or family member and includes economic blackmail, control over money a woman earns, denial of access to education, health assistance or remunerated employment and denial of property rights (Coomaraswamy 1996).

Gender-based violence against women takes many forms and occurs throughout a woman's life cycle. Heise (1994) describe the different forms of violence that women experience throughout their lifespan

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1 This includes the intentional use of physical force with the potential for causing death, disability, injury or harm. Coercing or forcing other people to perform any of the above actions has also been classified as physical violence.

**Table 1**  
**Forms of violence experienced by women throughout their lifespan**

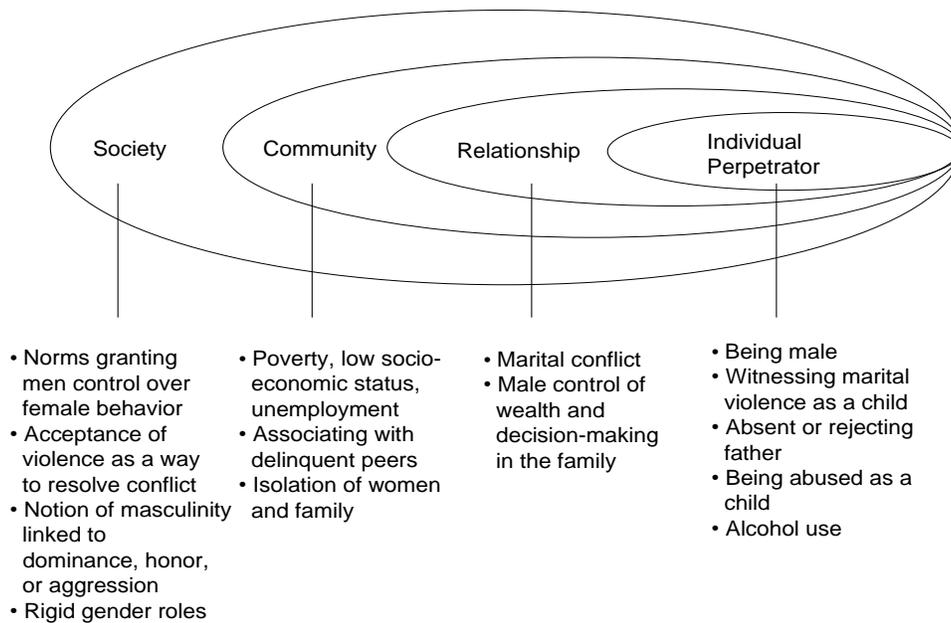
Phase	Type of Violence Present
Pre-birth	Sex-selective abortion; battering during pregnancy; coerced pregnancy.
Infancy	Female infanticide; emotional and physical abuse; differential access to food and medical care.
Girlhood	<ul style="list-style-type: none"> <li>• Child marriage; genital mutilation; sexual abuse by family members and strangers; differential access to food, medical care and education.</li> </ul>
Adolescence	<ul style="list-style-type: none"> <li>• Violence during courtship; economically coerced sex (e.g. for school fees); sexual abuse in the workplace; rape; sexual harassment; arranged marriage; trafficking.</li> </ul>
Reproductive age	Physical, psychological and sexual abuse by intimate male partners and relatives; forced pregnancies by partner; sexual abuse in the workplace; sexual harassment; rape; abuse of widows, including property grabbing and sexual cleansing practices.
Elderly	<ul style="list-style-type: none"> <li>• Abuse of widows, including property grabbing; accusations of witchcraft; physical and psychological violence by younger family members; differential access to food and medical care.</li> </ul>

Source: Heise, Pitanguay and Germain (1994). *Violence Against Women: The Hidden Health Burden*. **World Bank, Discussion Paper**. Washington. D.C.: The World Bank.

According to Ahuja (1998) and Sharma (1997) a common approach in some of the theories has been to focus on individual aggressors. There are two kinds of explanations focusing on individuals. One includes psycho-pathological explanations that focus on personality characteristics of victims and offenders. These theories provide pathological explanations for violent behaviour focusing on brain structures, chemical imbalances, dietary deficiencies, hormonal factors as well as evolutionary theories and genetic characteristics to explain violent behaviour. The socio-psychological model on the other hand argues that violent behaviour can be understood by careful examination of the external environmental factors that have an impact on the behaviour of individuals leading to stressful situations or family interactional patterns.

Feminist analysis of violence has been based on power relations between men and women that deny women equal access to power and resources thus making them more vulnerable to violence from men. The cause of this violence can be traced to patriarchy – the ideology that bestows on men power and authority over all aspects of women’s lives including their bodies (Mo Hume (2009). Heise (1998) proposes a clearer and interrelated ecological framework for understanding violent behaviour among individuals. This framework includes a range of physical, social, emotional and psychological factors at the personal, community and societal levels. In this model, the causative factors are represented in the form of four concentric circles (Figure 1).

**Figure 1**  
**Ecological Model of Factors Associated with Partner Abuse**



Source: Heise (1998) **Violence against women: an integrated ecological framework**. Violence against women.

### III. WRITE DOWN YOUR STUDIES AND FINDINGS

#### Studies on Violence against Women

Studies from WHO (1997) indicate that between 16% and 52% of women world-wide are physically assaulted by an intimate partner at least once in their lives. Evidence from Sri Lanka shows that 60% of 200 women interviewed said they were beaten by their partners, 51 of the women said their partner used a weapon during the physical assault. In Bangladesh, 50 % of wives murdered were killed by their husbands (Coomaraswamy 1996). In Ecuador, for example, a World Bank study found that approximately 22% of women reported being sexually abused in school. A qualitative study in Ethiopia found that harassment and sexual abuse contributed to low female enrollment rates and high dropout rates from secondary school. In Pakistan nearly one-third of the women had experienced physical violence at least once in marital life, the reasons being financial constraints, children or in laws, although these factors were not significantly associated with anxiety/depression. Many incidences of violence are not reported because of the shame and fear associated with being a victim. Rates of sex trafficking, sexual violence in armed conflict situations, female infanticide, and violence in schools and the workplace, for example, are thought to be significantly underdocumented, particularly in developing countries (Coomaraswamy1996).

Women in India constitute half of its population (50%) and most of them are grinding under the socio-cultural and religious structures. The study found that overall about 50% of the women had experienced physical or psychological violence at least once in their married lives. National Family Health Survey (NFHS - 2002) found that at least 1 in 5 ever married women in India have experienced domestic violence since the age of 15. In *India safe* 2000 multi-site study of nearly 10,000 households, 40 percent of

the women reported experiencing at least one form of physical abuse and 26 percent reported severe physical abuse, including being hit, kicked, or beaten. UNFPA also reports that 40% of the women in India suffer domestic violence and abuse from male partner. Records from the Special Cell for Women and Children in Mumbai, established by the Police Commission to provide a range of support services to women and their families, revealed that 53 percent of women endured domestic violence for 3-17 years before complaining to police (Dave and Solanki 2000). National Crime Record Bureau statistics show that the rate and incidence of crime has increased from 5.1 and 14 in the year 2006 to 34.9 and 59 during the year 2011(Appendix 1, 2 and 3). The most common crimes against women in India are sexual harassment, rape, dowry, child marriage, female infanticide and sex-selective abortion, domestic violence and trafficking. Many rapes go unreported. Due to "family honour" many complaint files are withdrawn and in many cases the police do not give a fair hearing.

#### The Position of Women in Kerala's Development

Kerala is one of the smallest states in the Indian union. It occupies 1 per cent of the total land area of India with a population of 3.33 Crore, which is 3 % of the total population of India at the 2011 census. The land of Kerala comprises the narrow coastal strip bounded by the Western Ghats in the east and the Arabian Sea on the west. Kerala has had a vibrant history springing from the ancient times flowing down the mediaeval and running to the present. Modern Kerala came into existence on 1st November 1956, by amalgamating the states of Travancore-Cochin and Malabar on the basis of the State Re-organization Act.

Kerala has often been referred to as the "land of women" (52%). Historically the state has been quite different from the rest of the country in terms of the indicators of women's

development. The Kerala model of development owes its attributed success to the achievements in the areas of health and education where the contribution of women is particularly significant. Several factors have contributed to the success. The matriarchal system<sup>2</sup> that prevailed among some of the dominant communities in the past, the progressive social movements, government policies, and a historically conducive climate are a few of the other factors that have been identified as contributors to the success of women in Kerala. Along with the government, various Christian missionaries like LMS, CMS and BEMS- the pioneers of women's development made continuous efforts to popularize women's education and empowerment. LMS missionaries were the first protestant missionary society which sent missionaries to Kerala. Johanna Mead was the pioneer missionary in the field of women's education in Kerala. The activities of the missionaries helped to change the attitude of the people towards girl's education. Members of each caste became aware of their rights in the society and tried to improve their conditions. Certain social evils such as sati, smārtha, devadasi system, pula Pedi etc disappeared from the society of Kerala. Communities such as Ezhavas, Nairs and Harijans were guided by great visionaries and monastic orders (Ashrams) - Sree Narayana Guru, Sree Chattambi Swamikal & Ayyankali<sup>3</sup> - who exhorted them to educate themselves by starting their own schools. The teachings of these saints have also empowered the poor and backward class women to organize themselves and bargain for their rights. The rulers of the Princely state of Travancore (Thiruvithaamkoor) were at the forefront in the spread of education. A school for girls was established by the Maharaja in 1859, which was an act unprecedented in the Indian subcontinent. Starting with the turn of the last century, the state had a favorable sex ratio (1004) which gradually picked up and reached 1084 in 2011 (India figure is 940). Similarly in terms of literacy, infant mortality rates, birth rate, and mean age at marriage, women in Kerala score higher than their counterparts elsewhere in the country (Appendix 4 and 5). In fact, the girls outnumber boys from the secondary school level onwards due to their lower dropout rates. Girls constitute 52% at the plus two level, 76% at the graduate level and 74% at the post graduate level (K.P. Kannan 2012)

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<sup>2</sup> The term matrilineal system refers to groups that trace their ancestral descent through maternal lines instead of paternal lines and in which familial authority is wielded by women. The status of women is better in matrilineal families whereas they are in subordinate status in patrilineal families.

<sup>3</sup> In 1903 Sree Narayana Dharma Paripalana (SNDP) Yogam was started for the upliftment of the Ezhava Community and in 1907, Ayyankali (belonging to the Pulaya caste, the lowest in the caste hierarchy) formed the Sadhu Jana Paripalana Sanghom and they were in reality the strident voices of the oppressed of the times. In 1906, Vakkom Abdul Khadder Moulavi established the Islam Dharma Paripalana Yogam for the upliftment of the Muslims. Almost during this time all the major low castes like Kuravas, Thandars, Parayas, Arayas and Kammalas formed their own associations. These are social actions for their progress collective.

The Kerala model of development<sup>4</sup> owes its attributed success to the achievements in the areas of health and education where the contribution of women is particularly significant. These early achievements in literacy and education have positively influenced the status of women in the state. In fact statistics (from different human development reports) indicate that women have contributed more than men in the development of education programs and health sectors of the state. According to Geraldine Frazer- Moleketi, "Kerala's strength is the high levels of female literacy. Because when you educate a woman, you educate a family (Geraldine Frazer- Moleketi 2012)."

#### **Why this huge increase of violence in a highly literate state?**

Most people have a glorified image of Kerala as a matrilineal society that boasts several positive social indicators. However, the matrilineal system existed only among the Nairs and a few other communities. And none of the social or political movements that contributed to great change in Kerala (class, caste, etc) ever took up gender issues or upheld the dignity of women. Why does a state that boasts India's highest literacy levels and excellent social development indicators see a 300% increase in violence against women? possibly because literacy and education do not change mindsets. In a deeply patriarchal society, education teaches women only to be good wives and mothers. Recent research carried out by organizations and individual researchers suggests that routine violence against women is high in Kerala. What propels such widespread violence against women in the state where women are so highly literate?. The **International Center for Research on Women (ICRW)** study found that Thiruvananthapuram had a very high prevalence of domestic violence. Violence in Thiruvananthapuram is about 64% in urban non-slum areas and 71% in rural areas, as shown in the graph. This is higher than Bhopal, Lucknow, Nagpur and Vellore (Appendix 5). Another study on gender-based violence in Kerala, undertaken by Sakhi in 2004 for the Kerala government's department of health, revealed that 40% of respondents had experienced violence in the home at some point in their lives. Another study conducted in Kerala found that 45 percent of women had at least one incident of physical violence in their lifetime. More psychological and physical violence was reported by women who had less social support (Rajmohan and MKC Nair 2003).

A research study conducted by C.S. Chandrika (1998) on sexual harassment at the workplace as a part of the study for SAKSHI, an NGO in New Delhi found that 95% of the women felt that there was prevalence of sexual harassment at the work place in Kerala. Another phenomenon is that of 'missing girls' in Kerala. A serious issue in the context of Kerala is the atrocities against tribal women and the increasing number of unwed mothers in tribal hamlets. According to an ICRW-INCLIN (International Centre for Research on Women and International

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<sup>4</sup>Kerala model is defined as the Kerala's high standard of living (comparable to US or Europe) at very low per capita income which is only 1/80th of US citizens per capita income. According to Frank and Chasin this model is "a set of economic practices developed in the state of Kerala, resulted in attaining a high level of standards in human development, despite having a very low industrial development" (Frank and Chasin 2000).

Clinical Epidemiologist Network) study (2000), Thiruvananthapuram, the capital city of Kerala, ranks first among five cities in India in prevalence of domestic violence. There are increasing reports of dowry-related violence, rape (1019 reported rape in 2012) and other atrocities against women in Kerala. Kerala has recorded 23,853 cases involving violence, including rape, against women and 1,326 cases of attack on children in the past two years (2013). Domestic violence dominates among the crimes against women in Kerala, a study by the Institute of Social Science for Kerala Police (2013) has revealed. As much as 51.4 per cent of the crimes are related to domestic crimes which are more common among the women who are between 26 and 40 years (44.9 per cent). Poverty coupled with alcoholism is the root cause for crime against women, it has been revealed. But there are other causes among which the most vulnerable ones are social media and modern ICT tools. A high level of divorced (Appendix 6) and widowed women at the macro level state data and micro level panchayat data show the poor status of women in the Kerala society, argue Ramanathaiyer and Macpherson (2000).

#### IV. CONCLUSION

##### 1. Conclusion and Suggestions

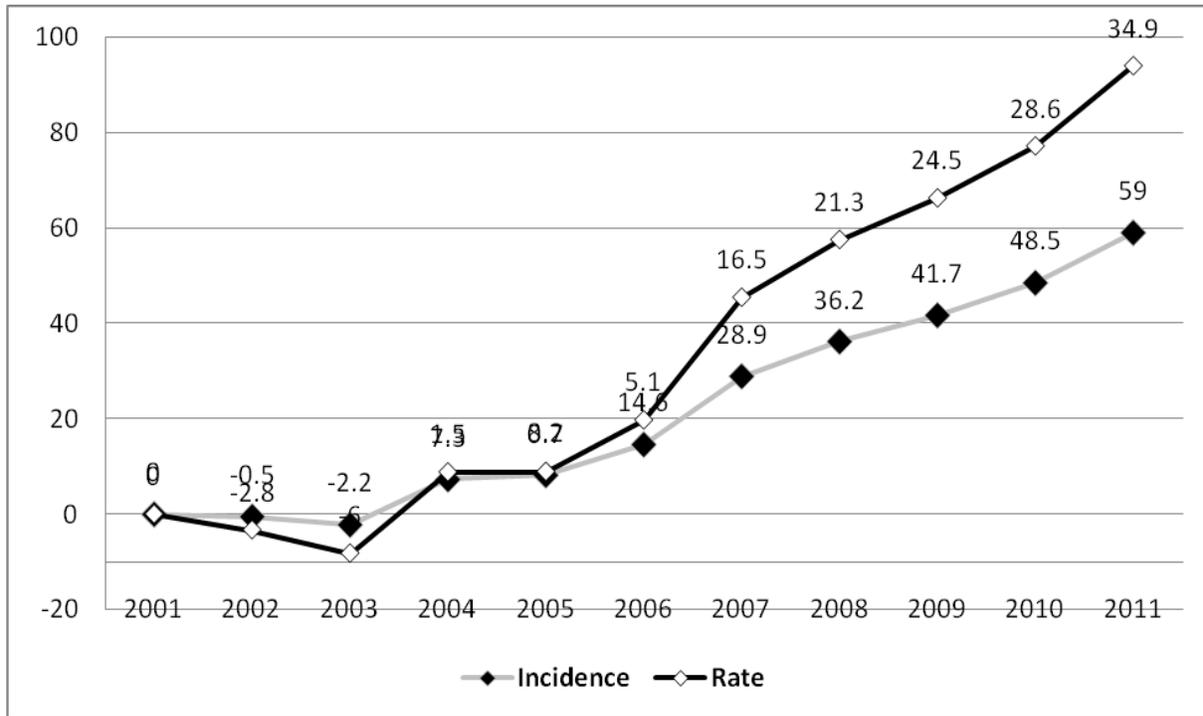
Centuries have come, and centuries have gone, but the plight of women is not likely to change. Time has helplessly watched women suffering in the form of discrimination, oppression, exploitation, degradation, aggression, humiliation. It has been seen that when the society imposes sanctions against the perpetrators of violence, the women are empowered to exert for their rights. Only when the family and the society are democratized, the status of the women is strengthened. At this time, it becomes the duty of the state to facilitate and strengthen the process. The solution lies in the fact that women empowerment approach to combat violence against women should be well integrated and interwoven into all policies and programs of the governments. Women should be equal partners not only at the public places but should have adequate control of their own resources.

The following measures can be considered for bringing phenomenal change in the status of women.

1. There should be co-ordinated efforts of police, administration and judiciary for enforcing measures against atrocities on women.

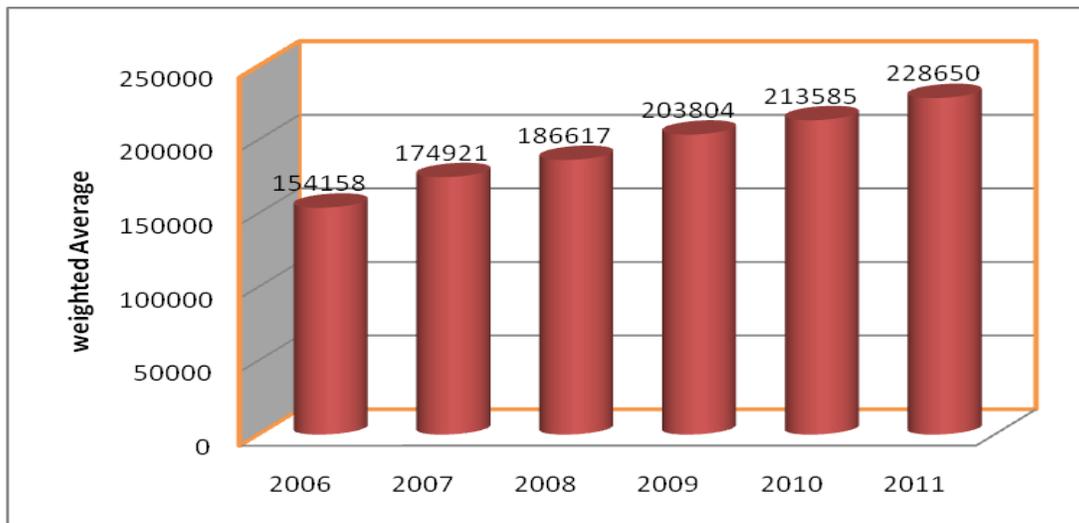
2. Efforts should be made for the proper and effective enforcement of existing laws related to women.
3. Police need to be sensitized to treat domestic violence cases as seriously as any other crime. Special training to handle domestic violence cases should be imparted to police force. Women representation in the police force should be increased.
4. Non- Governmental agencies and private institutions need to be a part of any initiative that seeks to address the issue of Domestic Violence.
5. People's Planning Programmes through Self Help Groups and Neighbourhood Groups should be encouraged to facilitate mutual sharing between women
6. More counseling centers with professionally qualified counselors should be started at the rural/urban areas focusing more on domestic violence victims.
7. Pre-marital and post marital counseling should be made compulsory resulting in the minimization of the breaking down of families.
8. Frequent legal awareness camps for women empowerment and spreading social awareness about women's status & rights should be organized in rural /urban areas.
9. Male attitudes and society's attitudes need to undergo change. Since prevention of domestic violence requires fundamental changes in attitudes and behaviour, it confronts societal and individual resistance to change.
10. To increase the reporting of such cases at first we need to empower the women and children. They must be educated on their rights and encourage them to come forward to register the cases. There are many violent cases but due to stigma in the society very few are reported.
11. Punishment of every culprit need to be exemplary
12. Law enforcers should be well trained to react swiftly and with sensitivity towards the women and children cases.
13. Women's Commission should be given more penal powers beyond just recommendatory powers. It should be expanded with more members and provided with adequate resources and personnel.

**Appendix 1: Incidence & Rate of Crime against Women Percentage Change from 2001**



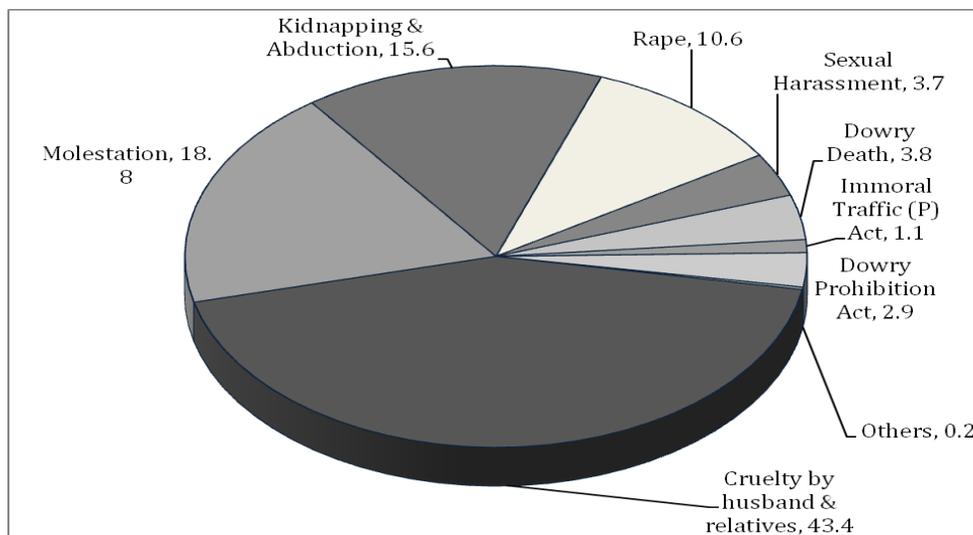
Source: **Crimes in India**, 2011, National Crime Record Bureau.

**Appendix 2: Rate of Crime against Women: 2006-2011**



Source: **Crimes in India**, 2011, National Crime Record Bureau.

**Appendix 3: Crime against Women Percentage Distribution during 2011**



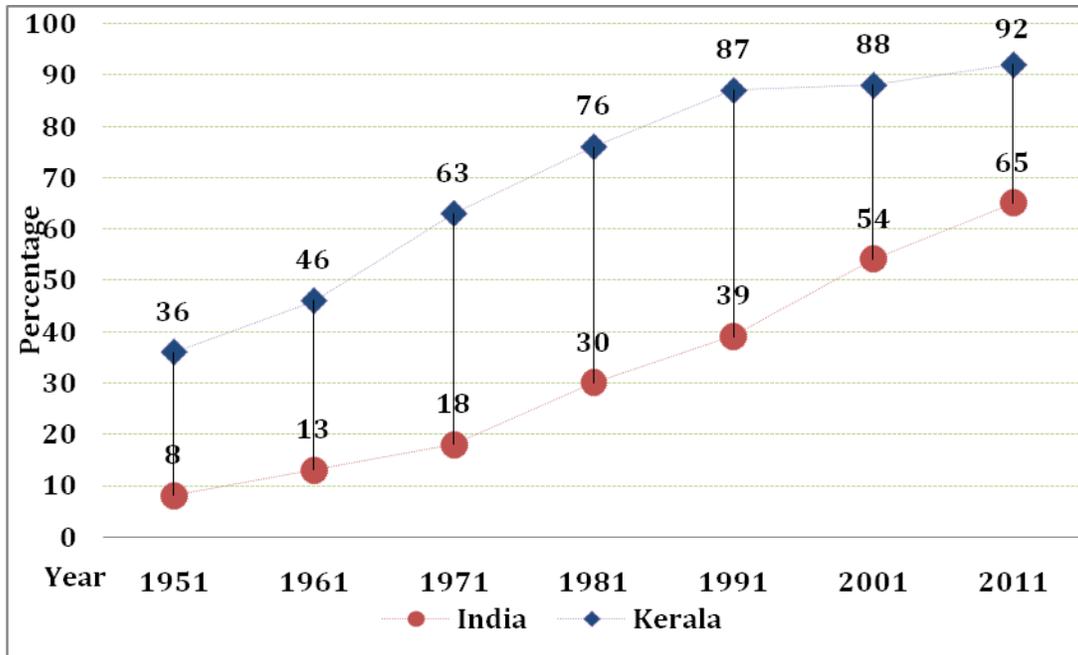
Source: **Crimes in India**, 2011, National Crime Record Bureau.

#### Appendix 4: Vital statistics of Kerala and India: 1951-2011

Year	Birth Rate		Education		Infant mortality		Sex Ratio	
	Kerala	India	Kerala	India	Kerala	India	Kerala	India
1951	44	40	47.37	16.67	128	146	1028	946
1961	39	41	55	24.02	94	129	1022	941
1971	32	37	60.42	29.45	61	114	1016	930
1981	26	34	70.42	36.17		110	1034	935
1991	18	30	90.59	52.11	16.5	92	1040	928
2001	17.3	26	90.92	65.38	11	70	1058	933
2011	14.8	20.9	93.91	74.04	13	48	1084	940

Source: **Census of India**, Various Years

#### Appendix 5: Growth Trends in Female Literacy-Kerala and India



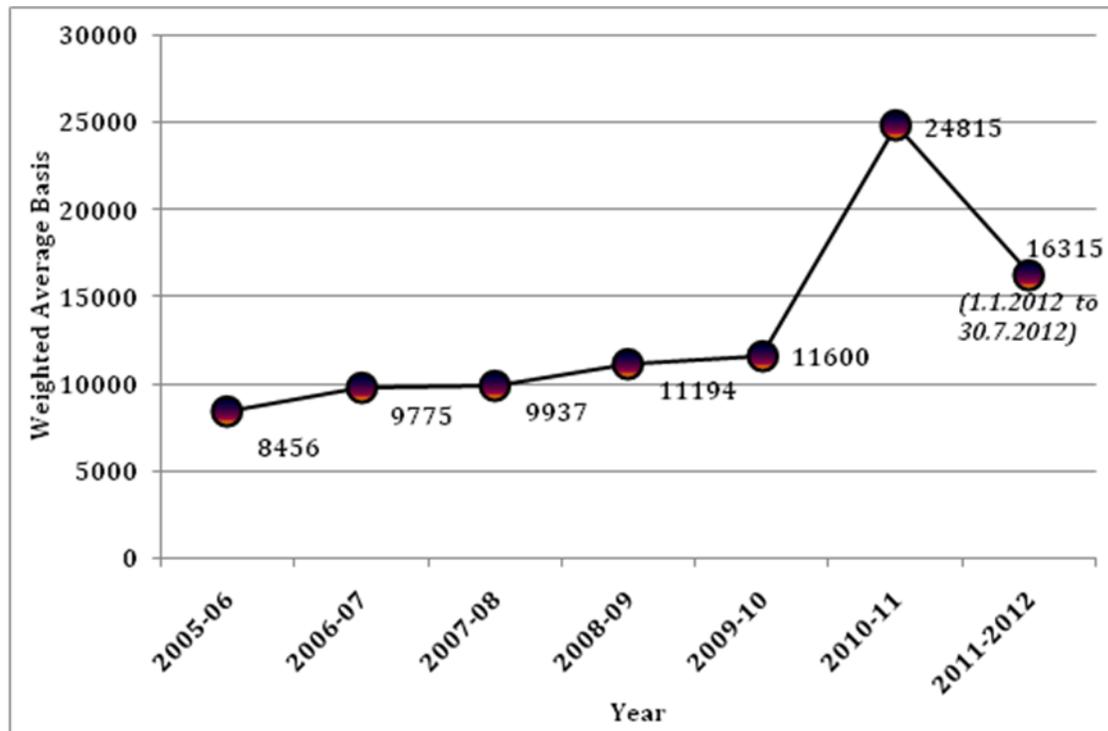
Source: Census of India, Various years.

**Appendix 6: Violence against women (%) in selected rural sites in India (19)**

Name of the city	Any type	Psychological	Physical
Bhopal	25.4	22.6	15.6
Lucknow	60.3	56.3	41.5
Nagpur	59.5	58.7	34.6
<b>Trivandrum</b>	<b>68.8</b>	<b>68.9</b>	<b>30.7</b>
Vellore	42.9	38.8	28.8
<b>Overall</b>	<b>51.7</b>	<b>49.2</b>	<b>30.9</b>

Source: ICRW (2000)

**Appendix 7: Divorce Rate (Weighted Average Basis)**



Source: **Divorce Cases**, Family Court, Trivandrum, Kerala.

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# Stability Analysis of Fly Ash over Burden Backfill Structure Using Physical Modeling Techniques

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**Abstract-** Due to rapidly growing energy needs and the resultant rise in the use of coal to meet them, exploration and exploitation of coal resources has seen exponential growth. Global concerns about the environmental impact of coal exploitation have led to an increasing shift to open-cast mining of coal, in place of the traditional deep-pit mining. This has led to search for a suitable method of handling the large quantity of soil – termed overburden – that is a by-product of open-cast coal mining. The most practical method of disposal of overburden has been to dump it in nearby open areas, which causes concern about the stability and mechanical behavior of the resultant hillocks.

This thesis attempts a study of the operations of the open-cast mines of Singareni Collieries Company Limited (SCCL) in the Godavari Valley coalfield, which are spread over four districts of Andhra Pradesh, viz. Adilabad, Karimnagar, Khammam and Warangal. In pursuance of the objective of this study, a comprehensive field data-collection exercise was undertaken to collect details of mining practices, geology, rainfall pattern, ground water conditions and other relevant factors. This was followed by a field study, conducted to ascertain the foundation characteristics of the soil at the external dumps of the open-cast mines. Samples of soil were procured from the open-cast mines and subjected to laboratory study for evaluating the physico-mechanical and geo-technical characteristics of soil for determining various attributes such as specific gravity, bulk density, porosity, permeability, granulometric distribution of different size fractions, Atterburg's limit, cohesion, angle of internal friction, California bearing ratio etc. Numerical modeling was then conducted to determine the structural stability of dump configuration on the basis of data obtained from laboratory studies. Lastly, field trials were carried out using physical modeling, to evaluate dump stability when backfilling using an admixture of pond ash and overburden.

This study establishes the suitability of mixing overburden with pond ash due to its various advantages keeping in mind the civil engineering aspects viz. bearing capacity, geotechnical parameters etc of the mix and existing ground conditions. Additionally, since substantial quantity of pond ash gets used up in creation of admixture dumps, the extent of an ecological and health hazard is reduced. Thus, mixing pond ash to overburden prior to backfilling provides dual benefit; increase in the stability of dumps and reduction in the free quantity of an environmental pollutant.

**Index Terms-** Open-Cast Mining, Physico-Mechanical, Physical Modeling, Pond Ash, Overburden

## I. INTRODUCTION

At present, the power sector in India is dominated by coal. Coal currently accounts for more than 50% of total primary commercial energy supply in the country and for about 70% of total electricity generation. Coal is likely to remain a key energy source for India, for at least the next few decades, as India has significant domestic coal resources (relative to other fossil fuels) and a large set of existing installed base of coal-based electricity capacity, although recent experiences have thrown into sharp relief the uncertainties and concerns regarding the adequacy of coal supplies to satisfy the growing hunger for power. At the same time, with the growth of

the coal-based power, local environmental and social challenges relating to coal mining, processing, and use are becoming more pressing.

The SCCL had put up a pioneering effort in the introduction of mechanization in coal mining industry in India. SCCL has been putting in relentless efforts to modernize the extraction technologies in its mines. Technology occupies the top position among the priorities of perspective plan which holds the key to the objectives and targets of the plan.

Ramagundam Super Thermal Power Station (RSTPS) is a coal based thermal power plant and its coal requirements are met through transportation of coal on a large scale from the nearby [Singareni](#) Collieries Company Limited (SCCL), a Government Company. The coal is transported using the MGR(Merry-go-round) system wherein, a train comes on one rail route, delivers coal and returns on another route. This thermal power plant consumes about 13 Million Tonne of coal for power generation thereby resulting in ash generation in the tune of about 4.2 Million Tonne (coal having ash content of 30 – 35%) of which about 80-82% is fly ash and 18-20% is bottom ash.

This ash is transported hydraulically at water to ash ratio of 3-4:1 to ash ponds. The ash pond consists of four Lagoons and occupies a total area of 607.04 hectares. Wet disposal of this huge amount of ash in ponds is not a cost effective method of disposal.

Ramagundem Area of SCCL has four of its largest mechanized opencast mines in close proximity to RSTPS, National Thermal Power Corporation. Out of above mentioned opencast projects of SCCL, Medapalli Opencast Project is located at close proximity (at a distance of about 30 -32 Km) to the ash ponds of RSTPS, NTPC, Ramangundam. Keeping the above facts in mind and to avail the opportunity of bulk utilization of coal ash as mine fill material/ reclamation of surface mines located in close vicinity of the power plant, a project entitled “Stability and structural evaluation of Fly Ash-Overburden backfill using numerical modeling techniques”

**Table 1: List of Ramagundam Mechanized Opencast Mines**

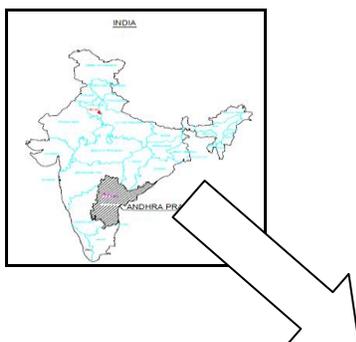
Sl. No.	Name of The mine	Coal Production(Lakh Tones/y)	O/B removal (Lakh Cu. m./y)
1	OC – I	8.87574	48.11684
2	OC – II	1.76549	6.09740
3	OC – III	6.19693	32.65048
4	Medapalli OCP	7.13894	1.24590

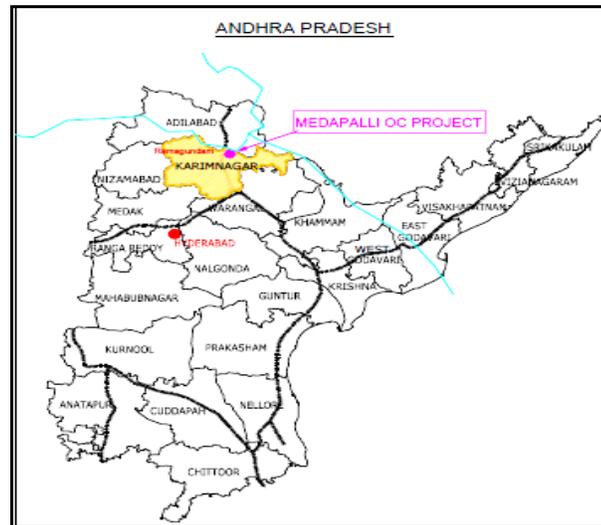
(Source: [http://scclmines.com/prod\\_report.asp area=12-Jun-2012](http://scclmines.com/prod_report.asp area=12-Jun-2012), updated till June 2012)

## II. SAMPLE COLLECTION

A detailed survey of the ash pond of RSTPS, NTPC was carried out before uplifting pond ash samples for scientific investigation. To obtain representative samples of pond ash, an excavation of 1m x 1m cross-section up to 1m depth was made and the excavated ash was thoroughly mixed and one bag (30 Kgs aprox.) representative sample was taken after coning and quartering from each point.

A survey of external overburden dumps of Medapalli Opencast was also carried out and representative samples of soil and overburden material were collected from all the external dumps. A total of 6 bag samples of overburden material and 2 bag samples of soil were collected.





(a)

**Figure (a): Map Showing the Location of OCIII Mine**

## (1) METHODOLOGY

The methodology adopted to accomplish the objective of the project is given below in chronological manner:

- (a) Sample collection
- (b) Laboratory study to evaluate the physico-mechanical/ geotechnical characteristics of pond ash and overburden material which includes determination of specific gravity, bulk density, porosity, permeability, granulometric distribution of different size fractions, Atterburg's limit, cohesion, angle of internal friction, California bearing Ratio etc.
- (b) Field data collection regarding mining details, geology, rainfall pattern, ground water conditions etc.
- (c) Field study to determine the foundation characteristics of the soil at the external dumps of Opencast Mines.
- (d) Numerical modeling to determine the structural stability of dump configuration/stability with pond ash and overburden on the basis of data obtained during laboratory studies.
- (e) Field trials to carry out physical modeling to evaluate dump stability when backfilling with pond ash overburden admixture.

## (2) PHYSICAL CHARACTERISTICS

The physical characteristics of ash depend on the quality/rank of coal used, degree of pulverization, furnace temperature, its chemical composition etc. Similarly, physical characteristics of overburden are mainly influenced by the geology of the area, mining method adopted, general topography etc. Storage, transportation, re-handling and reclaiming of pond ash and overburden material at opencast mine have been found to be greatly influenced by physical characteristics viz., specific gravity, bulk density, porosity, angle of repose, permeability, compressibility, granulometric distribution and other geotechnical parameters.

Hence, the physical properties of pond ash samples of RSTPS, NTPC and Medapalli, SCCL were tested at CIMFR.

## (3) PHYSICAL MODEL STUDY FOR BACKFILLING POND ASH – OVERBURDEN ADMIXTURE AT MEDAPALLI, SCCL

Survey of the area near external dumps of Medapalli was carried out by CIMFR scientists to select the site for carrying out model studies on backfilling using pond ash – overburden admixture in the ratio of 1:4 by weight. A suitable site at the dip side of the CHP near the water discharge point of the mine was selected.

**KEY**

1 – 1.5m high overburden, 2 – 0.5 m high pond ash, 3 – 0.5 m high overburden  
 H – Total height = 2.5m, L – Dump length = 12m, W– Dump width = 10m  
 Slope angle of the dump = 37°

The model study was planned to be carried out in stages. It was decided to dump a layer of overburden at the base of the model followed by a layer of pond ash and subsequently another layer of overburden. The volume of pond ash and overburden dumped in the model study is in the ratio of 1: 4, i.e. 108 m<sup>3</sup> of overburden and 26m<sup>3</sup> of pond ash. The top two layers of overburden and pond ash was mixed properly and leveled by means of a dozer.

To assess the effect of water on the dump stability, it was decided to sprinkle water on it and observe the dump behavior. Hence, a water sprinkler truck having a capacity of 28 Lakh liters was allowed to mover over the model dump from the model study it was observed that the fines were slowly coming out of the dump resulting in creation voids at some locations. At some places it has been observed that there were minor movements of the OB due escape of ash from the dump. Based on this it is concluded that the escape of ash along with water must be restricted.

**(4) MINING DETAILS**

**Table 2: Envisaged Mining Schedule of Medapalli, SCCL**

	Year	Year	Coal by Shovel – Dumper Combination (Mt)	Coal by High Wall Mining (Mt)	Total Coal (Mt)	OB (M.Cum)	SR (Cum/T)
Excavated Quantities	Upto 2006-07		11.83			78.17	6.61
Balance Quantities As per FR of Medapalli OCP expansion	2007-08	1	2.50		2.50	16.25	6.50
	2008-09	2	3.00		3.00	17.50	5.83
	2009-10	3	3.00		3.00	18.25	6.08
	2010-11	4	3.00	0.97	3.97	17.79	5.93
	2011-12	5	3.00	1.09	4.09	18.82	6.27
	2012-13	6	3.00		3.00	18.70	6.23
	2013-14	7	3.00		3.00	18.93	6.31
	2014-15	8	3.00		3.00	18.92	6.31
	2015-16	9	3.00		3.00	18.53	6.18
	2016-17	10	3.00		3.00	16.50	5.50
	2017-18	11	3.00		3.00	15.15	5.05
	2018-19	12	3.00		3.00	14.40	4.80
	2019-20	13	3.00		3.00	13.85	4.62
	2020-21	14	3.00		3.00	13.50	4.50
	2021-22	15	3.00		3.00	13.45	4.48
2022-23	16	2.82		2.82	13.23	4.69	
		Total	47.32	2.06	49.38	263.77	5.57
Total			59.15		61.21	341.94	5.78

The estimated

Geological reserves in Medapalli block are 68.05 Mt. The total mineable reserve including proposed high wall mining is 61.21Mt. OC-3 OCP is presently working with Partial hiring option i.e. the Overburden removal is by hiring of HEMM and the coal is by departmental equipment i.e., with 2.8 Cum Hydraulic backhoes in combination with 35T dumpers with targeted production of 3.0 Mt. per annum. The life of mine with this targeted production since its inception is 29 years ( final year of operation is 2022 – 23).The mine does not provide for internal dumps since high wall mining is introduced for the first time in India to extract the coal reserve locked up in the high wall faces. Envisaged mining schedule including High wall Mining reserves as given in Table 2. The Mining area is divided into two quarries i.e. Quarry-I and Quarry-II. The Mining operations will be carried out in both the quarries till end of life of the project.

**Table 3: Planned Dump Configuration**

Parameters	Dump yard No.1	Dump yard No.2	Dump yard No.3
Total Area (hectares)	88.62	242.03	93.65
Dump height (m)	90	90	90
Quantity (M.Cum.)	40.678	119.154	72.09
Top RL (m)	930	930	930
Slope angle (degree) Individual deck	37	37	37
Slope angle (degree) Overall	27	27	27

Dumping strategy includes separate spoil dumps for Topsoil and other Overburden. There are three external dumps. Dump yard-1, Dump yard-2 and Dump yard-3 for Overburden and three topsoil dumps i.e., BC dumpyard-1, BC dumpyard-2 and BC dumpyard-3. The maximum height of topsoil dump is planned to be 10m. The overburden dumps is planned for a height of 90m in three decks of 30m each with 30m berm width for allowing safe transport. Dump slope for each deck is as per the natural angle of repose of 37 and overall slope is 26. Details of planned dump quantities with dump configuration are given in Table 3.

**(4.1) SUBSOIL CHARACTERIZATION**

Soil characterization and classification is of utmost importance when dealing with engineering problems as it act as a language of communication. Classification of soil will help grading them to be used for specific engineering project according to their merit. For this, soil core samples were collected from 3 boreholes (BH 3, BH 4 and BH 5) drilled near Dump yard No.3 and 2 during previous study carried out at MOCP. The core collected from the sampling boreholes was analyzed for Index properties which are given in Table 4.

**Table 4: Index Properties of Medapalli Opencast Soil Sample, SCCL**

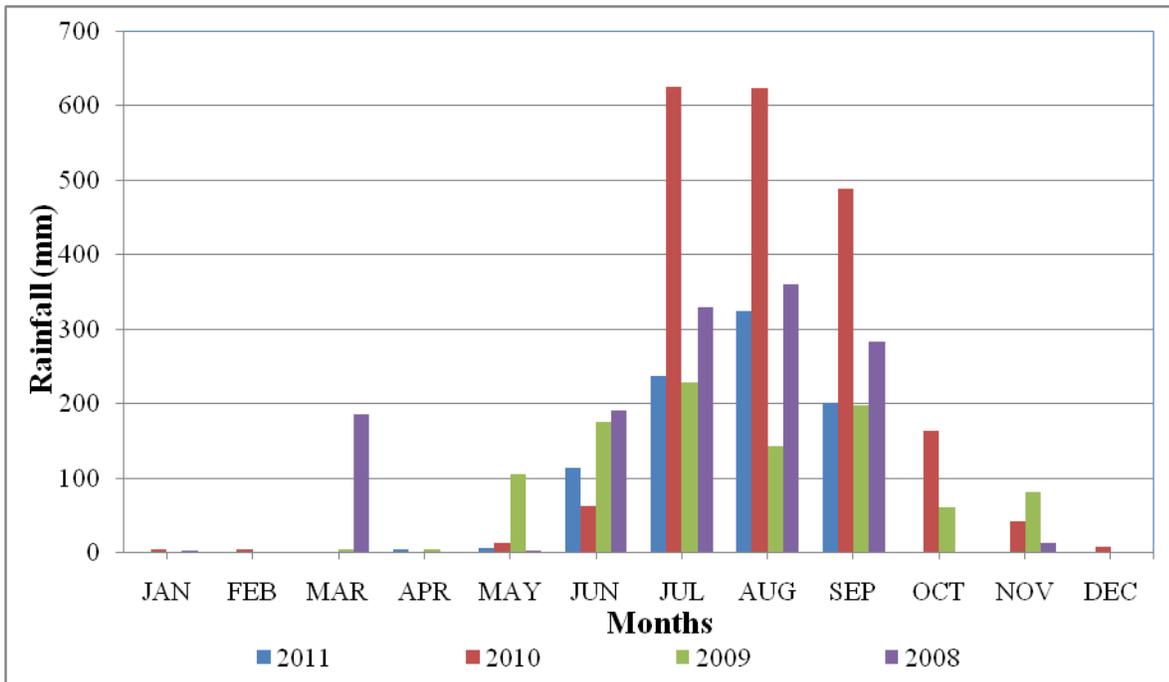
Depth (m)	Bore hole Num	W at	Index Properties	Grain Size Analysis (%)
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		Soil Description / Classification		Natural Moisture Content (NMC), %	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index.	Free Swell Index, %.	Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt & Clay
3.0	BH4	Brown Silty Sand (SM)	3	18	35	16	19	33	7	21.5	14	19	38.5
4.5	BH4	Black Medium Sand		10	Non Plastic				1	28	71	-	-
6.0	BH4	Black Clay (CH)		20.5	51	22	29	60	3	1	22	12	62
7.5	BH4	Brown Medium Sand		-	Non Plastic				21	20	46	13	-
9.0	BH4	Brown Medium Sandy Gravel		-	Non Plastic				34	22	44	0	-
13.5	BH4	Whitish Medium Sand		-	Non Plastic				5	20	41	33	1
6.0	BH3	Brown Sandy Gravel	3	18	Non Plastic				46	22	28	4	-
8.5	BH5	White Medium Sand	3.5	-	Non Plastic				28	17	38	17	-

#### (4.2) TOPOGRAPHY DRAINAGE AND RAINFALL

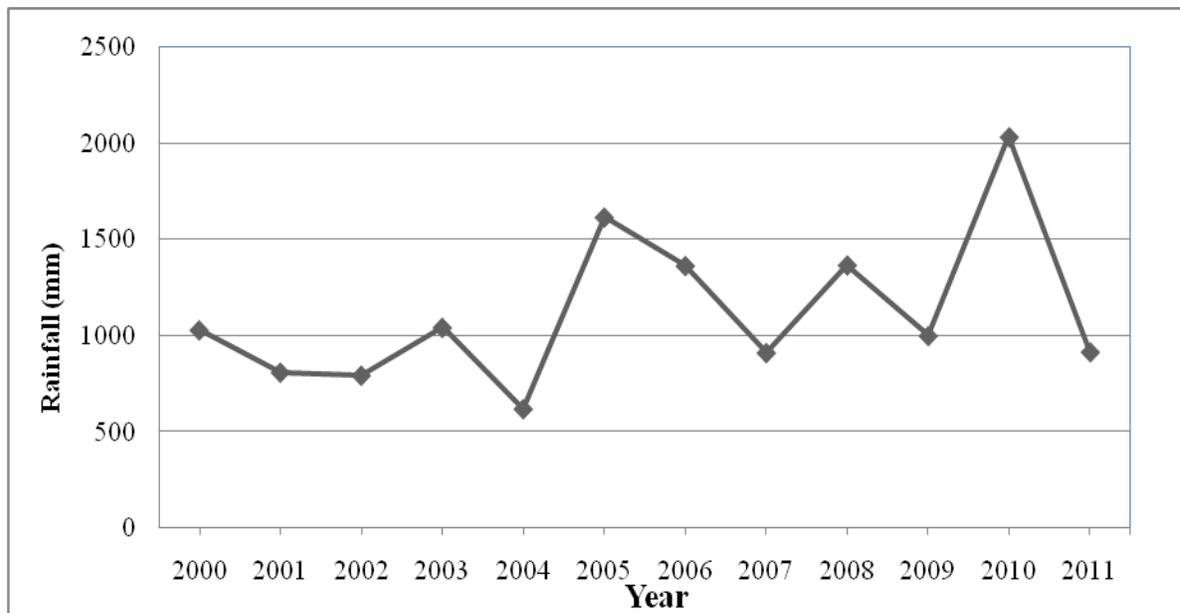
The area forms the southern bank of the Godavari River and is characterized by flat to gently undulating terrain with general elevation varying from 130m to 140m above mean sea level with a gentle slope towards south East. River Godavari forming North Eastern boundary of the block, drains the area along with its ephemeral tributaries. The highest Flood Level of Godavari River was recorded as 138.55m above MSL (Corresponding to 838.55m of assumed Level) during the monsoon on 20.10.1995. Large portion of the block is covered under this HFL of the river.

The slope stability of any opencast mines is critically influenced by the infiltration of rainwater into the slopes and consequent buildup of the pore water pressure. In order to understand the rainfall pattern at MOCP, SCCL, rainfall data for the last four years (2008 -11) were analyzed to know the general trends. The month-wise rainfall data for the last four year is depicted in Fig. 1.



**Fig. 1: Rainfall Pattern for the Last Four Years (2008 – 2011)**

Fig. 1 indicates that the rainy season of this region is mainly spread over a period of four months mainly between June and September. The maximum monthly rainfall during this period is 625.25mm (July, 2010), while the minimum monthly rainfall is 62.55mm (June, 2010). The annual rainfall for the last twelve years (2000-12) is show in Fig.2



**Fig. 2: Annual Rainfall over the Last Twelve Years**

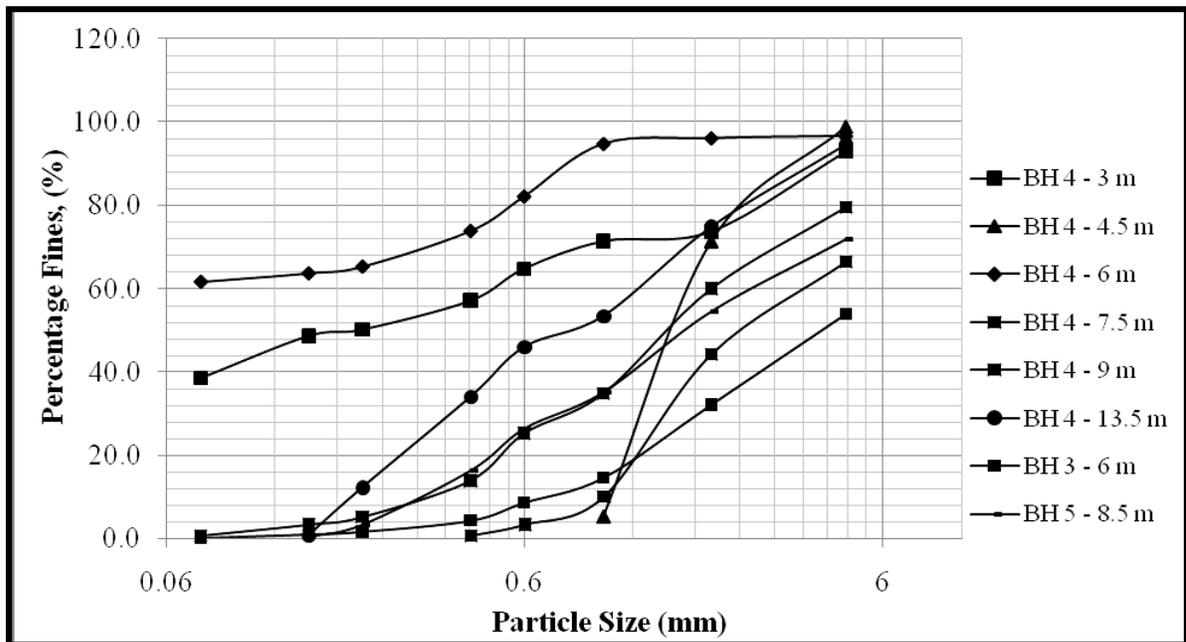


Fig. 3: Grain Size Distribution of Medapalli Soil sample

The grain size distribution of the core sample was also carried out and the results are shown in Fig. 3. The grain size distribution has a flat curve which indicates that the soil is well graded and will offer more resistance to displacement and settlement than one with uniformly graded particles.

### III. RESULT AND DISCUSSION

From the results of laboratory investigation, physical modeling and model study carried out in field, following inferences and recommendations can be drawn.

- The specific gravity of RSTPS pond ash has been found to be 1.99, which means that it is about 27% lighter than overburden (Avg. Sp.Gravity 2.54) therefore the energy requirement for its transportation by any means (mechanical or hydraulic) will be less.

The bulk density of ash overburden admixture was found to decrease with the increase in percentage of pond ash content and then it becomes constant at 40% pond ash. This indicates that with the increase in ash content the density and therefore the strength of backfill admixture decreases. This also indicates that more volume of ash –overburden admixture can be stored in pre-defined area when compared with overburden alone.

- From the grain size analysis it was found that 19.2% of overburden representative sample and 9% of pond ash particles are below 106 micron size and fines (< 20 microns) are found to be 2% for overburden and 3.2% for pond ash under scrutiny. The  $C_u$  and  $C_c$  value of pond ash indicates that it is uniformly graded, whereas for overburden samples it indicates that they are well graded. The grain size distribution of soil samples have a flat curve, which indicates it is well graded. A well graded soil and will offer more resistance to displacement and settlement than one with uniformly graded particles, therefore it can be concluded pond ash alone will be more compressible than overburden material, foundation soil as well as ash – overburden admixture.
- The permeability of water through the fill packed mass of pond ash and overburden was found to be less for over overburden material alone, but it was found out that with the increase in the pond ash percentage in the backfill admixture the value of “k”

also increases. The natural angle of repose was found to be about  $35^{\circ}$  for overburden material alone, but it decreases when pond ash is added to it. From the above observation two conclusions can be draw, firstly that addition of overburden material to pond ash increases its porosity and therefore is permeability and secondly, there is a decrease in angle of repose of the pond ash – overburden admixture due to decrease in particle size gradation and therefore this will result in reduction in its strength characteristics.

- The Results of Liquid limit and plastic limit test carried out on overburden, pond ash, pond ash-overburden admixture in different percentage indicated that they are non-plastic in nature, but for soil samples it was found that Brown Silty Sand and Black Clay portion of core exhibits plasticity. Direct shear test results indicated that the cohesion increases with the increase in pond ash percentage of the admixture up to 30% which indicates that the calcium content of pond ash increases the cohesive strength of the admixture.
- The compressibility of MOCP overburden was found to highest (15.45 %) followed by RSTPS pond ash (12.68%) at the pressure of  $90 \text{ Kg/cm}^2$ . But when pond ash is mixed with overburden at a ratio of 1:3 the compressibility decreases slightly (14.52%). A marginal decrease in compressibility was observed as ash increases the density of the fill (acts as a filler material).
- The foundation characteristics at MOCP was determined by carrying out Standard Penetration Test (SPT) at the selected site for a depth of 1.0 m, 2.0 m and 3.0 m. and the ultimate safe bearing capacity of ground was found to  **$647.845 \text{ kN/ m}^2$  (or)  $64.78 \text{ t/m}^2$** . From the calculation on bearing capacity it was concluded that ground possessing a bearing capacity of  **$64.78 \text{ t/m}^2$**  can store following quantity of pond ash – overburden admixture :

BD = bulk density

Parameters	Total Area (hectares)	Quantity (M.Cum.) ash – overburden admixture	
		20% Ash (BD = $1.63 \text{ T/m}^3$ )	30% Ash (BD= $1.48 \text{ T/m}^3$ )
Dump yard No.1	88.62	35.21	38.78
Dump yard No.2	242.03	96.18	105.93
Dump yard No.3	93.65	37.22	40.99

- Stability analysis to optimize bench configuration for ash-overburden admixture was carried out by using numerical modeling. The study involved carrying out in detail slope stability analysis in terms of angle of slope, height and berm with. The study was done using Bishop’s slip circle analysis. The stability analysis was done for benches of 30m height and width of 30.0m in three decks for overall dump height of 90.0m. A factor of safety of about 1.15 - 1.2 is considered for formulating slope designs. Based on the stability analysis results, the following bench configuration for backfilling in external OB dumps of MOCP are recommended for two different pond ash – overburden admixture having an overall height of 90m.

Mix ratio	Bench configuration		
	Slope angle (degree)	Deck height (m)	Berm width (m)

20% Pond ash + 80% MOCP Overburden	30 - 32	30	30
30% Pond ash + 70% MOCP Overburden	28 - 29	30	30

- From the physical model study undertaken at MOCP, it was observed that the fines were slowly coming out of the dump resulting in creation voids at some locations. To avoid such fiasco it suggested that the dump should be made in such a form that there is no direct contact of ash material with water as it will lower the cohesion and stability. Following recommendation is made regarding dumping pond ash along with overburden.
  - Pond ash may be dumped randomly in stages such that alternate layer of ash and overburden is formed. The total height of the deck should be 30 m and in each deck alternate layer of ash and OB of 5 meters height should be dumped. After the completion of the 1<sup>st</sup> stage of dumping. Dozing, compaction and leveling is required to be done (by dozers) so as to mix the ash and overburden as thoroughly as possible. Similarly, subsequent stages are formed so as to attain a total height of 5m to complete full deck of dump.
  - Dumping of overburden alone is to be carried out to ensure that the ash-OB admixture is totally covered and protected from the OB dumps all-around. At the top of the dump i.e. at the finishing stage, the dump shall be covered with 2m thick soil and adequately compacted by dozing.
  - The sides of the OB dumps shall be kept benched and height thereof shall not exceed 30m at an angle of slope not exceeding the angle of repose of the dumped materials viz.  $28^{\circ}$ , as obtained in the laboratory for mixtures of 25% RSTPS pond ash and 75% MOCP overburden
  - Width of the OB dump shall not be less than 30 m which shall also be compacted. The benches shall be laid in such a manner that the overall slope of the dump shall not exceed  $21^{\circ}$  from horizontal.

#### IV. CONCLUSION

Geotechnical tests were performed for the coal mine refuse samples of different mines to evaluate the suitability as filling material. These tests include CBR, Standard Proctor Compaction test, Direct shear test, Permeability test and Atterberg limits test. From the result of these tests it may be concluded that mixing of fly ash can be used for the purpose of backfilling without much treatment. Dumping of overburden alone is to be carried out to ensure that the ash-OB admixture is totally covered and protected from the OB dumps all-around. Width of the OB dump shall not be less than 30 m which shall also be compacted. The benches shall be laid in such a manner that the overall slope of the dump shall not exceed  $21^{\circ}$  from horizontal.

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# A Study on Causes of Work Stress among Tile Factory Workers in Kannur District in Kerala

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**Abstract-** Stress is a universal element at work and all human beings have to face stress in all walks of life. The consequences of stress are a deviation from the existing physical and psychological condition of human life. The aim of this paper is to identify the cause of work stress among tile factory workers in Kannur district in Kerala. The research design undertaken for the study was descriptive research and convenience sampling method is used. The sample size consists of 100 workers, 50 male workers and 50 female workers selected from 3 tile factories in Kannur District. Henry Garrett ranking method and Mann – Whitney test was used to analyze the data collected and the results of the study.

**Index Terms-** Stress, Quality of work life

## I. INTRODUCTION

The study of stress is important both for individuals and organizations because of its deleterious effects. Modern life is full of stress, and stress is the pressure people feel in life due to their reaction to the situations. No one is immune to stress. Stress is a non specific response to demands from environment and it results in physical, psychological and behavioural deviations of people. Stress can be managed at both individual level and organizational level. Individual approach to manage stress includes exercise, behaviour control, proper diet, meditation, relaxation etc. Organizational strategies to manage stress include clarity of employee roles, procedures, policies and rules, changes in organizational structure, counselling, spread of message of evil effects of stress and so on. Stress is dangerous. Stress management technique is attracting more and more people. Everybody in the workplace experiences some kind of frustrations, tensions or anxieties in relation to the general work environment. Stress is a part of every employee's life. However, where stress is excessive, personal and organizational performance is at best damaged. All the worst, stress is a liability and threat to the survival of an organization. Stress can have serious consequences that affect both health and work performance. In terms of health, the current belief among many medical practitioners is that 50 or 70% of all physical illness are related to stress. Stress can cause depression, irritation, anxiety, fatigue, lowered self-esteem and reduced job satisfaction. Sustained over a longer period, stress can lead to the use of drug or alcohol.

## II. STATEMENT OF THE PROBLEM

Tile factory workers are blue collar workers. Majority of them are privately employed and are unorganized. They belong to the lower strata of socio economic groups and are highly stressed. Researchers and media are often interested to take up the problems of middle or high income groups for publicity and acceptance. So, the researcher took it as a challenge to conduct a study on this topic and bring out the problems of people who are mainly unorganized and are often denied of their rights. Since the result of the survey was rather shocking, the researcher felt that the need to depict the poor state of their life and bring it to the notice of the authorities concerned. Factory workers develop a wide variety of occupational illness during their working lives, manifested in physical and psychological stress. Blue collar workers perform manual labour and generally earn low wages. Often blue collar work is associated with lack of education, but this is not the case. Many blue collar jobs require advanced skills, technical training, or years of apprenticeship. For many workers that are considered blue collar, dealing with work stress is a constant part of their daily life. Faced with shrinking job market, possible layoffs and factory closings, blue collar workers often worry about their financial future. Depending on their position, blue collar workers often face a unique set of stressors.

## III. LITERATURE REVIEW

Meneze's (2005) studies found that a mainstream group of employees articulated that their organizations did not care for its employees and sometimes employees don't like to work with their organizations indicating high level of stress among them and majority were between the age brackets of 26 – 35 years. Misfit with organization, no part in decision making, were reported main cause of stress as well as no control over work environment, personality traits, lack of relaxation along with ambiguous rules affect employees performance. The importance of stress is highlighted nowadays by the employers to manage and reduce stress through practical guidelines in public sector but not in private organizations. Noblet, Andrew; LaMontagne, Anthony D. (2006) observes the enormous human and economic costs associated with occupational stress suggested that initiatives designed to prevent and /or reduce employee stress should be high on the agenda of Workplace Health Promotion (WHP) programme. The aim of the second part of this study is a detailed description of what the comprehensive approach to stress prevention/reduction looks like in practice and to examine the means by which WHP can help to develop initiatives that address both the sources and the symptoms of job stress. Upson,

John W.; Ketchen Jr., David J.; Ireland, R. Duane (2007) in their article titled "Managing Employee Stress: A Key to the Effectiveness of Strategic Supply Chain Management" focused their research on supply chain activities and studied the dangerous role of stress among supply chain members. They have also given measures to address this stress. The researchers concluded that by using the suggested initiatives, both employees' quality of life and the organization's performance can improve. Kopp, Maria S; Stauder, Adrienne; Purebl, Gyorgy; Janszky, Imre; Skrabski, Arpad (2008) in their research paper titled "Work stress and mental health in a changing society" to indicate that a cluster of stressful working and psychosocial conditions are responsible for a substantial part of variation in self reported mental and physical health with work related factors. D.R. Rutter and M.J. Lovegrove (2009) in their research titled "Occupational stress and its predictors in radiographers", they conducted a study to establish the level of occupational stress in UK NHS radiographers, and to examine its causes. The result was significantly lower in the mammography group than in the others. However, the junior staff reported low level stress due to role ambiguity, role conflict and work problems and the superintendents reported a high level stress; but the effects were sometimes buffered by social support from colleagues. Rahim (2010), attempted his study with increasing psychological problems i.e. stress, strain, anxiety, depression, sleep disorders, etc. This situation, in which the employees have little or no sense of identification with their job, can cause an individual looking for another job or don't perform efficiently their own.

David Neary (2011) examines work-related stress and rehabilitation in the light of the introduction of Stress Management Standards in the UK in 2004. The Management Standards are outlined and the relevant literature on good practice in stress and rehabilitation is reviewed to provide a context for empirical research conducted with human resource practitioners in organizations. This view from the workplace provides insights on the issues faced, especially in the public services, when managing stress and rehabilitation. These include the role played by stress in people's personal life, the limitations of line management and the role of General Practitioners. Ramezan Jahanian, Seyyed Mohammad Tabatabaei and Behnaz Behdad (2012) observed that stress is a fact in our daily life. When a person needs help, it means the person feels physically and emotionally disabled. Most people believe that their capacity and capabilities are so little to encounter high level of stress. Today, with progress in all respects, human is facing new challenges in many different fields as if progress in turn creates new problems. Over a century, the nature of working has been changed widely, and still these changes are in progress. Following these changes, number of illnesses has been increased, morality and human aspects are faded and new problems are occurred every day, so that we are facing job stress which called "illness of the century". Catherine Chowwen (2013) deals in her research that the influence of joint and independent predictions of emotional intelligence, perceived leadership style and job characteristics on occupational stress among bank workers in South East, Nigeria. The method adopted is a survey involving 210 male and female bankers. Five hypotheses were tested with two fully and three partially confirmed. Emotional intelligence, perceived leadership style and job characteristics significantly

and jointly predicted stress, in addition, those with high emotional intelligence reported lower stress experience compared with those with low level of emotional intelligence. This lies in the identification of the factors that are central to a person controlling his / her stress and suggesting strategies to promote the stress reduction process. Employers can help employees change their perceptions of stress, provide them with strategies to help them cope and improving their confidence in their ability to do so.

#### **Workplace factors causing stress**

In addition to repetitive tasks, other factors in the workplace that cause stress among blue collar workers in tile factories include:

**A: Work Related:** Constant exposure to dust and smoke, Insufficient lighting and ventilation, boring repetitive work, Sustained over or under load, Inflexible work schedule, Poor pollution control, Dual career, Significant risk to health and safety.

**B: Organization Related:** Authoritarian style of the management, Lack of organizational information, Malfunctioning of employee assistance programmes, Poor role in establishing rules of conduct, Poor employee oriented policies, Conflicting priorities, No role in decision making.

**C: Relationship at work:** Trouble with boss, Conflict with supervisors, Non co-operative colleagues, Social or physical isolation, Harassment and bullying, unduly critical of others, Conflict with the organization goal, Low self esteem.

**D: Career Development:** Career uncertainty, Frustration over career ambition, Threat to job security, Lack of appreciation, Lack of recognition, Threat of redundancy, Restructuring of role, Limited opportunity.

#### **IV. OBJECTIVES OF THE STUDY**

1. To identify and compare the causes of work stress among the tile factory workers at gender level.
2. To suggest better strategies to overcome work stress

#### **RESEARCH METHODOLOGY**

Research methodology is a way to systematically solve the research problems. It may be understood as a science of studying how research is done scientifically. It includes the overall research design, the sampling procedure, data collection method and analysis procedure. In this study, Descriptive research was adopted. Descriptive research study includes surveys and fact-finding enquiries of different kinds, which help the researchers to describe the present situation.

#### **SAMPLING DESIGN**

Sampling design is to clearly define set of objects, technically called the universe to be studied. A sampling design is a definite plan for obtaining a sample from the given population.

#### **SAMPLE SIZE & SAMPLING METHOD**

The sample size consists of 100 respondents, 50 male workers and 50 female workers selected from 3 tile factories in

Kannur District. Convenience sampling method under Non-Probability sampling was employed in selecting the sample.

In order to ensure greater clarity and validity pre-testing was done with limited number of respondents and necessary modifications were made in the interview schedule. With the objectives in mind the researcher collected first hand information about the universe through pilot study. The pilot study helped the researcher to narrow down the scope of the study and facilitated the selection of samples.

#### **DATA COLLECTION METHODS**

The present study covers both primary as well as secondary data.

#### **A) PRIMARY DATA**

For the study both primary as well as secondary information were collected. Interview schedule method was used to collect the primary data. To collect information in deepest level, observation and guidance methods also were employed.

#### **B) SECONDARY DATA**

Secondary data were collected from organizations' records, documents, 'website', company's annual reports, muster roll, brochure, Journals etc

#### **TOOLS FOR ANALYSIS**

Data collected through Research Schedule were presented in a master table. From the master table sub tables were prepared. In order to do analysis and interpretation of the data simple statistical tools like Henry Garrett Ranking method and Mann – Whitney test are used. Analysis was done using PAST 2.17 software of University of Oslo. The following formula can be used for calculating the Henry Garrett Ranking Method.

$$\text{Henry Garrett Ranking Method} = \frac{100(R_{ij}-0.5)}{N_j}$$

Where,  $R_{ij}$  is Rank given for  $i$ th item  $j$ th individual  
 $N_j$  is Number of items ranked by  $j$ th individual

**HENRY GARETT RANKING METHOD**

**MANN WHITNEY U TEST**

<b>CAUSES OF WORK STRESS AMONG WORKERS IN TILE FACTORIES IN KANNUR DISTRICT IN KERALA</b>							
<b>Sl. No.</b>	<b>Factors</b>	<b>MALE</b>			<b>FEMALE</b>		
		<b>Total Score</b>	<b>Mean Score</b>	<b>Rank</b>	<b>Total Score</b>	<b>Mean Score</b>	<b>Rank</b>
1	Poor physical Environment	2675	53.5	2	2600	52	5
2	No role in decision making	2402	48.04	7	2236	44.72	9
3	Dual career	2642	52.84	3	2773	55.46	1
4	Threat to job security	2550	51	4	2253	45.06	8
5	Boring repetitive work	2256	45.12	8	2340	46.8	7
6	Personal / Family problems	2466	49.32	6	2672	53.44	3
7	Frustration over career ambition	2255	45.1	9	2447	48.94	6
8	Social / Physical Isolation	2483	49.66	5	2644	52.88	4
9	Financial Problems / Low wages	2798	55.96	1	2680	53.6	2
10	Harassment and bullying	2213	44.26	10	2159	43.18	10

Factor	Ranking Male	Ranking Female
1	2	5
2	7	9
3	3	1
4	4	8
5	8	7
6	6	3
7	9	6
8	5	4
9	1	2
10	10	10
Males: N = 10 Mean Rank = 5.25		Females: N = 10 Mean Rank = 5.25

**H0: There is no significant difference between the rankings of male and females tile factory workers for the factors causing stress at work.**

**H1: There is significant difference between the rankings of male and female tile factory workers for the factors causing stress at work.**

U= 50 and p value at 5% level of significance was found to be 0.9697

As p value is greater than 0.05 at 5% level of significance, we accept the H0.

## V. FINDINGS OF THE STUDY

A descriptive study was conducted on causes of work stress among tile factory workers in Kannur district in Kerala. Out of the 100 samples 50 male workers and 50 female workers were selected from 3 tile factories in Kannur district. In the pilot study, factors like poor physical environment, no role in decision making, dual career, threat to job security, boring repetitive work, personal / family problems, frustration over career ambition, social / physical isolation, financial problems / low wages, harassment and bullying have been given in the Interview schedule.

On the basis of the outcome of the pilot study, only factors like poor physical environment, no role in decision making, dual career, threat to job security, boring repetitive work, personal / family problems, frustration over career ambition, social / physical isolation, financial problems / low wages, harassment and bullying have been used in the final Interview schedule. Male and female respondents are instructed to indicate the importance of the causes of work stress factor by giving rank 1 to the most important factor, rank 2 the second important factor and so on. Based upon the ranks assigned by the causes of work stress among the workers at gender level. To find the most significant factor cause of work stress among workers in tile factories Henry Garrett Ranking Technique is employed. It is

calculated as percentage score and the scale value is obtained by employing the scale conversion Table given by Henry Garrett.

The Percentage Score is calculated as

$$\text{Percentage Score} = \frac{100(R_{ij}-0.5)}{N_j}$$

Where,  $R_{ij}$  is Rank given for  $i$ th item  $j$ th individual

$N_j$  is Number of items ranked by  $j$ th individual

The percentage score for each rank from 1 to 10 are calculated. The percentage score thus obtained for all the ten ranks are converted into scale values using Scale Conversion Table given by Henry Garrett. The scale values for first rank to tenth rank is 81, 70, 63, 57, 52, 47, 42, 36, 29 and 18 respectively. The score value ( $fx$ ) is calculated for each factor by multiplying the number of respondents ( $f$ ) with respective scale values ( $x$ ). The total scores are found by adding the score values ( $fx$ ) of each rank for every factor. The mean score is then calculated to know the order of preference given by the respondents for the factors. Based on the mean score, the overall ranks are assigned for each. The ranking analysis of the factors causes of work stress among workers in tile factories in Kannur district in Kerala Henry Garrett's ranking shown in Table 1 & 2.

**Table 1 (Male workers):** It is clear that male workers are given more importance to the factor that financial problems / low

wages (55.96) followed by poor physical environment (53.5), Dual career (52.84), Threat to job security (51), Social / Physical isolation (49.66), Personal / family problem (49.66), No role in decision making (48.04), Boring repetitive work (45.12), Frustration over career ambition (45.1), Harassment and bullying (44.26).

**Table 2 (Female workers):** It is clear that female workers are given more importance to the factor that Dual career (55.46), Financial problems / low wages (53.6), Personal / family problems (53.44), Social / physical isolation (52.88), Poor physical environment (52), Frustration over career ambition (48.94), Boring repetitive work (46.8), Threat to job security (45.06), No role in decision making (44.72), Harassment and bullying (43.18).

Ranking Male and female Mann – Whitney Test (Past 2.17 – (University also) used.

Male - N = 10, Mean Rank = 5.25, u = 50, p = 0.9697 and Female N = 10, Mean Rank = 5.25 Accept Null hypothesis. As per the 'p' value > 0.05 at 5 % level of significance Null hypothesis is accepted.

## VI. SUGGESTIONS

Learning ways to cope with work stress is essential for the workers' physical, mental and emotional health and well being. So as to enable them to perform their work duties clearly and confidently. Hence, the organization must introduce Employee Assistance Programmes (EAPs) and workshops to enable its employee to cope with stress successfully. EAP should include counseling employees who seek assistance on how to deal with alcohol and drug abuse, managing personal finances, handling conflicts at workplace, dealing with marital and other family problems and coping with health problems. It should be ensured that work load is in line with the workers capabilities. Workers should be given opportunities to participate in discussions and actions affecting their job. Workers should be given opportunities for social interaction and to form support groups among themselves. As a general rule, actions to reduce work stress should give top priority to organizational change to improve working conditions.

## VII. CONCLUSION

Stress in the workplace has become the black plague of the present century. The productivity of the workforce is the most decisive factor as far as the success of an organization is concerned. So, the management should ensure that their workforce are not affected by things like their workplaces' physical condition, degree of chaos, ventilation, lights, noise, cleanliness and temperature to name a few. Work stress has multiple causes, so it has to have multiple solutions. So, the organization should take steps to introduce a well designed stress reduction programme addressing three levels.

- (a) Individual: - Strategies designed to help the individual employee cope more effectively with stress.

- (b) Small groups: - Strategies indented to help workers develop more social support on the job and at home.
- (c) Organizational: - Strategies directed toward improving the conditions of work.

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**Table 1 : Causes Of Work Stress Among Tile Factory workers in Kannur District in Kerala – Sample size -Male – 50**

	<b>Ranks</b>		<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>	<b>V</b>	<b>VI</b>	<b>VII</b>	<b>VIII</b>	<b>IX</b>	<b>X</b>	<b>Total</b>	<b>Total</b>	<b>Mean</b>	<b>Rank</b>
	<b>Scale</b>		<b>81</b>	<b>70</b>	<b>63</b>	<b>57</b>	<b>52</b>	<b>47</b>	<b>42</b>	<b>36</b>	<b>29</b>	<b>18</b>		<b>Score</b>	<b>Score</b>	
	<b>Factors</b>															
1	Poor physical	f	7	10	4	6	4	1	6	2	5	5	50	2675	53.5	2
	Environment	fx	567	700	252	342	208	47	252	72	145	90				
2	No role in	f	5	6	4	5	6	2	4	3	8	7	50	2402	48.04	7
	decision making	fx	405	420	252	285	312	94	168	108	232	126				
3	Dual Career	f	9	5	6	3	4	7	2	6	3	5	50	2642	52.84	3
		fx	729	350	378	171	208	329	84	216	87	90				
4	Threat to job security	f	6	3	5	7	5	4	6	8	4	2	50	2550	51	4
		fx	486	210	315	399	260	188	252	288	116	36				
5	Boring repetitive	f	2	6	4	3	5	3	7	6	8	6	50	2256	45.12	8
	Work	fx	162	420	252	171	260	141	294	216	232	108				
6	Personal / Family	f	5	3	5	5	7	8	4	3	5	5	50	2466	49.32	6
	Problems	fx	405	210	315	285	364	376	168	108	145	90				
7	Frustration over	f	4	2	4	5	6	3	6	5	9	6	50	2255	45.1	9
	Career ambition	fx	324	140	252	285	312	141	252	180	261	108				
8	Social / physical	f	2	7	8	3	5	8	2	8	2	5	50	2483	49.66	5
	Isolation	fx	162	490	504	171	260	376	84	288	58	90				
9	Financial problems	f	9	6	7	8	2	4	5	3	4	2	50	2798	55.96	1

	/ Low wages	fx	729	420	441	446	104	188	210	108	116	36				
10	Harassment and	f	1	2	3	5	6	10	8	6	2	7	50	2213	44.26	10
	Bullying	fx	81	140	189	285	312	470	336	216	58	126				
<b>Table 2 : Causes Of Work Stress Among Tile Factory workers in Kannur District in Kerala -Sample size -Female -50</b>																
	Total	$\Sigma f$	50	50	50	50	50	50	50	50	50	50				

Note: x = Scale value, f = number of respondents, fx = score

	<b>Ranks</b>		<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>	<b>V</b>	<b>VI</b>	<b>VII</b>	<b>VIII</b>	<b>IX</b>	<b>X</b>	<b>Total</b>	<b>Total</b>	<b>Mean</b>	<b>Rank</b>
	<b>Scale</b>		<b>81</b>	<b>70</b>	<b>63</b>	<b>57</b>	<b>52</b>	<b>47</b>	<b>42</b>	<b>36</b>	<b>29</b>	<b>18</b>		<b>Score</b>	<b>Score</b>	
	<b>Factors</b>															
1	Poor physical	f	7	3	5	7	4	6	7	4	5	2	50	2600	52	5
	Environment	fx	567	210	315	399	208	282	294	144	145	36				
2	No role in	f	2	4	2	6	8	5	3	5	9	6	50	2236	44.72	9
	decision making	fx	162	280	126	342	416	235	126	180	261	108				
3	Dual Career	f	8	7	9	4	2	5	6	3	3	3	50	2773	55.46	1
		fx	648	490	567	228	104	235	252	108	87	54				
4	Threat to job security	f	5	4	3	2	4	5	6	7	6	8	50	2253	45.06	8
		fx	405	280	189	114	208	235	252	252	174	144				
5	Boring repetitive	f	2	4	6	1	8	7	3	9	8	2	50	2340	46.8	7
	Work	fx	162	280	378	57	416	329	126	324	232	36				
6	Personal / Family	f	8	6	7	4	7	2	5	2	3	6	50	2672	53.44	3
	Problems	fx	648	420	441	228	364	94	210	72	87	108				
7	Frustration over	f	4	7	3	5	2	4	7	9	3	6	50	2447	48.94	6
	Career ambition	fx	324	490	189	285	104	188	294	324	87	162				
8	Social / physical	f	5	8	4	9	5	4	5	3	2	5	50	2644	52.88	4
	Isolation	fx	405	560	252	513	260	188	210	108	58	90				
9	Financial problems	f	6	5	7	8	3	9	3	2	4	3	50	2680	53.6	2
	/ Low wages	fx	486	350	441	456	156	423	126	72	116	54				

10	Harassment and	f	3	2	4	4	7	3	5	6	7	9	50	2159	43.18	10
	Bullying	fx	243	140	252	228	364	141	210	216	203	162				
	Total	$\Sigma f$	50	50	50	50	50	50	50	50	50	50				

Note: x = Scale value; f = Number of respondents; fx = Score

# On $\pi\mu$ - Compact spaces and $\pi\mu$ - connectedness

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**Abstract:** In this paper we introduce a new notion called  $\pi\mu$ -compact spaces and  $\pi\mu$ - connectedness on generalized topological space. Some properties and characterizations of such spaces are investigated.

Mathematics subject classification: 54A05, 54D15

**Index Terms:**  $\pi\mu$ - compact space,  $\pi\mu$ - connected, strongly  $\pi\mu$ - continuous,  $\pi\mu(\mu)$ -seperated.

## 1. Introduction

The theory of generalized topological space (GTS), were introduced by Á.Császár [ 2, 4, 6], is one of the most important developments of general topology in recent years. It is well known that the concept of compactness and connectedness plays an important role in generalized topological space. The notion of  $\mu$ -compactness in generalized topological space was introduced by Jyothis Thomas and Sunil Jacob John[7]. In [3] Á.Császár has also introduced the concept of  $\gamma$ -compact in generalized topological space. R.X.Shen [8] has introduced the notions of  $\alpha$ -connected,  $\sigma$ -connected,  $\pi$ -connected,  $\beta$ -connected and also studied the preservation of connectedness under the basic operators in generalized topological spaces. The purpose of this paper is to define  $\pi\mu$ -compact spaces and  $\pi\mu$ - connectedness on generalized topological space and obtain their properties and characterizations.

## 2. Preliminaries

We recall some basic concepts and results.

Let  $X$  be a nonempty set and let  $\exp(X)$  be the power set of  $X$ .  $\mu \subseteq \exp(X)$  is called a generalized topology [4](briefly, GT) on  $X$ , if  $\emptyset \in \mu$  and unions of elements of  $\mu$  belong to  $\mu$ . The pair  $(X, \mu)$  is called a generalized topological space (briefly, GTS). The elements of  $\mu$  are called  $\mu$ -open [2] subsets of  $X$  and the complements are called  $\mu$ -closed sets. If  $(X, \mu)$  is a GTS and  $A \subseteq X$ , then the interior of  $A$  (denoted by  $i_\mu(A)$ ) is the union of all  $G \subseteq A$ ,  $G \in \mu$  and the closure of  $A$  (denoted by  $c_\mu(A)$ ) is the intersection of all  $\mu$ -closed sets containing  $A$ . Note that  $c_\mu(A) = X - i_\mu(X - A)$  and  $i_\mu(A) = X - c_\mu(X - A)$  [3].

**Definition 2.1**[2] Let  $(X, \mu_x)$  be a generalized topological space and  $A \subseteq X$ . Then  $A$  is said to be

- (i)  $\mu$ - semi open if  $A \subseteq c_\mu(i_\mu(A))$ .
- (ii)  $\mu$ - pre open if  $A \subseteq i_\mu(c_\mu(A))$ .
- (iii)  $\mu$ - $\alpha$ -open if  $A \subseteq i_\mu(c_\mu(i_\mu(A)))$ .
- (iv)  $\mu$ - $\beta$ -open if  $A \subseteq c_\mu(i_\mu(c_\mu(A)))$ .
- (v)  $\mu$ -r-open [9] if  $A = i_\mu(c_\mu(A))$
- (vi)  $\mu$ - $\pi\alpha$ -open [1] if there is a  $\mu$ -r-open set  $U$  such that  $U \subset A \subset c_\mu(U)$ .

**Definition 2.2** [1] Let  $(X, \mu_x)$  be a generalized topological space and  $A \subseteq X$ . Then  $A$  is said to be  $\mu$ - $\pi\alpha$  closed set if  $c_\mu(A) \subseteq U$  whenever  $A \subseteq U$  and  $U$  is  $\mu$ - $\pi\alpha$ -open set. The complement of  $\mu$ - $\pi\alpha$  closed set is said to be  $\mu$ - $\pi\alpha$  open set.

The complement of  $\mu$ -semi open ( $\mu$ -pre open,  $\mu$ - $\alpha$ -open,  $\mu$ - $\beta$ -open,  $\mu$ -r-open,  $\mu$ - $\pi\alpha$ -open) set is called  $\mu$ - semi closed ( $\mu$ - pre closed,  $\mu$ - $\alpha$ - closed,  $\mu$ - $\beta$ - closed,  $\mu$ -r- closed,  $\mu$ - $\pi\alpha$ -closed) set.

Let us denote the class of all  $\mu$ -semi open sets,  $\mu$ -pre open sets,  $\mu$ - $\alpha$ -open sets,  $\mu$ - $\beta$ -open sets, and  $\mu$ - $\pi\alpha$  open sets on  $X$  by  $\sigma(\mu)$  ( $\sigma$  for short),  $\pi(\mu)$  ( $\pi$  for short),  $\alpha(\mu)$  ( $\alpha$  for short),  $\beta(\mu)$  ( $\beta$  for short) and  $\pi\mu(\mu)$  ( $\pi\mu$  for short) respectively. Let  $\mu$  be a generalized topology on a non empty set  $X$  and  $S \subseteq X$ . The  $\mu$ - $\alpha$ -closure (resp.  $\mu$ -semi closure,  $\mu$ -pre closure,  $\mu$ - $\beta$ -closure,  $\mu$ - $\pi\alpha$ -closure) of a subset  $S$  of  $X$  denoted by  $c_\alpha(S)$  (resp.  $c_\sigma(S)$ ,  $c_\pi(S)$ ,  $c_\beta(S)$ ,  $c_{\pi\mu}(S)$ ) is the intersection of  $\mu$ - $\alpha$ -closed( resp.  $\mu$ - semi closed,  $\mu$ - pre closed,  $\mu$ - $\beta$ -closed,  $\mu$ - $\pi\alpha$  closed) sets including  $S$ . The  $\mu$ - $\alpha$ -interior (resp.  $\mu$ -semi interior,  $\mu$ -pre interior,  $\mu$ - $\beta$ -interior,  $\mu$ - $\pi\alpha$ -interior) of a subset  $S$  of  $X$  denoted by  $i_\alpha(S)$  (resp.  $i_\sigma(S)$ ,  $i_\pi(S)$ ,  $i_\beta(S)$ ,  $i_{\pi\mu}(S)$ ) is the union of  $\mu$ - $\alpha$ -open ( resp.  $\mu$ - semi open,  $\mu$ - pre open,  $\mu$ - $\beta$ -open,  $\mu$ - $\pi\alpha$  open) sets contained in  $S$ .

**Definition 2.3** [1] A function  $f$  between the generalized topological spaces  $(X, \mu_x)$  and  $(Y, \mu_y)$  is called

- (i)  $(\mu_x, \mu_y)$ -  $\pi\alpha$  – continuous function if  $f^{-1}(A) \in \mu$ - $\pi\alpha$  ( $X, \mu_x$ ) for each  $A \in \mu_y$ .
- (ii)  $(\mu_x, \mu_y)$ -  $\pi\alpha$  – irresolute function if  $f^{-1}(A) \in \mu$ - $\pi\alpha$  ( $X, \mu_x$ ) for each  $A \in \mu$ - $\pi\alpha$ ( $Y, \mu_y$ ).

### 3. $\pi\mu$ - compact spaces

**Definition 3.1** A generalized topological space  $(X, \mu_x)$  is called  $\pi\mu$ - compact if each cover of  $X$  composed of elements of  $\mu$ - $\pi\alpha$  open sets admits a finite sub cover.

**Definition 3.2** Let  $(X, \mu_x)$  be a generalized topological space then

- (i) a collection  $\{A_\lambda; \lambda \in \Lambda\}$  of  $\mu$ - $\pi\alpha$  open sets of  $X$  is called  $\pi\mu$ - open cover of a subset  $B$  of  $X$  if  $B \subset \cup\{A_\lambda; \lambda \in \Lambda\}$  holds.
- (ii) a subset  $B$  of generalized topological space  $X$  is called  $\pi\mu$ - compact relative to  $X$  if for every collection  $\{A_\lambda; \lambda \in \Lambda\}$  of  $\mu$ - $\pi\alpha$  open subsets of  $X$  such that  $B \subseteq \cup\{A_\lambda; \lambda \in \Lambda\}$ , there exist a finite subset  $\Lambda_0$  of  $\Lambda$  such that  $B \subseteq \cup\{A_\lambda; \lambda \in \Lambda_0\}$ .

- (iii) a subset  $B$  of generalized topological space  $X$  is said to be  $\pi\mu$ - compact if  $B$  is  $\pi\mu$ - compact as a generalized subspace of  $X$ .

Notice that if  $(X, \mu_x)$  is a generalized topological space and  $A \subseteq X$  then  $\mu_A = \{U \cap A; U \in \mu_x\}$  is a generalized topology on  $A$ .  $(A, \mu_A)$  is called a generalized subspace of  $(X, \mu_x)$

**Remark 3.3** If  $X$  is finite then  $(X, \mu_x)$  is  $\pi\mu$ - compact for any generalized topology  $\mu_x$  on  $X$ .

**Theorem 3.4** Let  $(X, \mu_x)$  be a generalized topological space then every  $\mu$ - $\pi\alpha$  closed subset of  $\pi\mu$ - compact space  $X$  is  $\pi\mu$ - compact relative to  $X$ .

**Proof:** Let  $A$  be  $\mu$ - $\pi\alpha$  closed subset of  $X$  then  $X \setminus A$  is  $\mu$ - $\pi\alpha$  open. Let  $\{A_\lambda; \lambda \in \Lambda\}$  be a cover of  $A$  by  $\mu$ - $\pi\alpha$  open subsets of  $X$  then  $\{A_\lambda; \lambda \in \Lambda\} \cup (X \setminus A)$  is a  $\pi\mu$ - open cover of  $X$ . By hypothesis,  $X$  is  $\pi\mu$ - compact. Then it has a finite sub cover of  $X$ , say  $(A_1 \cup A_2 \cup \dots \cup A_n) \cup (X \setminus A)$ . But  $A$  and  $X \setminus A$  are disjoint, hence  $A \subset (A_1 \cup A_2 \cup \dots \cup A_n)$ . So  $\{A_\lambda; \lambda \in \Lambda\}$  contains a finite sub cover for  $A$ . Therefore  $A$  is  $\pi\mu$ - compact relative to  $X$ .

**Theorem 3.5** Let  $(X, \mu_x)$  and  $(Y, \mu_y)$  be two GTS's and  $f: X \rightarrow Y$  be a bijective map.

- (i) If  $X$  is  $\pi\mu$ - compact and  $f$  is  $(\mu_x, \mu_y)$ - $\pi\alpha$  continuous then  $Y$  is  $\mu$ - compact.
- (ii) If  $f$  is  $(\mu_x, \mu_y)$ - $\pi\alpha$  irresolute and  $X$  is  $\pi\mu$ - compact then so is  $Y$ .

**Proof:** (i) Let  $f$  be an  $(\mu_x, \mu_y)$ - $\pi\alpha$  continuous bijective map and  $X$  be an  $\pi\mu$ -compact space. Let  $\{A_\lambda / \lambda \in \Lambda\}$  be an  $\mu$ - open cover for  $Y$ , then  $\{f^{-1}(A_\lambda) / \lambda \in \Lambda\}$  is a  $\pi\mu$ - open cover of  $X$ . Since  $X$  is  $\pi\mu$ -compact it has a finite sub cover say  $\{f^{-1}(A_1), f^{-1}(A_2), f^{-1}(A_3), \dots, f^{-1}(A_n)\}$ . But  $f$  is bijective, so  $\{A_1, A_2, \dots, A_n\}$  is a finite sub cover of  $Y$ . Hence  $Y$  is  $\mu$ - compact.

(ii) Let  $\{A_\lambda / \lambda \in \Lambda\}$  be any collection of  $\mu$ - $\pi\alpha$  open subsets of  $Y$ . Since  $f$  is  $(\mu_x, \mu_y)$ - $\pi\alpha$  irresolute bijective map, then  $\{f^{-1}(A_\lambda) / \lambda \in \Lambda\}$  is a  $\pi\mu$ - open cover of  $X$ . Since  $X$  is  $\pi\mu$ - compact and  $f$  is bijective map, there exists a finite  $\pi\mu$ - open sub cover of  $Y$ . Hence  $(Y, \mu_y)$  is  $\pi\mu$ - compact.

**Definition 3.6** A function  $f$  between the GTS's  $(X, \mu_x)$  and  $(Y, \mu_y)$  is called strongly  $\pi\mu$ - continuous function if inverse image of every  $\mu$ - $\pi\alpha$  open set in  $Y$  is  $\mu$ - open in  $X$ .

**Theorem 3.7** Let  $(X, \mu_x)$  and  $(Y, \mu_y)$  be two GTS's and  $f: X \rightarrow Y$  be a strongly  $\pi\mu$ - continuous onto map. If  $(X, \mu_x)$  is  $\mu$ -compact then so is  $(Y, \mu_y)$ .

**Proof:** Let  $\{A_\lambda / \lambda \in \Lambda\}$  be a  $\pi\mu$ - open cover of  $Y$ . Since  $f$  is strongly  $\pi\mu$ - continuous then  $\{f^{-1}(A_\lambda) / \lambda \in \Lambda\}$  is an  $\mu$ -open cover of  $X$ . Since  $X$  is  $\mu$ -compact, it has a finite sub cover say  $\{f^{-1}(A_1), f^{-1}(A_2), \dots, f^{-1}(A_n)\}$ . Therefore  $\{A_1, A_2, \dots, A_n\}$  is a finite  $\pi\mu$ - open cover of  $Y$ . Hence  $Y$  is  $\pi\mu$ - compact.

**Remark 3.8** Since  $\mu$ - open implies  $\mu$ - $\pi\alpha$  open, it follows that  $\pi\mu$ -compact implies  $\mu$ - compact.

**Theorem 3.9** A generalized topological space  $X$  is  $\pi\mu$ - compact if and only if every family of  $\mu$ - $\pi\alpha$  closed sets in  $X$  with empty intersection has a finite subfamily with empty intersection.

**Proof:** Suppose  $X$  is  $\pi\mu$ - compact and  $\{A_\alpha; \alpha \in \nabla\}$  is a family of  $\mu$ - $\pi\alpha$  closed sets in  $X$  such that  $\cap\{A_\alpha; \alpha \in \nabla\} = \emptyset$ . Then  $\cup\{X \setminus A_\alpha; \alpha \in \nabla\}$  is a  $\pi\mu$ - open cover for  $X$ . Since  $X$  is  $\pi\mu$ - compact this cover has a finite sub cover, say  $\{X \setminus A_{\alpha_1}, X \setminus A_{\alpha_2}, \dots, X \setminus A_{\alpha_n}\}$  for  $X$ . That is  $X = \cup\{X \setminus A_{\alpha_i}; i = 1, 2, \dots, n\}$ . This implies that  $\cap_{i=1}^n A_{\alpha_i} = \emptyset$ .

Conversely, suppose that every family of  $\mu$ - $\pi\alpha$  closed sets in  $X$  which has empty intersection has a finite subfamily with empty intersection. Let  $\{B_\alpha; \alpha \in \nabla\}$  be a  $\pi\mu$ - open cover for  $X$ . Then  $\cup\{B_\alpha; \alpha \in \nabla\} = X$ . Taking the complements we get  $\cap\{X \setminus B_\alpha; \alpha \in \nabla\} = \emptyset$ . Since  $X \setminus B_\alpha$  is  $\mu$ - $\pi\alpha$  closed for each  $\alpha \in \nabla$ , by the assumption, there is a finite subfamily  $\{X \setminus B_{\alpha_1}, X \setminus B_{\alpha_2}, \dots, X \setminus B_{\alpha_n}\}$  with empty intersection. That is  $\cap_{i=1}^n B_{\alpha_i} = \emptyset$ . Taking the compliments on both sides we get  $\cup_{i=1}^n B_{\alpha_i} = X$ . Hence  $X$  is  $\pi\mu$ - compact.

### 4. $\pi\mu$ - connected spaces.

**Definition 4.1** A generalized topological space  $(X, \mu)$  is said to be connected [8] (called  $\gamma$ - connected in [5]) if there are no non empty disjoint sets  $U, V \in \mu$  such that  $U \cup V = X$ .

**Definition 4.2** [8] A generalized topological space  $(X, \mu)$  is called  $\alpha$ -connected (resp.  $\sigma$ -connected,  $\pi$ -connected,  $\beta$ -connected) if  $(X, \alpha(\mu))$  (resp.  $(X, \sigma(\mu)), (X, \pi(\mu)), (X, \beta(\mu))$ ) is connected.

**Definition 4.3** A generalized topological space  $(X, \mu_x)$  is called  $\pi\mu$ -connected ( $\mu$ - $\pi\alpha$  connected [1]) if  $(X, \pi\mu(\mu))$  is connected.

It is easy to see from the definition that

$$\pi\mu\text{- connected} \Downarrow$$

$$\begin{array}{ccc} \beta\text{-connected} & \Rightarrow & \pi\text{-connected} \\ \Downarrow & & \Downarrow \\ \sigma\text{-connected} & \Rightarrow & \alpha\text{-connected} \quad \Rightarrow \quad \text{connected} \end{array}$$

**Example 4.4** Let  $X = \{a, b, c, d\}$  and  $\mu = \{\emptyset, X, \{a\}, \{c\}, \{a, c\}, \{a, b, c\}\}$ . Then the GTS  $(X, \mu)$  is connected and  $\beta$ -connected but not  $\pi$ -connected.

**Example 4.5** Let  $X = \{a, b, c\}$  and  $\mu = \{\emptyset, X, \{a\}, \{b\}, \{a, b\}\}$ . Then the GTS  $(X, \mu)$  is  $\pi$ -connected but not  $\pi$ -connected.

**Example 4.6** Let  $X = \{a, b, c, d\}$  and  $\mu = \{\emptyset, X, \{a, b, c\}, \{b, c, d\}, \{a, c, d\}, \{a, b, d\}\}$ . Then the GTS  $(X, \mu)$  is  $\sigma$ -connected but not  $\pi$ -connected.

**Example 4.7** Let  $X = \{a, b, c, d\}$  and  $\mu = \{\emptyset, \{a\}, \{a, b\}, \{b, c\}, \{a, b, c\}\}$ . Then the GTS  $(X, \mu)$  is  $\pi$ -connected but not  $\sigma$ -connected and  $\beta$ -connected.

**Definition 4.8** [5] Let  $(X, \mu_x)$  be a generalized topological space. Given  $U, V \subseteq X$ , let us say that  $U$  and  $V$  are  $\alpha(\mu)$ -separated if  $c_\alpha(U) \cap V = c_\alpha(V) \cap U = \emptyset$ .

**Definition 4.9** Let  $(X, \mu_x)$  be a generalized topological space. The subsets  $U$  and  $V$  are  $\pi\mu$ -separated if  $X = U \cup V$  and  $c_{\pi\mu}(U) \cap V = c_{\pi\mu}(V) \cap U = \emptyset$ .

**Lemma 4.10** For  $U, V \subseteq X$ , the following statements are equivalent: (i)  $U$  and  $V$  are  $\pi\mu$ -separated.

(ii) There are  $\mu$ - $\pi\alpha$  closed sets  $F_U$  and  $F_V$  such that  $U \subseteq F_U \subseteq X - V$  and  $V \subseteq F_V \subseteq X - U$ .

(iii) There are  $\mu$ - $\pi\alpha$  open sets  $G_U$  and  $G_V$  such that  $U \subseteq G_U \subseteq X - V$  and  $V \subseteq G_V \subseteq X - U$ .

Proof: (i)  $\Rightarrow$  (ii) Let  $F_U = c_{\pi\mu}(U)$ ,  $F_V = c_{\pi\mu}(V)$ . Since  $U$  and  $V$  are  $\pi\mu$ -separated then  $F_U$  and  $F_V$  are  $\mu$ - $\pi\alpha$  closed sets such that  $U \subseteq F_U \subseteq X - V$  and  $V \subseteq F_V \subseteq X - U$ .

(ii)  $\Rightarrow$  (iii) Let  $F_U$  and  $F_V$  are  $\mu$ - $\pi\alpha$  closed sets such that  $U \subseteq F_U \subseteq X - V$  and  $V \subseteq F_V \subseteq X - U$ . Then  $G_U = X - F_V$  and  $G_V = X - F_U$  are  $\mu$ - $\pi\alpha$  open sets such that  $U \subseteq G_U \subseteq X - V$  and  $V \subseteq G_V \subseteq X - U$ .

(iii)  $\Rightarrow$  (ii) Let  $F_U = X - G_V$ ,  $F_V = X - G_U$ , the implication is obvious.

(ii)  $\Rightarrow$  (i) Clearly  $c_{\pi\mu}(U) \subseteq F_U$ ,  $c_{\pi\mu}(V) \subseteq F_V$ , the implication is obvious.

**Lemma 4.11** Let  $(X, \mu_x)$  and  $(Y, \mu_y)$  be generalized topological spaces. If  $f: X \rightarrow Y$  is  $(\mu_x, \mu_y)$ - $\pi\alpha$  irresolute and  $U_y$  and  $V_y$  are  $\pi\mu$ -separated, then  $f^{-1}(U_y)$  and  $f^{-1}(V_y)$  are  $\pi\mu$ -separated.

Proof: Let  $U_y$  and  $V_y$  are  $\pi\mu$ -separated. Then by Lemma 3.9, there exist  $\mu$ - $\pi\alpha$  open sets  $G_{U_y}, G_{V_y}$  in  $Y$  such that  $U_y \subseteq G_{U_y} \subseteq Y - V_y$  and  $V_y \subseteq G_{V_y} \subseteq Y - U_y$ . Then  $f^{-1}(U_y) \subseteq f^{-1}(G_{U_y}) \subseteq X - f^{-1}(V_y)$  and  $f^{-1}(V_y) \subseteq f^{-1}(G_{V_y}) \subseteq X - f^{-1}(U_y)$ . Since  $f^{-1}(G_{U_y})$  and  $f^{-1}(G_{V_y})$  are  $\mu$ - $\pi\alpha$  open sets, and by Lemma 4.10,  $f^{-1}(U_y)$  and  $f^{-1}(V_y)$  are  $\pi\mu$ -separated.

**Lemma 4.12** If  $S$  is  $\pi$ -connected subsets of a generalized topological space  $(X, \mu)$  such that  $S \subseteq U \cup V$  where  $U, V$  are  $\pi\mu$ -separated sets then either  $S \subseteq U$  or  $S \subseteq V$ .

Proof: Since  $U$  and  $V$  are both  $\pi$ -separated sets, it follows that  $X = U \cup V$  and  $U \cap c_{\pi\mu}(V) = \emptyset$ ,  $V \cap c_{\pi\mu}(U) = \emptyset$ ,  $U, V$  are  $\mu$ - $\pi\alpha$  closed sets in  $X$ . For any subset  $S$  of  $X$ , we have  $S = (S \cap U) \cup (S \cap V)$ . Clearly  $S \cap U$  and  $S \cap V$  are  $\pi\mu$ -separated. Since  $S$  is  $\pi$ -connected hence at least one of them  $S \cap U$  and  $S \cap V$  should be empty. Hence either  $S \subseteq U$  or  $S \subseteq V$ .

**Theorem 4.13** Let  $A$  be  $\pi$ -connected subspace of generalized topological space  $X$ . If  $A \subseteq B \subseteq c_{\pi\mu}(A)$  then  $B$  is also  $\pi$ -connected.

Proof: Let  $A$  be  $\pi$ -connected and let  $A \subseteq B \subseteq c_{\pi\mu}(A)$ . Suppose that  $B = U \cup V$  is a  $\pi\mu$ -separation of  $B$  by  $\mu$ - $\pi\alpha$  open set. Then by Lemma 4.12, above  $A$  must lie entirely in  $U$  or in  $V$ . Suppose that  $A \subseteq U$ , then  $c_{\pi\mu}(A) \subseteq c_{\pi\mu}(U)$ . Since  $c_{\pi\mu}(U)$  and  $V$  are disjoint,  $B$  cannot intersect  $V$ . So  $V = \emptyset$ , which is contradicts to the fact that  $V$  is non empty subset of  $B$ . Hence  $B$  is  $\pi$ -connected.

**Theorem 4.14** Let  $(X, \mu_x)$  and  $(Y, \mu_y)$  be generalized topological spaces and let  $f: X \rightarrow Y$  be a  $(\mu_x, \mu_y)$ - $\pi\alpha$  irresolute function. If  $(X, \mu_x)$  is  $\pi$ -connected then so is  $(Y, \mu_y)$ .

Proof: Suppose  $Y = U_y \cup V_y$  with  $\pi\mu$ -separated sets  $U_y, V_y$  of  $Y$ . Then  $f^{-1}(Y) = f^{-1}(U_y) \cup f^{-1}(V_y)$ . By Lemma 4.11,  $f^{-1}(U_y), f^{-1}(V_y)$  are  $\pi\mu$ -separated. By Lemma 4.12, either  $f^{-1}(Y) \subseteq f^{-1}(U_y)$  or  $f^{-1}(Y) \subseteq f^{-1}(V_y)$ . So  $Y \subseteq U_y$  or  $Y \subseteq V_y$  and  $V_y = \emptyset$  or  $U_y = \emptyset$ . Hence  $(Y, \mu_y)$  is  $\pi$ -connected.

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# A Novel Approach of Area Optimized and pipelined FPGA Implementation of AES Encryption and Decryption

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**Abstract-** In this paper we present an architecture to implement Advanced Encryption Standard (AES) Rijndael algorithm in reconfigurable hardware. Rijndael algorithm is the new AES adopted by the National Institute of Standards and Technology (NIST) to replace existing Data Encryption Standard (DES). Compared to software implementation, hardware implementation of Rijndael algorithm provides more physical security as well as higher speed. The first factor to be considered on implementing AES is the application. High-speed designs are not always desired solutions. In some applications, such as mobile computing and wireless communications, smaller throughput is demanded. Architecture presented uses memory modules (i.e., Dual-Port RAMs) of Field-Programmable Gate Array (FPGAs) for storing all the results of the fixed operations (i.e., Look-Up Table), and Digital Clock Manager (DCM) that we used effectively to optimize the execution time, reduce design area and facilitates implementation in FPGA. The architecture consumes only 326 slices plus 3 Block Random Access Memory (BRAMs). The throughput obtained was of 270 Mbits/s. The target hardware used in this paper is Spartan XC3S500E FPGA from Xilinx. Results are presented and compared with other reference implementations, as known from the technical literature. An implementation of high speed AES algorithm based on FPGA is presented in this paper in order to improve the safety of data in transmission. The mathematic principle, encryption process and logic structure of AES algorithm are introduced.. The simulation results show that the high-speed AES encryption algorithm implemented correctly. Using the method of AES encryption the data could be protected effectively. The presented architecture can be used in a wide range of embedded applications.

## I. INTRODUCTION

Security of data is becoming an important factor for a wide spectrum of applications, including communication systems, wireless devices, and many other embedded applications. Resistance against known attacks is one of the main properties that an encryption algorithm needs to provide. When a new attack is demonstrated as effective (also in term of computation time), the update of the encryption system is a real necessity to guarantee the security of data. In October 2000, National Institute of Standards and Technology (NIST) selected Rijndael [1] as the new Advanced Encryption Standard (AES) [2], in order to replace the old Data Encryption Standard (DES)

[3] [4]. It offers a good combination of security, performance, efficiency, implementability and flexibility [5]. AES specifies a Federal Information Processing Standards (FIPS) approved cryptographic algorithm that is used to safely protect electronic data [6]. The selection process included performance evaluation on both software and hardware platforms and many hardware architectures were proposed. However, most of these architectures simply transcript the algorithm into hardware designs without relevant optimizations and tradeoffs. Moreover, the throughput and area constraints considered are often unrealistic as shown by the recently published results. In this paper, we present an architecture for the AES Rijndael algorithm based on three techniques to improve the implementation of the AES Rijndael Algorithm:

- Look-Up Table to facilitate implementation.
- Digital Clock Manager (DCM) to optimize execution time.
- Memory modules (Dual-Port RAMs) to reduce design area.

The proposed architecture uses only a relatively small area and lower execution time and it can be used for a wide range of applications. However, most of publications on implementations of AES only provide performance and area figures without interfaces and registers.

## II. DESCRIPTION OF AES RIJNDAEL ALGORITHM AND PREVIOUS WORK

### 2.1. Description of AES Rijndael Algorithm:

The Rijndael is a block cipher, which operates on different keys and block lengths: 128 bits, 192 bits, or 256 bits. The input to each round consists of a block of message called the state and the round key. It has to be noted that the round key changes in every round. The state can be represented as a rectangular array of bytes. This array has four rows; the number of columns is denoted by  $N_b$  and is equal to the block length divided by 32. The same could be applied to the cipher key. The number of columns of the cipher key is denoted by  $N_k$  and is equal to the key length divided by 32. The cipher consists of a number of rounds - that is denoted by  $N_r$  - which depends on both block and key lengths. Each round of Rijndael encryption function consists mainly of four different transformations: SubByte, ShiftRow, MixColumn and key addition. On the other hand, each round of Rijndael decryption function consists mainly of four different transformations: InvSubByte, InvShiftRow, InvMixColumn, and

key addition. The output of the above transformations is called the 'State'. The state consists of the same byte length as each block of the message. The description of the four transformations of the Rijndael cipher and their inverses will be given below.

$$\text{State} = \begin{bmatrix} d_{15} & d_{11} & d_7 & d_3 \\ d_{14} & d_{10} & d_6 & d_2 \\ d_{13} & d_9 & d_5 & d_1 \\ d_{12} & d_8 & d_4 & d_0 \end{bmatrix} \quad \text{---2.1}$$

2.1.1 SubByte Transformation:

The SubByte transformation is a non-linear byte substitution, operating on each of the state bytes independently. The SubByte transformation is done using a once-pre-calculated substitution table called S-box. That S-box table contains 256 numbers (from 0 to 255) and their corresponding resulting values. The SubByte transformation applied to the State can be represented as follows:

$$\text{SB(State)} = \begin{bmatrix} \text{SB}(d_{15}) & \text{SB}(d_{11}) & \text{SB}(d_7) & \text{SB}(d_3) \\ \text{SB}(d_{14}) & \text{SB}(d_{10}) & \text{SB}(d_6) & \text{SB}(d_2) \\ \text{SB}(d_{13}) & \text{SB}(d_9) & \text{SB}(d_5) & \text{SB}(d_1) \\ \text{SB}(d_{12}) & \text{SB}(d_8) & \text{SB}(d_4) & \text{SB}(d_0) \end{bmatrix} \quad \text{---2.2}$$

2.1.2 InvSubByte Transformation:

The InvSubByte transformation is done using a once-pre-calculated substitution table called InvS-box. That table (or InvS-box) contains 256 numbers (from 0 to 255) and their corresponding values.

$$\text{SR(SB(State))} = \begin{bmatrix} \text{SB}(d_{15}) & \text{SB}(d_{11}) & \text{SB}(d_7) & \text{SB}(d_3) \\ \text{SB}(d_{10}) & \text{SB}(d_6) & \text{SB}(d_2) & \text{SB}(d_{14}) \\ \text{SB}(d_5) & \text{SB}(d_1) & \text{SB}(d_{13}) & \text{SB}(d_9) \\ \text{SB}(d_0) & \text{SB}(d_{12}) & \text{SB}(d_8) & \text{SB}(d_4) \end{bmatrix} \quad \text{---2.3}$$

2.1.3. ShiftRow Transformation

In ShiftRow transformation, the rows of the state are cyclically left shifted over different offsets. Row 0 is not shifted; row 1 is shifted over one byte; row 2 is shifted over two bytes and row 3 is shifted over three bytes. Thus, the ShiftRow transformation proceeds as follows:

2.1.4. InvShiftRow Transformation

In InvShiftRow transformation, the rows of the state are cyclically right shifted over different offsets. Row 0 is not shifted, row 1 is shifted over one byte, row 2 is shifted over two bytes and row 3 is shifted over three bytes.

**InvShiftRows()** is the inverse of the **ShiftRows()** transformation. The bytes in the last three rows of the State are cyclically shifted over different numbers of bytes (offsets). The first row,  $r = 0$ , is not shifted. The bottom three rows are cyclically shifted by  $N_b - \text{shift}(r, N_b)$  bytes, where the shift value  $\text{shift}(r, N_b)$  depends on the row number, and is given in the section 2.3

Specifically, the **InvShiftRows()** transformation proceeds as follows:

$$S'_{r,(c+\text{shift}(r,N_b))\bmod N_b} = S_{r,c} \quad \text{for } 0 < r < 4 \text{ and } 0 \leq c < N_b \quad \text{---2.4}$$

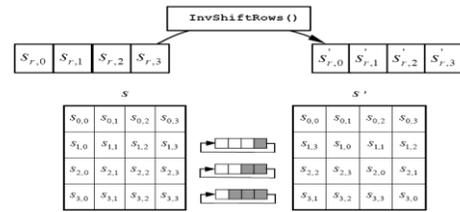


Figure 1 InvShiftRows () transformation

2.1.5. MixColumn Transformation

In Mix-Column, the columns of the state are considered as polynomials multiplied by a fixed polynomial, C(x) given by:

$$c(x) = '03'x^3 + '01'x^2 + '01'x + '02' \quad \text{---2.5}$$

The MixColumn transformation can be written in a matrix multiplication as follows:

$$R = \text{MC}(\text{SR}(\text{SB}(\text{State}))) = \begin{bmatrix} '02' & '03' & '01' & '01' \\ '01' & '02' & '03' & '01' \\ '01' & '01' & '02' & '03' \\ '03' & '01' & '01' & '02' \end{bmatrix} \otimes \begin{bmatrix} \text{SB}(d_{15}) & \text{SB}(d_{11}) & \text{SB}(d_7) & \text{SB}(d_3) \\ \text{SB}(d_{10}) & \text{SB}(d_6) & \text{SB}(d_2) & \text{SB}(d_{14}) \\ \text{SB}(d_5) & \text{SB}(d_1) & \text{SB}(d_{13}) & \text{SB}(d_9) \\ \text{SB}(d_0) & \text{SB}(d_{12}) & \text{SB}(d_8) & \text{SB}(d_4) \end{bmatrix} \quad \text{---2.6}$$

2.1.6. InvMixColumn Transformation

In InvMixColumn, the columns of the state are considered as polynomials multiplied by a d(X) fixed polynomial, defined by:

$$d(x) \otimes d(x) = '01' \quad \text{---2.7}$$

$$d(x) = '0B'x^3 + '0D'x^2 + '09'x + '0E' \quad \text{---2.8}$$

2.1.7. AddRoundKey

AddRoundKey performs an addition (bitwise XOR) of the State with the RoundKey:

$$\text{AK}(R) = \begin{bmatrix} R_{15} & R_{11} & R_7 & R_3 \\ R_{14} & R_{10} & R_6 & R_2 \\ R_{13} & R_9 & R_5 & R_1 \\ R_{12} & R_8 & R_4 & R_0 \end{bmatrix} \oplus \begin{bmatrix} rk_{15} & rk_{11} & rk_7 & rk_3 \\ rk_{14} & rk_{10} & rk_6 & rk_2 \\ rk_{13} & rk_9 & rk_5 & rk_1 \\ rk_{12} & rk_8 & rk_4 & rk_0 \end{bmatrix} \quad \text{---2.9}$$

The inverse operation (InvAddRoundKey (IAK)) is trivial. RoundKeys are calculated with the key schedule for every AddRoundKey transformation. In AES-128, the original cipher key is the first ( $rk^0$ ) used in the additional AddRoundKey at the beginning of the first round.  $rk^i$ , where  $0 < i \leq 10$ , is calculated from the previous  $rk^{i-1}$ . Let  $q(J)$  ( $0 \leq J \leq 3$ ) be the column j of the  $rk^{i-1}$  and let  $w(J)$  be the column j of the  $rk^i$ . Then the new  $rk^i$  is calculated as follows:

$$W(0) = q(0) \oplus (\text{Rot}(\text{SB}(q(3)))) \oplus rcon^i$$

$$W(1) = q(1) \oplus W(0)$$

$$W(2) = q(2) \oplus W(1)$$

$$W(3) = q(3) \oplus W(2)$$

2.2 THE BASIC STRUCTURE OF THE AES:

A full description of the AES is detailed in FIPS197 [2]. However, for sake of understanding we again outline the AES standard structure. AES is a block cipher developed in effort to address threatened key size of Data Encryption Standard (DES). It

allows the data length of 128, 192 and 256 bits, and supporting three different key lengths, 128, 192, and 256 bits. AES can be divided into four basic operation blocks where data are treated at either byte or bit level. The byte structure seems to be natural for low profile microprocessor (such as 8-bit CPU and microcontrollers).

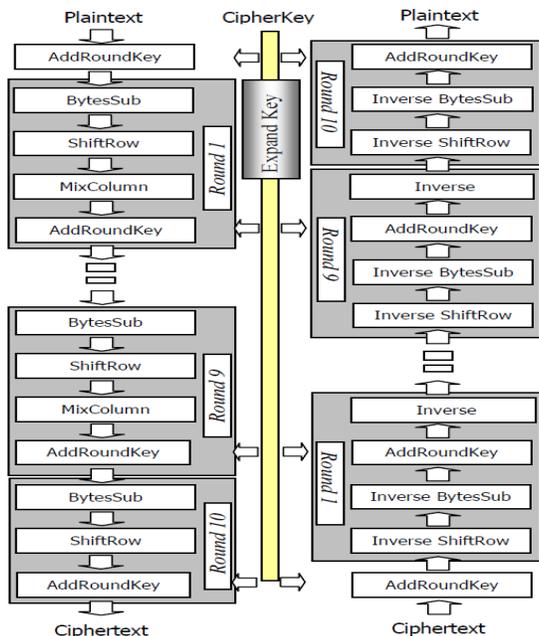


Fig. 2: Rijndael Encryption and Decryption Process

The array of bytes organized as a 4x4 matrix is also called "state" and those four basic steps; BytesSub, ShiftRow, MixColumn, and AddRoundKey are also known as layers. These four layer steps describe one round of the AES. The number of rounds is depended on the key length, i.e., 10, 12 and 14 rounds for the key length of 128, 192 and 256 bits respectively. The block diagram of the system with 128 bit data is shown above.

**BytesSub Transformation:**

This operation is a non-linear byte substitution. It composes of two sub-transformations; multiplicative inverse and affine transformation. In most implementations, these two sub-steps are combined into a single table lookup called S-Box.

**ShiftRow Transformation:**

This step is a linear diffusion process, operates on individual rows, i.e. each row of the array is rotated by a certain number of byte positions.

**MixColumn Transformation:**

This is also a linear diffusion process. Column vector is multiplied (in GF(28)) with a fixed matrix where bytes are treated as a polynomial of degree less than 4.

**AddRoundKey:**

Each byte of the array is added (respect to GF(2)) to a byte of the corresponding array of round subkeys. Excluding the first and the last round, the AES with 128 bit round key proceeds for nine iterations. First round of the encryption performs XOR with

the original key and the last round skips MixColumn transform. Round keys are generated by a procedure call round key expansion or key scheduling. Those sub-keys are derived from the original key by XOR of two previous columns.

For columns that are in multiples of four, the process involves round constants addition, S-Box and shift operations. All four layers described above (including key scheduling) have corresponding inverse operations. The deciphering is therefore the reverse order of the ciphering process. However, it should be noted that the MixColumn reverse operation requires matrix elements that are quite complicated compared to {01}, {02} or {03} of the forward one. This results in the more complex deciphering hardware compared with the ciphering hardware. In the next section we demonstrate how the standard procedure for MixColumn transform is rewritten in order to ease its hardware implementation.

III. IMPLEMENTATION OF AES 256

As we know that we have a plaintext of 128 bits and key of 256 bits size. The number of rounds in AES 256 is 14. The first round consists of all the five operation like Preround operation, subbyte, shift rows, mix columns and Add round key operations. From 2<sup>nd</sup> round to 13<sup>th</sup> round have four operations subbyte, shift rows, mix columns and Add round key operations. And the last 14<sup>th</sup> round consists of three operations subbyte, shift rows and Add round key operations.

In AES 256 the process of generating the key is each round key is a 256-bit array generated as,

- Input key of 256 bit is divided into eight parts of 32 bits as columns in a matrix 4\*8.
- Last column is taken and given as input to S box.
- The output of S box is given shift rows operation.
- The above output MSB side 8 bits are XORed with the round constant (i.e. round constant value is different for different rounds)
- The above output is XORed with 0<sup>th</sup> column of input key it gives
- The above output is taken as 0<sup>th</sup> column of the generated new key.
- 0<sup>th</sup> column of new key is XORed with 1<sup>st</sup> column of input key gives 1<sup>st</sup> column of new key.
- 1<sup>st</sup> column of new key is XORed with 2<sup>nd</sup> column of input key gives 2<sup>nd</sup> column of new key.
- 2<sup>nd</sup> column of new key is XORed with 3<sup>rd</sup> column of input key gives 3<sup>rd</sup> column of new key.
- The above obtained 3<sup>rd</sup> column of new key is given to S box.
- The output of S box is XORed with 4<sup>th</sup> column of input key which gives 4<sup>th</sup> column of new key.
- 4<sup>th</sup> column of new key is XORed with 5<sup>th</sup> column of input key which gives 5<sup>th</sup> column of new key.
- 5<sup>th</sup> column of new key is XORed with 6<sup>th</sup> column of input key which gives 6<sup>th</sup> column of new key.
- 6<sup>th</sup> column of new key is XORed with 7<sup>th</sup> column of input key which gives 7<sup>th</sup> column of new key.

In this way we generate new keys of 256 bits in AES 256 algorithm by attaching the eight obtained columns of new key.

In the first round this key of 256 bits is divided into two parts each of 128 bits size and this keys of 128 bits are used one in the prround operation (i.e xor operation between plaintext and key) and other is used in Add Round key operation .At the end of round function there will be 128bit output and 256 bit key output obtained from key generation process.

In the second round as we don't have prround operation so the round output of 1<sup>st</sup> round is applied as input to sub byte and the remaining operations are same as round 1. This process of round operation is repeated upto 13<sup>th</sup> round operation. And the last round is similar to previous round , the only change is it doesn't hav mix columns operation.

**AES Decryption** process is nothing but the inverse process of encryption AES. The output of the encryption process i.e cipher text is given as input to decryption. The same input key of 256 bits is used as another input. The input key is given to the key generation module to generate new keys as we do in the encryption process. The output keys generated are given as inputs to inverse mix columns which gives keys for the fourteen rounds of decryption.

Now in the first round all the five operation like Prround operation , subbyte ,shift rows , mix columns and Add round key operations. From 2<sup>nd</sup> round to 13<sup>th</sup> round have four operations subbyte ,shift rows , mix columns and Add round key operations. And the last 14<sup>th</sup> round consists of three operations subbyte, shift rows and Add round key operations.As in the encryption process the output of first round is taken as input to the next round upto the final fourteenth round and the output of fourteenth round is taken as final output.

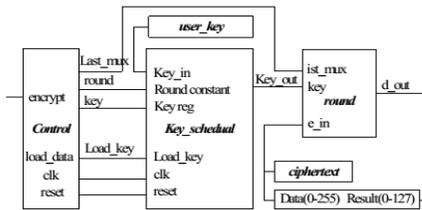


Fig.3 AES Decryption

The design uses a synchronous clock in order to make the circuit works with a unified clock and uses pipeline architecture to improve the working speed. Figure 5 shows the system implementation structure. Round module includes Sub Bytes, Shift Rows, Mix Columns, Add Round Key and an S-box matrix. Sub Bytes is a substituted operation to execute the operation and the affine transformation on finite field. Shift Rows is a cycle shift with bytes for unit. The most important process in Mix Columns is the multiplication on finite field. Add Round Key is a process that makes a 128 bits key to exclusive or the data in state one by one. S-box is a matrix that be defined to make a nonlinear replacement for Sub Bytes.

#### IV. SIMULATION RESULTS

At first each operation like substitution byte, shift row, mix column and key expansion operation are simulated using verilog

code and design files. Output is realized using input vectors and key from NIST publication [4].

In encryption module each standard round is simulated and output is verified. Figure 4 shows the simulation of one standard round where all basic operations (Substitution bytes shift rows mix columns and add round key) are performed and latency is observed.

The simulation results of full encryption module and decryption is shown in Figure 4.1(a),(b) where input vectors and keys are given from NIST standard publication [4] and output was verified.

Input Plaintext:00112233445566778899aabbcc ddeeff  
Input Cipher Key :  
000102030405060708090a0b0c0d0e0f1011121314151617  
Cipher text:8ea2b7ca516745



Figure 4.1(a),(b) encryption and decryption module

The output result of the encryption was found accurately after 15 clock cycle from the starting of encryption process.

So the latency of encryption is only 15clock cycle. In the Figure 5 the generated last key(14th) is shown as keyout and latency is observed by keyready function. As the device used is Altera EP2K35F672C6 from Cyclone II family has maximum clock frequency of 50MHz, so the encryption through put will be 6.4Gbps as per clock cycle encrypt 256 bits data samples. If other device having more clock frequency is used then throughput can be increased linearly.

The output of the algorithm are visualized by the 16 seven segment display of the FPGA board where 256 bit cipher produced from 256 bits plaintext which is the implementation of simulation results in Figure 5.Inputs are given by toggle switch or by input data to the program. 256 bit encryption key are also given to the code directly.

Overall the simulation of XILINX software and implementation results on the FPGA board found accurate with reduced latency of 15 clock cycle.

#### Conclusion and future work:

From our work we have concluded that the concept of Pipelined AES architecture can be practically implemented. It has been observed that the implementation of AES Encryption onthe FPGA is successful and several data input. The cipher key can be changed with respect to the user requirements. The result

shows that the design with the pipelining technology and special data transmission mode can optimize the chip area effectively. Meanwhile, this design reduces power consumption to some extent, for the power consumption is directly related to the chip area. Therefore the encryption device implemented in this method can meet some practical applications. As the S-box is implemented by look-up-table in this design, the chip area and power can still be optimized. So the future work should focus on the implementation mode of S-box. Mathematics in Galois field (28) can accomplish the bytes substitution of the AES algorithm, which could be another idea of further research.

While implementing the AES Algorithm m, the critical aspect was the area utilization. Which was done using implantation of functions for different sub modules in the algorithm the work has approximately reduced around 10% utilization on chip as compared to basic available modules.

We have successfully implemented AES encryption on FPGA. We have achieved the data encryption as per 100% accuracy as compared to data encryption module.

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# Impact of Front Line Demonstrations (FLD) on the Yield of Pulses

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**Abstract-** The study was carried out during *kharif*, rabi and summer seasons in fifty villages of Narmada, Gujarat during 2012-13. All 400 demonstrations on pigeon pea, chick pea, black gram and green gram crops were carried out in area of 160 ha by the active participation of farmers with the objective to demonstrate the improved technologies of pulses production potential. The improved technologies consisting use of modern variety, seed treatment with *rhizobium* and PSB culture, balanced fertilizer application and integrated pest management. FLD recorded higher yield as compared to farmer's local practice. The improved technology recorded higher yield of 1880 kg/ha, 1480 kg/ha, 880 kg/ha and 927 kg/ha in pigeon pea, chick pea, black gram and green gram, respectively than 1450, 1130, 680 and 711 kg/ha. In spite of increase in yield of pulses, technological gap, extension gap and technology index existed. The improved technology gave higher gross return, net return with higher benefit cost ratio as farmer's practices.

**Index Terms-** Pulses, Yield, Technology gap, Extension gap, Technology index

## I. INTRODUCTION

Historically India is the largest producer, consumer and importer of pulses. Pulses are a good and chief source of protein for a majority of the population in India. Protein malnutrition is prevalent among men, women and children in India. Pulses contribute 11% of the total intake of proteins in India (Reddy, 2010). In India, frequency of pulses consumption is much higher than any other source of protein, which indicates the importance of pulses in their daily food habits. Keeping the cheapest source of protein, it is important to increase pulses production to increase balanced diet among the socially and economically backward classes.

India accounts for 33% of the world area and 22% of the world production of pulses. About 90% of the global pigeon pea, 65% of chickpea and 37% of lentil area falls in India, corresponding to 93%, 68% and 32% of the global production, respectively (FAOSTAT, 2011). Although it is the world's largest pulses producer, India is importing 3-4 million tons (MT) of pulses every year to meet its domestic demand. However, during the last decade, growth in pulses production has increased significantly. India achieved a record 18.1 MT pulses production in 2010-11 with in Pigeon pea (3.27 MT), chickpea (8.25 MT), moong (1.82 MT) and urad (1.74 MT). Pulses are grown across the country with the highest share coming from Madhya Pradesh (24%), Uttar Pradesh (16%) and Gujarat (23 %).

Even though pulses production increased significantly during the last decade but continuing the faster growth is a bigger challenge for researchers, extension agencies and policy makers to fulfill the domestic demand of its in India. The productivity of pulses in India (694 kg/ha) is lower than most of the major pulse producing countries. In Gujarat, pulse were cultivated an area (6.18 Lakh ha) with production (4.68 Lakh T) and productivity (757 kg/ha) during the year 2010-11 (DOA, 2011). Narmada area of Gujarat comes under tribal belt where malnutrition in women and children is common problem. Therefore, this investigation was carried out in this area for popularizing of pulse production with objective of providing nutritive diet and increase availability of pulse per capita.

## II. MATERIALS AND METHODS

The present study was carried out by the Krishi Vigyan Kendra, Navsari Agricultural University in *kharif*, rabi and summer seasons in the farmers fields of fifty villages of Narmada district during 2012-13. All 400 front line demonstrations in 160 ha area were conducted in different villages. Materials for the present study with respect to FLD was on following

- (i) Improved variety (Pigeon pea-Vaishali, Chickpea-GG-2, Black gram-GU-1, Green gram-Meha)
- (ii) Seed treatment with *Trichoderma* 10 gm/kg seed, *rhizobium* and PSB culture with 10 ml/kg seed
- (iii) Farm manure @ 10 ton/ha
- (iv) Fertilizers (N:P: S: Zn) 20:40 :20 : 20 kg/ha
- (v) Adoption of IPM.

The improved technology included modern varieties, seed treatment and maintenance of optimum plant population etc. The sowing was done during June-July in Pigeon pea and black gram, Oct.-Nov. in Chickpea and Feb.-March in Green gram. The spacing was 90 x 20 cm, 45 x 10 cm, 45x 10 cm and 45 x 10 cm in pigeon pea, chick pea, black gram and green gram, respectively. The seed rate of pigeon pea, chick pea, black gram and green gram were 20 kg/ha, 80 kg/ha, 20 kg/ha and 20 kg/ha, respectively. The fertilizers were given as per improved practices as basal dose. Hand weeding within lines was done at 25-30 and 50-55 DAS. The crops were harvested at perfect maturity stage in all pulses with suitable method.

In general, soils of the area under study were medium black clay with medium to low fertility status. The average rainfall of this area was 952 mm with 50 rainy days. In demonstration plots, critical inputs in the form of quality seed and treatment, farm manure, balanced fertilizers and agro-chemicals were provided by KVK. For the study, technology gap, extension gap and

technology index were calculated as suggested by Samui, *et al* .(2000).

Technology gap = Potential yield- Demonstration yield  
Extension gap = Demonstration yield-Farmers yield

$$\text{Technology index (\%)} = \frac{\text{Technology gap}}{\text{Potential yield}} \times 100$$

### III. RESULTS AND DISCUSSION

#### Yield

The average yield of pulses [ pigeon pea (1880 kg/ha), Gram (1480 kg/ha), Black gram (880 kg/ha) and Green gram (927 kg/ha)] were much higher than as compared to average yield of farmers practices [pigeon pea (1450 kg/ha), Gram (1130 kg/ha), Black gram (680 kg/ha) and Green gram (711 kg/ha). The average percentage increased in the yield over farmer's practices was 29.7, 31.0, 29.4 and 30.4 for pigeon pea, gram, black gram and green gram, respectively. The results indicated that the front line demonstrations have given a good impact over the farming community of Narmada district as they were motivated by the new agricultural technologies applied in the FLD plots (Table 1). This finding is in corroboration with the findings of Poonia and Pithia (2010).

#### Technology gap

The technology gap in the demonstration yield over potential yield were 120 kg/ha for pigeon pea, 120 kg/ha for chick pea, 120 kg/ha for black gram and 73 kg/ha for green gram. The technological gap may be attributed to the dissimilarity in the soil fertility status and weather conditions (Mukharjee, 2003) (Table 1).

#### Extension gap

The highest extension gap of 430 kg/ha was recorded in pigeon pea followed by 350 kg/ha for chick pea and the lowest was observed in 216 kg/ha for green gram and 200 kg/ha for black gram. This emphasized the need to educate the farmers through various means for the adoption of improved agricultural production technologies to reverse this trend of wide extension gap. More and more use of latest production technologies with high yielding variety will subsequently change this alarming trend of galloping extension gap. The new technologies will eventually lead to the farmers to discontinue the old technology and to adopt new technology (Table 1). This finding is in corroboration with the findings of Hiremath and Nagaraju, (2010).

#### Technology Index

The technology index shows the feasibility of the evolved technology at the farmer's fields and the lower the value of technology index more is the feasibility of the technology (Jeengar, *et al.*, 2006). The technology index was 6.0 percents for pigeon pea, 7.5 percents for chick pea, 12.0 percents for black gram and 7.3 percents for green gram (Table 1).

#### Economic return

The inputs and outputs prices of commodities prevailed during the study of demonstrations were taken for calculating gross return, cost of cultivation, net return and benefit: cost ratio (Table 2). The cultivation of pigeon pea, chickpea, black gram and green gram under improved technologies gave higher net return of Rs. 39460, 30800, 19050 and 22432/ha, respectively as compared to farmers practices. The benefit cost ratio of pigeon pea, chickpea, black gram and green gram under improved technologies were 4.49, 3.26, 2.99 and 3.35 as compared to 3.95, 2.95, 2.51 and 2.73 under farmers practices. This may be due to higher yields obtained under improved technologies compared to local check (farmers practice). This finding is in corroboration with the findings of Mokidue *et al*, (2011).

### IV. REASON OF LOW YIELD OF PULSES AT FARMER'S FIELD

Optimum sowing time is not followed due to non availability of quality seed. More than 90 per cent of farmer pulses seed sowing as broadcast method and most of situation the plant population at farmer's field is very high or two-three times high of the recommended stand. Lack of popularization of seed cum fertilizer drill for sowing and use of inadequate and imbalance dose of fertilizers especially the nitrogenous and phasphatic fertilizers by farmers does not make possible to fetch potential yield. Mechanical weed control is costly and chemical control is quit uncommon in this region.

### V. SPECIFIC CONSTRAINTS WITH MARGINAL/SUB MARGINAL FARMERS

**Small Holding:** the adoption of well proven technology is constrained due to small size of holding and poor farm resources. Small and marginal farmers have less capability to take risk and do not dare to invest in the costly input due to high risk and the poor purchase capacity of small farmer.

**Farm Implements and Tools:** traditional implements and tools are still in practice due to small holding which have poor working efficiency. The lack of simple modern tools for small holding also hinders the adoption of improved technology. Thus, the cultivation of pulses with improved technologies has been found more productive and seed yield might be increase up to 23.2 per cent. Technological and extension gap extended which can be bridges by popularity package of practices with emphasis of improved variety, use of proper seed rate, balance nutrient application and proper use of plant protection measures. Replacement of local variety with the released variety of pulses would be increase in the production and net income by more than fifty six thousand rupees.

### ACKNOWLEDGEMENT

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Hence, by conducting front line demonstrations of proven technologies, yield potential of pulse crops can be increased to

great extent. This will subsequently increase the income as well as the livelihood of the farming community.

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**Table 1 productivity, technology gap, extension gap and technology Index of pulses under FLDs**

Name of pulses	Area (ha)	No. of farmers	Yield (kg/ha)			% increase over local check	Technology gap (kg/ha)	Extension gap (kg/ha)	Technology Index (%)
			Potential	Improved technologies	Local farmers practices				
Pigeon pea	40.0	100	2000	1880	1450	29.7	120	430	6.0
Chickpea	40.0	100	1600	1480	1130	31.0	120	350	7.5
Black gram	40.0	100	1000	880	680	29.4	120	200	12.0
Green gram	40.0	100	1000	927	711	30.4	73	216	7.3

**Table 2 Gross return (Rs./ha), Cost of cultivation (Rs./ha), net return (Rs./ha) and B:C ratio as affected by improved and local Technologies**

Year	Gross return		Cost of cultivation		Net Return		B: C ratio	
	Improved technologies	Improved technologies	Improved technologies	Local farmers practices	Improved technologies	Local farmers practices	Improved technologies	Local farmers practices
Pigeon pea	50760	39150	11300	9910	39460	29240	4.49	3.95
Chickpea	44400	33900	13600	11500	30800	22400	3.26	2.95
Black gram	28600	22100	9550	8800	19050	13300	2.99	2.51
Green gram	31982	24530	9550	9000	22432	15530	3.35	2.73

# Calculation of Pigging Effectiveness for Petroleum (product) Pipelines

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**Abstract- Pigging** is a process of pushing a device (PIG) equipped with metal wire brushes to clean the deposits on the inner walls of the pipeline. This study depicts a concise expression for calculating Pigging effectiveness in petroleum product (Diesel, Petrol, Kerosene) pipelines especially where smaller batches of products are being pumped i.e. where the pipe length between two successive pump stations is not filled with a single product. As the pipeline has more than one products (or same products but from different refineries) filled in between successive pump station, the Bernoulli's equation can't be applied across the whole length. The study tries to propose a method for getting an approximate value of pressure across individual batches.

Comparing 'friction factor' for getting Pigging effectiveness sometimes gives a negative value. This study tries to find out the probable reasons & suggests a new expression for calculation of Pigging effectiveness.

**Index Terms-** Friction factor, Petroleum product pipelines, Pigging, Turbulent flow, interface.

## I. INTRODUCTION

For a fully developed flow in a pipeline, the pressure head drop ( $\Delta h$ ) across the pipe length ( $l$ ) of pipe diameter ( $D$ ) with a steady flow velocity ( $v$ ) is given by the equation:  $\Delta h = f l v^2 / 2gD$  .....(i) (Darcy Weisbach eqn.)

where 'f' is the friction factor that is characteristic of the surface roughness of the pipe & the Reynolds no. Thus,  $f \propto \Delta h / v^2$ , since volume flow rate  $Q = A.v$  where  $A$  is cross sectional area of the pipe, this implies  $f \propto \Delta h / Q^2$  .....(i)

Thus we see that the relation of 'f' with the flow rate is not linear rather it is inversely proportional to square of flow rate ( $Q^2$ ).

In oil industry product pipelines, different products (Diesel, Petrol, Kerosene) are pushed through pumping sets one after the other in the same pipe. Thus an interface (mixture) is formed at the junction of two different products. The pressure fall due to frictional losses, is further boosted at intermediate pump stations to push the products further to the next pump station. Mughalsarai is one such station coming after Patna pump station of the Barauni-Kanpur Pipeline (BKPL) of Indian Oil Corporation Ltd. The pipeline is designed to have turbulent flow to reduce interface generation (mixing).

**Pigging** is a process of pushing a device (PIG) equipped with metal wire brushes to clean the deposits on the inner walls of the pipeline. Thus it is supposed to cleanse the deposits (carbonates, sulphates, iron oxides, greasy sludge) on the inner walls of the pipes that should decrease surface roughness & hence friction factor 'f'. Now, after efficient Pigging the value of 'f' should decrease. As the flow rate is constant so  $\Delta h = \{(\text{Pressure drop across each batch length}) / \rho.g\}$ ; where  $\rho$  is the density of fluid &  $g$  is acceleration due to gravity.

Currently the pigging efficiency (effectiveness) has been calculated as:

$$\eta_{pig} = \frac{\left( \left( \frac{Q}{\Delta p} \right)_{ap} - \left( \frac{Q}{\Delta p} \right)_{bp} \right)}{\left( \frac{Q}{\Delta p} \right)_{bp}} \times 100\% \quad (\text{As per Operations manual of BKPL, IOCL})$$

**Abr.:** bp- before Pigging ; ap- after Pigging;

	Before Pigging	After Pigging
Date		
a) Suction Pressure at upstream station.(Kg/sq.cm)	6.5	3
b) Flow rate (KLS/hr) ( $Q$ )	251	258

c) Back. Pr. At downstream station.(Kg/sq.cm) 50 47

(c) minus (a) =  $\Delta p$

Flow rate (KL/KCS) X = 251/43.5 = 5.77 Y=258/52=5.86

- KCS = Kg/Cm<sup>2</sup> Here the efficiency(effectiveness) much depends on CDR injection
- So pigging efficiency is not realistic.

% Pigging efficiency (effectiveness) = (X-Y/X)\* 100 = 1.56%

**The initial correction seems to be: calculation of Pigging effectiveness by comparing the friction factor before & after Pigging as being followed at some of the companies.**

**Research Elaborations:**

Using notations as above, initially, pigging effectiveness may be calculated as:

$$\eta_{pig} = \frac{\left( \left( \frac{\Delta p}{\rho \cdot g \cdot Q^2} \right)_{bp} - \left( \frac{\Delta p}{\rho \cdot g \cdot Q^2} \right)_{ap} \right)}{\left( \frac{\Delta p}{\rho \cdot g \cdot Q^2} \right)_{bp}} \times 100\%$$

Taking the data from Table.1below, we can now compare the friction factor before & after Pigging : assuming same density of fluid before & after Pigging, from the first column of table1.

i)  $\Delta h_{bp} = (\Delta p / \rho \cdot g) = 43.5 \times k_1$  ; Q= 251 kl/hr thus  $f = \left( \frac{\Delta h}{Q^2} \right)_{bp} = k_2 \times 0.069$

$\Delta h_{ap} = 44 \times k_1$  ; Q = 258 kl/hr thus  $f = \left( \frac{\Delta h}{Q^2} \right)_{ap} = k_2 \times 0.066$  ( $k_1, k_2$  are constants)

Thus PIG effectiveness may be calculated as  $\eta_{pig} = \frac{(0.069 - 0.066)}{0.069} \times 100\% = 4.3\%$

**Data for Allahabad-Kanpur section of BKPL, as per Pigging reports for different quarters:**

	Date	30.10.10	8.1.11	24.03.11	21.06.11	28.10.11	9.3.12
Before PIGging	Back pressure	50	41	42.5	41	45	41
	Flow rate	251	217	230	231	247	237
	Suction pressure	6.5	10	7	3	5	5
After PIGging	Back pressure	47	49	39	39	43	40
	Flow rate	258	258	235	230	241	239
	Suction	3	3	3	4	4	4

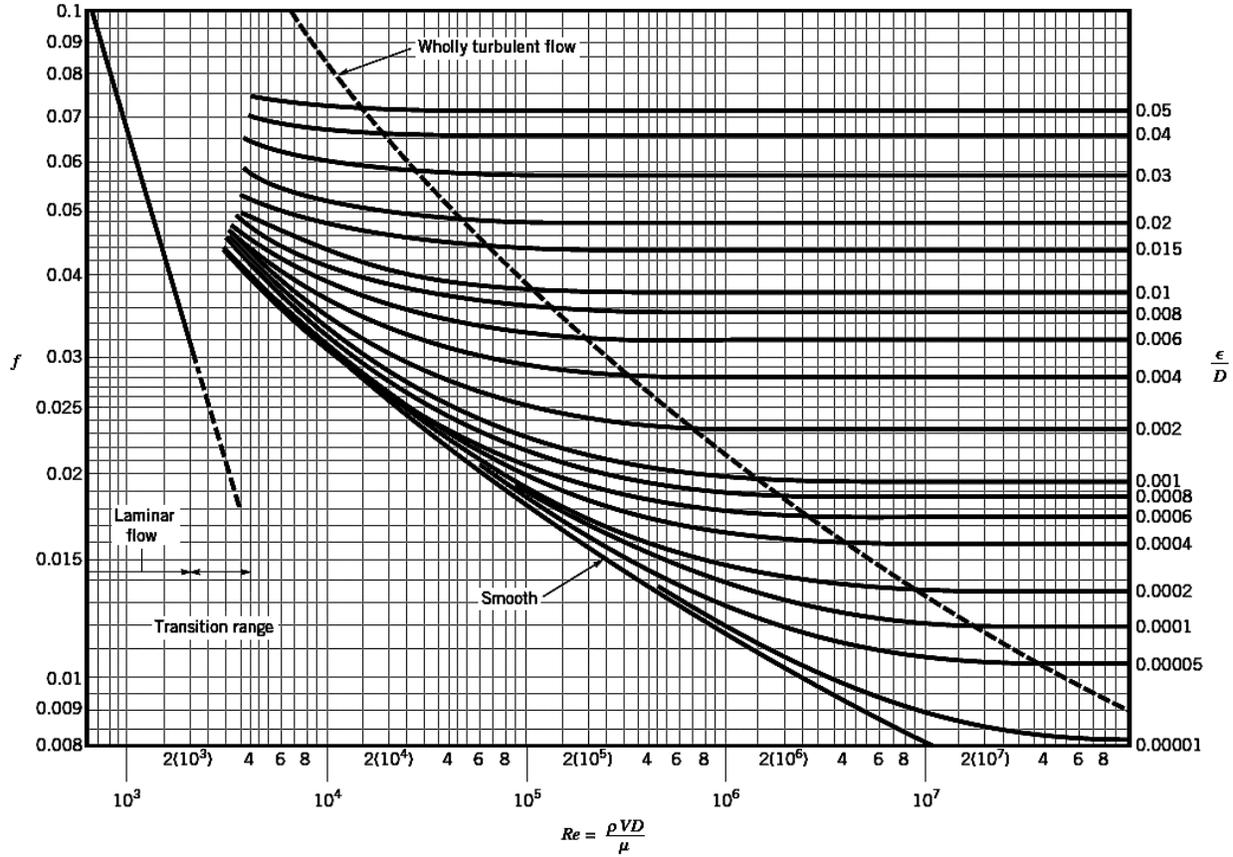
	pressure						
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Table 1.

Similarly:

- ii)  $\eta_{pig} = -5\%$
- iii)  $\eta_{pig} = 2.8\%$
- iv)  $\eta_{pig} = 7.04\%$
- v)  $\eta_{pig} = -3.07\%$
- vi)  $\eta_{pig} = 1.56\%$

Note the negative values of effectiveness .



**Fig.1: Moody's chart for flow through pipes**

Fig.1 on the vertical axis we have the friction factor 'f' & relative roughness 'e/D', where 'e' is the surface roughness of the inner surface of the pipe. On the horizontal axis we have the Reynolds number (Re). The following characteristics are observed from the Figure. For laminar flow,  $Re < 2300$ ,  $f = 64/Re$ , which is independent of relative roughness. For very large Reynolds numbers,  $f$  =function of (e/D) which is independent of the Reynolds number. For such flows, commonly termed 'wholly turbulent flow', along the wall pipe, exists the laminar sub layer so thin that the surface roughness completely dominates the character of the flow near the wall. If we calculate the Reynolds no. for BKPL : kinematic viscosity of Diesel (2-5 centi-Stokes), Diameter of Pipe = 12", average velocity  $V = \text{flow rate}/\text{x-section area} = (285 \text{ kilolitres/hr}) / (3.14 \times (3)^2 / 4) = 1.1 \text{ m/sec (say)}$

$Re = (V \times \text{Dia.}) / \text{kinematic Viscosity} = 65000 \text{ to } 160000$ . From Fig.1, clearly it lies in the turbulent region but to the left of the 'wholly turbulent flow' regime. Most of the pipelines would lie in this region only.

**Limitations:**

Effectiveness sometimes comes negative.

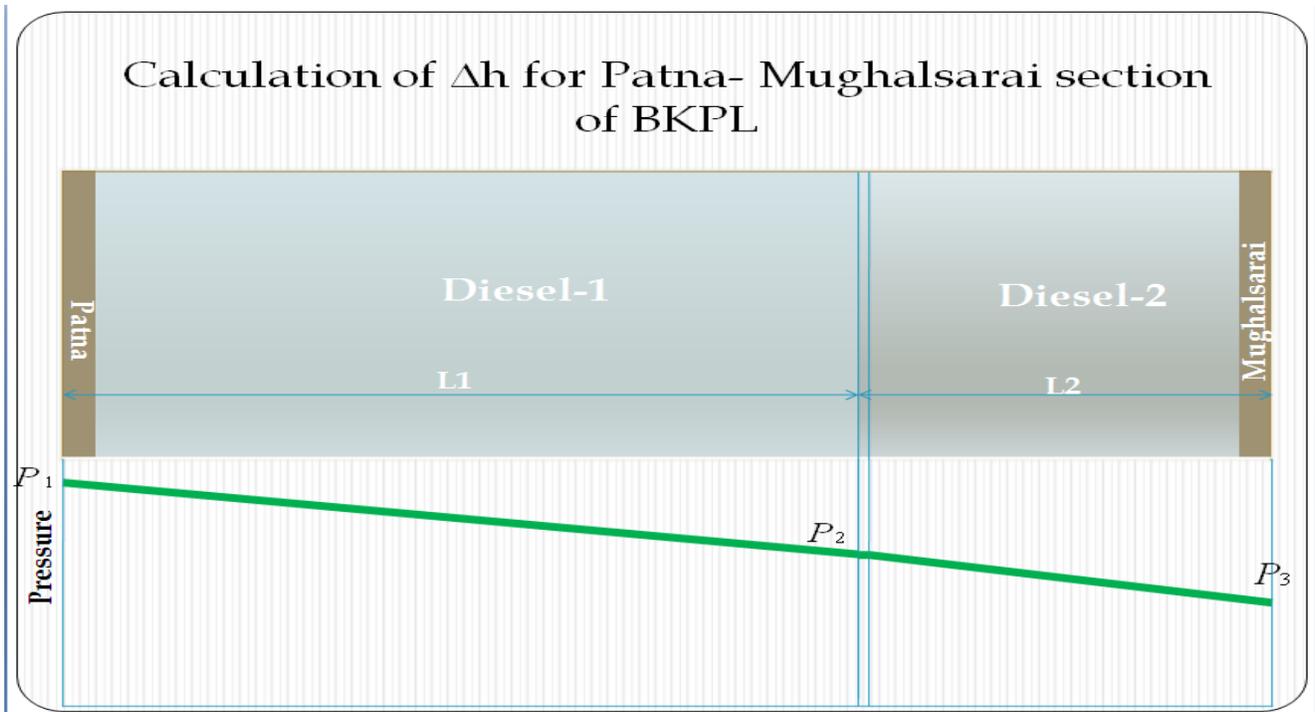
Actually, the region of the Moody's chart we are interested in has friction factor as a function of both relative roughness & Reynolds number. If the Reynolds number reduces after Pigging (due to variation of flow & kinematic viscosity of the particular batch of diesel), then even if the PIG has reduced the surface roughness value(e), there can still be a rise in friction factor after Pigging& thus negative effectiveness. In that case we should try to separate the effects of viscosity (& thus Reynolds number) from the effect of surface roughness on friction factor to have a better idea of PIG effectiveness because by Pigging we intend to reduce the surface roughness only.

**Corrections:**

We shall calculate

- i) Reynolds number ( $Re = \frac{Q}{A} \cdot D / \nu$ ) : for this we shall need the value of flow rate & kinematic viscosity ( $\nu$ ) of that particular batch of HSD (before & after Pigging)
- ii) Friction factor ' $f$ ' =  $2\Delta h g D / l v^2$  .....(Darcy Weisbach Eqn.)

Calculation of  $\Delta h$ : we are considering two batches of Diesel from different refineries (having different densities & viscosities)



As  $\Delta h$  is directly proportional to the length of pipe (Darcy Weisbach Eqn.), pressure must drop linearly. As we always know the line fill ( $L_1, L_2$ ), we can interpolate the approximate value of  $P_2$ , from the known values of  $P_1$  &  $P_3$ .

Applying Bernoulli's equation across length  $L_1$  of the diesel batch-1:

$$\frac{P_1}{\rho g} + \frac{v^2}{2g} + z_1 = \frac{P_2}{\rho g} + \frac{v^2}{2g} + z_2 + \Delta h + k \frac{v^2}{2g} \dots\dots\dots(iii)$$

where  $k \frac{v^2}{2g}$  is minor loss that may be neglected.

$P_1$  → Disch. Press. at Patna;  $z_1$  → elevation at Patna;

similarly  $P_2$  &  $z_2$  at interface.

Rearranging :  $\Delta h = \frac{\Delta P}{\rho g} + \Delta z \dots\dots\dots(iv)$

Now, if  $P_3$  &  $z_3$  are pressure & elevation respectively at Mughalsarai.

As pressure head drops linearly with length of the pipe ( $\Delta h \propto l$ ) & assuming the same for elevation, we have :

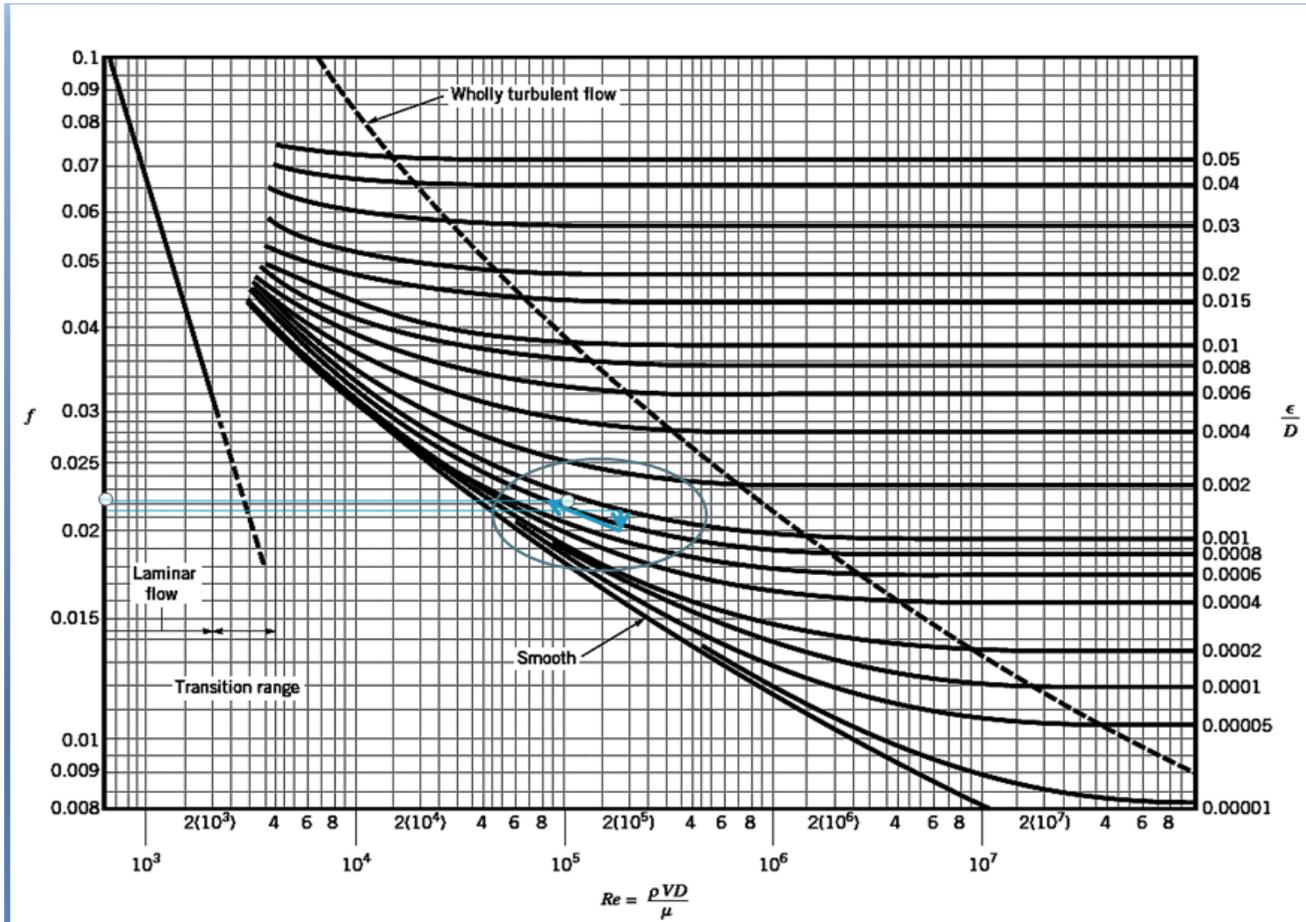
$$\Delta h = \left( \frac{P_1 - P_3}{\rho g} + (z_1 - z_3) \right) X \left( \frac{L_1}{L_1 + L_2} \right) \dots \dots \dots (v);$$

from eqn.(ii) we have :

$$f = \frac{2gD\Delta h}{L_1 v^2} = \frac{g\pi^2 D^5}{8Q^2 L_1} \Delta h \dots \dots \dots (vi)$$

It is shown below by blue lines that how it is possible in our scenario (Kinematic Viscosities varying from 2-5 centi stokes & Re varying from 65000 to 160000) that if we take into consideration, the variation of  $Re$  due to difference in kinematic viscosity due to different batches or temperature variation we may get an increased friction factor even after effective Pigging. Thus the negative value of effectiveness calculated from friction factor is explained. We can clearly see that:

- Even if relative roughness is reduced by 20% (0.001 to 0.0008), ' $f$ ' may still increase by 4%. Thus, a better idea would be to compare relative roughness before & after Pigging.
- For that we require ' $f$ ' &  $Re$  before & after Pigging.



Once we have calculated the Reynolds No. (Re) & then friction factor 'f' (eqn. vi), we may either make use of Moody's chart, or use Colebrook equation to find relative roughness before & after Pigging.

Then the effectiveness would be calculated as:

$$\eta_{pig} = \frac{((\epsilon/D)_{bp} - (\epsilon/D)_{ap})}{(\epsilon/D)_{bp}} \times 100\%$$

**Results: Analysis of PIGGING Effectiveness calculation for PATNA-MUGHALSARAI section of BKPL.**

March '12:

Date	Patna Discharge Press.(KCS)	Mughalsarai Suction Press.(KCS)	Flow Rate KLs/Hr.	Linefill at Patna mouth(L1)
26.3.12	67	4	300	BR3H-348, 1662 KLs
2.4.12	56	10	283	BR3H-02, 5079 KLs

June '12:

Date	Patna Discharge Press.(KCS)	Mughalsarai Suction Press.(KCS)	Flow Rate KLs/Hr.	Linefill at Patna mouth(L1)
16.6.12	70	6	300	BR3H-72, 14703 KLs
19.6.12	56	4	275	BR3H-83, 4473 KLs

Mar '13:

Date	Patna Discharge Press.(KCS)	Mughalsarai Suction Press.(KCS)	Flow Rate KLs/Hr.	Linefill at Patna mouth(L1)
15.3.13	61	5	273	BR3H-376, 3289 KLs
19.3.13	57	9	288	BR3H-377/HR3H-155, 5072 KLs

Note: HR3H & BR3H are Diesel batches(BS-III) from Barauni & Haldia Refinery respectively.

Observations:

Date of PIGging Effectiveness calculation	Reynolds No. (Before Pigging /After Pigging)	Friction factor(Before Pigging/After Pigging)	Effectiveness based on Relative Roughness 'ε/d'
26.3.12 / 2.4.12	131200/123770	.019/.016	100%
16.6.12 / 21.6.12	131200/120266	.0195/.018	96.7%
15.3.13 / 19.3.13	119400/137100	0.02/.016	100%

**Conclusion:**

The value of relative roughness 'ε/d' just after PIGGING is coming out approx. equal to zero that may imply that over last 50 years due to repeated PIGGING the pipeline inside surface has become smooth. Due to uniform deposition of sulphate/carbonate, iron particles & bacterial growth & sticky hydrocarbons (as per Pigging muck sample report# CCF/079716, DATED 1.11.2011 by Italab Pvt. Ltd., Mumbai) during next three months after Pigging an 'apparent' roughness develops, that is reflected by re- increased friction factor. As the Moody's chart was prepared by creating

artificial roughness, this apparent roughness can be calculated by the chart & my proposed expression for Pigging effectiveness is valid.

#### ACKNOWLEDGMENT

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# Marital Adjustment, Mental Health and Frustration Reactions during Middle Age

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**Abstract-** The present research was taken up with broad objective to study the marital adjustment, mental health and frustration reactions in different age groups of middle age from Delhi, India. The sample comprised of 300 middle aged subjects (n=300) which are bank employees, doctors and lecturers, within the age range of 40-55 years from Delhi, India. It was seen that subjects from AR1 (40-47 years) indicated better recreational adjustment, role distribution and autonomy than age group AR2 (48-55 years).

**Index Terms-** India, Marital adjustment, Mental health, Frustration Reaction, Middle age.

## I. INTRODUCTION

A specific time period with physical, mental, behavioural or other characteristics that are presumed to characterize, is known as "Adulthood" or "Middle age". Middle age is generally considered to extend from age forty to age 60 year. It is an especially difficult time in one's life; adjustment to it is greatly dependent on the foundation laid earlier. The period of middle age is typically marked with physical changes; as well as new responsibilities of caring for younger children and grand children, and also older parents. A central issue in the lives of young adults in the anxiety and anticipation of a "mid-life transition" as they enter middle adulthood. Middle aged adults often focus on midlife career change that is how much time they have left for retirement and the speed with which they are reaching with these occupational goals. They also are striving for a healthy balance between work and leisure.

Marriage is one of the most important events of a person's life. Marriage is a social security for all the individuals, i.e. society through marriage system provides security of needs and cares thereby its existence and prosperity is secured. Marriage is for pleasure, happiness and peace of mind on account of satisfaction through interactions with others, trust, understanding and fulfilling social obligations and enriching personality development. A marriage relationship is a delicate, Kaleidoscopic and complex phenomena. It may be very difficult to disentangle anyone particular casual element. Besides Marital Satisfaction or dissatisfaction or "Marital Adjustment or Maladjustment," "mid-life-crisis" also have some other thoughts to include: Worries about the future, inability to enjoy leisure time, a feeling that health is deteriorating, a negative evaluation of work life, and stress arising from taking care of the elderly. Midlife transition "is a natural stage that happens to many of us

at some point (usually at about age 40 years). A mid-life crisis is an emotional state of doubt and anxiety in which a person becomes uncomfortable with the realization that life is halfway over.

## II. RATIONAL

Human beings constantly have to adjust to various roles, environmental demands and pressures. Throughout the course of life, human beings strive for well-being and happiness in various spheres of life - personal, social, economic, marital and work. Achievement and success in these spheres lead to satisfaction in life, whereas inadequacy to do the same leads in frustration. In the present modern era, professionals like bank employees, doctors and lecturers have to spend more time at their work place and are more indulge in activities related to their career and professions. They have less time to fulfil their family responsibilities which may lead to dissatisfaction. Marital maladjustments are the consequences of dissatisfaction, especially during middle aged (40-55 years) as a result people are becoming more inclined towards extra-marital relationships and divorce. So, researcher was interested to know about the marital adjustment during middle age as well as the mental health and also to explore how they react in frustrated situations.

## III. MARITAL ADJUSTMENT

Marital adjustment and satisfaction are highly personal, and a person's satisfactions with other aspects of life are likely to affect his or her satisfaction with marriage. Marital adjustment is a life long process; although in the early days of marriage one has to give serious consideration. As Lasswell (1982) points out, "understanding the individual trait of the spouse is an ongoing process in marriage; because even if two people know each other before or at the time of marriage, there is a possibility that people change during the life cycle. Marital adjustment, therefore, calls for maturity that accepts and understands growth and development in the spouse. If this growth is not experienced and realized fully, death in marital relationship is inevitable. Sinha and Mukerjee (1990) defines marital adjustment as, "the state in which there is an over all feeling between husband and wife, of happiness and satisfaction with their marriage and with each other." It, therefore, calls experiencing satisfactory relationship between spouses characterized by mutual concern, care, understanding and acceptance.

Sexual compatibility and mutual enjoyment is an important factor contributing to the success of most marital relationship, Job of spouse, shape families in a variety of ways. Two major aspects of work directly affect family life: (1) the level of economic rewards associated with work and (2) the conditions associated with performing a job.

#### **Marital conflicts**

No matter how satisfactory and inevitable marriage is, some conflict theorists assert that marital relationships reflect and reinforce gender inequalities (Degler, 1980). Examples that support such an assertion are: (1) until the past few years, a husband could rape his wife and not be charged; (2) in traditional marriage vows the bride is given away to the groom; and (3) the woman has traditionally taken the surname of the husband after marriage. Conflict theory helps to explain the extent of violence in families, where care and cooperation are supposed to exist – something not easily explained by functionalist theory. Good communication skills do not prevent conflict. Actually a conflict, followed by a confrontation, can produce positive results.

Fujihara (1998) did a study on 153 married couples which showed that marital adjustment was significantly correlated with subcategories of social adjustment (1) household adjustment (except the spouse), (2) external family adjustment, (3) work adjustment, (4) social leisure adjustment and (5) general adjustment. Thus, marital adjustment may be a part of social adjustment for women, but the two may be discrete for men. A study, made on 1,609 couples from the Russian Army, found that marital dissatisfaction from husband will cross over to the wife directly, whereas the indirect crossover, when a stressor, such as economic hardship or a negative life event increases the strain of a partner, is mediated the impact of the wife's social undermining behaviour on her husband (Westman, Vinokur, Hamilton & Roziner, 2004).

Eng, Kawachi, Fitzmaurice and Rimm (2005), studied 38,865 men aged (40-75) to examine the affect of change in marital status on health behaviours among men and found Marital termination (Remarriage, widowhood and unmarried) may adversely affect health and dietary behaviours of men.

Vohs, Catanese, and Baumeister (2004) ended that, consistent with the traditional sexual script, research has consistently shown that men have a stronger sexual motivation than do women. Further, Sprecher (2002) found that relationship satisfaction (but not sexual satisfaction) negatively predicted the likelihood of relationship breakup for women but not for men. In contrast, sexual satisfaction (but no relationship satisfaction) negatively predicted the likelihood of relationship dissolution for men but not for women. Thus, perhaps for men decreased sexual satisfaction leads to decreased relationship satisfaction, whereas for women, the reverse is true.

#### **IV. MENTAL HEALTH**

The concept of mental health includes subjective well-being, perceived self-efficacy, autonomy, competence, intergenerational dependence, and self-actualization of one's intellectual and emotional potential among others. From a cross-cultural perspective it is nearly impossible to define mental health compressively. Mental health is a state of well being in

which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively, fruitfully and is able to make a contribution to his/her community (The world health reports 2001). Mental health covers an elusive and diffuse field and the term in itself encompasses a multiplicity of meaning.

Blanofield (1967) defined mental health as a composite of attitude towards oneself, ability to realize once potential through action, degree of independence form social influence and the ability to perceive realistically the world around. Ferguson (1965) stated that mental health is the ability to cope with one's environment in such a way that one's institutional drives are gratified. They considered that mental illness and mental health, are two opposite ends of the continuum on which any individual can be placed depending on the soundness of his mind. There is a general agreement that two terms mental health and mental illness refer to behaviors which are interpersonal in nature and to mental illness is judged to be dysfunctional according to the norms of an observer.

Matsuoka (1996) conducted a study on 58 middle aged people to determine the degree to which family cohesion accounted for different outcome measures of mental health among native Hawaiian families on an island on the verge of major tourism development. This development will cause economic changes that will pose major challenges for the native agrarian families. A series of interviews of focus groups elicited qualitative information on the relationship between family cohesion and mental health. The findings show a clear relationship between family cohesion and mental health status.

Willitts, Benzeval, and Stansfeld (2004) interviewed 2127 men and 2303 women aged less than 65 to describe the mental health of men and women with differing histories of partnership transitions. They came to the conclusion that partnership protects mental health. The negative outcomes of splitting partnership for health are long lasting in women.

Tiffin, Pearce and Parker (2005) studied 503 subjects from a birth cohort to investigate the affect of socio-economic status throughout the life course on self reported mental health at age 50 years and land up with the conclusion that a downward socio-economic trajectory over the whole life course is associated with poorer self reported mental health in men but not in women.

Research has shown that engaged workers report well mental and psychosomatic health (Demerouti et al., 2001). Furthermore, they exhibit personal initiative, proactive behavior and learning motivation (Sonnentag, 2003; Schaufeli and Salanova, 2007).

#### **V. FRUSTRATION REACTIONS**

We are often unable to satisfy our desires or accomplish our goals. Sometimes our ambitions exceed our abilities, or we misperceive the possibilities. But sometimes we are blocked by an external barrier that precludes gratification. Frustration refers to the thwarting or delaying of some ongoing course of action or goal gratification. Frustration is a broad term, it refers to the situation which produced thwarting or the psychological effects of this situation, as when someone is frustrated tends to react with anger, withdrawal depression, or distress. Frustration is an important component of psychological stress, since virtually any

seriously harmful condition will thwart important needs and goals and will require some adjective activity to repair the damage, if possible.

Frustration has been defined in various ways by various psychologists. Most of the definitions agree in stressing the role of interference in goal response in producing frustration.

Rosenzweig (1944) defines frustration as "frustration occurs, whenever the organism meets a more or less insurmountable obstacle or obstruction in its route to the satisfaction of any vital need." Dollard et al (1939) defined frustration as "an interference with the occurrence of an instigated goal response at its proper time in the behaviour sequence."

Obstacles of many kinds cause frustration. A useful distinction can be made between external and personal sources of frustration.

External frustration is based on conditions outside of the individual that impede progress towards a goal. All of the following are external frustrations: getting stuck with a flat tire; having a marriage proposal rejected. In other words external frustrations are based on delay, failure, rejection, loss and other direct blocking of motives. External obstacles can be either social or non-social. Frustration usually increases as the strength, urgency, or importance of a blocked motive increases.

Motivation becomes stronger as we near a goal. Frustration is more intense when a person runs into an obstacle very close to a goal. Personal frustrations are based on personal characteristics; Frustration is actually based on personal limitations. Yet failure may be perceived as externally caused.

All individuals at one time or another, in greater or lesser amount, have to tolerate frustration in their life. The term, frustration tolerance, refers to the amount of stress one can tolerate before his integrated functioning is seriously impaired. Thus frustration tolerance refers to the capacity of the individuals to show persistence in efforts despite repeated failures and antagonistic environment to maintain the integration of the personality.

The person who continues his/her efforts may be said to have more frustration tolerance than the one who discontinues his/her efforts or indulges in any reactionary mode of behavior. Inability to tolerate frustration leads to mental breakdown, maladjustment and problems in also personal relationship. The low frustration tolerance also leads to antisocial behaviour or in other maladaptive behavior.

Anupama Shah et al (1992), to assess the problems faced by unmarried women and their self-perception conducted a research study on 116 un-married women funded by ICSSR on single women, in Baroda. It was found that the unmarried women faced a lot of psychological and emotional problems. They had insecure feeling regarding old age, loneliness and 34% of the respondents reported frustration with life.

Dill, Jody and Anderson, Craig (1996) tested Berkowitz's reformulation of the frustration aggression hypothesis which states that any negative or aversive stimulus such as frustration, even if justified, will result in same measurable tendency to aggress. 34 college students served as selected samples. Degree of hostile, aggression directed at the frustrating individual was measured. As predicted, justified frustration produced less hostile aggression than unjustified frustration but even justified frustration produced more hostile, aggression than no frustration at all. Result support Berkowitz's frustration aggression reformulation. Findings were also consistent with the view that frustration induces negative affect, which in turn, increases hostility toward the experimenter.

## VI. HYPOTHESIS

On the basis of the previous researches the hypothesis tested in this study are as follows:

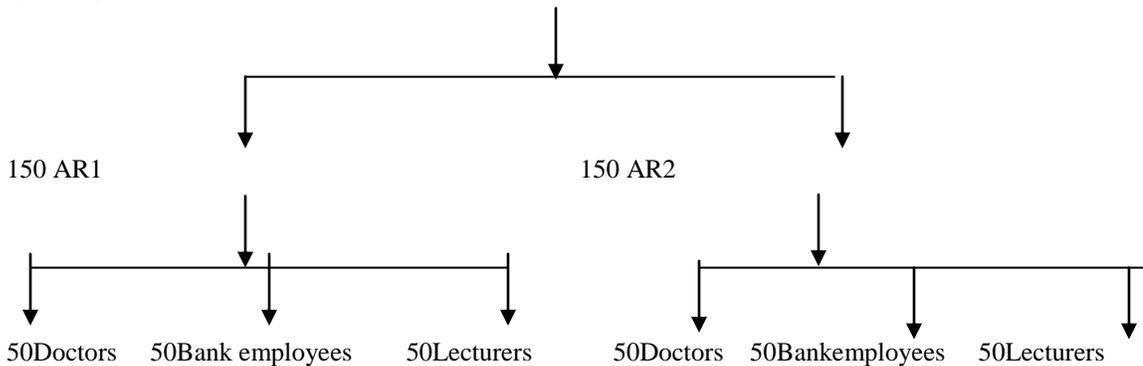
- Significant difference will be seen in marital adjustment of middle aged couple from different age ranges i.e. AR<sub>1</sub> (40-47 years) and AR<sub>2</sub> (48-55 years).
- Significant difference will be seen in mental health of middle aged couples from different age groups i.e. AR<sub>1</sub> (40-47 years) and AR<sub>2</sub> (48-55 years).
- Significant difference will be seen in frustration reactions of middle aged couples from different age group i.e. AR<sub>1</sub> (40-47 years) and AR<sub>2</sub> (48-55 years).

## VII. METHODOLOGY

For conducting the present study, "purposive sampling technique" has been used. The total sample consisted of 150 couples i.e. 300 subjects (N=300). The sample was subdivided into two categories according to the age i.e. AR<sub>1</sub> (40-47 years) and AR<sub>2</sub> (48-55 years). Doctors, lecturers and bank employees were included in the sample.

## Research Design

(N=300)



The following statistical tests were computed:

- Mean and Standard Deviation were computed.
- Pearson's 'r' was computed.

### Criteria for sample selection

- Subject must belong to the upper middle socioeconomic status.
- The age range of the subject should fall between (40-55 years).
- Minimum working hours of men and women should be 6 to 8 hours per day.
- Subject must be either doctors or lecturer or working with the banks only.

### Tools For Measurement

Two tools were used for the measurement of the Marital adjustment and Mental health. Those are:

#### Marital adjustment Questionnaire

Marital Adjustment Questionnaire was developed by the researcher (2004) to assess the marital adjustment in the couples during middle age. Pilot study was conducted by researcher on the 10% subjects of total sample (N=20) of the research. Necessary corrections were made to tool after the pilot study. The reliability and validity scores respectively are .96 and .74. Some basic needs of successful marriage during middle age were used as points of references for rating. Those are Family adjustment, financial adjustment, Emotional adjustment, Sexual adjustment, Recreational adjustment, Role distribution, Social adjustment. Marital adjustment questionnaire consisted of 42 items with a five point scale. Items of the scale are in statement form seeking information for each in any of the five options, which are "Very Rare", "Rare", "Sometimes", "Often", and "Very often". The weight given is 1,2,3,4 and 5 respectively. The

test is having reverse key also. Higher the score higher is the adjustment, lower the score poor will be the adjustment.

#### Mental health Inventory

Mental Health Inventory is a self-reporting four point scale and developed by Dr. Jagdish and Dr. A.K. Srivastava (1984). Validity and reliability of Mental Health Inventory is .54 and .73 respectively. The six dimensions have been inculcated in the scale are Positive self - evaluation (PSE), Perception of Reality (PR), Integration of Personality (IP), Autonomy (AUTO), Group Oriented Attitudes (GOA), Environmental Mastery (EM). The items of the scale are in statement form seeking information for each in any of the four options, which are Always, Most of Times, Sometimes, and Never. The weight is 4, 3, 2 and 1 respectively. Therefore, the higher the score on the scale, higher the status / level of mental health, or vice versa.

#### Frustration Reactions Questionnaire

The frustration reactions questionnaire was developed by the researcher herself to assess the frustration reactions in the subjects during the middle age. Frustration Reactions Questionnaire (FRQ) consisted of 25 items with 3 point scale. The nature of items used in the rating form constitutes its crucial and unique feature. Certain items of behaviour of middle aged people were used as points of references for rating. The reliability and validity scores respectively are .86 and .59. Item of the scale are in statement form seeking information for each in any of the three options i.e. Never, Sometimes and Always. The weightage is 0, 1 and 2 respectively. The test is having reverse key also. Highest score that can be obtained is 50 and lowest score is 0. Therefore, if a respondent is having high score on the scale his / her frustration level is high or vice versa i.e. the lower the score, the lower the frustration level.

VIII. RESULTS

**Table 1**  
**z-values of marital adjustment of middle aged couples (N=300) belonging to different age groups : AR<sub>1</sub> (40-47 years) and AR<sub>2</sub> (48-55 years)**

Variables	Age range (years)	Mean	SD	Z value	
				Calculated	Table
FMY	(40-47)	24.98	3.45	1.56 <sup>NS</sup>	1.96
	(48-55)	24.31	3.93		
FIN	(40-47)	22.66	3.03	1.59 <sup>NS</sup>	1.96
	(48-55)	22.07	3.40		
EMO	(40-47)	23.03	2.73	1.02 <sup>NS</sup>	1.96
	(48-55)	22.69	3.03		
SEC	(40-47)	24.76	2.75	0.871 <sup>NS</sup>	1.96
	(48-55)	24.46	3.20		
REC	(40-47)	22.74	2.87	2.12 <sup>**</sup>	1.96
	(48-55)	22.01	3.09		
RD	(40-47)	23.96	2.49	1.99 <sup>*</sup>	1.96
	(48-55)	23.29	3.30		
SOC	(40-47)	23.40	2.88	0.397 <sup>NS</sup>	1.96
	(48-55)	23.27	2.93		

\* Significant at .05 level

\*\* Significant at .01 level

NS - Non significant

A glimpse at the above table shows that the calculated z values for recreational adjustment and role distribution are 2.22 and 1.99 respectively which are higher than the table value

(1.96). It indicates that couples from AR<sub>1</sub> (40-47 years) have better recreational adjustment and capacity for role distribution as compared to couples from AR<sub>2</sub> (48-55 years).

**Table 2**  
**z-values of mental health of middle aged couples (N=300) belonging to different age groups : AR<sub>1</sub> (40-47 years) and AR<sub>2</sub> (48-55 years)**

Variables	Age range	Mean	SD	Z value	
				Calculated	Table
PSE	(40-47)	25.79	2.74	.953 <sup>NS</sup>	1.96
	(48-55)	26.11	3.06		
PR	(40-47)	17.74	2.01	1.843 <sup>NS</sup>	1.96
	(48-55)	17.29	2.24		
IP	(40-47)	17.52	2.22	1.881 <sup>NS</sup>	1.96
	(48-55)	17.03	2.32		
AUTO	(40-47)	10.92	1.63	2.996 <sup>**</sup>	2.59
	(48-55)	10.31	1.90		
GOA	(40-47)	21.07	2.42	0.537 <sup>NS</sup>	1.96
	(48-55)	20.91	2.74		
EM	(40-47)	14.85	2.51	0.088 <sup>NS</sup>	1.96
	(48-55)	14.82	2.76		

\* Significant at .05 level

\*\* Significant at .01 level

NS - Non significant

The table shows no significant difference in both age groups of middle aged couples regarding their mental health in total but significant differences were found in autonomy of middle aged couples of both age groups. The calculated z value for autonomy is 2.99, which is higher than table value (2.59).

Results revealed that couples of AR<sub>1</sub> (40-47 years) enjoy high level of autonomy than couples of AR<sub>2</sub> (48-55 years).

z values of other dimensions of mental health, have been found non significant. It may be due to the fact that middle aged couples of both age groups are striving for and proceeding

towards the achievements of their life time goals, settling down their children and securing their future, maintaining their sound mental health.

**Table 3**  
**z-values of frustration reactions of middle aged couples (N=300) belonging to different age groups : AR<sub>1</sub> (40-47 years) and AR<sub>2</sub> (48-55 years)**

Variables	Age group	Mean	SD	Z value	
				Calculated	Table
Frustration	(40-47)	7.44	6.08	1.67 <sup>NS</sup>	1.96
	(48-55)	8.22	5.48		

NS = Non significant

Above table clearly shows that there is no significant difference found in couples of different age groups i.e. AR<sub>1</sub> (40-47 years) and AR<sub>2</sub> (48-55 years) regarding their frustration reactions. Couples are adjusting well with the problems establish harmony / balance between home and career responsibilities, hence overcome frustration leading a sound life.

### IX. DISCUSSION AND CONCLUSION

The study hypothesized that "*Significant difference will be seen in marital adjustment of middle aged couple from different age ranges i.e. AR<sub>1</sub> (40-47 years) and AR<sub>2</sub> (48-55 years).*" and finds partial support for this hypothesis. Couples from age group (40-47 years) have better understanding for distributing roles appropriately; they achieve their goals in time after successful completion of family tasks and hence, find more time for recreation. This can be supported by research involving 87 middle aged and 75 older couples revealed that marital interaction is more effectively positive for older couples (Levenson, Cartensen & Gottman, 1994). Marital interaction was found to be less physiologically arousing for older couples than for those of middle age. These findings were consistent with other research in which marital happiness increases with age (Guilford & Bengston, 1979). If there is a relationship between marital interaction and happiness in marriages, then older couples may interact more positively, but perhaps less often due to low arousal. Barling (1986) in a study on "inter role conflict and marital functioning" found that conflict regarding work and family roles was associated with lower levels of marital adjustment among dual earner couples.

Second hypothesis states that "*Significant difference will be seen in mental health of middle aged couples from different age groups i.e. AR<sub>1</sub> (40-47 years) and AR<sub>2</sub> (48-55 years).*" and findings partially supports this hypothesis. Couples of AR<sub>1</sub> (40-47 years) are comparatively more energetic, enthusiastic in fulfilling their responsibilities; enjoy their lives and rights to resume their work with zest. They are at peak stage to achieve their goals and goals of their children. They enjoy each aspect of freedom in different phases of life in taking important decisions regarding future. **Tiffin, Pearce and Parker (2005)** studied 503 subjects from a birth cohort to investigate the effect of socio-economic status throughout the life course on self reported mental health at age 50 years and land up with the conclusion that a down ward socio-economic trajectory over the whole life course is associated with poorer self reported mental health in

men but not in women. The effective balancing of various professional and personal roles presumably could play a salient role in their level of job satisfaction, life satisfaction and overall well - being (**Barnett and Hyde, 2001 ; Frone, 2000 ; Marks, 2001 ; Moen & Yu, 2000**).

The third hypothesis states that "*Significant difference will be seen in frustration reactions of middle aged couples from different age group i.e. AR<sub>1</sub> (40-47 years) and AR<sub>2</sub> (48-55 years).*" and findings rejects the stated hypothesis. Dubey and Kumar (1986) conducted a study which shows that the current miserable condition of the society and its mental health is alarming; tension and stress have become a part of life. The twentieth century was branched as the age of stress and anxiety. Coping mechanisms of family to adjust because of excessive tension and stress in the society. The cause may vary from faulty learning, confliction objective, and unclear philosophy of life, dualism, false ego and fast changing values. Byers (2005) found that relationship of satisfaction partly mediates the association between self-disclosure and sexual satisfaction. The authors interpreted this finding as showing that self-disclosure leads to greater relationship satisfaction, which in turn, leads to higher sexual satisfaction.

The research can be **concluded** that:

***Couples are having better marital adjustment during early adulthood than in late adulthood.*** Even if, working females play dual roles and are over burdened but still they try to make adjustments in family and are satisfied and cool under all circumstances. They participate in family matters, cooperate more and make themselves available when ever required for family matters. They try to seek recreation and satisfaction out of successful management.

It is also supported by the following research studies:

Nearly, Terrence and Joseph (1985) interpreted for good marital adjustment. They stated that age is the significant factor in marital adjustment. Elderly couples are happy and have good marital adjustment. Kington and Nock (1987) studied and found that the amount of time spend together by couples is significantly reduced by the number of hours spent in the paid force, this affects marital adjustment adversely.

***Similarly, couples are more mentally healthy during early adulthood than in late adulthood.*** A great importance of balance of psychic forces in the males showing sound mental health. Ability to understand and to share other people's emotions, the ability to concentrate at work and interest in several activities in middle aged males results in good adjustment with spouse and with the family members. They always have an inner feeling to spend quality time with their spouse, take care of and satisfy

sexual needs of the partner. They have concern and feel responsible for needs of the family members and for smooth functioning of the family, they are able to make equal role distribution among the family members. They try to maintain balance between family and society. During middle age the males have less family responsibilities (as the children are grown up or settled down) and would also desire to spend some time for social work or welfare activities. It leads to their over all life satisfaction.

Hill (2005) conducted a study on 1,314 individuals and found that work to family facilitation was positively related to job satisfaction and life satisfaction, and negatively related to individual stress. Family to work facilitation was positively related to marital satisfaction, family satisfaction and life satisfaction, and negatively related to organizational commitment. Working fathers reported long work hours (49 hours / week), major involvement in household responsibilities (46 hours / week), and a work culture less supportive of their family life than working mothers reported. However, working fathers reported less individual stress, and greater family satisfaction, and life satisfaction than working mothers.

#### X. PRACTICAL IMPLICATIONS OF THE STUDY

This study has very deep social implications to strength the marital bonds between the working couples. This can help / suggest

1. The middle aged couples to develop patience and tolerance and understanding for each other.
2. The importance of recreation, role distribution for smooth functioning marriage life.
3. Working couples to owe respect and equality rights to each other regarding financial and family matters with special reference to females.
4. The young ambitious working couples with highly demanding jobs in private sector to bring stability in their married life through spending quality time with each other.

#### XI. SUGGESTIONS

- This study was conducted to see the middle age crisis in adulthood regarding marital adjustment, mental health and frustration reactions. Further investigation may be undertaken to find out other factors affecting marital adjustment during early and late adulthood.
- Sample of present investigation was drawn only from Delhi State. Further research would be conducted in other states or metro cities, which will cater to the sample of different back grounds.
- Similar research study may be replicated for other professions from public and private sectors to assess the difference. Thus study on wider and varied population may provide richer and more valuable information.
- Further revitalization programmes could be undertaken for the identified marital'ly maladjusted couples.
- Similar research study can be undertaken on a sample belonging to different communities and cultures like Hindu, Muslim etc.

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# U. T. Place as a Behaviourist

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**Abstract-** U. T. Place is rightly called the forerunners of Physicalism or Identity Theory of Mind. But he also claims himself to be a behaviourist. Like the behaviourist he believed that mental events can be elucidated purely in terms of hypothetical propositions about behaviour. These can also be elucidated by the reports of the first person's experiences. He has many arguments in favour of behaviourism for which he is called a behaviourist. In this article I shall give a glimpse of behaviourism, particularly of logical behaviourism and then explain the circumstances under which Place is called a behaviourist.

**Index Terms-** Mind, Brain, Behaviour, Consciousness, Dispositions, Physicalism.

## I. BEHAVIOURIST ANALYSIS OF MIND

In the history of philosophy the theory of behaviourism occupies an important place in narrating the nature of mind. This theory is called by Armstrong a sophisticated form of the theory of mind. According to this theory, there is nothing called mind which is occult or private. This theory does not believe the existence of mind apart from the behaviour of the body. This theory holds that in terms of physical behaviour or tendencies to behave in human body all mental states and processes can be accounted. All the mental processes are represented through behaviour and therefore the only means for investigation of mental processes or psychological processes of a person is his behaviour. This theory holds that physical conditions of the body and its interaction with the environment determine the behaviour of a person. Thus in unfolding the nature of mental concepts this theory emphasised on the importance of disposition.

Moreover this theory does not accept any unobservable stimuli rather it focuses solely on observable stimuli, responses and its consequences. This theory holds that behaviour of a person can be observed and at the same time verified by other persons and it is for this reason they define consciousness in terms of bodily behaviour.

This behaviouristic explanation is of different types, such as Methodological, Psychological and Logical. But here I shall discuss the logical behaviourism only because this theory is important in philosophy.

## II. LOGICAL BEHAVIOURISM

The logical behaviourism is advocated by Gilbert Ryle (1949) and later Wittgenstein (1953). The development of Ryle's logical behaviourism is based on the criticism of Descartes' theory of dualism. In explaining mind Ryle uses the term behaviour, skills, tendencies, propensities, dispositions,

inclinations etc. He does not believe that mind is something occult, mysterious, other worldly, something private or spiritual. Ryle in his book *The Concept of Mind* writes, "Dispositional words like "now", "believe", "aspire", "cleaver" and "humorous" are determinable dispositional words. They signify abilities, tendencies or pronenesses to do, not things of one unique kind, but things of lots of different kinds"<sup>5</sup>.

According to Logical behaviourism all statements about mental phenomena can be translated into a set of hypothetical statements about behaviour. Here the term 'translatability' does not mean presently existing behaviour but can be translated into a set of statements about that person's actual and possible behaviour. Logical behaviourism deals with the meaning of mental terms or concepts within the sphere of philosophy. By mental states it means behavioural dispositions or tendencies.

L. Wittgenstein, another logical behaviourist also develops his theory by criticising Descartes' dualism. Wittgenstein does not believe that mental states are there in the mind. For him, it is mental activities for which mind stands not for mental entities. He says that to understand the inner processes of a person outward criterion is needed.

## III. U. T. PLACE AS A BEHAVIOURIST

It is well known to all that U.T. Place is a fore runner of Physicalism according to which mental states and processes and brain states and processes are identical. But in addition to this he is also a contributor to the theory of Behaviourism. He paid his respects to Ryle, Wittgenstein and Skinner who inspired him in developing behavioural theory. Admitting himself to be a behaviourist, Place writes in his article 'From Mystical Experience to Biological Consciousness: A Pilgrim's progress'.

"One consequence of studying psychology alongside philosophy at a time when Ryle, Austin, Grice, and Strawson were creating Oxford ordinary language philosophy was that the acknowledged behaviourism of Ryle and the unacknowledged behaviourism of Wittgenstein, which I learned about from the then newly appointed Wilde Reader in Mental Philosophy at Oxford, Brain Farrell, was to awaken an interest, also fostered by Farrell, in the neo-behaviourism of Tolman, Hull, and Skinner whose different formulations were then the focus of theoretical debate within psychology, not so much in Britain as in the United States. It was through this that I became, as I remain to this day, a behaviourist"<sup>6</sup>.

5 G. Ryle (1949), *The Concept of Mind*, p-114

6 U.T Place, (2004) *Identifying the Mind*, P-27

There are ample reasons for which Place can be considered as a behaviourist.

(1) He subscribes to the idea that study of private experiences of the individual is possible only through the objective records of what he says when he is asked to narrate them. It is because of the fact that words are anchored to what is observable publicly and for which linguistic communication is possible.

(2) Place believes that we can describe and explain the behaviours of others through our ordinary psychological language. But this does not do very well in describing our own private experience. And all these are due to the fact that words are anchored to what is publicly observable and for which linguistic communication is possible.

(3) Place says that we can explain and describe the publicly observable behaviour of others through ordinary language and this is the primary function of ordinary language. But as a theoretical language it is unsuitable for scientific psychology. Thus Place supports the attempt of the behaviourist who extended their effort to construct an alternative to ordinary language for scientific purposes.

(4) He also believes that in case of both human and animal, our ordinary psychological language is the source of important insight which controls behaviour. By the use of the technique of conceptual analysis, which is developed by Wittgenstein and other ordinary language philosophers, these insights can only be extracted.

(5) Place further maintains that an integral and vital part of the causal mechanism in the brain is the phenomenon of conscious experience. These conscious experience controls the interaction between the organism and its environment by the process of transforming input into output, stimulus into response. Thus only in the light of the distinctive function it performs in that process of input and output transformation, its peculiar properties can be understood.

But in spite of all these Place at the same time believes the existence of conscious experience and the possibility of its scientific study. According to him, to deny the existence of conscious experience is to abandon everything that he has stood for. He declares himself as a behaviourist but does not admit the identification of dispositions with central states, although he believed that dispositions of behavioural sort causally depend upon the brain. Disagreeing with behaviourists, he said that mental processes are just processes in the brain but whereas dispositional mental states are not states of the brain. This view was given towards the end of his life.

Once it was believed that mental events are a separate class of events which cannot be described in terms of the concepts employed by the physical sciences. But this kind of belief is not above the question and as such now-a-days it has no universal acceptance among philosophers and scientists.

In his famous article "Is Consciousness A Brain Process" (1956) Place boldly stated that unlike the materialism of the seventeenth and eighteenth centuries the modern Physicalism is behaviouristic. On this view consciousness is treated either as a special type of behaviour, or disposition to behave in a certain way.

The logical behaviourist's analysis of cognitive and volitional concepts in terms of disposition was accepted by Place.

He emphatically stated that an analysis in terms of dispositions to behave is fundamentally sound in case of cognitive concepts like 'knowing', 'believing', 'understanding', and 'remembering'. The same is also true in case of volitional concepts like 'wanting' and 'intending'. But he believes that there are some sorts of mental concepts which he calls 'intractable residue of concepts' clustering around the notions of consciousness, experience, sensation and mental imagery in case of which no behaviouristic account would suffice. Although these mental concepts cannot be analysed in terms of dispositional verb, Place expresses his firm conviction that ultimately a satisfactory behaviouristic account in case of these mental concepts will be found. He admits that there are certain statements that refer to some events and processes that have some sort of private or internal experience. These are really private to the individual of whom they are attributed. He cites statements of such cases about pains and twinge, about how things look, sound and feel, to speak metaphorically about things dreamed of or pictured in mind's eye. But he apprehends that one may infer that making this assumption leads him to an inevitable dualist position. Dualists believe that over and above the physical and physiological processes there is a separate category of processes. This category is formed by sensation and mental images. They also believe that mental state possesses an ontological reality and there is a correlation between these two categories. But Place firmly believes that one who accepts the separate category of inner processes is not a dualist. According to him, there is no logical ground by which one can dismiss the thesis that consciousness is a process in the brain.

But although Place believes that consciousness is a process in the brain, he is not in favour of the thesis that to describe our dreams, fantasies and sensation is to talk about a process in our brain. He extends his view that 'cognition statements' are analysable into statements about behaviour. But he does not claim that in the same way statements about sensation and mental images are reducible to or analysable into statements about behaviour. It is clearly false to say that statements about consciousness are statements about brain processes.

#### IV. CONCLUSION

From the above analysis it is clear that although Place is one of the advocates of Physicalism, he has much contribution in the development of behaviourism. He agrees with behaviourism in many respects. Although he believes that some sorts of mental concepts such as, the notions of consciousness, experience, sensation and mental imagery, which he believes inner process, cannot be explained by the theory of behaviourism yet he has firm conviction that ultimately a satisfactory behaviouristic account will be able to explain these concepts. He was so inclined towards behaviourism that he even admitted that modern Physicalism is behaviouristic in character.

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# Constraints and Opportunities of Village Chicken Production in Debsan Tikara Keble at Gonder Zuria Woreda, North Gonder, Ethiopia

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**Abstract-** This study was conducted to identify the constraints and opportunities of village chicken production in Debsan Tikara Keble at three villages in Gondar Zuria Woreda by using semi structured questionnaire, field visit and interview from 150 randomly selected respondents. The result revealed that the main constraints were feed shortage (28%), predation (30%) and flock mortality (28%). Almost 58% of chickens share the same room with the main house. The farmers use traditional medicine to treat chickens (82%). Average age of first egg laying of chicken was 6 months, number of eggs per clutch was 13, the clutch size was 3 and hatchability percentage was 72%. The main opportunities for village chicken production was market access 36%, credit service 28%, training and extension service 16%, feed and water access 20%. From this study, constraints and opportunities of village chicken production was merely identified based on this result by improving the management practice, poultry breeds and educating the framers are viable options to improve the livelihood of the households.

**Index Terms-** village chicken, constraints, opportunities, respondents

## I. INTRODUCTION

Ethiopia has large population of chickens estimated about to be 48.89 Million <sup>[1]</sup> with native chickens of non descriptive breed representing 96.6% hybrid of chickens 0.55% and exotic breed of chickens mainly kept in urban and peri-urban areas 2.8% <sup>[1]</sup>. Village chicken production system in Ethiopia followed by primitive type with 5-20 birds per house hold simple rearing in backyard with inadequate feeding and health care. However; the population number of chicken flock is small <sup>[2]</sup>. such production system may result in slow growing and poor layer of egg.

Modern poultry production started in Ethiopia some year ago mainly in colleges and research stations. The activities of these institutions mainly produced on the introduction of exotic breeds to the country and distribution of these breeds to the farmers including management, feeding housing and health care practices <sup>[2]</sup>. Poultry production and management practice in Gondar zuria worda, Debsan Tikara Kebele can be characterized by extensive poultry production system and the production and productivity of village chicken is low due to flock mortality by disease, predator and poor management practice. In the woreda; the poultry population approximately is 169,282. Even if the population is high, the farmers do not benefited the sector, because of traditional production system, predator challenge, disease prevalence, feed shortage and poor management practices <sup>[3]</sup>. However, there is not enough information regarding with production challenges and opportunities of poultry production. Therefore this study was design to assess the challenges and opportunities of poultry production in the study area.

## II. MATERIALS AND METHODS

### A. Description of the study Area

The study was conducted in Debsan Tikara Keble , Gondar Zuria woreda of North Gonder zone of Amhara region , Northwest Ethiopia . The woreda contains 35 rural kebeles and 2urban Kebeles and it covers 142.08 Km<sup>2</sup> area with 209,000 human population and 169282 poultry population <sup>[3]</sup>. The elevation of the study ranges from 1800-2700m above sea level and the total annual rain fall varies from 641mm – 1678mm. The maximum and minimum annual temperature for the study area was 26.4% and 12.7°c respectively <sup>[3]</sup>

**B. Methods of Data collection**

The data was collected by using semi-structured questionnaire, field visit and interview from 150 randomly selected respondents in three villages(Village 1,Village 2 and Village 3). Major constraints and opportunities of village chicken production were collected. In addition to these, feeding system, housing condition, marketing, health care, production performance, credit and extension service etc was collected as a primary sources and secondary data was collected from different documents of Agricultural Development Office.

**C. Data Analysis and presentation**

The data was analyzed by using SPSS statistical software through simple descriptive statistics like average, and percentage and presented in form of tabulation

**III. RESULTS AND DISCUSSION**

**A. Supplementary feeding**

The percentage of respondents that had given a supplementary feed for chicken were presented in Table 1

Table 1: Supplementary feeds of village chicken

Types of supplementary feed	No of respondents( Number)						%
	Village 1	Village 2	Village 3	Total	Mean	SD	
Grains	27	25	24	76	25.33	1.5	50.67
Food leftover	7	12	13	32	10.67	3.2	21.33
Kitchen waste	16	13	13	42	14	1.7	28
Total	50	50	50	150	50	0	100%
Amount of supplementation (Kg)	0.049	0.043	0.046	0.138	0.046	0.003	

The majority of respondents (50.67%) were depend on supplementing grains followed by kitchen waste (28 %) and only 21.33 % of respondents were provided food left over for their chickens. This implied that producers have awareness about feed supplementation. However the chicken production system is still traditional. The grain feed supplementation were different with seasonal conditions. This inline with the repport of <sup>[4]</sup>,reasonable grain feed supplementations varied with cultivates. Feed supplements such as grains, food leftovers and kitchen waste were offered once a day early in the morning. An average of 0.046 kg is given per day per hen as a supplementary in twice of a day (Table- 1). This result is disagreeing with <sup>[5]</sup> report; 0.035 kg grain supplement is given to local chickens per day per hen in the free range system. The reason is maybe due to better feed availability and farmer’s adoption in feeding of their chickens in the woreda.

**B. Breed types and number of chickens**

Breed types and number of chicken in the study area is presented in Table 2

**Table 2: Breed types of chickens**

Types of breeds	Number of chicks				Percentage (%)
	Village 1	Village 2	Village 3	Total	
Local breed	1442	1459	1466	4367	93.9
Cross breed	55	65	69	189	4.06
Exotic breed	30	31	33	94	1.9
Total	1527	1555	1568	4650	100%

The majority of chickens in the study area were raised from local breeds 93.9% followed by cross breed and exotic Rhode Island Red breed 4.06% and 1.9% respectively. This approximately similar with report of [6] who indicated that poultry production in Ethiopia is large with 96.6%, 2.8% and 0.6% of local, exotic and cross breed respectively. This is because of the low accessibility of improved breeds and low awareness of the producers to use improved breed widely.

*C. Housing System of Village Chickens*

The housing systems of village chicken is presented in table 3

**Table 3: Housing system of village chickens**

Housing system	No respondents						%
	Village 1	Village 2	Village 3	Total	Mean	SD	
Share the room with perch	29	31	27	87	29	2	58%
Different shelter in the same room	16	14	15	45	15	1	30%
Building house	5	5	8	18	6	1.7	12%
Total	50	50	50	150	50	0	100%

The majority of farmers were housed their chickens by sharing the same room with perch i.e 58%. The rest 30% and 12% respondents were used different shelter in the same room with the families and separate building house respectively. Even if; the farmers were used the same room with and without perch to housed chickens, they can produce low amount of products. However they were constructed chicken houses to protect chickens from predators, rain and wind during night time. These agree with report of [7] who indicated that majority of chicken producers housed chickens by sharing the same room with people particularly over night time than day time in Ethiopia.

*D. Causes of chicken lost*

Main causes of village chicken lost in the study area is presented in Table 4

Table 4: main causes of chicken Lost

Causes of Mortality	No of respondents						%
	Village 1	Village 2	Village 3	Total	Mean	SD	
Predators	26	27	25	78	26	1	52%
Diseases	21	22	22	65	21.7	0.6	43.4%
Animal trampling	3	1	3	7	2.3	1.2	4.6%

Total	50	50	50	150	50	0	100%
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The result revealed that 52% of the death were due to predators which followed by different diseases such as new castle disease (NCD) and coccidiosis was 43.4%. Whereas minimum death was observed by animal trampling effects was 4.6%. This disagree with the report of <sup>[8]</sup>, as reported that NCD is one of the major cause of death of village chicken mortality in central high land of Ethiopia. This may due to scavenging feeding system and comfortable area for predators.

**E. Health Care mechanism**

The health care mechanism of village chicken is presented in table 5

**Table 5: Health Care Mechanism of Chicken**

Types of Medicine	No of respondents						%
	Village 1	Village 2	Village 3	Total	Mean	SD	
Traditional medicine	42	40	41	123	41	1	82%
Modern medicine	8	10	9	27	9	1	18%
Total	50	50	50	150	50	0	100%

Health care is one management aspect of village chicken production. To improve the productivity of chicken should kept healthy. As indicated in the above table 5, the majority of farmers 82% were used traditional medicine to cure chickens when they infected. Farmers used traditional medicine such as simza, fito, and garlick with feeds. On the other hand; 18% of respondents were applied modern medicine that given by veterinarian. Farmers were used modern medicine were small 18%, because low veterinarian accessibility, lack of awareness and unadaptability to use modern medicines. In the study area health care practices such as avoiding feed contamination and water and cleaning of poultry house were not performed well. In addition these were no any vaccination. Therefore; chicken health care was one of constraints of village poultry production. In village chicken production system, periodic devastation of flock by disease is very high. This study agrees with report of <sup>[9,10,11]</sup> which reported that disease is the major factor the loss of the flock in village poultry production system.

**F. Production and reproduction performance**

The average production and reproduction performance of village chicken is illustrated in table 6.

**Table 6: Production and reproduction performance of village chicken**

Characteristics	Village 1	Village 2	Village 3	Total	Mean	SD
Average age at first egg laying (Month)	6	6	6	18	6	0
Number of egg clutch per hen	15	10	14	39	13	2.6
Number of clutch hen per year	3	3	3	9	3	0
Number of egg set per clutch	12	8	10	30	10	2
Hatchability (%)	73	71	72	223	72	1

The above table indicates that village chicken in the study area attain sexual maturity and laying first egg at an average 6 months of age. The hen lays about 13 eggs /hen/ clutch and the size is three times per year with 72% of hatchability on the average 10 number of egg settled per clutch. Age of 1<sup>st</sup> egg laying of village chicken is disagree with the report of <sup>[5]</sup> seven months, this variation is may due to free water availability and feed supplementation of village chicken in the study area.

*G. Marketing of village chickens and their Eggs*

Marketing of village chicken and eggs is presented in Table 7

**Table 7: Chickens and egg price in the study area**

Sold variables	Price					
	Village 1	Village 2	Village 3	Total	Mean	SD
Cock	80	85	75	240	80.00	5
Hen	75	75	75	225	75.00	0
Cockerel	60	55	65	180	60.00	5
Pullet	45	40	45	130	43.30	2.9
Egg	2.00	1.75	1.75	5.5	1.80	0.1

There were high chicken and egg price variation due to festivals based on their coat cover of the bird. The average price of cock, cockerel, hen and pullet were reached 80, 75, 60 and 43.30 respectively; and the price of egg was reached 2 birr during non fasting period and festival time, so the producers were fetched good price during that time. There is no any market problem in the study area because of good infrastructures like transportation facilities and the proximity to Enfrance and Maksegnit town; moreover, different traders were came from Metema and Sudan to bought chickens and their products. Keeping village chicken by small holder for cash income to purchase food items and to cover other family expenses as the report of <sup>[12]</sup>, small holder village chicken owners found in different part of the country sale chickens and eggs to cover school fee, to purchase improved seed and to get cash for grain milling services.

*H. Training and extension service*

Training and extension service that was done in the study area was presented in Table 8

**Table 8: Training and credit service for village chicken producers**

Services	No of respondents						%
	Village 1	Village 2	Village 3	Total	Mean	SD	
Credit	20	21	22	63	21	1	42%
Training	6	7	8	21	7	1	14%

Credit and training	13	12	11	36	12	1	24%
Not got both	11	10	9	30	10	1	20%
Total	50	50	50	150	50	0	100%

Training and extension services held in the study area were other determinant factor to improve village chicken production. Gondar Zuria Woreda Agricultural Office had provided training and Amhara credit and saving institution had given credit for many farmers , As shown in the above table, producers have gotten agricultural and extension services through training, credit and training and credit service 14%, 42% and 24% respectively ; to improve poultry management and enhance village poultry sector for better benefit of farmers. Only 20% of respondents had no gotten training extension services. This implies that the majority of respondents 80% had gotten training and credit service, and additional extension agents work with the famers. This may one important prospect to improve village poultry productions.

*I. Constraints of village chicken production*

The major constraints of village chicken production is presented in table 9  
 During this study, the farmers were listed the major limiting factors of poultry production in the area. The primary problem cited were predation, feed shortage, flock mortality and low prediction performance.

**Table 9: Constraints of village chicken production**

Constraints	No of respondents						%
	Village 1	Village 2	Village 3	Total	Mean	SD	
Predation	15	14	16	45	15	1	30
Feed shortage	15	15	12	42	14	1.7	28
Flock mortality	10	11	15	36	12	2.6	24
Low production performance	10	10	7	27	9	1.7	18
Total	50	50	50	150	50	0	100

This result revealed that predator constraints (30%) identified as the major problem. Farmers had suffered serious losses due to predation. This may due to extensive /scavenging/ feeding system of chickens and suitability of the area for presence of predators. The other constraints 28%, 24%and 18% were feed shortage, flock mortality and low production performance of village chickens respectively. This implies that the constraints are almost nearly similar , so the farmers give attention for all the problems. This in line with finding of <sup>[13]</sup> those reported that the predator include primarily bird of prey such as vultures, which prey chickens ,and wild mammals such as cats and foxes which prey mature birds.

*J. Opportunities of village chicken production in the study area*

The major opportunities of village chicken production is presented in table 10

**Table 10: Opportunities of village chicken production**

Opportunities	No of respondents						%
	Village 1	Village 2	Village 3	Total	Mean	SD	

Training and extension	7	9	8	24	8	1	16%
Market	19	17	18	54	18	1	36%
Credit service	14	13	15	42	14	1	28%
Feed access	10	11	9	30	10	1	20%
Total	50	50	50	150	50	0	100%

Even if; there were many problems in the study area there were also some opportunities to improve village chicken production and productivity for the future such as market availability credit service , feed access and training and extension service. In the above table, market was the primary opportunities (36%) for the sector improvement followed 28%, 16% and 20% of opportunities for chicken production credit, training and feed access respectively .

#### IV. CONCLUSION

In this study area, village chickens are raised under traditional management practice with many problems such as low production performance (18%), feed shortage (28%), predation (30%) and flock mortality (24%) . On the other hand; market availability (36%), credit service (28%), training and extension service (16%) and water access (20%) were some of the opportunities indentified in the area. Better understanding of these constraints and good prospects of village chicken production is important to improve food security and improves the standard of living condition of the farmers.

The incidence of predation in the area was about 52% and most of the farmers were used traditional medicine (82%) to treat chicken. Chickens share the same room with the family was 58% and they reach to lay first egg at an average age 6 months and the hatchability of chickens was 72% and about 28% of respondents were obtained credit service. Based on this result the following recommendations are made

- 1) The farmers should reduce free ranging feeding system to reduce flock mortality by predators.
- 2) The farmers should pay strong attention for appropriate intervention in disease and predator control to improve chicken product and productivity.
- 3) The producers should provide adequate quality and quantity of feeds in regular manner for better production performance of chickens and less prone to disease.
- 4) The agricultural office and producers should work in collaborating way in the area of diseases and predator control, feed and breed improvement and other management aspects.
- 5) Design and implement more research, educating farmers, improve breeds and all management aspects to solve the existing village chicken production are viable options.

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# Production and Marketing of Chicken At Kimbibit Woreda In North Shoa Zone, Oromiya Region, Ethiopia

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**Abstract-** The study was conducted to determine production and marketing chicken at Kimbibit Woreda from three representative kebelles by selecting a total of 150 households who involved in chicken production. The data were collected by questionnaire, personal observation and interview like composition, marketing channels and purpose of village chicken production. The result of the study revealed that about 80% of the households kept local chicken, 12% local and cross breed, and 8% kept exotic and local breed together. The major sources of parent stock were from market (52%), research centers (6%) and hatched in home (42%). In this study village chicken in the study area become sexual maturity and egg laying first at average 6<sup>1/2</sup> months, the average number of clutch /hen/years was 3 and their hatchability was 76%. 60% of the household rear their chicken for laying, 26% for income source and 14% for consumption. The main constraints were diseases 54%, predators 20% and 8% lack of professional assistant. Therefore, to reduce these constraints government sector should give enough training for village chicken producers to maximize their income for livelihood improvement.

**Index Terms-** household, chicken production, marketing system

## I. INTRODUCTION

In Ethiopia, the agricultural sector is the corner stone of the economic and social life of the people. The sector employs 80-85% of the population and contributes 40% of the total growth domestic product [1]. Animal production in general and chicken production as the one component of agriculture covers 40% of the agricultural output playing an important role in the rational economy as it contributes 13-16% of the total GDP [1].

Chicken are among the most adaptable domesticated animals, and there are few places on the globe where climatic conditions make the keeping of chicken flock impossible [2].

The total chicken population in the country is estimated at 39.6 million [3]. The majority (98%) of these chicken are maintained under traditional system with little or no input for housing, feeding and health care, the indigenous chicken belong to a group of local unimproved breeds commonly found in developing countries and may include mixed (unspecified) breeds resulting from uncontrolled breeding [4].

Kimbibit woreda (sheno town) is one of the North Shewa zone woreda in which chicken production is practiced under smallholder which provide people benefits in good security (meat and egg) and for source of income. However, due to lack of management, in adequate health care, lack of improved reeds the return or output obtained from local chicken is very low outcome. Therefore, the aim of carried out this research in this woreda was to alleviate the problems that related to chicken production and marketing system under small holders.

## II. MATERIALS AND METHODS

### A. Description of the study

The study was conducted in Adadi Falle Kebele in Kimbibit woreda, North shewa zone of Oromia regional state. The woreda is 195km from the zonal capital Fitcha, and 80km from Addis Ababa. The districts extends form 9°12' – 9°32' N latitude and 39°33' E longitudes. The woreda has 31 kebelles with a total area of 752.27km<sup>2</sup> lands and 72,247 overall totals human population.

The altitude of woreda ranges form 1390-2980m above sea level (a.b.s.l) and predominantly has semi- arid types of climate. The annual rainfall is 913mm and mean minimum and maximum temperature of the center are 13°c and 19°c respectively. The topography of the woreda is 89% plain, 4% undulating, 2% valley and 5% is mountainous. The major live stock population in the area are cattle, sheep, goats, chicken and equines are practiced with integration crop production like barely, wheat, bean, pea, little and other types of crops.

*B. Sampling Methods and Sample Size*

The study was conducted at kimbibit Woreda in three representative Kebelles and a total of 150 individual households were selected purposively. These kebelles were selected purposively for the study due to accessibility of road, village chicken production practiced in the area and reliable information gathered to the study.

*C. Methods of Data Collection*

The data were collected by using both primary and secondary source of data/ the primary data was collected by using questionnaire, personal interview and direct observation. Parameters selected to collect relevant data included under questionnaire are; Educational level of households, flock composition, types of bread, productivity of chicken management practice, feeding system and source of parent stock flock were gathered. By interview parameters like purpose of village chicken, marketing system, health care, and constraints of village chicken were asked. By observation housing system, types of feed offered, number of cocks, pullets and layers were seen. The secondary data was collected from the written document of Kimbibit woreda Agricultural development office.

*D. Data Analysis Techniques*

The data was analyzed by using SPSS statistical software through simple descriptive statistics like average, and percentage and presented in form of tabulation

III. RESULTS AND DISCUSSION

*A. Flock Composition*

The flock composition in the study are is presented in table 1

**Table 1: Flock composition**

Types of chicken	No. of chicken				%
	Adadi Felle	Adadi Matta	Lay Kombolcha	Total	
Layers (>20wks)	90	85	95	270	21.5
Cocks (>20wks)	75	83	77	235	18.7
Pullets (8-20wks)	60	65	69	194	15.5
Cocker's (8-20wks)	75	73	70	218	17.4
Chicks (0-8wks)	110	115	112	337	26.9
<b>Total</b>	410	421	423	1254	<b>100%</b>

The result revealed that the households participated in different age of poultry composition. The main they raised different class of poultry was to substitute generation of breed, for hatching, egg marketing and consumption, and for income generation. In this study chicks population were higher in number, due to some management taken during the first eight weeks. According to the respondent

view, during hatching period they care for their chickens by keeping them from predators like cat, eagle (locally called cullulee) and etc.

*B. Breed types*

The breed types in the study are is presented in table 2.

**Table 2: Types of breed in the study area**

Breed types	No. of respondent						%
	Adadi Felle	Adadi Matta	Lay Kombolcha	Total	Mean	SD	
Local	40	45	35	120	40	5	80
Cross and local	6	3	9	18	6	3	12
Exotic and local	4	2	6	8	4	2	8
<b>Total</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>50</b>		

From this study 80% of the households kept local chicken followed by 12% kept cross and local together and 8% of the households kept exotic and local under the same management. The majority of this chicken were managed under traditional (extensive) system due to lack of availability of feed labor and time shortage to manage tem the respondents choose free scavenging system. Form group discussion held with farmers, woman and children are the members of households take responsibility in chicken production in the study area.

*C. Source of Parent Stock Flock*

**Table 3: The source of parent flock in the study area**

Source of parent	No. HHs						%
	Adadi Felle	Adadi Matta	Lay Kombolcha	Total	Mean	SD	
Hatched	20	22	21	63	21	1	42%
Market	26	27	25	78	26	1	52%
Research center	4	1	4	9	3	1.7	6
<b>Total</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>50</b>	<b>0</b>	<b>100%</b>

The study indicated that producers purchase (bought) their chicken from research center, market and home hatched chicks. The major source of parent stock flock was from market (52%), some was from research center (6%), hatched (42%). This is approximately similar with the report of [5] 41.5% were from open markets, 13.3% from government farm and 41.5% were from home breed. DebreZeit poultry research center was major source of parent stock those who obtained from research centers.

*D. Purpose of village chicken production*

**Table 4: Purpose of village chicken in the study area**

Parameters	No. HHs						%
	Adadi Felle	Adadi Matta	Lay Kombolcha	Total	Mean	SD	
Income source	13	14	12	39	13	1	26

Egg laying & hatching	30	32	28	90	30	2	60
Consumption	7	4	10	21	7	3	14
<b>Total</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>50</b>		<b>100%</b>

This result showed that the main purpose of village chicken production in the study area was for income source (26%), for egg laying and hatching 60% and consumption 14%. This is similar with that of [6] who reported that the main objective of poultry keeping by villagers was production of eggs marketing and for home consumption. In the study area the majority of respondents have been rearing chicken for egg laying and hatching. This may to replace generation of flock.

*E. Chicken Husbandry Practice*

**Table 5: Types of feeds and feeding practice of chicken in the study area**

Parameters		No. of HHs						%
		Adadi Felle	Adadi Matta	Lay Kombolcha	Total	Mean	SD	
Source of supplementary feed	Farm produced	47	50	44	141	47	3	94
	Purchased	3	3	3	9	3	0	6
Feed used as supplementation	Wheat	35	33	37	105	35	2	70
	Barely	12	10	8	30	10	2	20
	Corn	5	6	4	15	5	1	10
Methods of feed provision	Using feeder	7	9	11	27	9	2	18
	Spread on ground	41	40	42	123	41	1	82

Under traditional management system, the major feed source of chickens scavenging feed source consisting of insets, grass and harvest left over's indicating that village chicken production system was friendly within the environment in the study area. As shown above, table the majority of respondents were depend on supplementing wheat (70%), barely (20%) and only 10% of respondents provide corn for their chickens. This may due to on is not produced in the study area. The result illustrate that village chicken producers have better initiation about poultry feeding system. Even if, the production system is extensive, this feed supplementing important to improve the productivity of chickens. Generally, good supplementation accelerates growth rate, fertility weight of chicken and avoid disease occurrence.

*F. Housing System*

Housing is very important to keep chicken from predators at night and day time. The type of houses of village chicken are shown in the table 6.

**Table 6: Housing practice of local chicken in the study area**

Housing System	No. of respondents						%
	Adadi Felle	Adadi Matta	Lay Kombolcha	Total	Mean	SD	
Near outside house	7	9	11	27	9	2	18
Perch with in the family house	27	28	29	84	28	1	56
Building house for	16	13	10	39	13	3	26

chicken							
<b>Total</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>50</b>		<b>100%</b>

The majority of respondents 56% were housed their chicken by share perch within the family house and only a few number of respondents 18% were used near outside house for poultry. In the study area the housing of village chicken production were the same house with the people over night to protect from predators, which attach chicken during night time. This result agrees with [8]who reported that chicken confined within family house during night time and released for scavenging early in the morning. So this result illustrated that respondents were not have enough knowledge about importance of constructing house. So they need assistant of professionals (expert) how they construct house for their poultry and why it is important.

*G. Production and reproduction performance of village chicken*

The average production and reproduction performance of village chicken in the study area where illustrated in table 7 below:

**Table 7: Production and reproduction of chicken in the study area**

Parameter	Adadi Felle	Adadi Matta	Lay Kombolcha	Mean	SD
Average age at 1 <sup>st</sup> egg laying(Month)	6	7	6.5	6.5	0.5
No. of egg /clutch/ hen	13	14	15	13	1
No. of brooding /hen/ year	2	3	4	3	1
No. of egg incubated	10	11	13	11	1.5
No. of chicks hatched	7	9	10	9	1.5
Clutch size	3	3	3	3	0
Hatchability	70%	82%	77%	76.%	0.5

The above table indicates that village chicken in the study area become sexual maturity and laying first egg at an average 6.5 months. The average number of eggs laid per clutch was 13, average number of clutch /hen/ year was 3 times with 76% of hatchability. The average number of chick hatched was 9 and the average number of egg incubated was 11. Farmers in the study area used local chicken for egg incubation. This study is nearly similar with the report of [6]) a breeding female chicken attain sexual maturity at the age of 6.8 months and the overall mean egg laying performance of hens for the first, second and third higher clutch were 17.0, 20.9, and 24.8 egg respectively. In my result all mean of egg laying performance of hen is less than that of [6]) report. Because farmers provide supplementation feed only during rainy season. They assume that chicken under scavenging find their feed during dry season from harvest over left.

*H. Marketing of Chicken and eggs*

**Table 8: Price of chicken and eggs in the study area**

Price of each	Birr					
	Adadi Felle	Adadi Matta	Lay Kombolcha	Total	Mean	SD
Cock	72	75	76	223	74.3	2.1
Hen	50	55	57	162	54	3.6
Pullet	36	35	39	110	36.7	2.1
Cockler	34	32	36	102	34	2
Egg	1.75	2.00	2.00	5.75	1.9	0.1

In the above table there were high price variation of chicken and egg in the study area due to festivals, coat color and size of birds. The price of cock, hen, pullet, cockler and egg on average were 74.3, 54,36.7,34 and 1.9 respectively during none fasting and festivals. The product of chicken was sold in sheno town. This market nearest to Debre Brahan and Addis Ababa and road accessibility and transportation is good. So the producer could fetch good price during festivals. According to respondent's answers, the price of chicken and egg is low during rainy season and high during New Year, Ethiopian Easter and etc. this result is line with [7] reported that the supply and demand of egg and chicken are not similar throughout the year. One of the functions of keeping village chicken by households is to purchase house consumption materials like salt, onion, kerosene and etc. Generally they engaged in chicken production for the purpose of fetch cash. This is similar with the report of [8] small holder village chicken owner sell their chicken and eggs to get income or cash

*I. Health care of village chicken*

**Table 9: Types of treatment mechanisms and local name of disease in the study area**

Parameters		No. of respondent					%	
		Adadi Felle	Adadi Matta	Lay Kombolcha	Total	Mean		SD
Traditional treatment		39	37	38	114	38	1	76
Modern treatment		6	7	8	21	7	1	14
Not used both		5	6	4	15	5	1	10
Local name of disease	Fengel (somba) (NCD)	39	37	41	117	39	2	78
	Other disease	11	13	9	33	11	2	28

In this study the producers used modern and traditional treatments for those sick chickens. The most of village chicken households were used traditional treatment (76%) such as tenadam. Feed local alcohol by mixing with Enjera and cut blood vessel those sick chickens. Some of them used modern treatment (14%) they used human related medicine and they take sick chicken to professional man that found around their environment. On the other land 10% of the respondents did not used both traditional and modern treatment due to less attitude forwards chickens. [7] reported that traditional treatment is used by the majority of chicken. In this study NCD disease were the common diseases that affect the production of village chicken in the study area.

*J. Constraints of village chicken production*

**Table 10: The main constraints of village chicken production in the study area.**

Constraints	No. of respondent					%	
	Adadi Felle	Adadi Matta	Lay Kombolcha	Total	Mean		SD
Predators	11	9	10	30	10	1	20
Disease	30	27	24	81	27	3	54
Feed shortage	5	6	4	15	5	1	10
Lack of improved breed	2	4	6	12	4	2	8
Lack of professional Assistance	2	4	6	12	4	2	8
<b>Total</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>50</b>		<b>100%</b>

Source: own survey

In this study, disease, predators, lack of professional assistant, lack of improved breed and shortage of feed were the common constraints of village chicken production. However, disease (54%) was the major challenges followed by predators (20%) in the study area. [7] also indicated that NCD is the most prevalence and that devastates village chicken production and the prevalence of NCD chicken mortality are higher at the start of the main rainy season, mainly from April to June. Similarly, [5] reported that the main cause of chicken mortality in North – West Ethiopia is found to be disease (82.8%) and mortality is more common in wet season (April – September) than dry season (October – March).

#### IV. CONCLUSION

In this study, the majority of chickens are raised under traditional management practice with low feed supplementation. The main purpose of chicken production were for income (26%), egg laying and hatching, (60%) and consumption (14%). The production performance of local chicken were low due to lack of improved breed (8%), feed shortage (10%), predators (20%), disease (54%) and lack of professional assistant (8%) were the main constraints that reduce productivity of local chicken.

The chickens share the same perch room with the family house was (56%) and chicken reach to lay first egg at an average age 6.5 months and average number of clutch /hen/ year was 3 times. Generally chicken in the study area were reared under extensive system within low management and the farmers were used traditional medicine (76%) to treat chicken when they become sick. Based on the result of this study, the following points are recommended.

Professional assistant was a major challenge for village chicken production in the study area, so should reduce this challenges by training the village households how to improve chicken productivity.

Disease was the major challenges in the study area. So as to reduce chicken mortality and improve productivity, control of disease mainly NCD could be achieved through vaccination and improvement in veterinary and advisory services.

The productivity of village chicken was low due to high mortality of chicks and low management. Therefore, to sustain the productivity obtained from village chicken, improving breeding and improved management will increase the production.

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# Numerical Solution of a non-linear Volterra Integro-differential Equation via Runge-Kutta-Verner Method

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**Abstract-** In this paper a higher-order numerical solution of a non-linear Volterra integro-differential equation is discussed. Example of this question has been solved numerically using the Runge-Kutta-Verner method for Ordinary Differential Equation (ODE) part and Newton-Cotes formulas for integral parts.

**Index Terms-** A higher-order accuracy, Lagrange interpolating, quadrature formulas, Runge-Kutta methods, non-linear Volterra integro-differential equation.

## I. INTRODUCTION

A functional equation in which the unknown function appears in the form of it is a derivative as well as under the integral sign is called an integro-differential equation (see [10, 11, 14, 15, 16]). In this paper we will consider the non-linear Volterra integro-differential equation of the form (see [2, 4, 7, 8])

$$u'(t) = u(t) (F(t, u(t), \int_{t_0}^t k(t-s)u(s) ds)), \quad u(t_0) = u_0, \quad t \geq t_0. \quad (1)$$

Equation (1) can be solved numerically using various methods (see [6, 9, 10, 11, 12]). In this paper  $u(t_n)$  will denote the exact value of  $u$  at  $t_n = t_0 + nh$ . We shall use  $\tilde{u}(t_n)$  or  $\tilde{u}_n$  to denote a numerical solution  $u$  of at  $t_n$ . However, in this paper we will construct higher-order numerical method for equation (1). Since the integral cannot be determined explicitly, it may be approximated using familiar numerical integration methods. The Newton-Cotes integration formulae, which include the 2-point closed Newton-Cotes formula is called the trapezoidal rule, the 3-point rule is known as Simpson's 1/3 rule, the 4-point closed rule is Simpson's 3/8 rule, the 5-point closed rule is Boole's rule (Bode's rule), Weddle's rule, higher rules include the 6-point, 7-point and 8-point are well suited here since they use nodes which were given in [1, 10, 13, 17] and [4, 12].

## II. THE NUMERICAL INTEGRATION OF A NON-LINEAR VOLTERRA INTEGRO-DIFFERENTIAL EQUATION

In general formulae for the numerical solution of integro-differential equations rely upon formulae for the underlying Ordinary Differential Equation (ODE), combined with auxiliary quadrature rules approximation of

$$\tilde{z}(t_n) := h \sum_{j=0}^n \omega_{n,j} k(t_n - t_j) \tilde{u}(t_j) \approx \int_{t_0}^{t_n} k(t-s) u(s) ds. \quad (2)$$

Of course, whereas we have defined approximations  $\tilde{z}(t_n)$  in terms of quadrature rules that reflect the underlying ODE method, it is in principle possible to "mix and match". The combinations of formulae can be chosen on the basis of order of convergence. The first involves adapting Runge-Kutta methods. We will require to approximate integral term

$$\tilde{z}(t_n) := h \sum_{j=0}^n \omega_{n,j} k(t_n - t_j) \tilde{u}(t_j) \approx \int_{t_0}^{t_n} k(t-s)u(s)ds$$

at selected values at  $t$ . Equation (1) can be solved several ways. In this paper we shall focus on higher-order numerical method for equation (1). The integral may be approximated using familiar numerical integration methods. The Newton-Cotes integration formulas, which include left and right rectangle rules, the trapezoidal rule, Simpson's 1/3 rule and Simpson's 3/8 rule are well suited here since they used nodes which were previously calculated [10, 11]:

$$\int_{t_0}^{t_n} k(t-s) u(s) ds \approx h \sum_{j=0}^n \omega_{n,j} k(t_n - t_j) \tilde{u}(t_j)$$

where  $\omega_{n,j}$  are the appropriate coefficients for the composite integration schemes chosen. A combination of integration method may be used.

### III. NUMERICAL ROUTINE FOR NON-LINEAR VOLTERRA INTEGRO-DIFFERENTIAL EQUATION

Now consider the non-dimensional problem (1). In order to solve (1) numerically, we purpose the use of two methods familiar to most mathematicians. We consider methods which approximate the solution the initial value problem (IVP)

$$u'(t) = u(t) F(t, u(t)), \int_0^t k(t-s) u(s) ds, u(t_0) = u_0,$$

at time  $t_n = t_0 + nh, n=0, 1, 2, 3, \dots$ , where  $h = t_n - t_{n-1}$  is the constant nodal step-size and, in the Example 3.1,

$$F(t, u(t)) = r - c \int_0^t k(t-s) u(s) ds.$$

For example, the explicit Euler method approximates the solution to Example 3.1 at  $t_{n+1}$

$$\tilde{u}_{n+1} = \tilde{u}_n + h \tilde{u}_n \left( r - c \int_0^{t_n} e^{-\delta(t-s)} u(s) ds \right).$$

The explicit finite difference method given in [11] as applied to equation (1) easily extended to more accurate predictor-corrector method. The predictor step uses  $(\tilde{u}_{n+1} = \tilde{u}_n + h \tilde{u}_n ( F(t_n, \tilde{u}_n, \tilde{z}(t_n)))$ ) to obtain  $\tilde{u}_{n+1}^k$ , which is followed by the corrector step, which uses higher order trapezoidal method

$$\tilde{u}_{n+1} = \tilde{u}_n + h \tilde{u}_n \left( \frac{1}{2} F(t_n, \tilde{u}_n, \tilde{z}(t_n)) + \frac{1}{2} F(t_{n+1}, \tilde{u}_{n+1}^k, \tilde{z}(t_{n+1})) \right). \tag{3}$$

This procedure is known as modified Euler method (second order Runge-Kutta-RK2) and is one order magnitude more accurate than the explicit Euler method.

The fourth order classical Runge-Kutta method (RK4) can also be adapted to the numerical solution of equation (1). Stepping from  $\tilde{u}_n$  with step-size h to obtain  $\tilde{u}_{n+1}$ , the RK4 method as applied to this problem in [10, 11].

The **sixth order** Runge-Kutta-Verner methods [3] may be used but not readily, since the intranodal evaluation points are uniformly spaced. Consequently, the integrals needed during the intermediate calculations to step from  $t_n$  to  $t_{n+1}$  may require the trapezoidal rule or Lagrange polynomial interpolating integration on a non-uniform partition  $[t_n, t_{n+1}]$ .

Runge-Kutta-Verner method (RKV) can also be adapted to the numerical solution of (1). Stepping from  $\tilde{u}_n$  with step-size h to obtain  $\tilde{u}_{n+1}$ , the RKV method as applied to this problem may be written as:

$$k_1 = h \tilde{u}_n F(t_n, \tilde{u}_n, \tilde{z}(t_n) ),$$

$$\tilde{u}_{n+1/6}^a = \tilde{u}_n + \frac{k_1}{6},$$

$$k_2 = h \tilde{u}_{n+1/6}^a F(t_{n+1/6}, \tilde{u}_{n+1/6}^a, \tilde{z}_{n+1/6} ),$$

$$k_2 = h \tilde{u}_{n+1/6}^a F\left( t_{n+1/6}, \tilde{u}_{n+1/6}^a, \tilde{z}_n + \frac{h}{12} [\tilde{u}_n + \tilde{u}_{n+1/6}^a] \right),$$

$$\tilde{u}_{n+4/15}^b = \tilde{u}_n + \frac{4k_1}{75} + \frac{16k_2}{75},$$

$$k_3 = h\tilde{u}_{n+4/15}^b F(t_{n+4/15}, \tilde{u}_{n+4/15}^b, \tilde{z}_{n+4/15}),$$

$$k_3 = h\tilde{u}_{n+4/15}^b F\left(t_{n+4/15}, \tilde{u}_{n+4/15}^b, \tilde{z}_n + \frac{4h}{30}[\tilde{u}_n + \tilde{u}_{n+4/15}^b]\right),$$

$$\tilde{u}_{n+2/3}^c = \tilde{u}_n + \frac{5k_1}{6} - \frac{8k_2}{3} + \frac{5k_3}{2},$$

$$k_4 = h\tilde{u}_{n+2/3}^c F(t_{n+2/3}, \tilde{u}_{n+2/3}^c, \tilde{z}_{n+2/3}),$$

$$k_4 = h\tilde{u}_{n+2/3}^c F\left(t_{n+2/3}, \tilde{u}_{n+2/3}^c, \tilde{z}_n + \frac{2h}{6}[\tilde{u}_n + \tilde{u}_{n+2/3}^c]\right),$$

$$\tilde{u}_{n+5/6}^d = \tilde{u}_n + \frac{165k_1}{64} + \frac{55k_2}{6} - \frac{425k_3}{64} + \frac{85k_4}{96},$$

$$k_5 = h\tilde{u}_{n+5/6}^d F(t_{n+5/6}, \tilde{u}_{n+5/6}^d, \tilde{z}_{n+5/6}),$$

$$k_5 = h\tilde{u}_{n+5/6}^d F\left(t_{n+5/6}, \tilde{u}_{n+5/6}^d, \tilde{z}_n + \frac{5h}{12}[\tilde{u}_n + \tilde{u}_{n+5/6}^d]\right),$$

$$\tilde{u}_{n+1}^e = \tilde{u}_n + \frac{12k_1}{15} - 8k_2 + \frac{4015k_3}{612} - \frac{11k_4}{36} + \frac{88k_5}{255},$$

$$k_6 = h\tilde{u}_{n+1}^e F(t_{n+1}, \tilde{u}_{n+1}^e, \tilde{z}_{n+1}),$$

$$k_6 = h\tilde{u}_{n+1}^e F\left(t_{n+1}, \tilde{u}_{n+1}^e, \tilde{z}_n + \frac{h}{2}[\tilde{u}_n + \tilde{u}_{n+1}^e]\right),$$

$$\tilde{u}_{n+1/15}^f = \tilde{u}_n + \frac{8263k_1}{15000} + \frac{124k_2}{75} - \frac{643k_3}{680} - \frac{81k_4}{250} + \frac{2484k_5}{10625},$$

$$k_7 = h\tilde{u}_{n+1/15}^f F(t_{n+1/15}, \tilde{u}_{n+1/15}^f, \tilde{z}_{n+1/15}),$$

$$k_7 = h\tilde{u}_{n+1/15}^f F\left(t_{n+1/15}, \tilde{u}_{n+1/15}^f, \tilde{z}_n + \frac{h}{30}[\tilde{u}_n + \tilde{u}_{n+1/15}^f]\right),$$

$$\tilde{u}_{n+1}^g = \tilde{u}_n + \frac{3501k_1}{1720} - \frac{300}{43}k_2 + \frac{297275k_3}{52632} - \frac{319k_4}{2322} + \frac{24068k_5}{84065} + \frac{3850k_7}{26703},$$

$$k_8 = h\tilde{u}_{n+1}^g F(t_{n+1}, \tilde{u}_{n+1}^g, \tilde{z}_{n+1}),$$

$$k_8 = h\tilde{u}_{n+1}^g F\left(t_{n+1}, \tilde{u}_{n+1}^g, \tilde{z}_n + \frac{h}{2}[\tilde{u}_n + \tilde{u}_{n+1}^g]\right),$$

$$\tilde{u}_{n+1} = \tilde{u}_n + \frac{13k_1}{160} + \frac{2375}{5984}k_3 + \frac{5k_4}{16} + \frac{12k_5}{85} + \frac{3k_6}{44}, \tag{4}$$

and

$$\tilde{u}_{n+1} = \tilde{u}_n + \frac{3k_1}{40} + \frac{875}{2244}k_3 + \frac{23k_4}{72} + \frac{264k_5}{1955} + \frac{125k_7}{11592} + \frac{43k_8}{616}. \tag{5}$$

In this example, the trapezoidal rule is used to approximate  $\tilde{z}(t_n) \approx \int_{t_0}^{t_n} k(t-s)u(s)ds$  on  $[t_n, t_{n+1/6}]$ ,  $[t_n, t_{n+4/15}]$ ,  $[t_n, t_{n+2/3}]$ ,  $[t_n, t_{n+5/6}]$ ,  $[t_n, t_{n+1}]$ ,  $[t_n, t_{n+1/15}]$ ,  $[t_n, t_{n+1}]$  in calculating,  $k_2, k_3, k_4, k_5, k_6, k_7$  and  $k_8$  respectively. If desired, the trapezoidal rule may be used on  $[t_0, t_n]$  (gives second order accuracy, See Table 1); the trapezoidal rule and Simpson's 1/3 rule (giving third order accuracy, see [10, 11]) may be used on  $[t_0, t_n]$ .

In order to get **higher-order** accuracy the integral term must be evaluated more accurately on  $[t_n, t_{n+1/6}]$ ,  $[t_n, t_{n+4/15}]$ ,  $[t_n, t_{n+2/3}]$ ,  $[t_n, t_{n+5/6}]$ ,  $[t_n, t_{n+1}]$ ,  $[t_n, t_{n+1/15}]$ ,  $[t_n, t_{n+1}]$  in calculating,  $k_2, k_3, k_4, k_5, k_6, k_7$  and  $k_8$ , as shown in (6), (7), (8), (9), (10), (11), (12) below. The 5-point extended closed rule is Boole's method may be devised on  $[t_0, t_n]$  as following:

$$z(1)=0$$

$$u(1)=u_0$$

$$\text{If } n=1$$

$$z(n+1)= z(n) + h( u(n) + u(n+1) ) / 2$$

$$\text{elseif } n==2$$

$$z(n+1)= z(n-1) + h( u(n-1) + 4 u(n) + u(n+1) ) / 3$$

$$\text{elseif } n==3$$

$$z(n+1)= z(n-2) + 3h ( u(n-2) + 3 u(n-1) + 3 u(n) + u(n+1) ) / 8$$

$$\text{elseif } n==4$$

$$z(n+1)= z(n-3) + 2h ( 7 u(n-3) + 32 u(n-2) + 12u(n-1) + 32 u(n) + 7 u(n+1) ) / 45$$

$$\text{elseif } n==5$$

$$z(n+1)= z(n-4) + 5h ( 19 u(n-4) + 75 u(n-3) + 50 u(n-2) + 50 u(n-1) + 75 u(n) + 19 u(n+1) ) / 288$$

$$\text{elseif } n==6$$

$$z(n+1)= z(n-5) + h ( 41u(n-5) + 216 u(n-4) + 27 u(n-3) + 272 u(n-2) + 27 u(n-1) + 216 u(n) + 41 u(n+1) ) / 140$$

$$\text{elseif } n==7$$

$$z(n+1)= z(n-6) + 7h ( 751u(n-6) + 3577u(n-5) + 1323 u(n-4) + 2989 u(n-3) + 2989 u(n-2) + 1323 u(n-1) + \dots + 3577 u(n) + 7511 u(n+1) ) / 17280$$

$$\text{elseif } n==8$$

$$z(n+1)= z(n-3) + 2h ( 7 u(n-3) + 32 u(n-2) + 12u(n-1) + 32 u(n) + 7 u(n+1) ) / 45$$

$$\text{elseif } \text{mod}(n,4)==0$$

$$z(n+1)= z(n-3) + 2h ( 7 u(n-3) + 32 u(n-2) + 12u(n-1) + 32 u(n) + 7 u(n+1) ) / 45$$

$$\text{elseif } \text{mod}(n,4)==1$$

$$z(n+1)= z(n-3) + 2h ( 7 u(n-3) + 32 u(n-2) + 12u(n-1) + 32 u(n) + 7 u(n+1) ) / 45$$

$$\text{elseif } \text{mod}(n,4)==2$$

$$z(n+1)= z(n-3) + 2h ( 7 u(n-3) + 32 u(n-2) + 12u(n-1) + 32 u(n) + 7 u(n+1) ) / 45$$

$$\text{elseif } \text{mod}(n,4)==3$$

$$z(n+1)= z(n-3) + 2h ( 7 u(n-3) + 32 u(n-2) + 12u(n-1) + 32 u(n) + 7 u(n+1) ) / 45$$

$$\text{else}$$

$$z(n+1)= z(n-3) + 2h ( 7 u(n-3) + 32 u(n-2) + 12u(n-1) + 32 u(n) + 7 u(n+1) ) / 45$$

If we interpolating on  $\tilde{u}_{n-2}, \tilde{u}_{n-1}, \tilde{u}_n, \tilde{u}_{n+1/6}$  (special formulae required for the first two steps, for example we can use (4) and (5)) Lagrange's formula for points  $t=-2, -1, 0, 1/6$  gives

$$u(t) = \frac{1}{h^3} \left[ -\frac{3}{13} t \left( t - \frac{h}{6} \right) (t+h) u_{-2} + \frac{6}{7} t \left( t - \frac{h}{6} \right) (t+2h) u_{-1} - 3(t+h)(t+2h) \left( t - \frac{h}{6} \right) u_0 + \frac{216}{91} t(t+h)(t+2h) u_{1/6} \right].$$

If we integrate the expression between 0 and h/6, we get

$$\int_0^{h/6} u(s) ds \approx h \left( \frac{13}{168} u_{1/6} + \frac{1}{5184} u_{-2} - \frac{25}{18144} u_{-1} + \frac{469}{5184} u_0 \right). \tag{6}$$

Similarly, we can find  $t = t = -2, -1, 0, 4/15$

$$\int_0^{4h/15} u(s) ds \approx h \left( \frac{34}{285} u_{4/15} + \frac{8}{10125} u_{-2} - \frac{1024}{192375} u_{-1} + \frac{1538}{10125} u_0 \right), \tag{7}$$

and find  $t = t = -2, -1, 0, 2/3$

$$\int_0^{2h/3} u(s) ds \approx h \left( \frac{4}{15} u_{2/3} + \frac{1}{81} u_{-2} - \frac{28}{405} u_{-1} + \frac{37}{81} u_0 \right), \tag{8}$$

and find  $t = t = -2, -1, 0, 5/6$

$$\int_0^{5h/6} u(s) ds \approx h \left( \frac{85}{264} u_{5/6} + \frac{125}{5184} u_{-2} - \frac{3625}{28512} u_{-1} + \frac{3185}{5184} u_0 \right), \tag{9}$$

and find  $t = t = -2, -1, 0, 1$

$$\int_0^h u(s) ds \approx h \left( \frac{3}{8} u_1 + \frac{1}{24} u_{-2} - \frac{5}{24} u_{-1} + \frac{19}{24} u_0 \right), \tag{10}$$

and find  $t = t = -2, -1, 0, 1/15$

$$\int_0^{h/15} u(s) ds \approx h \left( \frac{31}{960} u_1 + \frac{1}{81000} u_{-2} - \frac{61}{648000} u_{-1} + \frac{2791}{81000} u_0 \right), \tag{11}$$

and finally find  $t = t = -2, -1, 0, 1$

$$\int_0^h u(s) ds \approx h \left( \frac{3}{8} u_1 + \frac{1}{24} u_{-2} - \frac{5}{24} u_{-1} + \frac{19}{24} u_0 \right). \tag{12}$$

Therefore the Runge-Kutta-Verner formulae become  $n \geq 3$  (for starting values we can use equation (4) and (5))

$$k_1 = h \tilde{u}_n F(t_n, \tilde{u}_n, \tilde{z}(t_n)),$$

$$\tilde{u}_{n+1/6}^a = \tilde{u}_n + \frac{k_1}{6},$$

$$k_2 = h \tilde{u}_{n+1/6}^a F(t_{n+1/6}, \tilde{u}_{n+1/6}^a, \tilde{z}_{n+1/6}),$$

$$k_2 = h \tilde{u}_{n+1/6}^a F \left( t_{n+1/6}, \tilde{u}_{n+1/6}^a, \tilde{z}_n + h \left[ \frac{13}{168} \tilde{u}_{n+1/6}^a + \frac{1}{5184} \tilde{u}_{n-2} - \frac{25}{18144} \tilde{u}_{n-1} + \frac{469}{5184} \tilde{u}_n \right] \right),$$

$$\tilde{u}_{n+4/15}^b = \tilde{u}_n + \frac{4k_1}{75} + \frac{16k_2}{75},$$

$$k_3 = h \tilde{u}_{n+4/15}^b F(t_{n+4/15}, \tilde{u}_{n+4/15}^b, \tilde{z}_{n+4/15}),$$

$$k_3 = h \tilde{u}_{n+4/15}^b F\left(t_{n+4/15}, \tilde{u}_{n+4/15}^b, \tilde{z}_n + h\left[\frac{34}{285} \tilde{u}_{n+4/15}^b + \frac{8}{10125} \tilde{u}_{n-2} - \frac{1024}{192375} \tilde{u}_{n-1} + \frac{1538}{10125} \tilde{u}_n\right]\right),$$

$$\tilde{u}_{n+2/3}^c = \tilde{u}_n + \frac{5k_1}{6} - \frac{8k_2}{3} + \frac{5k_3}{2},$$

$$k_4 = h \tilde{u}_{n+2/3}^c F(t_{n+2/3}, \tilde{u}_{n+2/3}^c, \tilde{z}_{n+2/3}),$$

$$k_4 = h \tilde{u}_{n+2/3}^c F\left(t_{n+2/3}, \tilde{u}_{n+2/3}^c, \tilde{z}_n + h\left[\frac{4}{15} \tilde{u}_{n+2/3}^c + \frac{1}{81} \tilde{u}_{n-2} - \frac{28}{405} \tilde{u}_{n-1} + \frac{37}{81} \tilde{u}_n\right]\right),$$

$$\tilde{u}_{n+5/6}^d = \tilde{u}_n + \frac{165k_1}{64} + \frac{55k_2}{6} - \frac{425k_3}{64} + \frac{85k_4}{96},$$

$$k_5 = h \tilde{u}_{n+5/6}^d F(t_{n+5/6}, \tilde{u}_{n+5/6}^d, \tilde{z}_{n+5/6}),$$

$$k_5 = h \tilde{u}_{n+5/6}^d F\left(t_{n+5/6}, \tilde{u}_{n+5/6}^d, \tilde{z}_n + h\left[\frac{85}{264} \tilde{u}_{n+5/6}^d + \frac{125}{5184} \tilde{u}_{n-2} - \frac{3625}{28512} \tilde{u}_{n-1} + \frac{3185}{5184} \tilde{u}_n\right]\right),$$

$$\tilde{u}_{n+1}^e = \tilde{u}_n + \frac{12k_1}{15} - 8k_2 + \frac{4015k_3}{612} - \frac{11k_4}{36} + \frac{88k_5}{255},$$

$$k_6 = h \tilde{u}_{n+1}^e F(t_{n+1}, \tilde{u}_{n+1}^e, \tilde{z}_{n+1}),$$

$$k_6 = h \tilde{u}_{n+1}^e F\left(t_{n+1}, \tilde{u}_{n+1}^e, \tilde{z}_n + h\left[\frac{3}{8} \tilde{u}_{n+1}^e + \frac{1}{24} \tilde{u}_{n-2} - \frac{5}{24} \tilde{u}_{n-1} + \frac{19}{24} \tilde{u}_n\right]\right),$$

$$\tilde{u}_{n+1/15}^f = \tilde{u}_n + \frac{8263k_1}{15000} + \frac{124k_2}{75} - \frac{643k_3}{680} - \frac{81k_4}{250} + \frac{2484k_5}{10625},$$

$$k_7 = h \tilde{u}_{n+1/15}^f F(t_{n+1/15}, \tilde{u}_{n+1/15}^f, \tilde{z}_{n+1/15}),$$

$$k_7 = h \tilde{u}_{n+1/15}^f F\left(t_{n+1/15}, \tilde{u}_{n+1/15}^f, \tilde{z}_n + h\left[\frac{31}{960} \tilde{u}_{n+1/15}^f + \frac{1}{81000} \tilde{u}_{n-2} - \frac{61}{648000} \tilde{u}_{n-1} + \frac{2791}{81000} \tilde{u}_n\right]\right),$$

$$\tilde{u}_{n+1}^g = \tilde{u}_n + \frac{3501k_1}{1720} - \frac{300}{43} k_2 + \frac{297275k_3}{52632} - \frac{319k_4}{2322} + \frac{24068k_5}{84065} + \frac{3850k_7}{26703},$$

$$k_8 = h \tilde{u}_{n+1}^g F(t_{n+1}, \tilde{u}_{n+1}^g, \tilde{z}_{n+1}),$$

$$k_8 = h \tilde{u}_{n+1}^g F\left(t_{n+1}, \tilde{u}_{n+1}^g, \tilde{z}_n + h\left[\frac{3}{8} \tilde{u}_{n+1}^g + \frac{1}{24} \tilde{u}_{n-2} - \frac{5}{24} \tilde{u}_{n-1} + \frac{19}{24} \tilde{u}_n\right]\right),$$

(13)

and the sixth-order method

$$\tilde{u}_{n+1} = \tilde{u}_n + \frac{3k_1}{40} + \frac{875}{2244} k_3 + \frac{23k_4}{72} + \frac{264k_5}{1955} + \frac{125k_7}{11592} + \frac{43k_8}{616}$$

is used to estimate the error in the fifth-order method

$$\tilde{u}_{n+1} = \tilde{u}_n + \frac{13k_1}{160} + \frac{2375}{5984} k_3 + \frac{5k_4}{16} + \frac{12k_5}{85} + \frac{3k_6}{44}.$$

In Example 3.1, we have used Runge-Kutta-Verner methods and numerical quadrature, trapezoidal rule, the 3-point rule is known as Simpson's 1/3 rule, the 4-point closed rule is Simpson's 3/8 rule, the 5-point closed rule is Boole's rule (Bode's rule), Weddle's rule, higher rules include the 6-point, 7-point and 8-point and their combinations.

**Example 3.1:** Consider a first order non-Linear Volterra integro-differential equation of the form

$$u'(t) = u(t) \left( r - c \int_0^t e^{-\delta(t-s)} u(s) ds \right), \quad t \geq 0; \quad u(0) = u_0. \tag{14}$$

For analytical solution of equation (14), take  $\delta = 0$  in (14). In equation (14), if we choose  $r = 2, c = 2, u_0 = 0.1$  we will get exact solution as

$$u(t) = \frac{22(21 + 2\sqrt{110})e^{\sqrt{\frac{22}{5}}t}}{5 \left( 21 + 2\sqrt{110})e^{\sqrt{\frac{22}{5}}t} \right)^2}. \text{ Now, writing } m(t) = \int_0^t u(s)ds, \text{ this is the same as the differential equation}$$

$$u'(t) = u(t)(r - cm(t)),$$

$$u'(t) = ru(t) - cm(t)u(t),$$

If  $m(t) = \int_0^t u(s)ds$  then  $m'(t) = u(t)$  and  $m''(t) = u'(t)$ . Additionally,  $m(0) = 0$  and  $m'(0) = u(0) = u_0$ .

$$m''(t) = r m'(t)(r - cm(t)),$$

$$m''(t) = r m'(t) - c m'(t)m(t),$$

Equivalent to the modified logistic equation for  $m(t)$ ,

$$m'(t) = r m(t) - \frac{c m^2(t)}{2} + m'(0),$$

$$m'(t) = r m(t) - \frac{c m^2(t)}{2} + u(0),$$

$$m'(t) = -\frac{c m^2(t)}{2} + r m(t) + u_0,$$

$$m'(t) = -\frac{c}{2} (m^2(t) - \frac{2r m(t)}{c} - \frac{2u_0}{c}),$$

$$m'(t) = -\frac{c}{2} (m(t) - a)(m(t) + b),$$

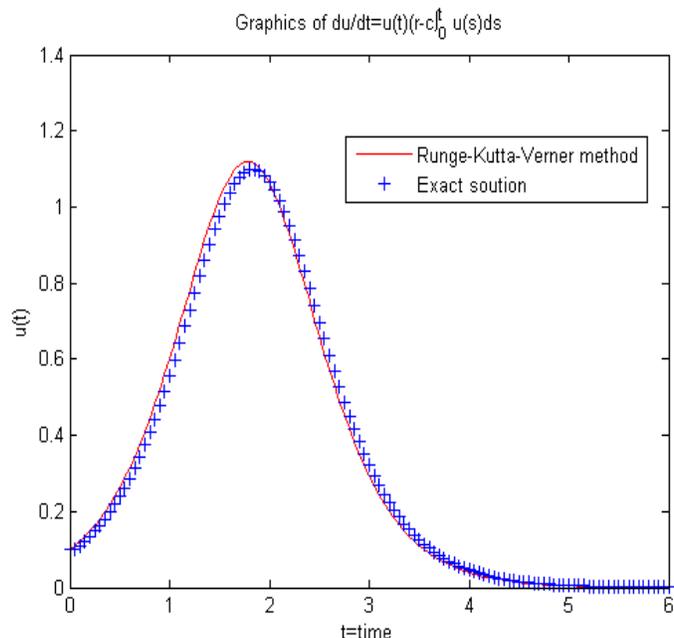
(15)

where  $a$  and  $b$  are roots of

$$m^2(t) - \frac{2r m(t)}{c} - \frac{2u_0}{c}.$$

If we solve equation (15) with initial condition  $m(0) = 0$  we get

$$m(t) = \frac{a e^{\frac{cat+cbt}{2}} - a}{e^{\frac{cat+cbt}{2}} + \frac{a}{b}},$$



After rearranging above solution we obtain 
$$m(t) = \frac{ab(e^{\frac{c}{2}(a+b)} - 1)}{be^{\frac{c}{2}(a+b)} + a}$$

$m(t) = \frac{ab(e^{\gamma t} - 1)}{be^{\gamma t} + a}$ , where  $\gamma = \frac{c}{2}(a+b)$  and  $ab = \frac{2u_0}{c}$ . We know that our exact solution was  $u(t)$ . When  $m'(t) = u(t)$ ,

$u(t) = \frac{u_0(a+b)^2 e^{\gamma t}}{(a + be^{\gamma t})^2}$  analytical solution of equation (14). Here  $a$  and  $b$  are roots of the equation  $m^2(t) - \frac{2r m(t)}{c} - \frac{2u_0}{c}$ ,

(where  $u_0 > 0$ ) so that  $a$  is approached by  $m$  at large values of  $t$ . The exponent  $\gamma$  is defined by  $\gamma = \frac{c}{2}(a+b)$ .

**Table 1:** Numerical solutions (14) for RKV method ( $r = 2, c = 2, u_0 = 0.1, \delta = 0, t_{\max} = 6$ ).

t	Numerical solution h=0.00625	Numerical solution h=0.003125	Actual Solution Results	Error with h=0.00625	Error with h=0.003125
1.0	0.5994306	0.5991739	0.5989171	5.1351e-04	2.5687e-04
2.0	1.0465870	1.0454132	1.0442420	2.3451e-03	1.1712e-03
3.0	0.2939327	0.2940388	0.2941451	2.1246e-04	1.0632e-04
4.0	0.0409158	0.0410287	0.0411417	2.2590e-04	1.1302e-04
5.0	0.0050827	0.0051087	0.0051348	5.2069e-05	2.6078e-05
6.0	0.0006223	0.0006269	0.0006316	9.2785e-06	4.6520e-06

Runge-Kutta-Verner method (RKV) and numerical quadrature rules results.

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# Fabrication of Micro-Pillar with PCM and X-ray Lithography

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**Abstract-** Microfabrication is actually a collection of technologies which are utilized in making microdevices. Some of them have very old origins, not connected to manufacturing, like lithography or etching. Electroplating is technique adapted to produce micrometre scale structures, as are various stamping and embossing techniques. Micro-Components are required in a range of new products such as medical devices, Micro-Pillar, Micro-Well, Micro-Chamber Micro-Fluidic Systems. This paper describes the Manufacturing of X-ray Mask with Photo-Chemical Machining (PCM) and the Fabrication of Micro-Pillar on Poly-Methyl-Meth-Acrylate (PMMA) with X-ray Lithography Technology. Fabrication of low cost X-ray mask has been done on Brass sheet using PCM. X-ray Lithography is used to obtain high aspect ratio Micro-Pillar for developing Micro-fluidic system. Synchrotron radiation of Beam line BL-07 at INDUS-2, RRCAT Indore is the source of X-ray for Lithography.

**Index Terms-** Photochemical Machining (PCM), Poly-Methyl-Meth-Acrylate (PMMA), High Aspect Ratio (HAR), Beam Line (BL)

## I. INTRODUCTION TO PHOTO-CHEMICAL MACHINING

Photochemical machining is an engineering production technique for the manufacture of burr free and stress free flat metal components by selective chemical etching through a photographically produced mask [1].

The major steps are:

- Preparation of phototool
- Selection of metal
- Preparation of workpiece
- Masking with photoresists
- Etching
- Stripping and inspection

### X-ray Mask preparation with PCM Process:

#### Specimen

Specimens are cut in square or rectangle with required size of Brass material having thickness 100 micron.

#### Artwork creation

On Auto Cad artwork of given size is prepared. Print out is taken on trace paper.

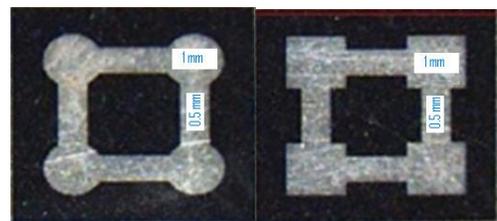


Fig.1 Pillar drawing is of 1000µm X 500µm.

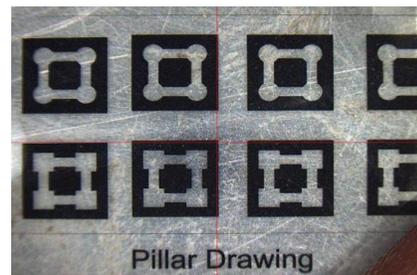


Fig.2 Basic shapes drawn with Auto CAD software

#### Negative preparation

Drawing on trace paper will become negative for our mask preparation.

#### Cleaning and Lamination

Before the Cu metal surface is coated with photo resist, clean the surface thoroughly, so as to make it completely free of physical & chemical contamination. It is advisable to clean the metal by solvent like Trichloroethylene to remove traces of Grease or oil. Contaminants such as Cupric – Oxide, Dirt etc, can be removed. Traces of such cleaning powder should then be removed by washing the metal plates under running water & scrubbing it with a soft brush. The surface should be quickly & thoroughly dried with forced warm water.

### Coating and Lamination

Photo resist can be applied precisely and economically by using a dipping process, done by a photo resist dip coater. After coating it is taken out from tank & dried it for 15 min.

### U.V. Exposure

The coated laminate is normally exposed in contact with photographic negative. Photo resist is sensitive to U.V. radiation & therefore an U.V tube based, U.V exposure unit can be used for exposure. The time of exposure depends upon many factors e.g. The source of light, thickness of coating, distance between the source of light & printing down frame etc. For double side exposure unit it is desirable to use double sided sandwich glass for printing frame. In sandwich plate negative & coated work piece placed for three minute & then taken off.

### Development

Exposed plate should be placed into solvent based developer. This will remove unexposed areas of the photo resist & will show a colorless resist image which has plastic like appearance. The total development time is between 60-90 sec.

### Washing

Immediately after development is over, wash it in running water on neutral pH. After washing & drying, dyeing is carried out to improve the visibility to the image & to find out any cracks or broken line & to facilitate the same for the purpose of re-touching before etching.

### Etching

This is an important and critical step in PCM process. Although basically this operation aims at chemical removal of unwanted Cu portion. Good results can be obtained by carefully studying the various aspects of the operation. Ferric Chloride is one of the most widely used etchant for Cu & Cu alloys. The main reason for its popularity is the low cost.

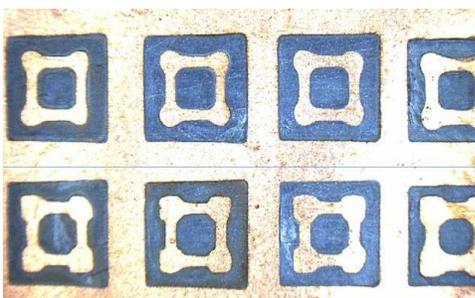


Fig.3 Brass Mask for Pillar Structure

### Experimental Setup

During experimentation temperature, the time of etching and concentration of etchant is necessarily to be changed. For this heating bath as shown in figure is used in which varies

temperature from 20 °C to 125 °C. In this heating bath heater is used to change the temperature of water which can be sensed by sensor. In this heated water, four beakers can be placed for experimentation. These instruments are used in place of etching machine shown in following figures.



Fig.4 U V Exposure



Fig.5 Laminate Coater



Fig.6 Etching Machine



Fig.7 Set for etching



Fig.8 Chemicals



Fig.9 Etching machine set up

## II. INTRODUCTION TO X-RAY LITHOGRAPHY

X-ray lithography is a process by which an image is transferred from an absorbing mask to a radiation-sensitive resist film (Fig.10). Alignment of x-ray mask to the substrate is required for multi-layer x-ray lithography applications and so called mix-and-match techniques, when different types of microlithography are used for different technological layers. The resulting latent image in the resist is then developed to produce a patterned resist mask which acts as a shield in the next step of microfabrication, when material is either removed from the substrate by etching through the resist mask or additional material is deposited [3].

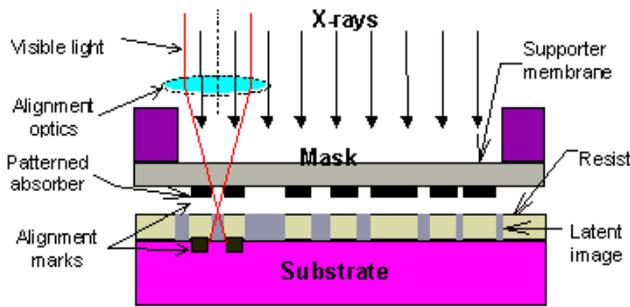


Fig.10 Schematic view of the proximity X-ray lithography process

Dr. Guckel contributed significantly to the original effort in X-ray lithography at the university and was a member of the Sematech Center of Excellence in X-ray lithography. His interests in micromechanics involve two research areas: surface micromachining and deep X-ray lithography. His efforts in deep X-ray lithography and electroplating are contributing significantly to three-dimensional micromechanisms[4].

Y. Cheng and B.Y. Shew informed on Deep X-ray lithography (DXL). They used to manufacturing much deeper and more precise microstructures than those produced by the conventional LIGA process[5].

C.Y. Lin, M.K. Chyu gave the technical focus of LIGA lies mainly on the use of X-rays low diffraction and high penetration features to generate a molding die for high-aspect-ratio microstructures. As a general notion in X-ray lithography, the fabricating depth is deemed to be only a function of the irradiating X-ray wavelength[6].

Timo Mappes and Sven Achenbach focused on X-ray lithography for devices with high aspect ratio polymer submicron structures. X-ray lithography fabrication sequence process conditions for polymer structures and metal replica with submicron feature size and high AR were determined [7].

M.C. Chou and C.T. Pan explored the Study of deep X-ray lithography behaviour for microstructures. The aim of their study was to investigate how the exposure dosage and developing temperature affect the developing rate for microstructures, with and without ultrasonic stirring, when the photoresist is exposed to X-ray radiation [8].

Physically the process of exposure in X-ray lithography is the same as in ordinary optical lithography, but the wavelengths involved are much shorter (0.1 - 10 nm in X-ray lithography versus 150-450 nm in the optical case). The current position of X-ray lithography in the spectrum of microfabrication techniques is still a technique for tomorrow. However, demands for a high throughput lithography tool capable of resolution beyond 0.18  $\mu\text{m}$  will almost certainly arise by the year 2001, and X-ray lithography with its resolution limit of nearly 30 nm will always remain an attractive possibility and may even represent the last resort for planar technology. While the use of X-ray lithography in commercial manufacturing of ULSI ICs is probably only a matter of time, its use for nanostructuring is already required in order

to avoid the use of slow and expensive e-beam lithography in cases where large volumes of nanostructures are to be produced. Most of these nanostructures can only be of high scientific and commercial value, if a parallel method for their mass replication is used.

The BL beamline (Fig.11) was designed to conduct the beam of X-rays from the bending magnet of the MAXII ring to the lithography set up. It has two Be windows for vacuum insulation as well as beam-shaping baffles and the usual equipment for pumping and pressure monitoring. A high speed X-ray scanner has been built and commissioned.

One of the most important features of the scanner is its high scanning speed up to 200 mm/s. Maximum exposed area is 76 x 76 mm.

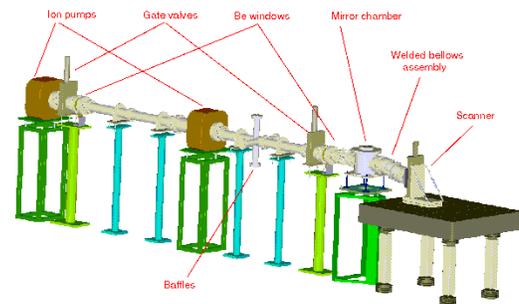


Fig.11 Fragment of the BL beamline with exposure station

X-ray Lithography is used to obtain Micro-Well, Micro-Pillar. In India, Synchrotron radiation of Beam line BL-07 at INDUS-2, RRCAT Indore is the source of X-ray for Lithography.

**X-ray Mask:** X-ray mask consist of low z membrane material for transmission of x-rays and high z absorbing material for absorption of hard x-rays. For experimental work, low cost x-ray PCM Brass and Copper masks are used. PCM based X-ray mask is made from Copper and Brass using Photochemical Machining. Fig. 12 shows the PCM based Brass x-ray mask used for the x-ray exposures.

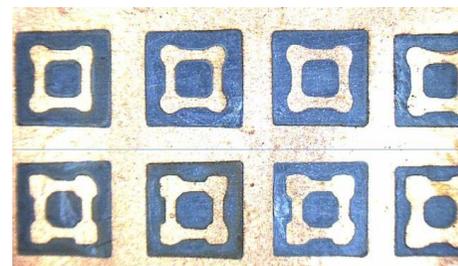


Fig.12 PCM Based X-ray Brass mask of 100 $\mu\text{m}$  thickness

**X-ray Exposure:** PCM based X-ray mask is fastened on PMMA sheet with the help of KEPTON TAPE

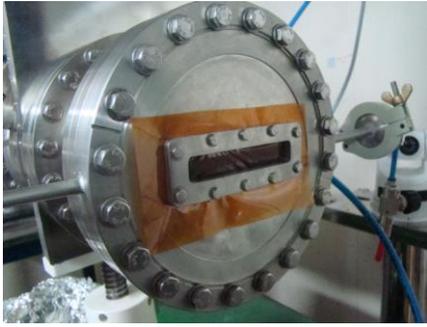


Fig.13 The x-ray beam coming out from the rectangular



Fig.14 The x-ray mask and PMMA in mounted



Fig. 15 The x-ray mask and PMMA in mounted on LM guide ways and ready for X-ray Exposure

PMMA sheet of 12 mm thickness is used for X-ray exposure. Table gives detail of the exposure dose in units of mA.s/cm. Indus-2 was running at 2.5 GeV operations during exposures. Table 2 gives X-ray dose data for Micro-Pillar structure development.

Table 2: X-ray Dose Data for Micro-Pillar

Sr. No.	Name of Mask	Exposed Dose
1.	Brass Masks to achieve Micro Pillar structures on PMMA	1,60,730 mA.s/cm

### Development of PMMA samples:

After X-ray dose exposure to PMMA then development of PMMA is done the help of PMMA Developer. The composition PMMA developer is described in Table 3.

Table 3: The PMMA developer used which consists of:

Sr. No.	Name of Chemical	% Volume
1	Di-ethyleneglycol mono-butylether	60
2	Morphelene	20
3	Ethanolamine	5
4	Water	15

After development we get the micro-structures on PMMA. Fig.16 shows fabricated Micro-Pillar with X-ray Lithography at BL-07 RRCAT, Indore.

PMMA Development Time: 96 Hours for Micro-Pillar.

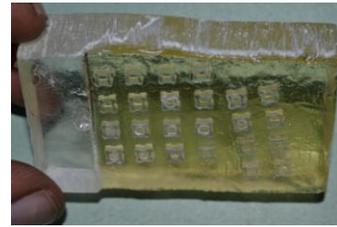


Fig.16 Fabricated Micro-Pillar on PMMA with X-ray Lithography

Micro-Pillar height readings were taken with the help of RAPID I-Vision Measuring Instrument. Table 4 describes height of pillar and aspect ratio.

Table 4: Characterization of Micro-Pillar

Sr. No.	Height of Pillar	Max. Aspect Ratio
1	1.2517	2.5
2	1.2876	2.5752
3	1.2135	2.427
4	1.3483	2.6966
5	1.2969	2.5938

Average Pillar Height=1.2796mm

### III CONCLUSION

This paper gives brief information about PCM and X-ray lithography in general. For X-ray Lithography technique, Brass mask can be prepared by using PCM process with cost effective way. Micro-Pillar fabricated which gave maximum aspect ratio as 2.69. Max. height achieved 1.3483. Average Mciro-Pillar height is achieved 1.2796 mm. This paper gives guideline for fabrication of micro-structures in PMMA material with precise accuracy. Micro-Pillar, Micro-Channel also can be fabricated with the same method which is mentioned in this paper.

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# Air temperature trends in Baghdad, Iraq for the period 1941-2000

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**Abstract-** Climate change is considered one of the major world concerns of present times. Air temperature is the most effective meteorological element for detecting climate change. The aim of this research is to investigate trends of temperature in the period 1941-2000 for Baghdad, Iraq. The trends in temperature including minimum, maximum, and mean monthly means were analyzed using the linear regression method. Data were also subjected to 11-year running mean to detect trends. The nonparametric statistics of Man-Kendall was applied to determine the significance of trends. Results showed that there was a warming period during the 1950's to mid-1960's and a cooling period during the period from mid-1960's to 1980's particularly during winter and summer seasons. It was also found that there was a strong tendency for a temperature increasing in the late 1990's during the summer season. Mann-Kendall rank statistics indicated that the mean temperature was significantly increased during the months of April and July and decreased during November.

**Index Terms-** Climate change; air temperature; Baghdad; Measurements; Man-Kendall test.

## I. INTRODUCTION

An increasing body of observations and analysis gives a collective picture of a warming world and other changes in the climate system. The global average surface temperature has increased over the 20th century by about 0.6 C. Climate change is threatening the food production, drinking water supplies and sustainable development throughout the world. Rising sea level, extreme weather events and desertification is just a few of the effects, especially threatening the millions of people living in less developed countries. Intergovernmental Panel on Climate Change report (IPCC 2001) [1] expresses that global warming mainly caused by human activities is a reality and there are growing fears of feedbacks that will accelerate this warming. Climate change may have strong implications for political, economic, and social policy [2]. Because climate change affects such a wide variety of disciplines and people, pursuing research in this field can generate important results that should be taken into account in strategic plans and policies [3].

Climate change research has been conducted in many parts of the world including the middle East. Several studies have reported that the Middle East region may face more aridity due to temperature increase and rainfall decrease. Nasrallah and Balling

(1995) [4] found a statistically significant temperature increase of 0.07°C/decade over Kuwait during the period of 1950-1990.

In Jordan, located on the northern part of the Arabian Peninsula, Smadi (2006) [5] performed a study to trace changes in annual and seasonal temperature during the 20th century. His results showed a warming trend starting from the years 1957 and 1967 for the minimum and maximum temperatures respectively. Bou-Zeid and El-Fadel (2002) [6] conducted a wide study covering the whole Middle East region. They found that water balance would be highly affected by the increasing temperature trend at a rate of 0.6-2.1°C. Ghahraman (2006) [7] evaluated the long-term trend of mean annual temperature at 34 synoptic stations in Iran with a minimum record of 30 years by the Student's t test. He concluded that there was a positive trend in 50% of the stations, while 41% of the stations had a negative trend. In addition, the behavior of trend direction was different for different climates and no specific pattern was found. Al-Zawad (2008) [8] studied the impacts of climate change on water resources in KSA using the climate model "PRECIS". The results of this model were fairly correlated to the historic climatic data of the region. He concluded that the temperature, the evaporation and the wind speed have showed an increasing trend on all regions of the country. Tecer and Crite (2009) [9] analyzed the mean, maximum, and minimum temperatures of the city Rize in Turkey to reveal trends, change points, significant warming (cooling) periods. They found that maximum temperatures have dramatically increased with 1.61°C over the last 33 years while annual minimum temperatures have increased by 0.99°C over the same period. Recently, Elner et al. (2010) [10] have analyzed the temperature trends and distribution in the Arabian Peninsula. They concluded that concluded that KSA as well as the Arabian Peninsula are suffering from a considerable warming temperature trend. Tabari and Talaee (2011) [11] investigated the trends of the annual, seasonal and monthly maximum and minimum air temperatures time series were investigated for 20 stations in the western half of Iran during 1966-2005. Their results indicated that a positive trend was found in 85% of the stations and there was a negative trend in 15% of the stations in the study region.

## II. MATERIALS AND METHOD

Baghdad is the capital of Iraq and its located in the central region of the country. Its geographical coordinates are 33° N and 44.4° E. Winds reaching the city are generally dry and because of the aridity and the relatively cloudless skies, there are large variations in daily temperature as well as between seasons and regions. Monthly means of minimum, maximum, and mean

temperature data for Baghdad were obtained from the Iraqi Meteorological Office for the period of 1941-2000. Time series analysis methods were used to detect any trends in the parameters under study. The data were subjected to the 11<sup>year</sup> running mean to detect trends. A linear trend line was used to the series to simplify the trend. The nonparametric statistics known as Man-Kendall [12] [13] was used. The Mann-Kendall test is a non-parametric test used for identifying trends in a time series data. The test compares the relative magnitudes of sample data rather than the data values themselves. The test statistic S, which has mean zero and a variance computed by Eq. 3, is calculated using Eqs. 1 and 2, and is asymptotically normal:

$$S = \sum_{k=1}^{n-1} \sum_{j=k+1}^n \text{sign}(x_j - x_k)$$

where  $x_1, x_2, \dots, x_n$  represent n data points,  $x_j$  represents the data point at time j, and

$$\text{sign}(x_j - x_k) = \begin{cases} 1 & \text{if } (x_j - x_k) > 0 \\ 0 & \text{if } (x_j - x_k) = 0 \\ -1 & \text{if } (x_j - x_k) < 0 \end{cases}$$

A very high positive value of S is an indicator of an increasing trend, and a very low negative value indicates a decreasing trend. However, it is necessary to compute the probability associated with S and the sample size, n, to statistically quantify the significance of the trend.

The variance of S, VAR(S), is calculated by the following equation:

$$\text{VAR}(S) = \frac{1}{18} [n(n-1)(2n+5) - \sum_{p=1}^g t_p(t_p-1)(2t_p+5)]$$

where n is the number of data points, g is the number of tied groups (a tied group is a set of sample data having the same value), and t is the number of data points in the p<sup>th</sup> group.

The normalized test statistic Z is computed as follows:

$$Z = \begin{cases} \frac{S-1}{[\text{VAR}(S)]^{1/2}} & \text{if } S > 0 \\ 0 & \text{if } S = 0 \\ \frac{S+1}{[\text{VAR}(S)]^{1/2}} & \text{if } S < 0 \end{cases}$$

The probability density function for a normal distribution with a mean of 0 and a standard deviation of 1 is given by the following equation:

$$f(Z) = \frac{1}{\sqrt{2\pi}} e^{-Z^2/2}$$

### III. RESULTS AND DISCUSSION

Table 1 shows the mean minimum  $T_{\min}$ , mean maximum  $T_{\max}$ , and mean temperature along with their standard deviation (SD) and coefficient variation for each month and for the four seasons, winter, spring, summer, and autumn. These values were computed from the original data. December, January, and February are considered to represent the winter season since these months are characterized by lowest maximum temperature. June, July, and August are characterized by highest maximum temperature and therefore they are considered to represent the summer season. spring and autumn are respectively represented by three months of March, April, May and September, October, November.

Figures 1 to 4 show the trends of  $T_{\text{mean}}$ ,  $T_{\min}$ , and  $T_{\max}$  in Baghdad for the winter, spring, summer, autumn. It seen from these results that the winter season shows a slight decreasing trends for  $T_{\min}$ ,  $T_{\max}$ , and  $T_{\text{mean}}$ . All the three trends for the spring season are increasing. For summer season,  $T_{\min}$  trend is slightly decreasing while  $T_{\max}$  trend is notably increasing resulting an increase in the  $T_{\text{mean}}$  trend. Autumn season is characterized by a decreasing trends in  $T_{\min}$  and  $T_{\max}$  and consequently in  $T_{\text{mean}}$ . Figure 5 shows the trends for the annual temperature. It is clear that  $T_{\min}$  trend tends to decrease while  $T_{\max}$  trend is increasing resulting in almost a constant trend for  $T_{\text{mean}}$ .

The 11-year average means show that there was a warming period during the 1950's to mid-1960's and a cooling period during the period from mid-1960's to 1980's particularly during winter and summer seasons and to less extent during spring and autumn seasons. The average means also illustrate that there was a strong tendency for a temperature increasing in the late 1990's during the summer season. Table 2 summarizes the linear equations for seasonal temperature.

Table 3 presents the results of Mann-Kendall rank statistics for monthly and seasonal trends.

These results indicate that  $T_{\min}$  significantly increases during July and decreases during the of November. The  $T_{\max}$  significantly increases during the months of April and July. The  $T_{\text{mean}}$  significantly increases during the months of April and July and decreases during November. The results also show that there is a significant increase in  $T_{\max}$  and  $T_{\text{mean}}$  during the spring season and a significant decrease in all three temperatures during the autumn season.

Table 1: Monthly and seasonal temperature means

Month	$T_{\min}$	$T_{\max}$	$T_{\text{mean}}$
January	4.09	15.71	9.90
February	5.58	18.64	12.11
March	9.39	22.79	16.09
April	14.75	29.29	22.02
May	19.88	36.10	27.99
June	23.15	41.06	32.10
July	25.20	43.63	34.42
August	24.24	43.36	33.80
September	20.55	39.97	30.26
October	15.87	33.23	24.55
November	9.83	24.20	17.01
December	5.19	17.31	11.25
Winter	4.95	17.22	11.09
Spring	14.67	29.39	22.03

Summer	24.20	42.68	33.44
Autumn	15.42	32.47	23.94
Annual	14.81	30.44	22.62

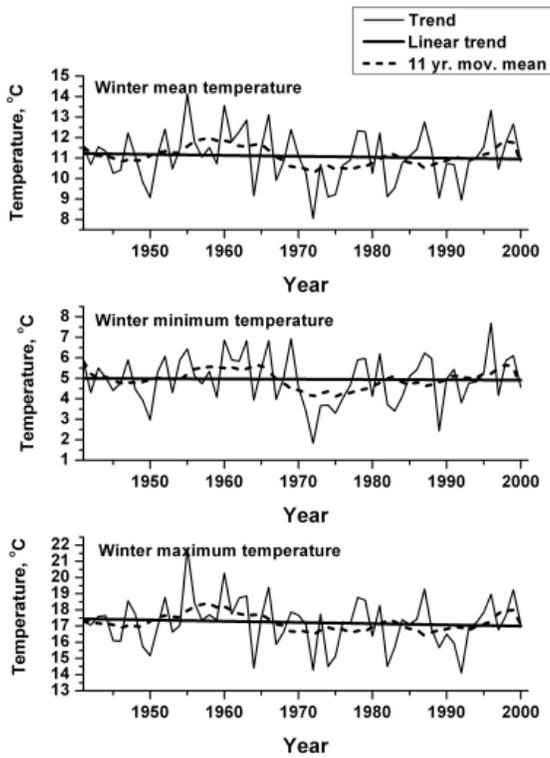


Figure 1. Winter temperature trend at Baghdad

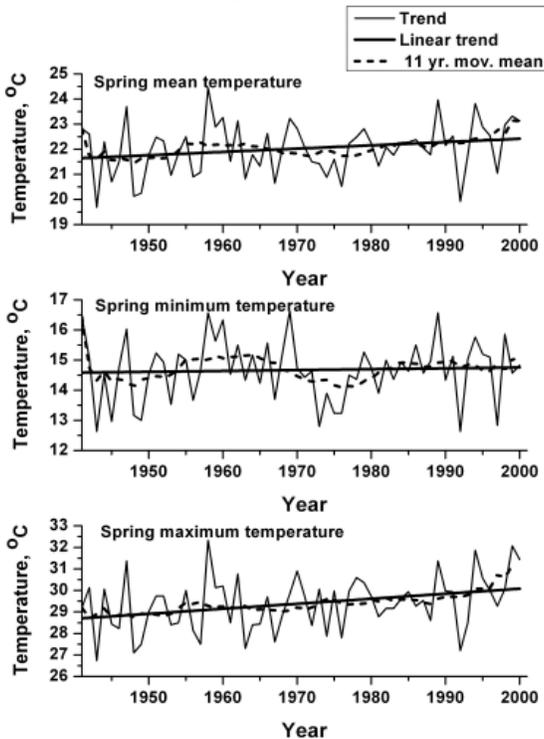


Figure 2. Spring temperature trend at Baghdad

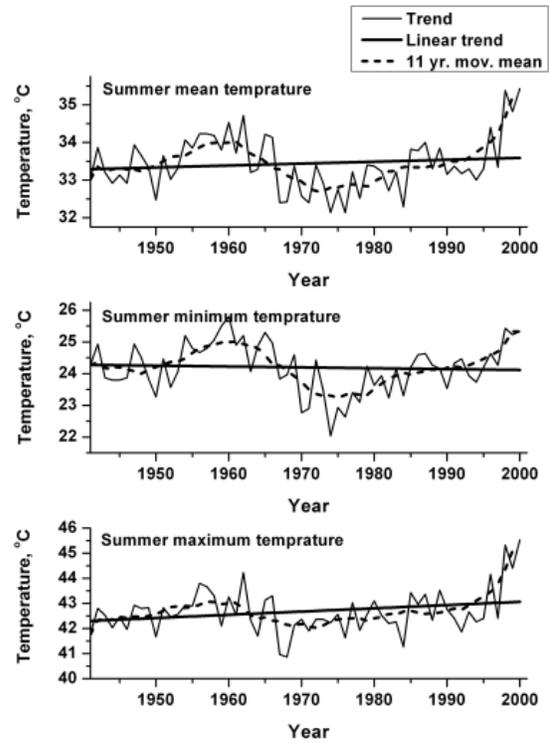


Figure 3. Summer temperature trend at Baghdad

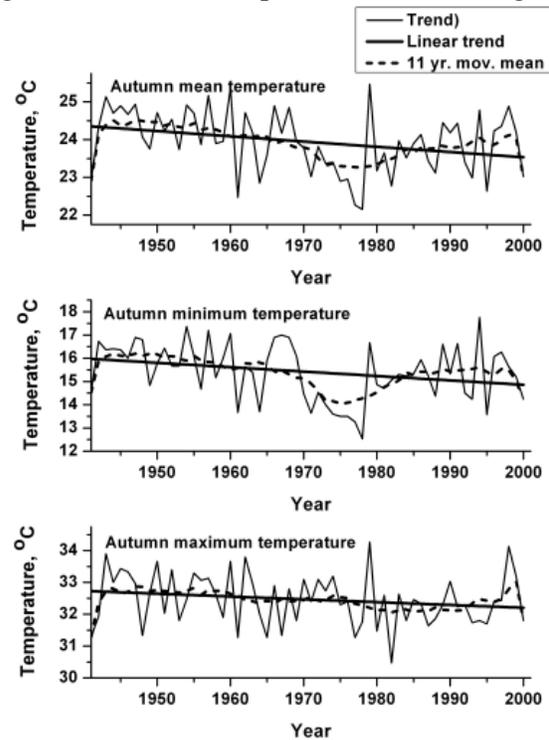


Figure 4. Autumn temperature trend at Baghdad

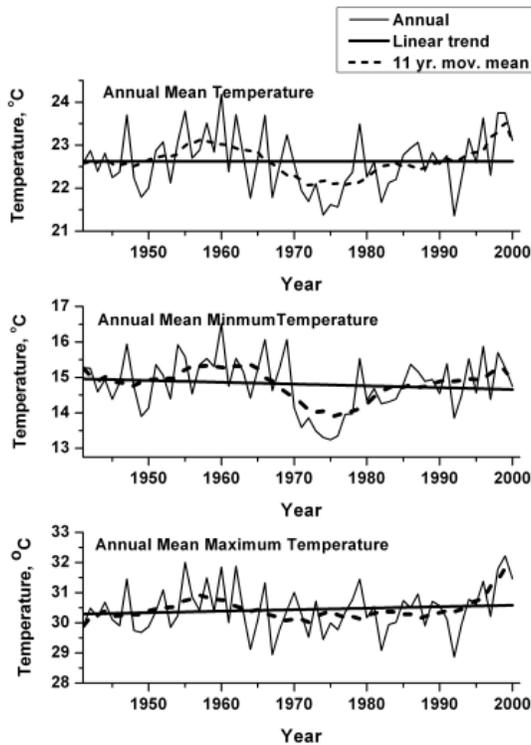


Figure 5. Annual temperature trend at Baghdad

Table 2. Linear equations for seasonal temperatures

Season	Temperature	Linear Equation
Winter	$T_{mean}$	$y = 19.948 - 0.00450x$
	$T_{min}$	$y = 7.790 - 0.00144x$
	$T_{max}$	$y = 32.104 - 0.00755x$
Spring	$T_{mean}$	$y = -3.755 + 0.01309x$
	$T_{min}$	$y = 9.020 + 0.00287x$
	$T_{max}$	$y = -16.530 + 0.02330x$
Summer	$T_{mean}$	$y = 23.431 + 0.00508x$
	$T_{min}$	$y = 29.580 - 0.00273x$
	$T_{max}$	$y = 17.282 + 0.01289x$
Autumn	$T_{mean}$	$y = 51.282 - 0.01388x$
	$T_{min}$	$y = 52.688 - 0.01891x$
	$T_{max}$	$y = 49.877 - 0.00884x$
Annual	$T_{mean}$	$y = 22.725 - 0.00005x$
	$T_{min}$	$y = 24.769 + 0.00505x$
	$T_{max}$	$y = 20.682 + 0.00495x$

Table 3. Results of Mann-Kendall rank statistics

Month	$T_{min}$	$T_{max}$	$T_{mean}$
January	0.002	-0.037	-0.018
February	-0.042	-0.047	-0.052
March	-0.051	0.099	0.041
April	0.140	0.228*	0.193*
May	-0.010	0.147	0.073
June	-0.091	0.096	0.002
July	0.151*	0.182*	0.169*
August	-0.110	0.025	-0.027
September	-0.130	0.031	-0.098
October	-0.128	-0.090	-0.131
November	-0.170*	-0.124	-0.180*
December	0.067	-0.027	0.020
Winter	-0.006	-0.037	-0.033
Spring	0.049	0.209*	0.165*
Summer	-0.006	0.111	0.052
Autumn	-0.204*	-0.167*	-0.197*
Annual	-0.054	0.099	0.006

\* significant at 0.05 level

#### 4. Conclusion

In this study, the trends of the monthly, seasonal and annual  $T_{min}$ ,  $T_{max}$ , and  $T_{mean}$  time series were examined for 20 Baghdad, Iraq for the period 1941–2000. The most important aspects of the results are the significant increase in  $T_{max}$  and  $T_{mean}$  during the spring season and a significant decrease in all three temperatures during the autumn season. It was also notable that there was a warming period during the 1950's to mid-1960's and a cooling period during the period from mid-1960's to 1980's particularly during winter and summer seasons. Further analyses for a longer period of time is needed to see if this cyclic behavior of temperature cooling and warming exists for such period.

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# Implementation of Phase-Shifting Transformer model into an OPF formulation by Matlab optimization toolbox

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**Abstract-** This paper presents the practical implementation of Phase-Shifting Transformer (PST) model into an Optimal Power Flow (OPF) problem by using the Matlab optimization toolbox. The complexity degree related to the proposed implementation is equivalent to that required by commercial optimization packages for solving optimization models, but with the advantage that Matlab is commonly the available software for research and academic purposes in electric engineering. Thus, this hugely reduces the time to the implementation, and for obtaining results of an OPF analysis of power systems with embedded FACTS devices, in this case with the Phase-Shifting Transformer model. The reliability of the proposed implementation is proved by comparing the PST-OPF solution of the 5-node system with reported results in the open literature. In order to illustrate numerically the prowess of the proposed Matlab based implementation to solve the PST-OPF model, a numerical example with the 10-machine 39-bus New England test system is presented.

**Index Terms-** Electric power system, Matlab, OPF, optimization, PST

## I. INTRODUCTION

The growth of electric power consumption in most countries is certain to continue unabated in the foreseeable future and the problems faced by the Electric Utilities in delivering the demanded power are increasing. The Phase-Shifting Transformer is one special application of transformers that will help utilities to better utilise existing transmission corridors and to improve on the operation of the system [1].

When power flows between two nodes, there is a voltage drop and a phase angle shift between the sending node and receiving node, which depend on the magnitude and angle of the load current. The Phase-Shifting Transformer compensates for the drop by inserting, between its sending and its receiving nodes, a series voltage in quadrature with the line-to-ground voltage. This quadrature voltage produces, between the PST terminals, a phase shift whose magnitude varies with the magnitude of the quadrature voltage, hence, the term phase-shifting transformer. The quadrature voltage is obtained from the shunt connected three phase transformer, called exciting transformer. It is inserted into the PST terminals via the series connected transformer, called the booster transformer [2].

Some significant benefits obtained by using the PST are: a) Reduction of active power losses by eliminating circulating

currents; b) Improvement in of transmission line capability through proper division of the power flow; c) Control of power flow [2].

With the worldwide increasing of the installation of FACTS devices in the electric power systems, OPF studies considering these devices are being used. An OPF analysis gives an answer to how the available controls should be adjusted in order to meet demand in the most economically manner while keeping within bounds all the constraints imposed on the system. Hence, the incorporation of the PST model into an OPF algorithm provides an opportunity to fully exploit the controller's capabilities in the economic operation of power systems.

In order to solve OPF models and, at the same time speed up the research of optimization applications, researchers have put attention on commercial optimization software packages as AMPL [3] and GAMS [4]. By way of example, AMPL and GAMS has been employed to: solve an OPF model with complementary constraints [5], identify and analyze saddle node bifurcations and limit-induced bifurcations of power systems [6], solve a transient stability constrained OPF model [7] and more recently to solve a OPF model that considers voltage stability constraints in order to control voltage stability of power systems [8] and to find the optimal location of FACTS shunt series controllers for power system operation planning [9], among other applications.

The Matlab optimization toolbox [10] was used in [11] to implement and solve a conventional OPF model. In this paper, such a proposal is adopted and extended to develop the implementation and solution of an OPF model integrated with PST model, here called PST-OPF model. In this sense, the complexity degree of the proposed implementation is equivalent to that required by commercial optimization packages for solving optimization models. Therefore, this proposal hugely reduces the time to the implementation and for obtaining results of an OPF analysis of power systems with PST device.

The paper's structure is as follows; Section II of the paper shows the general OPF formulation. The power system components and PST modelling are presented in the Section III. Section IV shows the explicit PST-OPF formulation. The computational implementation of the PST-OPF model is described in Section V. The prowess of the proposed implementation is illustrated by means of numerical examples in Section VI. The work conclusions are given in Section VII.

## II. GENERAL OPF FORMULATION

The OPF general formulation is given in [11],

$$\begin{aligned} \text{Minimize } & f(y) & (1) \\ \text{Subject to } & h(y) = 0 & (2) \\ & g(y) \leq 0 & (3) \\ & y_{\min} \leq y \leq y_{\max} & (4) \end{aligned}$$

where  $f(y)$  is the objective function,  $h(y)$  is a set of equality constraints representing both, power balance mismatch equations and control equations,  $g(y)$  is a set of inequality constraints modelling the generator output reactive power limits. The vector of system variables  $y$  is bounded by lower and upper limits  $y_{\min}$  and  $y_{\max}$ , respectively. The solution vector of the model (1)-(4) yields the desired optimum point  $y^*$ .

### III. POWER SYSTEM AND PST MODELLING

In order to assemble a full PST-OPF power system model, it is necessary to represent by means of a mathematical model the steady state operation of the power system components as well as the PST controller. In this work these models are described in polar coordinates, in terms of active and reactive power flow injections, as given below.

#### A. Power system main components

The generators, loads, shunt compensation elements, transmission lines and transformers are considered the most common power system components. The steady state power flow models of the above mentioned components are given in detail in [12] and are adopted in this proposal.

#### B. Phase-Shifting Transformer modelling

##### 1) Phase-Shifting Transformer

The PST device is capable of redirecting power flows by locally altering the voltage angle difference imposed on the device by network conditions. When power flows between two nodes, there is a voltage drop and a phase angle shift between the sending node and receiving node, which depend on the magnitude and angle of the load current. Figure 1 shows a transmission line representation and its phase diagram, where it is assumed that the line current  $I_{ps}$  is in phase with the voltage magnitude  $V_p$  [2].

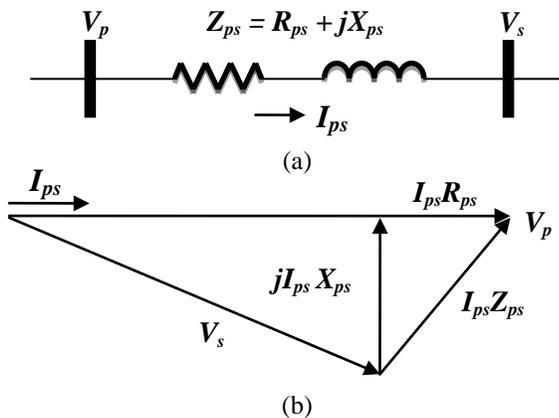


Figure 1: Transmission line representation.

Figure 1 (b) shows the voltage drop  $jI_{ps}X_{ps}$  is in quadrature with the system line-to-ground voltage  $V_p$ . The PST compensates for the  $jI_{ps}X_{ps}$  drop by inserting, between its sending and its receiving nodes, a series voltage in quadrature with the line-to-ground voltage. This quadrature voltage produces, between the PST terminals, a phase shift whose magnitude varies with the magnitude of the quadrature voltage, hence, the term phase-shifting transformer. The quadrature voltage is obtained from the shunt connected three phase transformer, called exciting transformer. It is inserted into the PST terminals via the series connected transformer, called the booster transformer.

##### 2) The classical Phase-Shifting Transformer model

In open literature [13, 14] it is common to represent the phase-shifting transformer as an impedance connected in series with an ideal transformer having a complex turns ratio. Figure 2 shows the equivalent circuit of the PST connected between nodes  $p$  and  $s$ . The transformer phase shifting capabilities are taken to be on node  $p$ .

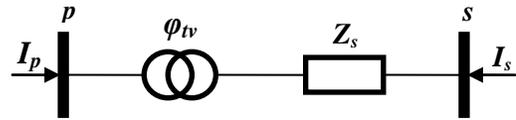


Figure 2: Equivalent circuit to PST.

The classical PST model can be obtained by introducing simplifying assumptions in the two-winding transformer model given in [2]. If  $Tv = Ti^* = \cos\phi_{tv} + j\sin\phi_{tv} = a + jb$ ,  $U_v = U_i^* = 1$ ,  $Y_o = 0$  and  $Z_p = 0$ , a nodal transfer admittance model for the PST shown in Figure 2 can be obtained,

$$\begin{bmatrix} I_p \\ I_s \end{bmatrix} = \frac{1}{(a^2 + b^2)Z_s} \begin{bmatrix} 1 & -(a + jb) \\ -(a - jb) & (a^2 + b^2) \end{bmatrix} \begin{bmatrix} V_p \\ V_s \end{bmatrix} \quad (5)$$

##### 3) Power flow equations

Based on the nodal admittance matrix equation given by (5), the following active and reactive power equations can be written for a two-winding transformer connected between node  $p$  and node  $s$  [2].

At node  $p$ :

$$P_{p\_in\text{yPST}} = V_p^2 G_{pp} + V_p V_s (G_{ps} \cos(\theta_p - \theta_s) + B_{ps} \sin(\theta_p - \theta_s)) \quad (6)$$

$$Q_{p\_in\text{yPST}} = -V_p^2 B_{pp} + V_p V_s (G_{ps} \sin(\theta_p - \theta_s) - B_{ps} \cos(\theta_p - \theta_s)) \quad (7)$$

At node  $s$ :

$$P_{s\_in\text{yPST}} = V_s^2 G_{ss} + V_s V_p (G_{sp} \cos(\theta_s - \theta_p) + B_{sp} \sin(\theta_s - \theta_p)) \quad (8)$$

$$Q_{s\_in\text{yPST}} = -V_s^2 B_{ss} + V_s V_p (G_{sp} \sin(\theta_s - \theta_p) - B_{sp} \cos(\theta_s - \theta_p)) \quad (9)$$

where  $P_p$ ,  $P_s$ ,  $Q_p$ ,  $Q_s$  are the active and reactive power flow injections at nodes  $p$  and  $s$ .  $V_p$ ,  $V_s$ ,  $\theta_p$ ,  $\theta_s$  are the voltage magnitudes and phase angles at nodes  $p$  and  $s$ , respectively. It must be mentioned that the susceptance and conductance are dependents of  $\phi_{tv}$ .

The PST can have various applications in power systems, however, in this work is used to control the active power flow at a desired level in the compensated branch ( $i-j$ ). The active power

flow,  $P_{ij}$ , through branch  $i-j$  is controlled in  $P_{esp}$  value by the PST connected between nodes  $i$  and  $j$ . This control action can be represented by next control equation,

$$P_{ij} - P_{esp} = 0 \quad (10)$$

where  $i=s, p; j=s, p; i \neq j$  and  $P_{ij}$  is the active power injected by the PST device ( $P_{i\_inypst}$ ) in the compensated transmission line, which is a function dependent of control variable  $\varphi_{iv}$ .

#### IV. PST-OPF EXPLICIT MODELING

The conventional OPF explicit modelling given in [11] is adopted and extended to readily develop the PST-OPF formulation by considering the PST model shown in Section III-B. The OPF general model (1)-(4) is the basis to derive the explicit PST-OPF model, as will be explained below.

##### A. Objective function

The objective function  $f(y)$  is the minimization of the total active power generation costs,

$$f(y) = \sum_{i=1}^{N_g} a_i + b_i (P_{gi}) + c_i (P_{gi})^2 \quad (11)$$

where  $a_i, b_i$  and  $c_i$  are the cost curve coefficients for the generation bus  $i$ .  $N_g$  is the number of generators, whose individual active output power is  $P_{gi}$ .

##### B. Equality constrains

In order to represent the system steady state operation, the energy balance of the power system must be unconditionally satisfied. This is enforced by means of the set of active and reactive power balance constraints at each bus,

$$h(y) = \left\{ \begin{array}{l} P_{gi} - P_{li} - \sum_{j \in i} P_{inj} - \sum_{j \in i} P_{j\_inypst} = 0, \\ Q_{gk} - Q_{lk} - \sum_{j \in k} Q_{inj} - \sum_{j \in k} Q_{j\_inypst} = 0 \end{array} \right. \quad \left. \begin{array}{l} i=1,2,\dots,N_b \\ k=1,2,\dots,N_b, k \notin N_g \end{array} \right. \quad (12)$$

where  $N_b$  is the total number of buses. The active and reactive output power of generator  $P_{gi}$  and  $Q_{gi}$ , respectively, are provided at the generation bus  $j(j=i,k)$ . The active and reactive power loads are represented by  $P_{lj}$  and  $Q_{lj}$ , respectively.  $\sum_{j \in i,k}$  is the set of nodes adjacent to node  $j$ , whilst  $P_{inj}$  and  $Q_{inj}$  are active and reactive power flows injected at bus  $k$  and  $i$  through the  $j$ -*esim* network element described by models of Section III. Note that the power balance constraints (12) must consider the injected power  $P_{j\_inypst}$  and  $Q_{j\_inypst}$  provided by each PST controller, according to models given by (6)-(9). Clearly, the incorporation of each PST controller into the conventional OPF model implies the introduction of one new state variable, which corresponds to phase shifter angle  $\varphi_{iv}$ . In addition, the power flow control equation (10) of the PST must be considered as an additional quality constraint, which is given by (13),

$$h_{ctrl}(y) = \{P_{ij,n} - P_{esp,n} = 0\}, n=1,2,\dots,N_{PST} \quad (13)$$

where  $N_{PST}$  is the number of PST controller operating in the power network.  $P_{ij}$  is the active power flowing from node  $i$  to node  $j, i=l,m, j=l,m, i \neq j$ .  $P_{sh,n}$  is the target value of active power flow across the  $n$ -*esim* PST device.

In the optimization formulation, the constraints (13) represent the active power flow control action of the PST controllers. Hence, these control actions are expressed as equality constraints which remain active throughout the whole iterative optimization process. If the active power flow control of the PST is at off state, constraint (13) is deactivated. The equations (12)-(13) represent the full set of equality constraints of the PST-OPF formulation.

It is very important to point out that the generator reactive output power  $Q_{gi}$  is a function of the system variables and does not have a scheduled value, therefore the reactive power balance constraint can be only stated for non-generation buses ( $k \notin N_g$ ). However, the reactive power balance at generation buses is achieved according to the procedure applied to handle the reactive generation limits, as will be explained in the next section.

##### C. Inequality constrains

The physical and operating limits of generators and substations are mathematically described by the following inequality sets,

$$Y = \left\{ \begin{array}{l} P_{gi}^{\min} \leq P_{gi} \leq P_{gi}^{\max} \\ V_j^{\min} \leq V_j \leq V_j^{\max} \end{array} \right\}, \quad \begin{array}{l} i=1,2,\dots,N_g \\ j=1,2,\dots,N_b \end{array} \quad (14)$$

$$g(y) = \{Q_{gi}^{\min} \leq Q_{gi} \leq Q_{gi}^{\max}\}, i=1,2,\dots,N_g \quad (15)$$

It must be pointed out that the active power generation  $P_{gi}$  and all the bus magnitude  $V_j$  limits are simply inequality constraints on variables, whilst the generator reactive power limits are modeled as a set of functional inequality constraints. Hence, the reactive power generation level  $Q_{gi}$  in (15), is given by the following function,

$$Q_{gi} = Q_{ti} + \sum_{j \in i} -V_i^2 B_{ii} + V_i V_j [G_{ij} \sin(\theta_i - \theta_j) - B_{ij} \cos(\theta_i - \theta_j)] \quad (16)$$

The relation (16) means that the reactive power balance generation bus  $i$  is always achieved when the generator is inside its reactive generation limits. When the generator hits either its lower  $Q_{gi}^{\min}$  or upper  $Q_{gi}^{\max}$  bound, the inequality constraint (15) is activated by the optimization algorithm, it then automatically becomes into an equality constraint in order to enforce the reactive power generation level  $Q_{gi}$  to be the violated limit  $Q_{gi}^v$ ,

$$Q_{gi}^v - Q_{gi} = 0 \quad (17)$$

where  $Q_{gi}$  is defined by (16). Note that constraint (17) not only avoids the violation of the reactive power generation limits, but also represents the reactive power balance equation.

In the PST-OPF formulation, the state variable limits,  $\varphi_{iv}$ , of each PST controller must be included as an inequality constraints set, as follows,

$$Y_{PST} = \{\varphi_{iv,i}^{\min} \leq \varphi_{iv,i} \leq \varphi_{iv,i}^{\max}\}, \quad i=1,2,\dots,N_{PST} \quad (18)$$

The corresponding lower  $\varphi_{iv}^{\min}$  and upper  $\varphi_{iv}^{\max}$  limits are simply represented by inequality constraints on variables. These limits allow simulating more practical operating conditions of the PST controller.

#### V. PST-OPF PRACTICAL IMPLEMENTATION

The PST-OPF explicit model (11)-(18) has been developed by implementing the PST model into an existent computational

algorithm for conventional OPF [11], which is solved by means of the Matlab optimization toolbox [10].

From an optimization point of view, the PST-OPF model represents a continuous nonlinear constrained optimization problem, which can be also solved by using the *fmincon* function of Matlab optimization toolbox [10]. This function uses a Sequential Quadratic Programming optimization algorithm, started with input/output arguments to configure the optimization parameters, set the model to be optimized and display information.

**A. Arguments of the *fmincon* function**

The *fmincon* function, as any Matlab function, deals with both input  $I_A$  and output  $O_A$  arguments. The general form of this function is [10],

$$[O_A]=fmincon(I_A) \quad (19)$$

where  $I_A$  and  $O_A$  are sets of input and output arguments, respectively. Tables I and II briefly show and describe the main elements of these argument sets according to the order they must be provided to the *fmincon* function. Details of the option parameters  $Opt \in I_A$  and  $output \in O_A$  are given in [10].

TABLE I: Description of the input arguments  $I_A$ .

Name	Description
@fun	The handle of the M-function file containing the objective function, in our case; @(X)objfun_OPF(X).
X	The vector containing the numerical value of the initial condition of system and PST variables ( $\theta, V, P_g, \phi_{rv}$ ).
A	All these parameter are not of interest in this work, they refer to linear equality and inequality constraints. They simply are set as empty arguments ( []).
B	
Aeq	
Beq	
Lb	Vector of lower bounds value of variables, in this work applied to the sets $V, P_g$ and $\phi_{rv}$ .
Up	Vector of upper bounds value of variables, in this work applied to the sets $V, P_g$ and $\phi_{rv}$ .
Nlcon	The handle of the M-function file containing the nonlinear equality and inequality functional constraints, here; @(X)constraints_OPF(X).
Opt	This structure provides optional parameters for the optimization process, which are set by means the optimset function of Matlab.

TABLE II: Description of the output arguments  $O_A$ .

Name	Description
X	This vector contains the numeric value of the system variables at the PST-OPF model solution, and is the same vector considered in $I_A$ (see Table I).
fval	Value of the objective function at the solution X.
eflag	Describes the exit condition of <i>fmincon</i> ; if eflag>0, the convergence was reached. If eflag=0, the maximum number of iteration was exceeded. If eflag <0, there was not
output	Structure that contains information of the optimization process results.
$\lambda$	Vector of Lagrangian multipliers at the solution X.
Grad	Value of the Gradient of the objective function at the solution X.
Hess	Value of the Hessian of the objective function at the solution X.

**B. PST-OPF computational implementation**

In order to implement a general PST-OPF program for digital computer, the PST-OPF model is solved by using the *fmincon* function, which is executed according to the computational procedure described in Figure 3. The proposed PST-OPF computational implementation starts reading the power system data and convergence tolerance. The power system data are converted to pu in order to normalize the system quantities, but also to avoid optimization scaling problems. The system variables are initialized as follows, nodal voltage magnitudes  $V$  are set to 1 pu and angles  $\theta$  are set to 0 rad, as in conventional power flow analysis. The active power generation levels  $P_g$  are initialized according to a network lossless Economic Dispatch (ED) analysis. In case of the PST variables, the primary and secondary complex taps are set with a magnitude of one and phase angle of zero, i.e. the phase shifter angles are initialized at  $0^\circ$ , although the algorithm of this proposed is very robust if the phase shifter angle is initialized within the range of  $\pm 10^\circ$ .

This analysis is formulated as a nonlinear programming problem, where the objective function (11) is the considered in the PST-OPF model; the equality constraint are the active power balance between the total generation and the total load in each bus of the power system, whilst the inequality constraints only correspond with the generation active power limits. The constraints and the objective function are written in two separated Matlab functions M1 and M2, respectively, which are called by the *fmincon* function executed from the implemented ED function.

The vector of initial conditions  $X$  is then passed to the implemented PST-OPF function, where the *fmincon* function is newly executed to obtain the solution of the PST-OPF model. The constraints (12)-(18), are written in another Matlab function (M3), called by *fmincon*, along with the objective function (11) written in M2, from the implemented PST-OPF function. The optimal solution  $X$  is used to compute the network active and reactive power flows, which are finally reported in a text file and on the computer display.

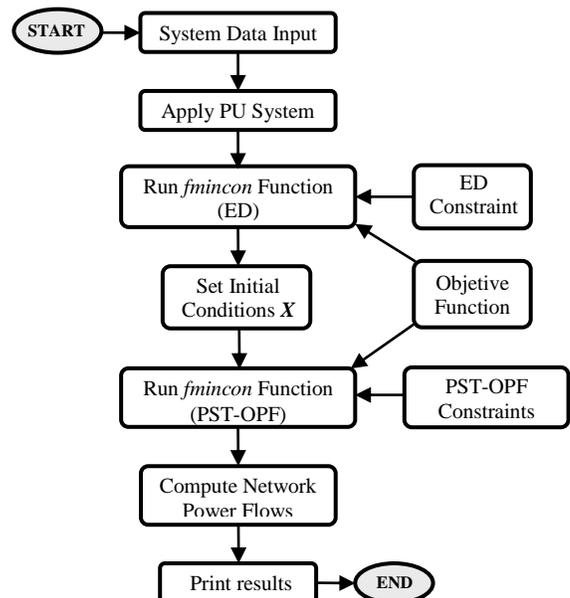


Figure 3: PST-OPF computational algorithm.

VI. NUMERICAL EXAMPLES

In order to illustrate numerically the prowess of the proposed implementation to carry out the PST-OPF analysis, the IEEE 5-node system and the 10-machine 39-bus New England system are considered in the numerical examples. In both test cases, the convergence tolerance of the optimization process is set at  $1 \times 10^{-9}$  and the phase shifting angle was initialized at  $0^\circ$ .

A. Test case: 5-node system

This section presents the PST-OPF results for the 5-node test system obtained by the proposed implementation. The aim of this case study is to numerically compare results of the proposed approach with those reported in [2]. In order to embed the PST, the test system was enlarged by adding the node Lake1 to the network, as in [2]. The PST is used to maintain the active power flow at 25 MW across the transmission line Lake-Main. In this test case, the primary and secondary winding impedances contain no resistance. The primary and secondary inductive reactances were set to 0.0 pu and 0.05 pu, respectively. The complex tap ratios were  $T_v = U_v = 1.0 \angle 0^\circ$ . The control of active power flow is carried out with the primary phase angle control. The nodal voltages are initialized with flat profile; the voltage magnitude limits for all nodes are set to  $0.9 \leq V \leq 1.1$  pu, except at node North, where the voltage magnitude limit is set to  $0.9 \leq V \leq 1.5$  pu.

The results of the optimal active and reactive power dispatches are displayed in Table III, both dispatches obey their corresponding limits.

Table III: Generators ratings and PST-OPF solution.

Node	MW Limits		MVAR Limits		OPF Dispatch	
	Lower	Upper	Lower	Upper	MW	MVAR
North	10	400	-500	500	79.81	1.22
South	10	400	-300	300	88.48	14.47
Total Power Generation					168.29	15.69

The Table IV shows that the profile of nodal voltages is inside limits. However, it must be pointed out that because of the voltage magnitude at node South hits its upper limits, the corresponding inequality constraint is activated and therefore it has a value equal to the upper limit.

Table IV: Nodal voltages at the PST-OPF solution.

Node	V (pu) Limits		OPF Voltages	
	Lower	Upper	V (pu)	$\theta$ (deg)
North	0.9	1.5	1.11	0.000
South	0.9	1.1	1.10	-1.461
Elm	0.9	1.1	1.07	-4.892
Main	0.9	1.1	1.08	-4.963
Lake	0.9	1.1	1.08	-2.895
Lake1	0.9	1.1	1.076	-4.580

The solution obtained by the proposed implementation compares well with that reported in [2], as illustrated in Table V. The solution was obtained in a CPU time of 5.1792 sec with a total generation cost of 748.961 \$/hr and total losses of active power of 3.285 MW. The table shows that the solutions are very similar, therefore it can be concluded that the proposed implementation is reliable for the analysis of OPF model with the PST device.

Table V: Comparison of two different solutions of PST-OPF model.

Parameter	Proposed	[2]
Cost (\$/hr)	748.961	748.330
Losses (MW)	3.285	3.143
Control angle (deg)	-1.0026	-2.010
Active power generation (MW)	168.29	168.13
Reactive power generation (MVAR)	15.69	15.25

B. Test case: 10-machine, 39 bus New England system

In this section the proposed implementation is used to carry out the PST-OPF analysis on the 10-machine 39-bus New England system shown in Figure 4. The parameters of the system are given in detail in [15] and the generators cost functions and ratings are given in [16]. The voltages magnitude limits for all nodes are set to  $0.95 \leq V \leq 1.09$  pu.

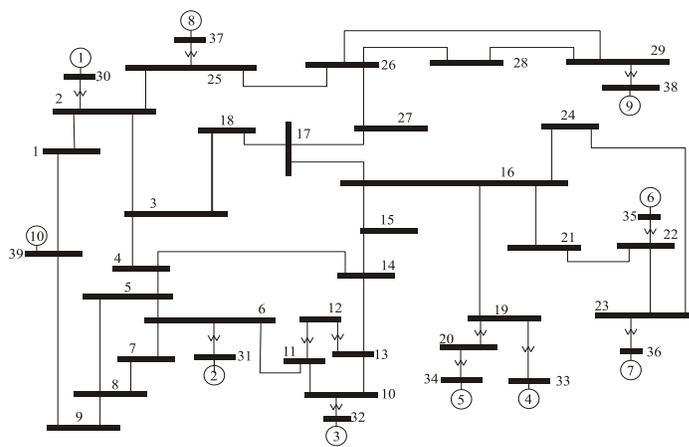


Figure 4: 10-machine, 39 bus New England test system

Firstly, a conventional OPF analysis (base case) is executed. This base case computes an optimal steady state operating point with a total generation cost of 61,214.142 \$/hr, and reveals that 264.71 MW are transferred from node 26 to 27 across the single line connecting both nodes. Then, at node 27, the load increases from 281 MW to 300 MW, changing the power flow in all lines connected to the node and the New England system is modified to integrate the PST device to the power system. A new node, 40-PST, was added to include the PST controller in the power system, which is strategically connected in the electric power system to increase the active power flow from 264.71 MW to 266.5 MW in the transmission line connected between nodes 26 and 27. The PST device parameters were the same as in the above test case. The Table VI summarizes the results of the conventional OPF (base case) and the PST-OPF analysis.

Table VI. Summary results of PST-OPF and OPF.

Results	OPF (Base Case)	PST-OPF
MW flow in compensated line	264.71	266.50
Generation (MW)	6,158.28	6,157.73
Generation (MVAR)	1,213.72	1,245.55
Losses (MW)	42.181	41.625
Cost (\$/hr)	61,214.142	61,213.142

To carry out the control action of the active power flow in MW 266.5 across the compensated transmission line connected between node 26 and 27, the phase shifting angle,  $\varphi_{ns}$ , changed his value from  $0^\circ$  to  $-7.3145^\circ$ .

The CPU time required to carry out the PST-OPF solution with the New England system was of 34.4531 sec. It is noteworthy that the numerical examples were executed in an Asus PC with Intel(R) Core(TM) i5-3210M processor at 2.5 GHz and 6 GB of RAM.

## VII. CONCLUSIONS

The proposed PST-OPF model is written into a unified reference frame, such that the whole set of electrical variables (voltage phasors and powers) and variables of PST-OPF can be solved simultaneously. But it must be pointed out that the proposed formulation readily allows to either consider or not the steady state operation of a given FACTS device into the power system simulation. The PST-OPF model was integrated into an OPF Matlab-based model, and the solution process uses the *fmincon* function of the Optimization Toolbox. Independently of the value of the initial condition of the state variables, the PST model presents very good robustness towards convergence and yields practical solutions. Solutions have been obtained through numerical examples where the OPF problem is integrated with FACTS devices. The results show that the proposed implementation allows simulating the economic operation of power systems readily. The time required to compute the optimal steady state is short enough for academic and/or research purposes, and perhaps promising to carry out power system planning studies.

Another advantage of this proposal is that the PST model is easily implemented into the OPF formulation due to the flexibility provided by the optimization toolbox of Matlab. Taking advantage of this easiness, the model of any other device of the FACTS family, as well as a large variety of optimization applications of power systems, can be readily integrated into the conventional OPF model.

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# Designing a reward distribution system and its influence on increasing employees Satisfaction at Shadran-e-Mehr Company

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**Abstract-** The aim of this study was to evaluate the effect of applying reward distribution system on increasing Shadran-e-Mehr employee's satisfaction. The methodology was survey and descriptive and the sample size was 70 people. Sampling was random. Data was collected through a standard questionnaire. In this factory, the productive and unproductive employees were 99 percent satisfied with this system. By using the observation method and data analysis, Shadran-e-Mehr Company sale level rose about 9 percent and the price of sold products rose only 2 percent after applying of the reward distribution system. Therefore, by fixing the stable possession, the efficiency of Shadran-e-Mehr Company's employees increased.

**Index Terms-** reward distribution system, employees' satisfaction, employees' efficiency, employees' operation, employees' motivation

## I. INTRODUCTION

Applying reward distribution systems have major effect on the ability of organization for employing, generating and maintaining motivation in potential employees and consider as the main reason of access to great performance (Fay and Thompson, 2001). If applying reward distribution system is not efficient or doesn't use an equal and proper reward, the operation of it won't have any importance. If the reward, which main foundation is provocation and satisfying the needs of employees, is not consider in the right way, it will turn to the source for discouraging employees. This system turns to the management tool which can cause company growth in long term (Niki, Nili and Nilipour, 2012). Reward distribution system is used as a framework for making functional reports in factories. This style enables the manager to translate targets, perspective of factory and different units of business and duties of managers into related indexes of evaluating the function (Bruggeman and Decoene, 2002). The core of reward distribution system is formed according to the perspective and strategy. In fact, these two are the base for pursuing financial goals, facilitating internal processes, gaining customer's satisfaction and developing and learning of the employees (Kaplan and Norton, 1996).

## II. METHODOLOGY

The method of this study is survey and the sample consisted of all the employees of Shadran-e-Mehr which was 70 people. According to Morgan table, the sample size for productive employees equals to 50 and for unproductive employees equals to 12 people. But the selected sample size for productive employees equals to 58 and for unproductive employees equals to 12 people because of comparison in different groups and getting to secondary results. Sampling was random. The measuring tool of this study consist of modified questionnaire of Minnesota Satisfaction (MSQ), 31 questions which have 5 components of generating motivation for harder and better work in organization's employees, generating motivation for group work in organization, strengthening relations between employees and their managers, providing an environment for progress at work and getting familiar with the organization's policies. The final coefficient of questionnaire is computed as 0.86 by Cronbach's alpha formula.

## III. RESULTS

The main question of study: How much is the applying of reward distribution system effective in the increasing of employee's satisfaction of the Shadran-e-Mehr Company?

Results of the t- test with single variable, comparison of the average quantity of reward distribution system execution effect on increasing the employee's satisfaction of the Shadran-e-Mehr Company with hypothetical mean of (3) (Table 1).

Table1. Result of T-test

hypothetical mean	average	Standard deviation	t	Significant level
3	3.42	0.61	5.48	0.001

In order to examine significant level in analytical analysis, the t-test was used at the level of  $\alpha = 0/05$ . By considering the obtained average, (3.42), which was greater than hypothetical mean of (3), and the obtained t, which was greater than critical amount of table, (1.96), we can conclude that in employees' view of Shadran-e-Mehr Company execution of distribution reward system is effective in increasing of their satisfaction. This result is also significant statistically.

First question of study: How much is the reward distribution system execution effective in generating motivation for harder work in Shadran-e-Mehr Company?

Results of the T-test with single variable, comparison of the average quantity of reward distribution system execution effect on generating motivation for harder work in Shadran-e-Mehr Company with hypothetical mean of (3) (Table 2).

Table 2 .

hypothetical mean	average	Standard deviation	t	Significant level
3	3.33	0.64	4.16	0.001

In order to examine significant level in analytical analysis, the t-test was used at the level of  $\alpha = 0/05$ . By considering the obtained average, (3.33), which was greater than hypothetical mean of (3), and the obtained t, which was greater than critical amount of table, (1.96), we can conclude that in employees' view of Shadran-e-Mehr Company execution of distribution reward system is effective in generating motivation for harder work in organization. This result is also significant statistically.

Second question of study: How much is the reward distribution system execution effective in generating motivation for group work in Shadran-e-Mehr Company?

Results of the t test with single variable, comparison of the average quantity of reward distribution system execution effect on generating motivation for group work in Shadran-e-Mehr Company with hypothetical mean of (3) (Table 3).

Table 3

hypothetical mean	average	Standard deviation	t	Significant level
3	3.36	0.55	5.26	0.001

In order to examine significant level in analytical analysis, the t-test was used at the level of  $\alpha = 0/05$ . By considering the obtained average, (3.36), which was greater than hypothetical mean of (3), and the obtained t, which was greater than critical amount of table, (1.96), we can conclude that in employees' view of Shadran-e-Mehr Company execution of distribution reward system is effective in generating motivation for group work in organization. This result is also significant statistically.

Third question of study: How much is the reward distribution system execution effective in establishing more relations with managers in Shadran-e-Mehr Company?

Results of the t test with single variable, comparison of the average quantity of reward distribution system execution effect on establishing more relations with Shadran-e-Mehr Company managers with hypothetical mean of (3) (Table 4).

Table 4.

hypothetical mean	average	Standard deviation	t	Significant level
3	3.31	0.64	3.85	0.001

In order to examine significant level in analytical analysis, the t-test was used at the level of  $\alpha = 0/05$ . By considering the obtained average, (3.31), which was greater than hypothetical mean of (3), and the obtained t, which was greater than critical amount of table, (1.96), we can conclude that in employees' view of Shadran-e-Mehr Company execution of distribution reward system is effective in establishing more relations with company managers. This result is also significant statistically.

Fourth question of study: How much is the reward distribution system execution effective in providing an environment for progress at work in Shadran-e-Mehr Company?

Results of the t test with single variable, comparison of the average quantity of reward distribution system execution effect on providing an environment for progress at work in Shadran-e-Mehr Company with hypothetical mean of (3) (Table 5).

Table 5.

Hypothetical mean	average	Standard deviation	t	Significant level
3	3.49	0.64	6.10	0.001

In order to examine significant level in analytical analysis, the t-test was used at the level of  $\alpha = 0/05$ . By considering the obtained average, (3.49), which was greater than hypothetical mean of (3), and the obtained t, which was greater than critical amount of table, (1.96), we can conclude that in employees' view of Shadran-e-Mehr Company execution of distribution reward system is effective in providing environment for progress at work in company. This result is also significant statistically.

Fifth question of study: How much is the reward distribution system execution effective in employees' following of Shadran-e-Mehr Company's policies?

Results of the t test with single variable, comparison of the average quantity of reward distribution system execution effect on employees' following of Shadran-e-Mehr Company's policies with hypothetical mean of (3)( Table 6).

Hypothetical mean	average	Standard deviation	t	Significant level
3	3.60	0.60	6.99	0.001

In order to examine significant level in analytical analysis, the t-test was used at the level of  $\alpha = 0/05$ . By considering the obtained average, (3.60), which was greater than hypothetical mean of (3), and the obtained t, which was greater than critical amount of table, (1.96), we can conclude that in employees' view of Shadran-e-Mehr Company execution of distribution reward system is effective in employees' following of Shadran-e-Mehr Company's policies. This result is also significant statistically.

#### IV. DISCUSSION AND CONCLUSION

The result of reward distribution system effect on increasing the satisfaction of Shadran-e-Mehr employees reveal that reward system can cause employees' satisfaction. In other words, operation and effort of Shadran-e-Mehr employees is affected by reward system. Employees have internal and external motivation to do duties and reward, which is external factor, can affect their work and effort motivations.

So it is certain that, reward system has positive effect on employees' performance and their operations get better when they have sufficient satisfaction of organization. The results of this study and done studies by Seyed Hashemi(2008), Sadughiyan and shokri(2005) Daneshfozun(2005), Janssen, and Yperen(2004), Gungar(2011), Yang(2008), Srinivas and Kandula(2007), Kaplan and Norton(1996)are in the same direction. According to this sameness we can conclude that righteously reward distribution system is performing an important role in boosting the performance and increasing the satisfaction of employees.

The results about the effect of reward distribution system execution on generating motivation to harder work in Shadran-e-Mehr Company revealed that reward system in company was effective on generating and maintaining motivation for harder work among employees and if the reward distribution system operates righteously in a company, the employees do their duties with much effort. In other words, reward system in Shadran-e-Mehr Company causes something like among employees: generating motivation for getting the result, generating motivation for harder work, generating motivation for doing duties in the right way, doing the duties in the best way in all work hours, using personal methods for doing the duties. According to Lovler reward system is strengthening the work motivations. When people find out that their effort, skill and ability is important and each person is examined according to his objective criteria and rewarding is also according this, they devote much effort and motivation for duties in the organization. In order to increase work motivations, the reward system must be designed in a way that people receive reward according to their ability, skill and effort which is taken for the organization. This subject in addition to this study is in the same direction in done studies by SeyedHashemi(1387), Daneshfozun(2005), Janssen, and Yperen(2004), Gungar(2011), Yang(2008), Srinivas and Kandula(2007), Kaplan and Norton(1996). In these studies also reward system reported as one of the most effective factors in the performance and motivation of employees.

The results obtained from effect of reward distribution system on generating motivation for group work in Shadran-e-Mehr Company revealed that reward distribution system is effective in employees' group work and team activities. In other words, if there is a just system in reward distribution, then we can see things such as generating better environment for doing group work, turning to other employees for assistance in performing activities, increasing of responsible behavior among employees, helping to each other in performing work activities, creating friendly relations between employees and making a friendly environment in company.

The achieved results from the effect of reward distribution system on establishing more relations with managers in Shadran-e-Mehr Company revealed that reward distribution system execution in Shadran-e-Mehr Company is effective in establishing more relations of employees with managers. In other words, behaviors such as creating an environment for managing the employees by managers, creating a method for observing the activities of employees by managers, asking for assistance from managers in solving the difficult problems, creating an environment for information exchange between manager and employees, creating personal relations between manager and employees are expanded in the organization if the reward distribution system has just execution.

An efficient and worthy relation between managers and employees is one of the basic principles of Scanlon pattern which is considered as a successful method in group efforts and managers, in addition to establishing friendship between employees and themselves, can reduce cost and time and improve finished product of company.

The results about the effect of reward distribution system execution on generating environment for progress at work in Shadran-e-Mehr Company revealed that if the reward distribution system is just logical, the probability of performance improvement and

environment creation for proper work will grow. Therefore, reward system plays an important role in work progress in organization and this subject in addition to this study is done in studies by SeyedHashemi(2008), Daneshfozun(2005), Janssen, and Yperen(2004), Gungar(2011), Yang(2008), Srinivas and Kandula(2007), Kaplan and Norton(1996) and it was reported that reward system is an element for work progress and generating organization motivation.

The results about the effect of reward distribution system execution on following of employees from Shadran-e-Mehr Company's policies revealed that, in the case of reward distribution system execution, we can expect that people follow company's policies and adapt their performance to organization policies. In other words, reward distribution system execution cause employees' effort for getting familiar to company's policies,directed activities of employees according to company's policies and adaptation of employees' work activities to organization's policies.

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# Morphological aspects of Floodplain Wetlands with Reference to the upper Brahmaputra River Valley

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**Abstract-** The floodplains of Brahmaputra river valley and its tributaries in Assam are full of wetlands with different types and sizes. The state has only the inland wetlands of both natural and man-made types. The people of Assam have a long history of eco-friendly utilization and management of wetland resources. Over the years the surrounding people of wetlands have been exerting pressure on wetland resources and as a result of it wetlands have undergone degradation at an alarming rate. The present study focuses on two major issues; firstly, to study of the morphological characteristics of flood plain wetlands in the upper Brahmaputra river valley through combination of remote sensing, GIS analysis and field observation. Secondly, to map the wetland ecosystem and degradation of structural habitat caused by streams and riparian alteration.

The study highlights an imperative need for restoration of wetlands and need for satellite remote sensing for monitoring and dynamic assessment of fluvial ecosystem changes which facilitates planning for ecosystem conservation, management and restoration.

**Index Terms-** Morphology, Floodplain, wetland, riparian alteration.

## I. INTRODUCTION

The river Brahmaputra is one of the world's largest rivers with a drainage area of 580,000 sq. km. (50.5% in China, 33.6% in India, 8.1% in Bangladesh and 7.8% in Bhutan). In India, its basin is shared by Arunachal Pradesh (41.9%), Assam (36.3%), Meghalaya (6.1%), Nagaland (5.6%), Sikkim (3.8%) and West Bengal (6.3%). In the plains of Assam the Brahmaputra flows in a highly braided channel marked by the presence of numerous mid-channel and lateral bars and islands. An extremely dominant monsoon interacting with a unique physiographic setting, fragile geological base and active seismo-tectonic instability together with anthropogenic factors have molded the Brahmaputra into one of the world's most intriguing gigantic fluvial system (Goswami, 1985; Ives and Messerli, 1889).

The valley of the river Brahmaputra with its innumerable fresh water lakes (locally called beel), or ox-bow lakes (era suti), marshy tracts and seasonally flooded plains and hundreds of riverine sandbars and islands was, till recently, an ideal wetland eco-system which contained specialised wetland animals like the fresh water dolphin, dugong and the great Indian one-horned rhino and reptiles like the crocodile, the winter monitor lizard and few species of turtles (ENVIS, 2004). All these creatures are either extinct or highly endangered at present. The destruction of

the Brahmaputra valley wetland system started with the arrival of the water hyacinth from Central America more than a century ago. Extensive growth of this fast growing weed can cut out sun light from the micro flora and also produces faster eutrophication by slowing down water current and depositing debris at the bottom. The second phase of enhanced eutrophication took place with the raising of earthen bunds along the banks of almost the entire length of the river and many of its tributaries after the 1950 earthquake. These artificial levees cut off, to a great extent, the periodic flushing out of the wetlands by the monsoon flood. The third and the final onslaught on the wetlands have taken place with the arrival of the human settlers in the sand bars and the minor riverine islands, mostly in the lower Assam. This has turned the wetlands into agricultural zones rich in rice and vegetables but totally denuded of wildlife. It is therefore felt to be an imperative need to conserve these wetlands and protect their unique biodiversity. If properly managed, the wetlands are going to be a source of immense wealth for this state leading also to enrichment of the quality of its environment (ENVIS, 2004). Hence, a preliminary attempt has been made to study the morphological aspects of Floodplain Wetland of the river Brahmaputra particularly of the Panidihing wetland in this paper.

## II. OBJECTIVE

To study of the morphological characteristics of flood plain wetlands in the study area through combination of remote sensing data and field observation and to map the wetland degradation.

## III. STUDY AREA

The study area, Panidihing- a natural wetland (27°10'N-27°45'N & 94°25'E-94°40'E) located in the Sivasagar district (26°43'N-27°18'N & 94°26'E-95°23'E). The total geographical area of the district and the present study area are 2668 sq. k.m. and 33.93 sq.k.m., respectively. The altitude of the area varies from 86 meters to 150 meters. The study area is bounded from north by Sapekhati Bam, Kokilamari village and Milankur Village; south by Disang river; west by river Brahmaputra and bounded from east by the Dimou river. The area lies between the Brahmaputra, Disang and the Dimou river. The natural boundary is demarcated by Dimou River (6.5 k.m. in length).

The area comprises of alluvial flood plain of the Brahmaputra River and is predominated by grassland and wetlands. The terrain is gently slopped from east to west. The area falls under temperate climate zone and the climate can be divided into four

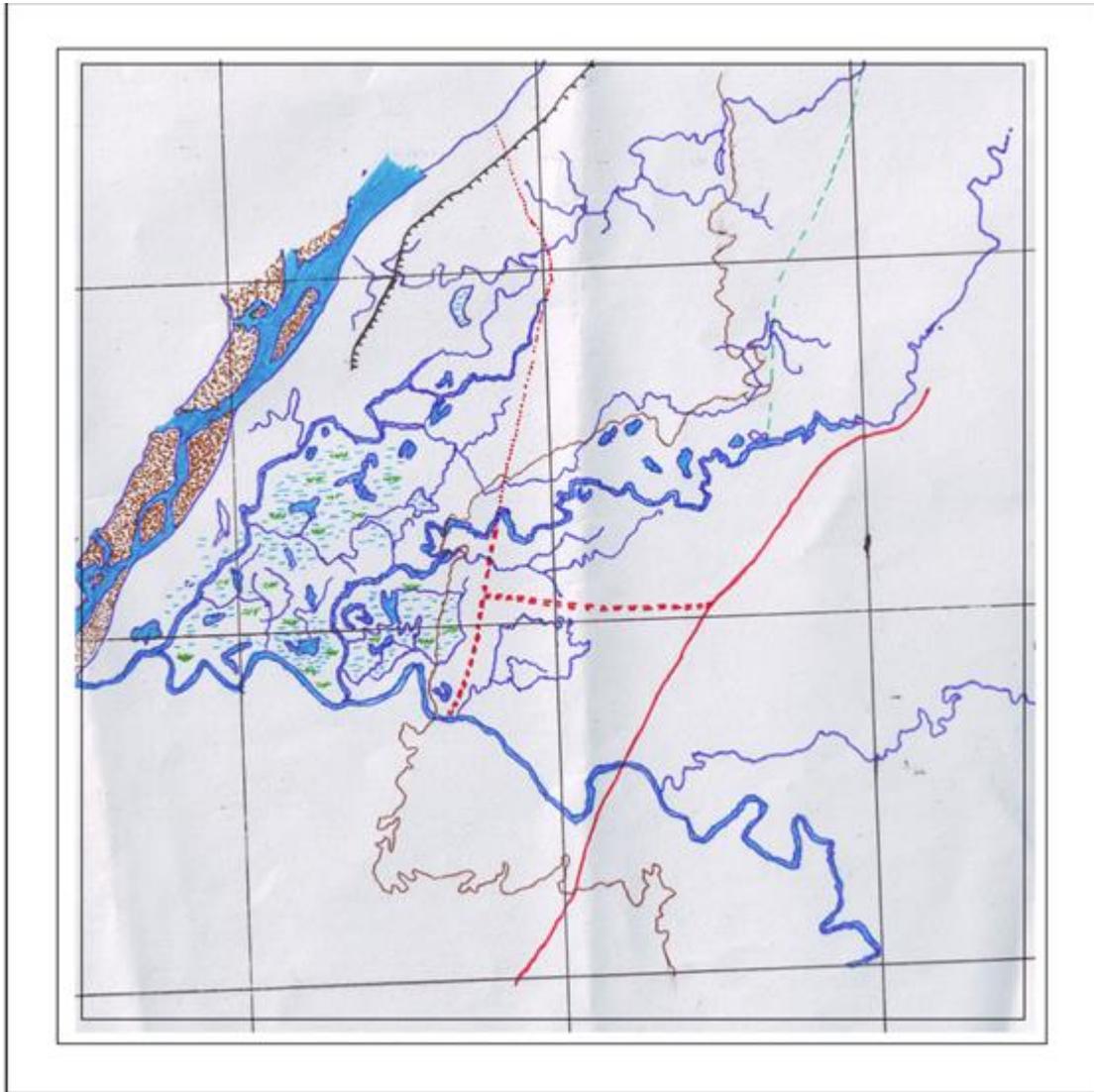
seasons- viz. winter season, pre-monsoon season, monsoon, post monsoon season. The rain fall occurs during the monsoon season. The average annual rainfall is recorded during the last 20 years is 2370mm. The mean annual temperature during winter 9<sup>o</sup>c to 23<sup>o</sup>c and during summer 21<sup>o</sup>c to 33<sup>o</sup>c. The relative humidity varies from 60% to 90%.

Total wetland area in the district is 12582 ha that includes 530 small wetlands (<2.25 ha). River/stream occupies 69.13% of wetlands. The other major wetland types are Waterlogged-natural

(10.57%), Lake/pond (8.28%), Ox-bow lakes (4.2%). There are 25 Tank/pond with 310ha area ( 2.46%) . Details of wetland statistics is given in Table.21. Aquatic vegetation is mainly observed in Lake/pond, waterlogged wetland types. The area under aquatic vegetation is more or less same in both the seasons. Seasonal fluctuation of open water spread of wetlands does not vary during both the seasons. The turbidity of water is moderate in both the seasons. The following table shows the area estimates of wetlands in Sivasagar Area in hectare:-

Sr. No.	Wetcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area		Open Water
<b>Post-monsoon Area</b>				<b>Pre-monsoon Area</b>			
<b>1100</b>				<b>Inland Wetlands - Natural</b>			
1	1101	Lakes/Ponds	30	1042	8.28	220	262
2	1102	Ox-bow lakes/ Cut-off meanders	75	529	4.20	317	333
3	1103	High altitude wetlands	-	-	-	-	-
4	1104	Riverine wetlands	16	113	0.90	40	36
5	1105	Waterlogged	34	1330	10.57	145	89
6	1106	River/Stream	74	8698	69.13	6045	5773
<b>1200</b>				<b>Inland Wetlands -Man-made</b>			
7	1201	Reservoirs/Barrages	-	-	-	-	-
8	1202	Tanks/Ponds	25	310	2.46	304	266
9	1203	Waterlogged	5	30	0.24	30	14
<b>Sub-Total</b>			<b>259</b>	<b>12052</b>	<b>95.79</b>	<b>7101</b>	<b>6773</b>
Wetlands (<2.25 ha), mainly Tanks		530	530	4.21	-		-

Source; ENVIS, Assam (2004).



#### IV. METHODOLOGY

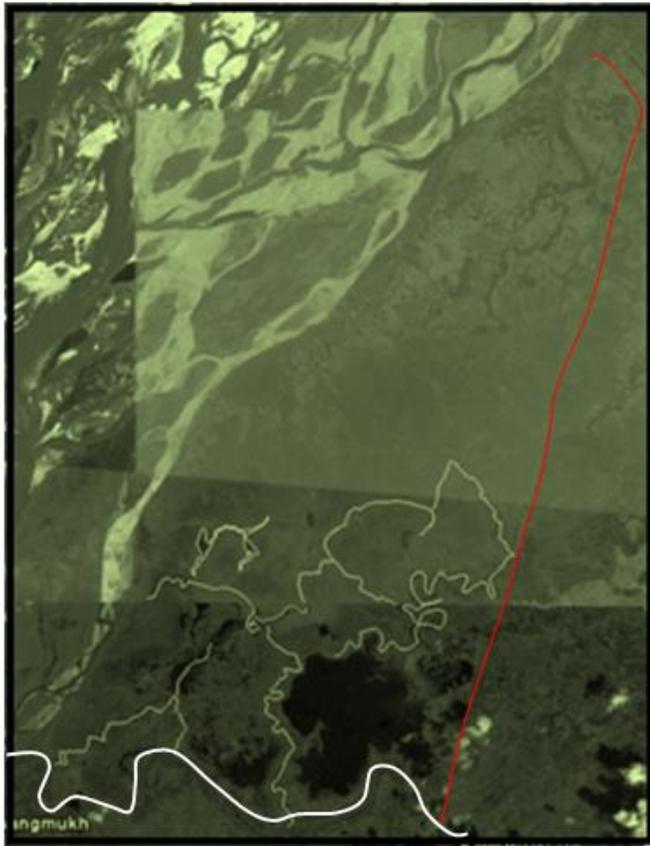
Drainage, swamps, *Beels*, (Dehadrai, 2006), abandoned channels, aquatic vegetation, ox-bow lakes, etc. from Panidihing Wetland are identified and mapped from Topographical sheets of 1:50,000 scale. Their present size, shape and areas have been measured from satellite Imagery and maps collected from Divisional Forest Office, Sivasagar district. Reports from various departments, viz. the Assam Remote Sensing Application Center, Fishery, Agriculture, Forestry and Governments publication are used for the study. Besides, in order to study the present conditions of the Panidihing wetlands several field visits have been carried out in the study area for necessary observation and information.

#### V. RESULTS AND DISCUSSION

##### **Genesis of the Panidihing Wetland:**

The wetland lying in between the three river system, south by Disang, east by Demou and west by Brahmaputra is of fluvial

origin. The toposheet (No 83 I/12) shows that the Panidihing Wetland lies within the contour height of 300 meter. Hence, surface slope doesn't have greater effect in the origin of the wetland. The *Doab* like location of the Panidihing, natural levee formation, embankment of the above rivers and the bordering historical *Dhai Ali* has made the area water logged and moist. The main *beels* of the wetland are Gorimari, Segunpara, Takai, Goboka, Singorijan, Gela Dimou Beel, Mora Disang, Baliyan Beel, Kekrakhathi Beel, Ketari Beel, Dighali and Phulai.



**Fluvial regime of the wetland:**

The wetland is fed by river water, particularly the Demou, the Disang and the Brahmaputra. All these three are perennial rivers and are being nourished by the seasonal rainfall and the surface run-off. The maximum and minimum water discharge of Dimou river is 16 and 2 cubic meter per second respectively. While the river Disang shows the maximum and minimum discharge of 1078 and 915 cubic meter per second respectively. The river Disang is highly sinuous. In this course the width of the river is 100 meter and depth is 12 meter. The average sediment load carried by river Disang is 219 ha/m (Sharma,2008). The abundant streams of Disang River form a good number of *beels* in the plain course. Such *beels* that falls within the study area are Dighali and Phulai *beel*. Besides these rivers and *beels*, there are a few seasonal streams that feed the fluvial regime of the wetland during summer season, viz. Boloma, Singorajan, Samarajan, Garmurajan, Morisuti, Dipling, Champai, Balikur, Naharanijan, Jamugurijan, Najan and Atilajan. The flow pattern seems to be fluctuating. The flow increases considerably during monsoon rains. The rivers have its minimum flow during January and to May period. The maximum flow is attained from the month of July, August, September, and October. After the month of October there is a steady fall in flow.

Apart from the hydrology of the above three main drainage of the wetland, the seasonal rainfall also feeds the fluvial regime of the wetland. Table 1 shows the rainfall of the Sivasagar district for last decade (2001-2009):

Years	Monsoon Season (Rainfall in M.M.)				Annual rainfall (Rainfall in M.M.)
	June	July	August	September	
2000	290.1	172.0	285.4	151.3	1247.3
2001	211.2	174.9	146.5	201.4	1084.4
2002	201.9	378.4	342.7	257.8	1432.7
2003	303.5	481.6	325.6	296.7	2314.3
2004	390.8	363.5	285.4	323.5	2178.3
2005	100.7	431.2	391.8	73.0	1900.8
2006	229.6	367.6	219.6	171.2	1478.1
2007	282.1	403.4	293.9	359.1	1840.5
2008	358.7	356.5	293.9	190.6	1523.4

Source, Statistical Handbook, Assam

**Bio-diversity of the Wetland:**

**Floral Diversity**

The Panidihing wetland is predominantly covered by grasslands and *Beels*. It represents five biomes- Assam alluvial Plains Semi Evergreen Forest, Eastern Seasonal Swamp Forest, Eastern Wet Alluvial Grasslands and Wetlands. In these biomes the most representative plant species found are *Dillenia indica*, *Ficus glomerata*, *Albizia lucida*, *Anthcephalus cadamba*, *Eugenia jamblana*, *Duabanga sneratioides*, *Bombax ceiba*, *Bischofia javanica*, *Alstonia scholaris*, *Macaranga denticulate*, *Zizyphus jujube*, *Erythrina variegata*, *Saccharum species*, *Impereta cylindrical*, *Arundo donax*, *phragmites kerka*, *Typha elephantine*, *Ipomea reptans*, *Ipomea aquatica*, *Enhydra fluctuans*, *Pistia stratites*, *Lema paneicstata*, *Neyraudia reynaudiana*, *Nymphia spp*, *Eichhornia spp* etc.

**Faunal Diversity**

Except seasonal visit of a herd of elephants comprising of about 50 individuals migrating from Arunachal Pradesh through Dhemaji district the wetland doesn't harbor any important mammalian species. Foxes and lesser cats take shelter in the wetland. Besides this, 160 species of birds identified so far in the wetland (Borooah 1990,1994). It is the breeding ground local waterfowls. As the wetland is on the banks of Brahmaputra and Desang, it acts as a breeding ground of variety of fishes and replenishes the fish production in the nearby wetlands and in the rivers.

**Physico-Chemical Characteristics:**

The physicochemical parameter of water samples were collected from three sampling stations(SS1, SS2 & SS3) from April 2010 to march 2011 is presented in the tables. It is found that the pH of the water was very alkaline during the pre monsoon, when compare to the monsoon and post monsoon seasons. It also recorded lowest pH values during post-monsoon and maximum during pre-monsoon season (Jadhav and Deshmukh,2006 ; Jindal and Gusain,2007). It also stated that intense photosynthetic activities of phytoplankton will reduce the free carbon dioxide content resulting in increased pH values (Gupta ; Gupta ,2006).

Sam p ling Stati ons	Ph			DO			WT			BOD			ALK			AT		
	Mo n soo n	Pos t Mo n	Pre Mo n	Mo n so n	Pos t Mo n	Pr e M o n	M o n s o n	P o s t M o n	Pr e M o n									
SS1	7.1 3	7.7 3	7.8 0	7.3 0	7.3 8	6.3 3	18. 43	25. 3	25. 8	1.8	1.5	2.2	58. 2	63. 2	66 .9	25 .1	28 .5	32 .6
SS2	7.0 5	7.8 5	7.8 8	7.7 3	7.1 0	6.1 5	21. 1	23. 7	25. 3	1.6	1.7	2.4	56. 4	64. 4	64 .7	27 .4	26 .3	32 .5
SS3	7.3 3	6.0 9	7.8 5	7.2 5	7.5	6.2 9	22. 5	24. 3	24. 7	1.4	2.6	2.5	60. 3	62. 3	52 .9	27 .0	27 .1	30 .2

\*Tests done by NEIST, Jorhat

**Change Detection:**

The toposheet of SOI (No: 83 I/12) and the two Satellite Imageries (GeoEye/SPOT ) of 1972, 2000 and 2010 respectively shows the changes in the wetland area in terms of its geographical area, conversion of wetland into agricultural land and encroachment of human habitat in the wetland. The rate of change of total area from 1972 to 2000 is 17% (41 sq.K.M in 1972 and 33.93 K.M. in 2000-as per DFO, Sivasagar), but from 2000 to 2010 is 21% (33.93 sq. K.M. in 2000 and 26.57 sq.K.M.). The field observation reveals the fact that human encroachment has become prominent as they have expanded their economic activities in the form of Paddy cultivation, Dairy farming, Daily fishing, mustard seed cultivation, removal of top soil layers by the contractors for construction and illegal felling down of the trees having high economic value. Use of modern method of agriculture, such as, inorganic fertilizer, mechanization in ploughing, sowing and harvesting has been adversely affecting both the faunal and floral realm of the Panidihing wetland. Another fatal threat to the wetland is the rich growth of *Ipomoea aquatica* over the extensive area. This has been restricting the growth of diverse plant species. The preliminary field visits also bring about a salient feature of the wetland to the effect that gradual siltation in the wetland has been going on in each and every over flooding. Upland of the wetland has been overgrazed by the increasing number of livestock which are coming not only from the neighboring areas but also from the distant places of the district.



*Change Detection by GeoEye, SPOT Image (2000 & 2010 superimposed)*

**VI. CONCLUSION AND PERSPECTIVE**

The paper is a segment of ongoing Ph.D work. Raw data so far collected and observations made till the writing of this paper are the main data base . This study reports preliminary investigative information on the morphological aspects of the Panidihing wetland as well as the changes it has been receiving from man induced environmental impact. It needs mention here that no other voluntary or the governmental agencies have been monitoring the spatio-temporal nature and extent of the Panidihing wetland. The records available with the forest department are quite obsolete as of now and the true demarcation of Panidihing Bird Sanctuary and the Panidihing Reserved Forest is also erroneous. Thus, the entire investigation on this issue will involve primary data collection with sophisticated modern tools

and techniques, viz. high resolution satellite imagery (LISS-III/IV), DGPS, most representative sample collection (species, soil, water and population), total weather station for local climatological data, bio and geo-statistical tools, etc.

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# The language of ladies at the Capital of Jordan

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## I. INTRODUCTION

The relatively recent upsurge of interest in the language of ladies at the international level owes an important deal to sociolinguistics, conscious feminism and interesting awareness of civil rights. This interest is also marvelous enhanced by the quick social change in the dress, appearance, and behavior of both ladies and men. However, as in all domains of scientific research, mainstream women's sociolinguistics is a field of controversy. Writing from various perspectives, authors address the subject of ladies language with different goals in mind. For example, some of these authors (cf. Labove 1972; Ervin-Tripp 1978; Hymes 1974) have indicated the interdependence of patterns of speech variation and the gender of the speaker/ hearer. Moreover, other authors (Lakoff 1975; Zimmermann and West 1975) have confirmed that gender differences are basically attributed to the socialization factor, hence the relevance of other variables such as ethnic membership, age, and social class in the analysis of ladies language. On the other hand, other authors (Coates 1986; Bull and Swan 1992) believe gender differences as reflexes of some types of women's sociolinguistic "subculture."

In Jordan, no attention is being paid to the language of ladies in the burgeoning domains of Jordanian sociolinguistics beyond indications here and there that the variable of gender is significant in performance. This may be due to the fact that ladies in this country are still, to a large extent, culturally invisible. The matter fact, documentation on the language of ladies in the Arab world at large is very seldom.

Jordan is a multilingual country where Jordanian Arabic, Caucasian, English and classical or standard Arabic are used with varying degrees of frequency in Jordan (cf. Enajji 1991). In this paper I will concentrate on two major themes: (1) the situations in which ladies use a particular language, as well as the constraints on this use, and (2) the social aspects of the image of ladies in Jordanian Arabic, the lingua franca for all women in Jordan except cases of Caucasian living in different areas in Jordan.

The paper is structured as follows: in the first section, some preliminaries concerning the gender variable are given. In the second, the methodology used in data collection is briefly described. Third one is an interpretation of the results of data analysis is presented. The last one is the language of and about ladies is correlated with their overall socio-economic status.

## II. THE GENDER VARIABLE

In the linguistics sense, one cannot say that ladies have their own specific language because there is no difference between the

language of ladies and the language of men; both of them achieve the same kind of competence in a given language. However, as far as performance is concerned, there are instances where the same meaning rendered differently by ladies and men in terms of the linguistic expressions they use, that is, their speech. Throughout this paper the term language is used to refer to speech.

Within sociolinguistics, the term gender is to be differentiated from the term sex. The later is usually used to designate both female and male participants in a speech activity, whereas the previous usually indicates to the notion of sex as a social variable. Gender is felt to be one of the most influential factors in language use.

As overview of the literature on the gender variable discovers that sex differences have been so far explained as reflexes of (1) social dominance, (2) social difference or more recently (3) asymmetrical discourse. The first view illustrates the idiosyncrasies of ladies speech as typical results of ladies dominated social status. The most famous example of this dominance approach is Lak off (1975) who believes that the bulk of gender differences in language to the phenomenon of socialization in a male dominated society. The process of socialization permits the internalization as well as the reinforcement of a strong sense of gender identity, which automatically results in a certain speech behavior. In other words, ladies speech is a subordinated form of linguistic behavior because women are socially subordinated to men.

Instances of this subordinated linguistic behavior are lack of assertion/authority, hesitation, politeness and a tendency to use standard forms of language. At the same time, these communicational behaviors, women search to compensate for their overall social insecurity.

Lak off's illustration of sex linked differences in terms of dominance were further developed by other sociolinguistics. Hass (1975) for instance, explained speech development in small children prior to the crucial age of five. His results reveal that distinct patterns are recognized in the way boys and girls use their languages. As for Zimmermann and West (1975) they illustrate the various linguistic characteristics of ladies language in terms of turn-taking roles in conversations. Ladies are not assertive in their speech because they are constantly subject to being interrupted by men in conversations.

Fishman (1980), on the other side, believes that differences in women's and men's language to different ways of beginning and keeping conversations. Part of ladies role in mixed conversations is to support what Fishman (1980) indicates to as bad work that is verbal behavior whose major role is to keep the flow of conversation.

The second approach to sex-linked differences is difference approach (Coates 1986, Maltz and Broker (1982). Studies within

this approach have gone beyond the impact of society in illustrating the language of females and males have confirmed that the two genders simply have different sociolinguistic subcultures. Differently, Ladies speech is not because their social status is inferior to the males, but because they have different female subculture where values and norms simply happen to be different from the male values and norms.

This is the finding of the early social differentiation of the genders, which gives rise to the single gender per groups where each gender learns certain conversational strategies norms and values.

Thirdly, approach to the role of sex in speech is a symmetrical approach, viewed by Bull and Swan (1992). Both authors based their suggestions on the writings of the feminist theorist Mackinnon (1987). In the symmetrical approach, sex is not regarded as something fixed through cultures, but as something that changes both through time and even within the makeup of the same person. Gender differences, referring to the view, can be illustrated only by concentrating on the various differences that sex makes in various kinds of speak because various kinds of people.

A symmetrical discourse is based on analyses of situations where talk is highly institutionalized and where the participants are symmetrically related, as in court rooms, doctors examining rooms etc. where doctors and judges control speech as they have more power over defendants and patients. For example, in such situations, only the dominant parties use the dominant language, not because of their social power but because of the constructed privilege that such institutions give them. These situations sex does not have a significant effect in courtroom, women judges have the same privileges that men judges have.

### III. METHODOLOGY:

The methodology of analysis used in this paper is based on three questionnaires, as well as several interviews and tapes recordings. Not all the ladies participating in the questionnaires, interviews, tape recordings were born in the city of Amman,

where the data were collected geographically dialect differences are thus not excluded.

The first questionnaire was submitted to a sample of 104 students, the second questionnaire was submitted to 26 university teachers, and the third questionnaire was submitted to a sample 52 women from different areas.

In addition to the questionnaires, 27 women were interviewed, 9 from each group that filled out the questionnaires. During the interviews, ladies were asked questions meant to elaborate on one or more points in the questionnaires or were asked questions that would confirm or disconfirm the answers given the questionnaire forms.

I also used tape recordings. The women who participated in the recordings did not know that they were being tape recorded. These ladies belong to different social classes and age groups. Some of them are academics, some are business women, shop keepers, doctors, and others house wives. Moreover, both formal and informal situations were used. I used homes, university, and the sport center as the main places for recordings. The choice of these places simply coincident with places I usually prefer.

### IV. ANALYSIS OF DATA:

The data obtained from the questionnaires may be categorized into two main themes: 1. The way Jordanian ladies use the three languages are available to them: Jordanian Arabic (JA), Caucasian ( C ), and English (E), and the way Jordanian women perceive language use. Table 1 is related to the first theme.

### V. INTERPRETATION OF THE DATA:

In my interpretation of the data obtained from the questionnaires, I will whenever appropriate correlate the findings of the questionnaires with following Table below it.

**Table 1 Frequency of language choice among Jordanian ladies (%)**

Questions	working women	Housewives
Which language do you use at home?	JA: 65 C: 19 E: 20	JA: 76 C: 20 E: 8
Is this choice motivated by habit?	Yes 78	Yes 84
Is this choice motivated by the need to impress others?	Yes 9	Yes 25
Is this choice motivated by the need To feel relaxed?	Yes 35	Yes 1
Which language do you speak to your Children?	J A 59 C: 10 E: 35	J A: 81 C: 12 E: 11
Which language do you use with your Friends?	J A: 54 C: 17	J A 73 C: 15

E: 33                      E: 16

Which language do you use in mixed  
Groups?

J A: 31  
C: 17  
E: 56

J A: 86  
C: 6  
E: 12

Those of the tape recordings, I will begin by interpreting the percentages obtained from table 1. According to question 1, Jordanian Arabic appears to be the language predominately used at home in Jordan. This correlates with Ennaji; s (1990) views that Moroccan Arabic is the lingua franca par excellence in Morocco. This similarly happened in Jordan. The fact that working women use more English at home is obviously due to their social status as women with jobs and hence to their relatively high level of education. However, a point of caution needs to be evoked here: in 1950s, 1960s and 1970s Jordanian housewives were in the majority of cases nonworking and hence generally no educated, but situation has dramatically changed in the early 1980sand especially in the early 1990s: more and more housewives are educated women who either could not find a job or choose to stay at home. This situation is obviously linked to overall economic situation of Jordanians.

Further conclusion that may be drawn from the answers to question 1 is that Caucasian is not much use at home: only 19 percent of working women and 20 of housewives use Caucasian at home. Caucasian is used more among adults than with children. Note that the percentage of ladies who speak Caucasian at home is higher nationalist people. It is also to noted that Moroccan ladies make abundant use of code mixing and switching viewed by (Lahlou 1990). Similarly has happened to Jordanian women.

As for English only 8 percent of housewives use it at home, whereas 20 percent of working women do. This of course correlates with women's job requirements.

The answer to question 2 shows that the use of Jordanian Arabic at home is mainly due to habit. This again reflects the strong acceptance of Jordanian Arabic as a mother tongue and a lingua franca.

The percentages corresponding to question 3 reveal that ladies may use J A in order to impress others. These are usually Caucasian phones who regard J A as more prestigious than Caucasian given the diglossic relationship of the previous to standard Arabic, and hence to religion. Just for information, that Caucasian language is mostly spoken language, and fewer who able to speak, write and read the language, especially the adults and particular the nationalist people. Caucasian people came to Jordan after the world war one; they fled their home land seeking for safer place in Jordan and other places cross the world.

Never the less, 8 percent of working women share this opinion. An interesting conclusion from the answer to the question 4 is that only working women appear to be conscious that the choice of a particular language is dictated by a need to feel relaxed. Question 4 is significant given that the choice of the language that ladies use with their children is extremely revealing.

In a multilingual country like Jordan, some of the people prefer to speak with their children in a language that they think will be useful for their future careers even if there are other languages that their parents hold in esteem. Here again, the unique place of J A as a mother tongue and a lingua franca is clear. However, the social status of women is also crucial here. Generally, housewives use Jordanian Arabic 81%, whereas working women tend to use it less (only 59%). On the other side, an important percentage of working women 35% use frequently English with their children, whereas only 11% of housewives do. Caucasian is less and less used 10% by working women and 12% by housewives.

The answers to question 6 show that the language that ladies use with their friends is predominately Jordanian Arabic (73% of housewives and 54% of working women). More working women usually use English in such situations (33%), whereas 16% of house wives do. Caucasian is more used among friends and nationalist than with children (17% by working women and 15% by housewives). This fact reveals that when women speak to their children, they are more concerned with future use of the language and its practical utility than with anything else.

The percentages corresponding to the last question in Table 1 show that in mixed groups, there is a sharp difference between working and nonworking women. In previous group, only 31% percent of women use Jordanian Arabic, whereas 86% use the same language in the same circumstances. Similarly, no less than 56% of working women use English in such groups, whereas 12% of housewives do. As for Caucasian it is frequently more used by working women in mixed groups than by housewives in similar situations. In fact, only 6% of housewives use Caucasian language in mixed groups. One illustration for this is that housewives, more than working women, need to assert themselves given their social status, and hence tend to use a language that they think is more prestigious. Although 86% percent of Jordanian nonworking women use Jordanian Arabic in mixed groups, the majority of these ladies mix this language with English in order to sound educated.

The major reason for this is that Jordanian women are more consciously aware than Jordanian men of the social importance of English as a prestigious language because they are more in need of this prestige than men. It is also to be noted that working ladies tend to use English –Jordanian Arabic code-switching and mixing more than housewives. Furthermore, ladies generally avoid the use of words and expressions belonging nonstandard language. It is perceived as “rough,” “uncivilized” and “uneducated” as opposed to standard language, which is generally viewed as “intelligent,” “independent,” and “sophisticated”. Ladies need to have an effect on the audience more than men. In conversations, ladies are more anxious to have

an effect on males than conversely. One possible reason for this is that ladies are more evaluated on what they say than males.

One general conclusion to be taken from the percentages given in Table 1 is that the status of ladies as working or nonworking has a direct effect on their use of language inside and outside the home. In wider perspective, the answers obtained

from Table 1 show that the less social status a lady has, the more standard she uses.

As for Table 2, the answers to question 1 reveal that Jordanian women

**Table2 elicitation of Jordanian women’s perception of language use**

Questions	working women	Housewives
What are the topics that you would like to Discuss with women?	personal: 93	personal: 99
Do you believe that there are words or Expressions that only men use?	yes: 85	yes: 102
Do you believe that there are words or Expressions that only women use?	yes: 98	yes: 102
Do you feel embarrassed in a mix groups?	Yes: 29	yes: 88
Do you believe there is a language of women In Jordan?	yes: 73	yes: 96
If your answer to the previous, how would You Qualify this language :inferior, typical, Superior?	inferior: 13 typical: 65 Superior: 28	inferior: 49 typical: 41 superior: 16

(working or housewives) prefer to discuss personal matters with other women than with men. This correlates nicely with the findings of the tape recordings, where the topics of conversations in all women groups centered almost exclusively on children, personal relations, family, jobs, and husbands. However, I should add her that 72% of working women prefer to discuss matters related to their jobs in mixed groups. Another correlation between the questionnaires and the tape recordings is that the later that topic shifts in all women groups conversations were rather abrupt, a fact which reveals that in all women groups conversations appear to be more relaxed and conversation situations are created more easily.

As for answers to question 2 they reveal that Jordanian ladies (working or housewives) are conscious of the fact that there are words and expressions that are used only by males. Most ladies gave examples like kallili ‘my pal’ or taboo words like wali ‘go to hell’ According to the answer obtained, men also trend to use more slang and violent speech than women.

Similarly, answers to question 3 shows that women assume that there are words and expressions that are typically used by women. According to the examples that were given, I can cite yaa (interjection of surprise), youwarjiny youm fik! ‘Drop dead’, ahij (interjection). These samples correlate with the results of the tape recordings: it looks that the majority of the vocabulary items that occur in the recorded speech of women are related to child rearing, cooking, fashion, hair-styling and home decorating. Ladies also make a great use of intensifiers such as iktheer ‘a lot’ shwija ‘a little’ iawah ‘not a bit’ etc., which show their emotions. Further, women tend to use diminutives are noticed like ‘shwi ‘little’ ‘biggest’ etc. Diminutives are noticed in the speech of women even in questions: qdish? ‘How big’? Women also prefer

euphemistic expressions and polite forms. Another correlation between the questionnaires and the interviews is that when asked to relate the most important event in their lives, most ladies revealed a lot of emotion.

According to the answers to question 4, more housewives 86% than working women 29% feel embarrassed in mixed groups. Most of the reasons given are “I cannot follow men’s lines of argumentation,” what men say is boring” “I am afraid of being misinterpreted,” etc. It is also to be noted that in mixed groups women talk far less than males. Ladies are more easily interrupted than males, a fact which mentions Zimmermann and West’s (1975) says that in mixed groups males trend to interrupt females as a result of which the later often resort to silence. The percentages corresponding to question 5 are very revealing. A good percentage of women 73% of working women and 96% of housewives believe that there is a language of ladies in Jordan. These results correlate with findings of questions 3 and 4 Table 2.

The last question in Table 2 reveals that more housewives 49% than working women 12% qualify the language of ladies as inferior, whereas more working ladies 65% than housewives 41% qualify it as typical of women. Interestingly, enough, only 16% of housewives and 28% of working women believe that their language is superior.

Generally, the conclusion is to be drawn from the answers to the questions that they speak differently from men. The answers also show a prevailing sense of solidarity and sharing among ladies.

## VI. LADIES LANGUAGE: A REFLECTION OF THEIR SOCIAL STATUS

In Jordanian society, as in any other society, women and men hold different positions and perform different functions. Naturally, different values are attached to these functions, very often to the detriment of ladies. In Jordan, many actions, practices, rules, and customs, as well as application of the law, contribute directly to limiting ladies role. Socially, Jordanian women are relegated to second position in key areas like the family, public circles and law courts. The social status and identity of Jordanian ladies largely depends on whether or not they are married, whether or not they have children and whether or not they have a job.

Overall, public recognition is often given to men, not women. Legally, unmarried women and widows always depend on their fathers or even sons; they are never recognized as responsible before the law, even in cases where they have some economic independence. To have a pass port a Jordanian lady needs the permission of her husband, her father, son or two men relative as witnesses. Further, ladies do not act as witnesses in court of law to certain degree. When married a woman like a child is usually referred to in relation to property.

There is a relationship of "owner-owed" in men-women interaction in Jordan. For instances, like mra 'unqu women in his possession' is accepted, but zalameh unqha man in her possession is not. A popular saying in Jordanian Arabic is ja flan la taqarrb la melk flan u la taqrrab la mart flan 'do not touch another man's property and don not touch another man's wife'. In Jordan, the level of education is still highly correlated with the possibility of having a job. One thing to be noted in relation to Jordanian ladies education is that it is very rare for women to be better educated than their husbands. A consequence of this is that, on the one hand, women earn less, and on the other side, they tend to have little opportunity for promotion. In fact, ladies tend to think more of their husbands' promotions than of their own promotions even if both partners hold the same position in the same institution.

A natural result of this state of affairs is that Jordanian Ladies tend to look assertiveness. This is reflected in speech, mainly in the excessive use of more polite forms of speech and euphemisms. (see the answers to questions 3, 5, and 6 in Table 2. Note here that politeness is a concept that can be judged only in relation to a speech social context. For instance, men's politeness is to be perceived as different forms of women's because only the latter stems from lack of assertion.

Jordanian ladies' speech is polite because in Jordanian society ladies are brought up to talk in a "ladylike" way and are expected to act and to talk accordingly. Expressions like bent bethum 'daughter of their house' (a girl of good upbringing), bent nas 'daughter of people' (a girl of a good back family ground' are highly sought after even by ladies themselves.

Moreover, ladies are differential in the use of forms of address. They use more terms like sidi not only as a form of respect but also as an attempt to keep distance. Ladies also like to prefix names of males with the titles like Y duktur 'Doctor'. This correlates with women's general tendency to use compliments more frequently than males viewed by (Herbert 1990). Further, in both all women and mixed groups, Jordanian ladies make extensive use of the expressions aiwah 'all right' mish haike

'isn't it'? Such expressions are much more elliptical than the English tag questions, but they share with these tags the context of use. It is true that Jordanian men also use such expressions but not as frequently as women and also seldom in unmarked situations where the social power of men is not jeopardized. Socially, these expressions have a function and a meaning; they show the typical communication strategies that ladies use: hesitation, lack of assertion, and the seeking of approval forms the participants in conversations. All this largely reflects women's lack of assertiveness and their constant feeling of insecurity in cross gender conversations (see the percentages to questions 4 in Table 2. The Jordanian socio-cultural background does not develop in women a feeling of self dependence and initiative.

In Jordanian society, the way ladies are talked about, even by women themselves, is a very good case of persistent stereotyping. Stereotypes reflect shared expectations that members of a specific society have as to what ladies and men are like and what is expected of them. Stereotypes are, thus, social reflexes of social divisions and social attitudes, which in turn are directly reflected in language use. This is an area where language and society interact significantly. Stereotypes stem from social norms and behaviors and it is very difficult for a stereotype to die a natural death. Jordanian society is positively biased toward men and negatively biased toward women. Men have power over women at the level of political leadership and legal rights and even in streets. Generally, speaking the attributes and values associated with women are more negative than the one associated with males.

It is true that, unlike English and French where man and homme 'man' refer to both men and women. However, Jordanian Arabic is full of expressions that reflect stereotypes relating to women. These stereotypes vary greatly from rural, bedowin, to urban areas, as well as a cross the class categories of women. For instance, although there is no generic usage of masculine terms to the extent it exists in other languages, the following expressions are attributed to women and do not have equivalents that allude to men

Hadik mra!  
'That's only woman!'  
Hadk Zalameh!  
That's only man!  
Suq I'linisaa! 'the market of women'  
Suq IZlaam!  
'the market of men!'  
Hadak mra mish, Zalameh  
a. That's woman not a man  
b. Negative connotation an insult!  
b.Hada Zalameh

That's a man not a woman': positive connotation; an attribute

In Jordanian context, one of the most widespread stereotypes is that women talk more than men. This is so much believed to be truth that any devalued or uninteresting talk is qualified as hadik mra Cf. {1} above. Although the literal meaning of this expression is 'women's talk' it is used to refer to anything 'unimportant' or uninteresting'. However, they have been

extensively studied by many researchers (e.g. Hilpert et al 1975; Strodtbeck 1951; Argyle et al. 1986; Swacker 1975) have revealed that men talk far more than women. The expression *hadak mra*. Mish Zalameh (c.f. {5} above said to a man is very strong; it donates the fact that women are associated with anything unworthy. The meanings attributed to words and expressions and the way these words and expressions are used create a powerful ideology that is difficult to eradicate or even change. In Jordanian society, this ideology creates a world view where men have physical and moral power over women.

Other similar examples are given below it.

Iwa bes helwah

'At least she is beautiful'

Iwa bes maah filus

'At least he is rich'

Anna bes Zalameh

'I am just a man'

Anna bes mra

'I am just woman'

Iftah itariq (said only by men

'let women hide themselves so that men can enter the house' (lit make the way free)

Referring to Lakoff (1975), gender language is language that is derogatory to women as a group. The expressions 6-8 above are not sexist in their literal meaning, but their use certainly is. On the other side the terms *sibian* 'boys' and *iwlaad* 'boys' refer to both boys and girls, whereas The terms *bannat* 'girls' *sabiyaat* 'girls' refer only to girls and hence marked. Such terms denote a sexist attitude.

Many masculine words and expressions are used in a generic sense. For instance, *Zalameh italim* 'men of education,' although the majority of teachers in Jordanian primary and secondary schools are composed of women. There is also *geel ilmstakbel* 'the future generation' or men of the future which excludes women at the level of linguistic expressions. Further, many expressions associated women, but not men, with children: *nasa wa iwladha* 'women with her children'. In every day speech, Jordanian women are often defined in relation to their fathers or husbands, whereas men are defined in terms of the jobs they hold in society. In addition, the use of title *aniseh* 'unmarried girl' and lady *saideh* 'married woman' is discriminatory in the absence of equivalent terms distinguishing unmarried from married men. One implication of this is that women need to be identified at first sight, as married or unmarried whereas; men are not subject to this. In fact, this clearly implies that the material status of Jordanian women is crucial to their public social identity, whereas the material status of men is not.

Stereotypes relating to how Jordanian women are perceived and talked about are dangerously reinforced in children's textbook. Females (both girls and women) are always revealed performing domestic duties like cleaning the floor and washing up the dishes, whereas males (both boys and men) are shown piloting an airplane, playing violent games, reflect this attitude and so on. Words and expressions that are little boys utter like *banaat fashlat* 'girls are weak' and so on. There is a marked continuity between the speech of girls and those women as well as between the speech of boys and that of men. The early

differences between the behaviors of girls and boys are only naturally carried over by women and men, a fact that explains miscommunication that often characterizes cross-sex interaction.

The image of Jordanian women in the national media is in line with the widespread stereotypes. The media related industries are over whelming males dominated. For instance, most commentators of commercials are men. Ladies are represented as 'petty' users of products or as commercial accessories accompanying a car or well coming important looking business men. Jordanian women have an ambiguous status vis-à-vis authority they have authority over children and maids; they are responsible for house maintenance, hence the expressions *malek addar* 'home owner' in this capacity only. However, politically women are largely invisible. It was only in the early 1990s that a tiny percentage of women were elected directly by people and few others were getting help by the state. Up to now few of women have managed to secure a seat in parliament.

At the social level, the status of ladies in Jordan is also ambiguous ;this is appropriately reflected in the popular saying *mra kwiseh u mra laa* 'a woman is good and a woman is bad'. This gives women an uncertain social status, similar to their uncertain political status. Further, a married women's identify depends on crucially on her relationship with her husband's: *anna mrat zalameh* 'I am a man's wife', said in contexts where a woman needs to state that she has social status, shows the women subordination to men.

Note for instance, the ridiculous connotation of *zalameh mra* 'I am a woman's husband'. Overall, there is a great uncertainty as to Jordanian women's sociolinguistic place and status. This situation is maybe wanted. It is a situation that is very much reminiscent of what Jaworski (1992: 36) claims: "should women be talked about, or discussed in any meaningful, relevant terms, they would have to be unambiguously identified as women, and this would pose a threat to the identity and coherence of the male status-quo world".

In Jordan, as in all societies, the usual reaction to the ambiguous is taboo, unspeakable, and silence. To large extent, Jordanian ladies are seen not heard especially in the public areas involving ritual speech.

The religious factor affects Jordanian ladies speech in a very apparent way. Their attachment to the Muslim religion is reflected in the religious terms used and a tendency to defend a specific point. Generally, women's speech greatly varies according to whether those ladies are visible religiously committed or not that is, whether or not they wear the veil.

## VII. CONCLUSION

The language of ladies in the city of Amman offers a very good case study in sociolinguistics. The urban area of Amman is to a large extent reprehensive of Jordanian urban areas. On a great scale, differences in the speech of Jordanian ladies and men cannot be attributable solely to biological differences: it is very difficult to illustrate the linguistic behavior of Jordanian females and males without describing the socio-economic setting that dictates this behavior. In fact, gender-role behaviors and attitudes

are socio-culturally defined, and the socio-cultural status of ladies in Jordan is largely showed in their speech.

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# A Review on Cross Layer Routing Techniques

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**Abstract-** Ever since wireless sensor networks (WSNs) have emerged, different optimization techniques have been proposed to overcome their constraints like energy efficiency, delay, finding the best route, etc. Furthermore, the proposal of new applications for WSNs has also created new challenges to be addressed. The concept of Cross-layer gave a verity of optimization techniques to the world of sensor networks and the approaches have proven to be the most efficient optimization techniques for these problems, since they are able to take the behavior of the protocols at each layer into consideration. Thus, this survey proposes to identify the key problems of WSNs and gather available crosslayer solutions for them that have been proposed so far, in order to provide insights on the identification of open issues and provide guidelines for future proposals. In this paper, the need for cross layer design in WSN and the interaction between the layers is discussed first and later we discussed the different types of cross layer techniques

**Index Terms-** Wireless Sensor Networks, Optimization Techniques, Cross Layer design, Constraints.

## I. INTRODUCTION

Due to the dynamic topology, limited resources and unpredictable channel conditions, the strict layered design is not flexible enough to cope with the wireless sensor network environment. The widespread use wireless sensor networks be a more and more important and common way to provide Internet connectivity. The worldwide success of the Internet, mainly determined by a layered architecture, has promoted the adoption of a similar solution for wireless sensor network. However, a strict layered design is not flexible enough to cope with the dynamics environments, and will thus prevent performance optimizations. It is because of the unpredictability and unreliability of the underlying wireless medium that research on cross-layer design in wireless ad hoc network and sensor networks has recently attracted a significant interest [10].

The traditional approach to optimizing performance by separately optimizing different layers of the OSI model may not be optimal. In order to obtain the best results, it might be necessary to perform optimization using the information available across many layers. The concept of cross-design is based on architecture where the layers can exchanges information in order to improve the overall network performances. Therefore, various cross-layering approaches, where protocol layers actively interact, exchange inherent layer information and fine tune their parameters according to the network status are becoming increasingly popular.

In WSN (wireless sensor networks) the node has small volume and uses the battery for energy supply, therefore has created that node's processing, memory property, communication range and energy is limited. In WSN, reducing the end-to-end delay and the energy consumption is very important. The limitation of energy is a fundamental problem in wireless sensor networks (WSNs) because of the limited battery capacity of sensor nodes. Communication protocols for WSNs, including routing and MAC layer protocols should be designed energy-efficiently. Traditional wireless MAC protocols such as IEEE 802.11 are not available for this purpose; since in these protocols, nodes are required to keep awake to listen to the medium even when the network becomes idle. This inefficient idle-listening mechanism wastes substantial energy.

The literature survey is discussed in the rest of the paper.

### A. Cross Layer Design

Generally speaking, cross-layer design refers to protocol design done by actively exploiting the dependence between protocol layers to obtain performance gains. This is unlike layering, where the protocols at the different layers are designed independently. Cross-layer design states that parameters of two or more layers can be retrieved and/or changed in order to achieve an optimization objective. The concept of cross-layering has been first proposed for TCP/IP networks, when wireless links were deployed. Since the TCP/IP stack has been proposed for wired connections, there was a loss of performance when wireless technology became part of existing networks.

Lately, cross-layering is a field that has been attracting more attention in WSNs research and it is still in its early development in this type of networks since it has not been deployed on many test beds or networks yet. Common goals of cross-layer optimizations in WSNs are reduction of energy consumption, efficient routing, QoS provisioning, and optimal scheduling, as can be verified throughout this work. There are several studies on cross layer protocols for WSNs. To address the receiver based contention, congestion control and duty cycling in WSNs. Some of the most used protocols on cross layer design and new protocol proposals are going to be presented, along with the optimizations they provide, in order to gather a small database on what has been proposed so far. Cross-layer design has been adopted on wireless sensor networks (WSNs) to improve their performance by discussing the state-of-the-art literature on the subject. Also, open issues on cross-layering will be identified to facilitate the work of researchers towards further improvements applied to WSNs.

After presenting the definition, we identify some basic types of cross-layer designs and present relevant examples from the literature. This serves four purposes: first, it clarifies and illustrates our definition of cross-layer design; second, it creates a

taxonomy for classifying existing cross-layer design proposals; third, it highlights the different interpretations of cross layer design in the literature and shows how they can be seen in a more unified way; and finally, it provides a framework for evaluating the implementation concerns raised by different kinds of cross-layer design proposals. As expected, the different kinds of cross-layer design proposals raise different implementation concerns. After creating the taxonomy of the cross-layer design proposals, we similarly categorize and discuss the initial proposals for implementing cross-layer interactions and highlight briefly for which kind of cross-layer design proposals the different implementation methods are suitable. Differently from the conventional networks layers, WSNs consider only the following layers: application (APP), network (NWK or NET), medium access control (MAC), and physical (PHY). Although there is no transport layer, since it is complex and it would waste sensors energy, some WSN protocols have been designed for congestion control and reliable end-to-end communication.

### B. Cross Layer Interaction

Cross layer interaction means allowing communication of layers with any other possibly non-adjacent layers in the protocol stack. Traditionally, the network protocols are divided into several independent layers. Each layer is designed separately and the interaction between layers is performed through a well-defined interface.

The main advantage of layering is architectural flexibility but layering approach is not efficient for wireless networks. Cross layering came into existence because of highly variable nature of links used in the wireless communication systems and due to resource poor nature of the wireless mobile devices there has been multiple research efforts to improve the performance of the protocol stack by allowing cross layer interaction by wireless systems. Because of QoS, energy consumption, poor performance, wireless links, mobility, packet loss, delay problems observed in the wireless networks much attention is paid in the cross layer interactions. Typically, sensor nodes avoid direct communication with distance destination since high transmission power is required to achieve reliable transmission. Instead in WSNs, sensor nodes communicate by forming a multi hop network to forward messages to the collector nodes, which is also called the sink node.

## II. LITRATURE SURVEY

### A. CLB (Cost Link Based) for routing

In paper [1], the physical layer (PHY) plays a very important role in wireless communication due to the challenging nature of communication medium. The power consumption of wireless devices heavily relies on physical layer. The medium access control (MAC) layer manages wireless resources for PHY layer and directly impact overall performance. This solved by defining a new cross layer scheme CLB (Cost Link Based) for routing [1]. Data aggregation with low energy consumption is task of finding extreme (maximum, minimum) sensor readings within a WSN. Extreme value aggregation has found many important applications in WSN development. Work by used compression to find approximate solutions to queries to deal with the large amount of data. Used a threshold and binary search

technique similar to our approach to find order statistics, specifically concentrating on the median. The work did not explore extreme value aggregation with more than just a straightforward broadcast- converge cast search.

In short, at the beginning of the query, every sensor node in the tree passes the query to all of its children. Once all of the children return with the maximum readings of their own respective subtrees, the parent sensor node then returns only the maximum reading of its own subtree back up to its parent in the network. Building on top of this work, went further by avoiding a count of distinct data points in the network as well as use previous query results to improve performance. Both concentrate on an ad hoc tree structure for WSN. This problem can be overcome by the proposed cross-layer probabilistic data aggregation method offers superior performance while demanding much lower energy consumption than existing algorithms. In comparison to the naive method, which consumes power as  $O(N \log(N))$ , our algorithm offers a marked improvement at  $O(1)$  [2].

### B. Fairness in delay-aware cross layer data transmission scheme (FDRX)

In paper [3], particularly, delivery of time-critical data becomes a significant challenge. For instance, the impact of delay on smart grid applications, considering a WSN that is used for condition monitoring of wind turbines. Timely delivery of critical data has been found to be a significant challenge in such applications. This can be solved by designing separately fairness-aware cross layer scheme and a delay-aware cross layer technique for WSNs. But here it is proposed a cross layer scheme that is both fairness-aware and delay-aware. Our fairness in delay-aware cross layer data transmission scheme (FDRX) is based on delay-estimation and data prioritization steps that are performed before the data transmission by the application layer. [3].

### C. Link Distance Reliability Cost (LRC) Based Cross Layer Route

Shortest path scheme is the most common criteria adopted by the conventional routing protocols proposed for WSNs. The problem is that nodes along shortest paths may be used frequently and the batteries may exhaust faster. The consequence is that the network may become disconnected leaving disparity in the energy and disconnect the networks. Therefore the shortest path is not the most suitable metric adopted for routing decision. We have considered the network that is less mobile. MAC and the physical layer information are explored for routing. It can be solved by designing the new routing protocol, concept of the minimum hop scheme is considered.

We propose Link distance Reliability Cost (LRC) based cross layer route discovery for WSN (Wireless Sensor Network) that improve the end-to-end throughput, delivery ratio and node energy consumption in WSNs. This approach also decreases the chance of loss of data because we have assured that battery capacity is not below the defined value [4].

### D. TCLM Model

In paper [5] the authors build up a reputation space and trust space in WSNs, and define a transformation from reputation

space to trust space. It is proposed a trust-based LEACH protocol to provide secure routing, which is an integration of a trust management module with a trust-based routing module. The trust management module is responsible for building trust relationships among sensor nodes with novel methodologies to provide efficient monitoring, trust exchange and evaluation.

The trust-based routing module is a modified version of original protocol with the same head-election algorithm and working phases, while having trust-based decision-making. A multi-angle trust mechanism for nodes in Wireless Sensor Networks which adding the sensing data and the node's energy in the factors of trust assessment in addition to communication, and new trust models to calculate the trust values of communication trust, the sensed data and the node's energy. The proposed a new protocol TTSN (Task-based Trust Framework in Sensor Networks) to construct a trust framework model in wireless sensor networks. The sensor node has different trust rating for different task.

The proposed model use watchdog scheme to observe the behavior in different events of these nodes and broadcast their trust ratings. The authors have proposed an approach called BTRM-WSN which is a bio-inspired trust and reputation model for WSNs aimed to achieve to most trustworthy path leading to the most reputable node in a WSN offering a certain service. It is based on the bio-inspired algorithm of ant colony system. Most of existing methods are designed for MANETs and suppose that each node have the full route from source to destination (i.e. designed for source routing), while for the hop by hop routing they discuss only one hop neighbors not along the full route, that is not suitable for WSNs. In addition to that, no one used the cross layer concept in computing and updating the trust values.

In paper [5] the data available at both DLL and Transport layer to make the network-layer decision more accurate, which improve the performance of the trust model. Wireless Sensor Networks (WSNs) are vulnerable to attacks (selfish or malicious i.e. misbehaving nodes) due to the nature of the wireless media, restricted resource and the natural co-operations of sensors. Therefore, the security issue is very critical in WSN. The decision making in a WSN is essential for carrying out certain tasks as it aids sensors establish collaborations. This can be solved by new model for trust in WSN, called A Trust-Based Cross-Layer Model, which use cross-layer concept (ACKs from data link layer and TCP layer) to design trust-based model for sensor networks that guarantee the trust route from source to sink and isolate the malicious node. [5].

#### E. Cross Layer Design for Routing

In [9], there is a growing interest in the use of WSNs in various applications, such as disaster management, border protection and security surveillance. In these applications, the sensor nodes are usually expected to be remotely deployed in large numbers and to operate autonomously in unattended environments. In WSNs, the transmission medium is shared by all nodes within each others' transmission range, and because of limited amount of energy and scarcity of the medium spectrum, choosing appropriate network architecture for routing is deemed to be an important step for sensor networks.

Transmission energy for transmitting a  $k$  -bit message to a receiver at distance  $d$  can be computed as

$$E_{Tx}(k, d) = E_{Tx-elec}(k) + E_{Tx-amp}(k, d) = E_{elec} * k + \epsilon * k * d^2$$

There are two common network architectures in WSNs Multi-hop and hierarchical (i.e. clustering). To enable the system to cope with dynamic load and cover a large area of interest without service degradation, cluster-based routing protocols get more spotlight. We compare our SCL protocol with the performance obtained using LEACH-C.

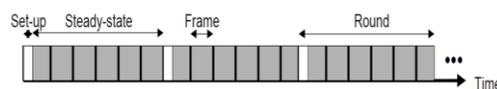
#### F. Simulation Model of SCL

We propose to create a cluster-based MAC protocol that takes advantage of the mechanisms of both CSMA and TDMA protocols. The following assumptions are made in the architecture of the network:

1. All nodes are homogenous, i.e. all have equal capacity in terms of power, computation and communication capacity.
2. The nodes in the network are aware of information about themselves, like the node IDs, locations and energy levels.
3. Nodes are stationary.
4. The Sink node has unlimited resource.
5. The number of transmitting nodes is varying, which means the system is event-driven, and traffic load is dynamic.

The purpose of our work is to find a balance between contention- and schedule-based protocols in the real world simulation. As the typical cluster-based architecture, the sensor nodes in the network are divided into clusters with one cluster-head (CH) in each cell, and these cluster-heads form the backbone of the sensor network. Therefore, all nodes in one cluster only send data to their own cluster-head. As described in LEACH, to reduce the interference between clusters, we use CDMA for the communication between CHs and Sink, while the hybrid MAC protocol is used among nodes within each cluster.

Just as in LEACH, the operation of the protocol is broken into rounds. For each round, it begins with a set-up phase, when the clusters are formed. Then a steady state phase follows, when data is collected by the cluster-heads then transmitted to the sink. The time-line of such operation is depicted in Figure 1 below.



**Figure 1: Shows an example of a Forwarding Mechanism**

In figure 2 the following algorithm, describes the operation of the proposed protocol. A detailed explanation is given bellow, and shows the main protocol scheme of the network.

At the beginning of the procedure, all nodes, which are still alive, send the information about themselves, such as their locations and energy levels to the Sink node in one hop at a specific time, which equals to  $id * T_{info-adv}$ , where  $id$  is the identity number of the node, and  $T_{Info-adv}$  is a parameter being set as

$$\frac{L_{\text{hdr}} + I_{\text{interval}}}{T_{\text{Info-adv}}} = \frac{\quad}{Bw} * g$$

**Step 1:** Information advertisements from all nodes to sink node.

**Step 2:** After Time out occurs, Cluster -Head election performed by the Sink.

**Step 3:** After Time out occurs, Clusters setup and Timeslots Assignment for each node in the networks. (Step 1-3 is said to be SET-UP Phase)

**Step 4:** After Time out Occurs, Hybrid MAC Protocol implementation for Data Collection intra-duster.

**Step 5:** After Time out Occurs, Data Relay from Client Hosts to the Sink.

(Step 4-5 is said to be STEADY STATE)

**Step 6:** After Time out Occurs, goto step 1 and continue the procedure.

**Figure 2:** Shows the algorithm for Information Advertisement

A simple TDMA protocol is used based on our assumption that all nodes know this information. Furthermore, there is a timer for each state for avoiding overlapping [6].

### G. MAC Layer Protocols

One of the main techniques for achieving low energy consumption in power restrained WSN is duty cycling. For this approach, the MAC protocol of each node periodically cycles between a sleep state and an awake state. To extend the network life span, each node must undergo a periodic sleep cycle for as long as it can, since the energy consumed in the sleep state is much lower than in the awake state.

Some MAC protocols such as S-MAC use fixed duty cycles. In some sensor network applications such as surveillance or object-tracking, nodes are inactive most of the time, but when an event happens, large amount of packets are generated which yields to network congestion. In such conditions, MAC protocols with fixed duty cycles experience data loss because they cannot adapt themselves to the heavy traffic load. Therefore, in order to solve this problem, new design approaches that adapt the duty cycles to the traffic load are being developed. Some load adaptable protocols are X-MAC, T-MAC and B-MAC. As the proposed algorithm considers the node's busyness level, it is necessary to have a MAC protocol which is adaptable to the traffic load.

1. T -MAC protocol is based on periodic sleep-listen schedules where nodes belonging to a cluster share the same schedule. This protocol has the advantage in that it reduces idle listening (since each node can only transmit during a fixed contention window) but it has the disadvantage that it needs synchronization.
2. B-MAC is an asynchronous protocol that sends long preambles to inform other nodes that they must wait for an incoming transmission. This method has the advantage that it does not need synchronization but it does force nodes into remaining awake during the whole preamble duration.

3. X-MAC is similar to B -MAC but with the advantage that it uses short preambles instead of long ones. This allows the nodes to send acknowledgments to the preambles to trigger the data transmission which reduces idle listening. For this reason and because it provides adaptation to the traffic load, we have selected X-MAC as the channel access method.

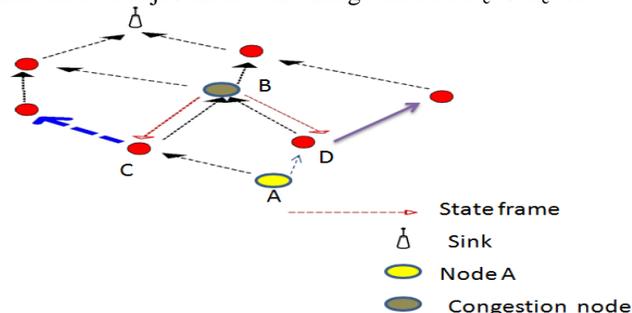
### H. Congestion Control

The congestion control includes forwarding mechanism (Figure 3) and rate adjustment mechanism.

1. Forwarding mechanics: when a routing node receives a packet, it doesn't always forward the packet to a fixed node, but selects a downstream neighbor node in its routing table as the next hop randomly.
2. Adjustment mechanism: the specific algorithm of adjustment is as follows.

**Step 1:** When congestion occurs, the adjustment factors of probability n will update to n+1. Then the congestion degree C will reduce greatly. The probability of selecting it to be the downstream neighbor is also reduced. At the same time, the rate adjustment will change the rate  $R_c$  to  $R_c/2$ .

**Step 2:** When the congestion removes, the adjustment factors of probability n will reset to 0. The probability of selecting it to be the downstream neighbor will also increase. And the rate adjustment will change the rate  $R_c$  to  $R_c+R$ .



**Figure 3:** Shows an example of a Forwarding Mechanism  
**I. Cross-Layer Design Approaches**

A growing number of recent papers are focusing on the cross-layer development of wireless sensor network protocols and frameworks. Recent works on WSNs demonstrate that cross-layer design approaches result in a significant performance improvement. This kind of design is focused on two main aspects are framework design and protocol design. The previous approaches can basically be classified depending on the layer interactions.

Therefore, there are protocol designs based on interactions between MAC and Physical layers, between MAC and Network layers, between Network and Physical layers, etc. This work focuses on the design of a multi-objective cross-layer algorithm for application to existing routing protocols based on the interactions between MAC, Network layer routing, Physical and Application layers. One example of cross-layer routing protocol design is the Energy Aware Routing Protocol proposed. This approach uses the residual energy of the nodes as a cost for the probabilistic selection of routes with the objective of equalizing

the energy consumption of all nodes. This cross-layer method has the advantage that it considers the health of all nodes from the source to the destination and the disadvantage regards one parameter (the residual energy) as the performance metric, which does not provide much flexibility. Another example is the routing protocol that relies on local decisions in an attempt to equalize the energy consumption of all nodes. This approach uses the level of busyness of the nodes, the number of children of each node and the current node role to choose the paths locally. This methodology has the advantage that the routes can be maintained easily, adding very little overhead, and that many parameters can be included to make the routing decisions. Nevertheless, it has the disadvantage that decisions are made locally without considering the entire path from the origin to the destination.

These cross layer designs and other similar approaches are limited in that they attempt to only reduce or equalize energy consumption and this single performance optimization severely restricts their flexibility. The objective of the tunable multi-objective algorithm presented here is to balance multiple performance requirements, as demanded by the overlaying applications while also considering the limited available node resources so that the system response to application demands is dynamic and flexible. To achieve this goal, our cross-layer approach looks to exploit the advantages of previous cross layer methodologies, as highlighted earlier, firstly by considering the complete source-destination routing path for decision making, which gives a more global view of the network and secondly by using several parameters in selecting the path with an aim of providing flexibility. In addition, parameters can be weighted depending on the application running on the nodes and these weighting factors can be dynamically reset post network initialization if the application needs to change its priorities.

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# Testing of EFI index in context of small mountain streams in Kosovo quality assessment

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**Abstract-** As the WFD requires carrying out regular quality assessment of fish population, in the frame of this study sampling was done in 3 sites along Lumebardhi i Pejes river.

A list of species composition is completed. Altogether 9 fish species and lamprey (*Eudontomyzon stankokaramani*) were present in catch. The classification of the ecological status is done by using EFI index. The Lumebardhi i Pejes River is an ecosystem with relatively favorable ecological conditions for the development of ichthyofauna but because of direct negative anthropogenic impact in different forms ( as gravel excavation etc), the development of ichthyofauna is on the decline..

**Index Terms-** : WFD, fish composition, ecological status, Lumbardhi i Pejes River

## I. INTRODUCTION

The implementation of the Water Framework Directive of the European Union among others requires future routine assessment of the ecological status of rivers using physical, chemical and biological quality components. Among the latter, fish communities referring to their species compositions, abundances, and age structure have to be considered as biological indicators. However, large scale assessment of abundance and age structures of fish communities require a much higher sampling effort and quality, than it has been achieved so far by common fish-faunistic field work in the Republic of Kosovo.

Consequently, not only suitable standard sampling approaches but also an assessment method fulfilling the requirements of the WFD is lacking. Type specific fish-faunistic references, (which according to the WFD are needed for the fish-based river assessment), do not exist yet in our country. Thus, the necessity of fundamental research work covering all mentioned aspects is obvious.

It is well known that fish species vary in the extent of their adaptation to, or dependence on environmental conditions. If pristine river conditions change due to anthropogenic alternations, the minimum requirements of particular sensitive fish species may no longer be fulfilled. This can lead to significant decreases of population size, or even to species extinction. On the other hand, tolerant fish species may profit from human- induced impacts and become more abundant. Consequently fish species composition and population structure change as a result of habitat degradation, due to physical, chemical or biological impairments. However, the sensitivity of fish reaction to river impact differs from one species to the other and moreover is dependent on the kind of pressures and the dimension of the impact.

### **River General conditions**

The Drini i Bardhë River springs from a solid rocky hill close to Radavc village, 580 m above sea level, about 12 km south of Peja town. The length of the Drini i Bardhë river in Kosovo is 154 km, while its total length is 175 km. When the river leaves Kosovo it possesses a flow average of 60 m<sup>3</sup>/sec and for this criteria it is the richest stream in the territory of Kosovo. One of the main tributaries of this river basin is Lumbardhi i Pejes River. This river springs are at 2.243 m above sea level and thus it is a mountain stream. Total length of the stream is 62 km from source until the discharge to Drini i Bardhë River. The distance from source (2,243m) to mouth in Drini i Bardhë River (365m) shows that the slope of the river is very high,.

### **Selection of sites and frequencies**

A fieldtrip carried out on beginning of June 2008 have helped in selecting more precisely the monitoring stations.

For this purpose it is proposed to collect biological information on 5 sampling and to carry out parallel data collection for physico-chemical analysis on the same 5 stations plus one additional

The following map summarises the sites location, and the types of analyses that was conducted during this

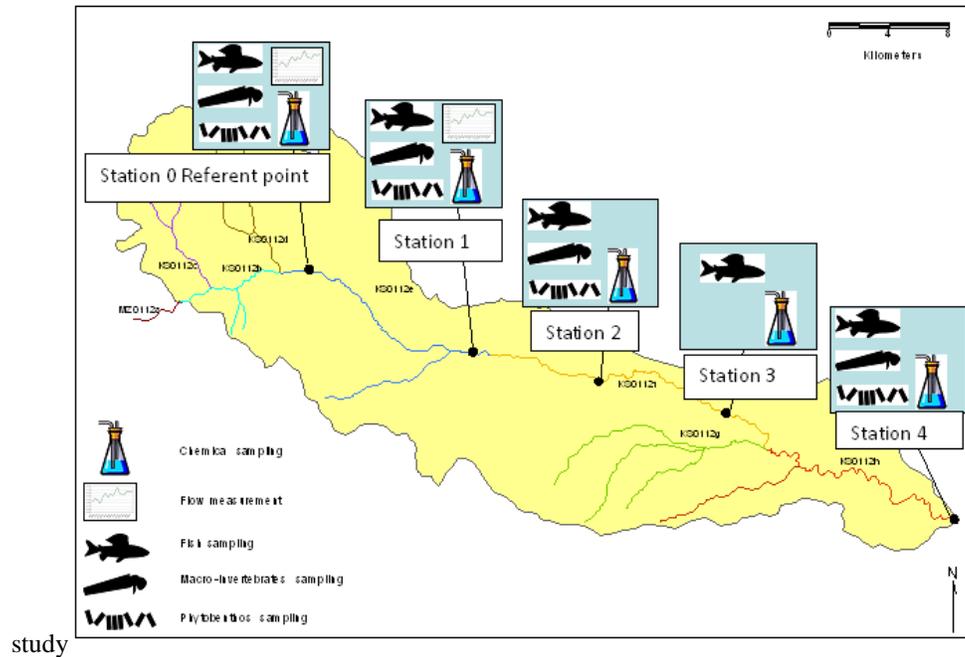


Figure 1. The sites location and the types of analyses

## II. MATERIAL AND METHODS

As the WFD requires carrying out regular quality assessment of fish population, it is necessary in the future to include such analysis in monitoring networks.

In the frame of this project the sampling was done in 3 sites (1 in June 2008, 2 in September 2008). There was no fish in Station 1 while in station 2 it was impossible to sample due to the lack of water. Station 1 is inside the Peja town and the lack of fish is because of the pollution

The electrofishing is used as sampling method. This is particularly useful method in situation where other techniques, such as netting, may be ineffective due to the nature of habitat. The sites were fished by wading using electrofishing equipment ([Hans Grassl GmbH](#)). The wetted width in electrofishing survey varied from 4m to 20m and the size of catchments (upstream of sampling site) was < 100 km<sup>2</sup>. The altitude varied between 364 m and 1073 m above sea level.

The type of electrical current used during survey is direct current (DC). Direct current (DC) always flows in the same direction and enables positive and negative outputs of a power source to be identified.

### Species identification

Many fishes are certainly identified in the field. However, for verification of their identification and some difficulties, from each fish species examples are preserved and send in laboratory for clarification.

In laboratory the best available keys for identifications are used as European Freshwater Fishes by M. Kottelat and J. Freyhof; Ribe Srbije by P. Simonovic; Slatkovodne Ribe Jugoslavije by T. Vukovic; N.Rakaj Ihtiofauna e Shqiperise.

All fish species are identified to species level. Some of difficulties of species identifications are verified with pictures, published descriptions, known geographic range or have the specimen identified and verified by specialist. Identity of those fish is confirmed further more in IGB, Institute of Inland fisheries and aquaculture

### EFI Index calculation

Currently, different fish based methods are used in Europe. The successful implementation of the WFD depends on the provision of reliable and standardized assessment tools. The European Fish Index (EFI) produced by the FAME-project aimed to develop, evaluate and implement a fish-based assessment method for the ecological status of European rivers to guarantee coherent and standardized monitoring throughout Europe ([fame.boku.ac.at](#)).

In our case EFI – index was preliminary tested for ecological classification of the reference locality (in our case in Kuqishte-Lumbardhi i Pejes River). EFI index is not yet calibrated for Kosovar conditions. EFI uses information about the site location (ecoregion, river region) and 12 environmental variables (geology, size, altitude, flow regime, lakes upstream, air temperature, slope, distance from source, wetted width, sampling strategy and method, and fished area) to predict the reference values for fish assemblage. The ecological status is expressed as an index ranging from 1 (high ecological status) to 0 (bad ecological status).

III. RESULTS

The results are presented for only three of general five study reaches. The reason for that is that in two study areas there was a lack of water and river bed was almost dry. There was no fish species in those reaches.

A list of species composition is completed. Altogether 9 fish species and lamprey (*Eudontomyzon stankokaramani*) were present in catch.

Within each sampling site the amount of species present varied between 1 species (in Sampling site 0), to 5 and 8 species in other two sampling sites. The other two sampling sites had rather similar fish assemblage structure. Sampling site 3 which is electrofished during September had the highest fish density of the entire electrofished river. This was mainly due to high density of *Phoxinus lumaireul* (59 samples) and *Barbatula barbatula* (22 samples).

The more detailed catch statistic for all sampling station is given in table 1.

Table 1: Detail fish catch statistic for sampling station

<i>Fish species</i>	<i>Sampling Date</i>	<i>Sampling site Station code</i>	<i>Number of individuals</i>
<i>Salmo farioides,</i>	05/09/2008	1 Rugova Valey St.cod 0	41
<i>Chondrostoma nasus</i>	05/06/2008	Grabanice e eperme St cod 4	15
<i>Barbus rebeli</i>	05/06/2008	Grabanice e eperme St cod 4	18
	05/09/2008	Gllaviqica irrigation dam St cod 3	5
<i>Leuciscus cephalus</i>	05/06/2008	Grabanice e eperme St. cod 4	13
	05/09/2008	Gllaviqica irrigation dam St.cod 3	14
<i>Alburnoides bipunctatus</i>	05/06/2008	Grabanice e eperme St.cod 4	10
<i>Pachychilon pictum</i>	05/06/2008	Grabanice e eperme St.cod 4	11
<i>Barbatula barbatula</i>	05/06/2008	Grabanice e eperme	1
	05/09/2008	Gllaviqica irrigation dam St.cod 3	22
<i>Rhodeus sericeus</i>	05/06/2008	Grabanice e eperme St.cod 4	1
	05/09/2008	Gllaviqica irrigation dam St.cod 3	3
<i>Phoxinus lumaireul</i>	05/09/2008	Gllaviqica irrigation dam St.cod 3	59
<i>Eudontomyzon stankokaramani</i>	05/06/2008	Grabanice e eperme St.cod 4	3

In sampling station 0 which was selected as referent point the EFI index is equal with 0.51 which refer to good ecological status, in sampling station 3 the EFI index is 0,42 and this refers to moderate ecological status and by the end in station 4 EFI- index is 0.50 which points also good ecological status (Table 2).

Table 2: Calculation of EFI index

Rivername	Sitename	Date	EFI - Index	Status
Lumbardhi i Pejes	Station 0	Saturday, September 06, 2008	0.51	Good
Lumbardhi -i Pejes	Station 3	Saturday, September 06, 2008	0.42	Moderate
Lumbardhi i Pejes	Station 4	Friday, June 06, 2008	0.5	Good

The EFI should not be used (or only used with caution) in e.g. Mediterranean rivers with high proportion of endemic species or in the rivers of the south-eastern part of Europe which support fish communities that differ greatly in species composition. (FAME CONSORTIUM, 2004). In our case three species are not present in the species list of the software used to calculate EFI. For *Barbus rebelli* we have used corresponding value of another species of the same genus, *Barbus meridionalis*. The identity of the *Phoxinus lumaireus* populations from Drin drainages requires further investigation (Freyhof, J. & Kottelat, M. 2008) and thus for this species we have used corresponding value of *Phoxinus phoxinus*. For *Eudontomyzon stankokaramani* which is endemic for Drini i Bardhe basin (Karaman 1974, Renaud 1982; Holci & Renaud 1986; Soric, 1998) to which belongs Lumbardhi i Pejes River and thus we have used corresponding value of a species from the same genus *Eudontomyzon marinus*.

However, concerning the fish composition, we have tried that fish species of Peja River-Drini I Bardh basin to categorize into ecological guild, which is also highly relevant for the river assessment according to the WFD (see table 3).

Table 3. Ecological classification of fish species occurring in Peja River- Drini I Bardhe basin

Fish species	Ecological guild				
	Habitat	Reproduction	Trophic range	Migration distance	Migration type
<b>Petromyzonidae</b>					
<i>Eudontomyzon stankokaramani</i>	rheophilic	lithophilic	filtering	Short/medium	anadromus
<b>Salmonidae</b>					
<i>Salmo farioides</i>	rheophilic	lithophilic	Inverti-piscivorus	short	anadromus
<b>Cyprinidae</b>					
<i>Chondrostoma nasus</i>	rheophilic	lithophilic	herbivorus	medium	potamodromus
<i>Barbus rebelli</i>	rheophilic	lithophilic	invertivorus	medium	anadromus
<i>Leuciscus cephalus</i>	rheophilic	lithophilic	omnivorus	short	potamodromus
<i>Alburnoides bipunctatus</i>	rheophilic	lithophilic	invertivorus	short	anadromus
<i>Pachychilon pictum</i>	rheophilic	lithophilic	omnivorus	short	potamodromus
<i>Rhodeus sericeus</i>	Indifferent	ostracophilic	omnivorus	short	potamodromus
<i>Phoxinus lumaireul</i>	rheophilic	lithophilic	invertivorus	short	potamodromus
<b>Balitoridae</b>					
<i>Barbatula barbatula</i>	rheophilic	psammophilic	invertivorus	short	potamodromus

Fish species are grouped according to their preference to flow conditions. Three major habitat guilds can be distinguished based on the degree of rheophilic behavior:

So, the sampling point 0 and 4 correspond with results coming up from EFI fish index; only rheophilic fish species were found there. The indifferent species which are more tolerant to water conditions were found in sampling station 3 and, that also correspondent with findings of fish index results.

#### IV. . DISCUSSION AND CONCLUSIONS

The results of this research work, besides helping to use freshwater fish as ecological indicators in all Kosovo rivers, also illustrates some pressures that freshwater ecosystems suffer in this region. In two sites we were faced with drought events which have a negative consequence on the river and their biota. The interpretation of drought is in fact to complicate because very accurate analysis could be necessary to know if the sites found dry usually are due to human or natural causes. Many authors suggest that restoration or preservation of native stream biota will require maintenance or restoration of natural flow regimes (Power et al. 1996; Stanford et al. 1996; Poff et al. 1997). Therefore, in order to preserve the native biota it is necessary not only the absence of pollution in the water but also the river should have natural discharge and natural flow regime again. Consequently, comprehensive hydrological studies for all Kosovo rivers are needed and it is also urgent to apply the policies, strategies and managements to respect the natural stream flow regime. Only in this way we will be able to preserve the integrity of the ecosystem functioning of Kosovo streams and their biota.

Another of the great problems to develop metrics and EFI index in Kosovo rivers is lack of reference areas to test the metrics. Chovarec et al. (2000) suggest that "reference condition is the state that has existed before the human interferences, or at least without human influences that have altered significantly their natural characteristics". Owen et al. (2001) considers that the "reference condition is when physical-chemical, hydromorphologic and biological values corresponding to the area without human alternation". So even the concept of reference condition is widely known and used, in our case study we have actually sampled from sites that have not been influenced, or have been influenced only minimally, by humans (Karr & Chu 1999).

During this research it is shown that freshwater fish can be a valuable ecological indicator, so they could be used in all other Kosovo rivers and streams. So we showed that fish provided different information than more traditional physicochemical or other biological indices.

As described in the WFD the terms "species composition", "species abundance" and "age structures" of the fish communities have to be taken into account for fish based river assessment. So, during this research the inventory list is fulfilled, and concerning abundance and age structure still it has to be discussed and decided which metrics will be taken and are more appropriate for Kosovo conditions.

Finally, the timing of the sampling is an important issue. Seasonal changes of fish assemblage composition are well known and verified during our sampling in early summer and autumn. Fishes reflect shift between winter and summer habitats. Therefore, a representative survey would require three surveys per year at different seasons, in small rivers at least two, one in spring and one in autumn.

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# Land Suitability Evaluation for Irrigation in Dejen District, Ethiopia

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**Abstract-** The objective of this study was to evaluate the suitability of the soil properties of the area for irrigation purpose. Soil properties of the study area such as texture, depth, electrical conductivity, drainage, calcium carbonate content and slope were collected from eight sampling sites in the form of semi-detailed surveying level. Qualitative evaluation was carried out by means of parametric method. The results showed that the major portion of the cultivated area (308.1ha) is deemed as being marginally suitable (S3) land due to moderate slope, and medium soil depth. 33ha of the area was found to be currently non-suitable (N1) mainly due to moderate slope, gravelly soil texture and medium soil depth. In the study area, 120.2ha was also found as permanently non-suitable (N2) because of the high slope, gravelly soil texture and shallow soil depth. For almost the total study area elements such as salinity, drainage and CaCO<sub>3</sub> were not considered as limiting factors.

**Index Terms-** Soil properties, irrigation, qualitative evaluation, parametric method

## I. INTRODUCTION

In agricultural context, finding optimal locations for crops can increase economic benefits, as well as reduce negative environmental consequences (Ashraf et al., 2010). Proper recognition of land abilities and allocation of them to the best and most profitable and stable revenue operation system has special importance for preventing of ecosystem structure destruction. With the increase of demand for land, land evaluation has become more important as people strive to make better use of the limited land resources. Land evaluation is the process of assessment land performance for specified purposes (Rossiter, 1996).

Proper evaluation of land resources in irrigation command area is prerequisite for better utilization of land resources which help to optimize and sustain the productivity of these land resources. Availability of irrigation leads to land use change as well as intensive cropping system. Improper use of irrigation water has resulted in environmental degradation of natural resources that leads to decline in the productivity of land resources and deterioration of land quality for its future use (Suresh et al., 2002).

Irrigation has been a basic need for sedentary societies settled in arid or semiarid lands. However, in recent times the modernization or the enlargement of irrigation schemes has been called into question by nonagricultural water users in many

developed countries where irrigation schemes were intended to alleviate situations of poverty (Hargreaves and Mekley, 1998).

Sys et al. (1991) suggested a parametric evaluation system for irrigation methods which was primarily based upon physical and chemical soil properties. In their proposed system, the factors affecting soil suitability for irrigation purposes can be subdivided into four groups: physical properties determining the soil-water relationship in the soil such as permeability and available water content; chemical properties interfering with the salinity/alkalinity status such as soluble salts and exchangeable Na; drainage properties and environmental factors such as slope. Hired et al. (1996) and Bond (2002) improved the classification methods for evaluating suitability in effluent irrigation and land suitability for irrigation.

Seleshi (2005) described that Ethiopia has immense potential in expanding irrigated agriculture. Despite its irrigation potential which is estimated to be about 3.7 million hectare, only about 190,000 hectare (5.3%) of the potential is currently under irrigation, which plays insignificant role in the country's agricultural production. Thus, to bring food security at national as well as household level, improvement and expansion of irrigated agriculture must be restored.

In Ethiopia, limited number of reports and investigations were made to assess the irrigation potential based on the physical land and water resources (Sleshi, 2005). Small scale studies conducted on soils of the country seem to be inadequate in providing basic soil information that can help to make decision on proper utilization of resources. Therefore, the objective of this study was to determine the suitability of the study area for irrigation purpose using the parametric evaluation system. It is believed that, such information will be used as a reference for the future development of irrigation method in similar site conditions contributing to their success. It will also ensure feasibility of irrigation establishment as land suitability study for irrigation is a key factor.

## II. MATERIALS AND METHODS

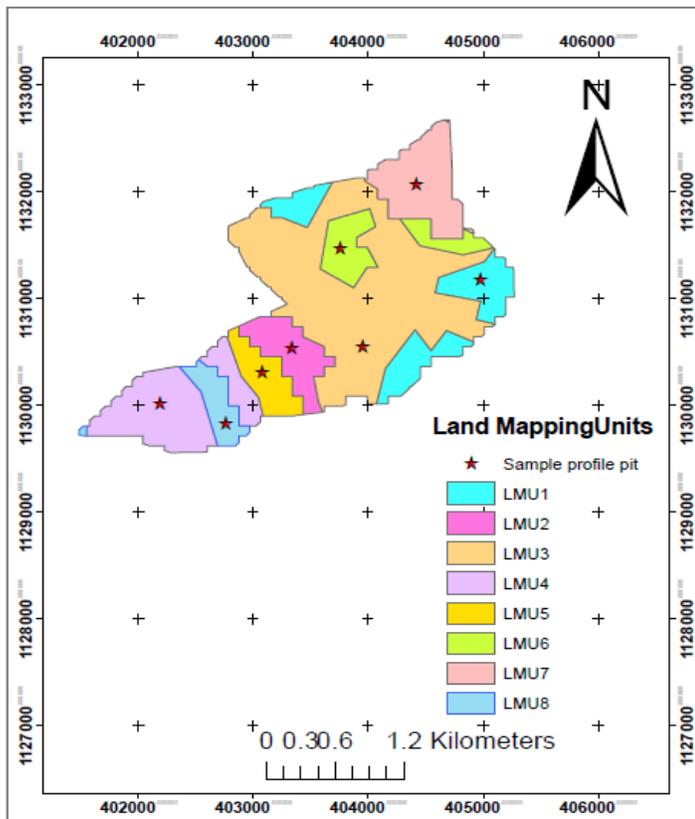
### *Study site*

The study was conducted at Bicheat Watershed of Dejen district, Amhara National Regional State which lies between 10° 21' N and 38° 05' E; elevation range from 1721m to 2530m. Geographically, it has a very flat (0-2%) and very steep (>60%) slopes. The mean annual rainfall of the area is 1157mm. The mean annual temperature is 16.9°C. *Eucalyptus* and *Juniperus* species are the dominant tree species in the study

area. The dominant soil types of the area includes: Vertisol, Nitisols and Leptosols.

*Soil sampling and chemical analyses*

Profile descriptions were made at eight sampling sites. Following to Denis<sup>5</sup> coarse fragments were separated from the fine earth fraction and the content of coarse fragment was determined by weighing the residue left on a 2mm sieve in the laboratory according to  $C_f$  (weight %) = (Soil fraction >2mm/Weight of the total dry soil)\*100. The effective soil depth, drainage, and the slope were measured directly at the field. EC was determined using (1:2.5 ratio of soil: water) suspension using EC meter. Texture of the soil was determined by the hydrometer method<sup>6</sup>.



**Figure 1.** Location of sampling sites (land mapping unit).

*Land evaluation procedure*

To evaluate the land suitability for irrigation the parametric evaluation system of Sys et al. (1991) was applied, using soil and land characteristics. These characteristics concern environmental factors, drainage properties, soil physical and chemical properties. They are rated and used to calculate the capability index for irrigation (Ci) according to the formula:

$$C_i = A * B / 100 * C / 100 * D / 100 * E / 100 * F / 100$$

Where: Ci: capability index for irrigation, A: rating of soil texture, B: rating of soil depth C: rating of CaCO<sub>3</sub> status, D: salinity/alkalinity rating, E: drainage rating, and F: slope rating.

According to the results of measured land index in parametric method suggested by Sys et al. (1991) lands having indexes >80 are in S1 (very suitable); 60-80 are in S2 (moderate suitable); 40-60 are in S3 (marginally suitable); 30-45 are in N1 (currently not suitable); and <30 are in N2 (permanently not suitable).

**III. RESULTS AND DISCUSSION**

The ultimate evaluation of the qualitative land suitability for irrigation using parametric methods is presented in Tables 1 and 2. As shown in Tables 1 and 2, there was not found highly suitable lands (S1) in the study area. The analysis of the suitability for irrigation indicates that the major portion of the cultivated area (308.1ha) is deemed as being marginally suitable land due to moderate slope, and medium soil depth. The currently non-suitable area which is only 33ha was due to moderate slope, gravelly soil texture and medium soil depth. In the study area, 120.2ha was also found as permanently non-suitable because of the high slope, gravelly soil texture and shallow soil depth. For almost the total study area elements such as salinity, drainage and CaCO<sub>3</sub> were not considered as limiting factors. These results are incongruent to Ali et al. (2009) who investigated soil quality for different irrigation systems in Lali Plain, Iran. They found that factors such as drainage, salinity and CaCO<sub>3</sub> never influenced the suitability of their study area.

Briza et al. (2004) applied a parametric system Sys et al. (1991) to evaluate land suitability for both surface and drip irrigation in Ben Slimane Province, Morocco. They reported that there was no highly suitable (S1) area for irrigation. And most of the areas were classified as marginally suitable (S3) for irrigation purposes. The most limiting factors were physical parameters such as slope, soil texture and soil depth.

**Table 1.** Capability index value and suitability classes the eight land unit.

Land unit	Area (ha)	Capability index	Suitability classes
1	59	67.2	S2
2	33	39.5	N1
3	219.7	58.14	S3
4	74.2	12.97	N2
5	25.5	28.26	N2
6	34.9	48.05	S3
7	53.5	48.05	S3
8	20.5	12.97	N2

**Table 2.** Area coverage and ratio of the eight land units

Suitability classes	Area (ha)	Ratio (%)	Land unit
S1	-	-	-
S2	59	11.3	1
S3	308.1	59.2	3, 6, 7
N1	33	6.3	2

N2	120.2	23.2	4, 5, 8
Total	520.3	100	

#### IV. CONCLUSION

To evaluate the land suitability for irrigation the parametric evaluation system was applied using soil and land characteristics. These characteristics concern environmental factors, drainage properties, soil physical and chemical properties. In the study area, 120.2ha and 33ha were found as permanently non-suitable and currently non-suitable respectively. Generally, the most important limiting factors in the area under study included land slope and physical properties of the soil, especially soil texture and soil depth.

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# Comparative Analysis of Multiple-pulse VSC-Based STATCOM's for Voltage-Dip Mitigation

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**Abstract-** This paper includes the performance of a Flexible Alternating Current Transmission Systems (FACTS) device, namely, STATic synchronous COMPensator (STATCOM) based on 6, 12, 24 and 48-pulse Voltage Source Converter (VSC), for the mitigation of voltage-dip caused by the starting of a high power induction motor. The different configuration of the STATCOM's implemented improves the voltage profile feeding to a high power induction motor at starting by injecting a controllable current to the supply line having an acceptable limit of harmonics as per the standards of IEEE. The capability of the STATCOM's to compensate the reactive power to the system when the voltage dip occurs due to starting of high power induction motor load is described. The 48-pulse VSC employed in the STATCOM injects an almost sinusoidal current of variable magnitude, in quadrature with the line voltage, thereby emulating an inductive or a capacitive reactance at the point of connection with the line and introduces a very less amount of harmonics in to the system. Author has developed all the multiple-pulse VSC-based STATCOM's and implemented it into a power-system consists a high power induction motor in MATLAB/Simulink environment to show the voltage-dip mitigation capability. The harmonic contents to be introduced by the different configurations of the STATCOM's are also shown by the author.

**Index Terms-** Static Synchronous Compensator (STATCOM), Voltage-dip mitigation, Voltage Source Converter (VSC), power quality, Voltage Injection Capability, Harmonics.

## I. INTRODUCTION

In the past, equipment used to control industrial process was mechanical in nature, which was rather tolerant of voltage disturbances. Nowadays, modern industrial equipment typically uses a large amount of electronic components, such as program logic control (PLC), adjustable speed drives and optical devices, which can be very sensitive to the voltage disturbances. The majority of disturbances that cause problems for electronic equipments are voltage dip or voltage sags [1]-[2]. Voltage dips may cause tripping, production disturbances and equipment damages. The voltage dips are found especially troublesome because they are random events lasting only a few cycles. However, they are probably the most pressing power quality problem facing many industrial customers today [3]. The concern for mitigation of voltage dip has been gradually increasing due to the huge usage of sensitive electronic equipment in modern industries. The investigator has shown that when heavy loads are

started, such as large induction motor drives, the starting current is typically 6 to 7 times of the full load current drawn by the motor. This high current cause dips in the voltage during starting intervals, because there is a lot of voltage drop across the distribution conductor as it is not designed for such heavy currents. Since the supply and the cabling of the installation are dimensioned for normal running current and the high initial current causes a voltage dip. Another reason for high starting current is the inertia of the load as high starting torque is required to start the high inertia loads, which is obtained by using high starting current. This problem becomes more severe at peak loading time. This is due to the fact that at peak loading time the voltage of the system is less than the rated voltage.

As the STATCOM is a solid-state voltage source converter coupled with a transformer, tied to a line can injects reactive current or power to the system to compensate the voltage-dip. The Voltage-Source Converter (VSC) is the main building block of the STATCOM. It produces square voltage waveforms as it switches the direct voltage source ON and OFF. The main objective of VSC is to produce a near sinusoidal AC voltage with minimum waveform distortion or excessive harmonic content as the lower order harmonics are very harmful for a machine [4]. The harmonic free voltage can be achieved by creating a number of pulses into a cycle [5]. To obtain the multiple-pulse converters i.e. 12- pulse, 24-pulse and 48-pulse VSC, two, four and eight, 6-pulse VSC's are used, with the specified phase shift between all converters. A 48-pulse VSC can be used for high power applications with low distortion, because it can ensure minimum power quality problems and reduced harmonic contents. A 12-pulse, 24-pulse and a 48-pulse GTO based VSC can be constructed using two 6-pulse, four 6-pulse, eight 6-pulse converter configurations by putting a phase-shift of 30°, 15° and 7.5° respectively. The STATCOM based on 48-pulse converter produces almost three phase sinusoidal voltage and maintains THD (Total Harmonic Distortion) well below 4%. [6] as per the comparison made by the author.

Srinivas K. V. et al in [7] developed a three-level 24-pulse STATCOM with a constant dc link voltage and pulse width control at fundamental frequency switching, validated the inductive and capacitive operations of the STATCOM with satisfactory performance. The harmonic content of the STATCOM current is found well below 5% as per IEEE standards. Sahoo A. K. et al in [8] developed a simulation model of 48-pulse VSC based STATCOM FACTS devices. This full model is validated for voltage stabilization, reactive power compensation and dynamic power flow control. It produces a

sinusoidal AC voltage with minimal harmonic distortion from a DC voltage with variable loads.

Huang S. P. et al in [9] also investigated that the GTO based STATCOM consisting a 48-pulse three-level inverter regarding minimal harmonic distortion. It has fine dynamic response and can regulate transmission system voltage efficaciously.

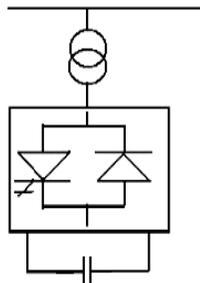
## II. THE STATCOM

The STATCOM is a VSC-based shunt device. It is made up of a voltage source converter (VSC), DC capacitor, shunt transformer and a controller associated with VSC as depicted in Fig.1. In general, STATCOM is capable of generating or absorbing independently controllable real and reactive power at its output terminals, when it is fed from an energy source or energy storage device at its input terminal. If there is no energy storage device coupled to the DC link and the losses are neglected, then shunt converter is capable of absorbing or generating reactive power only. Functionality, from the standpoint of reactive power generation, their operation is similar to that of an ideal synchronous machine whose reactive power output is varied by excitation control. Like the mechanically powered machine, these converters can also exchange real power with the ac system if supplied from an appropriate, usually dc energy source. Because of these similarities with a rotating synchronous generator, they are termed as: Static Synchronous Generator (SSG). When SSG is operated without an energy source and with appropriate controls to function as shunt-connected reactive compensator, it is termed, analogously to the rotating synchronous compensator (condenser) a Static Synchronous Compensator (STATCOM) or Static Synchronous Condenser (STATCON). Rotating synchronous condensers have been used in both distribution and transmission systems for 50 years. However, they are rarely used today because of a number of drawbacks as compared to the STATCOM.

### A. OPERATING PRINCIPLE

A STATCOM is a controlled reactive-power source. It provides the desired reactive power generation and absorption entirely by means of electronic processing of the voltage and current waveforms in a voltage-source converter (VSC). The reactive power exchange of STATCOM with the AC system is controlled by regulating the output voltage amplitude of voltage source converter.

Transmission line



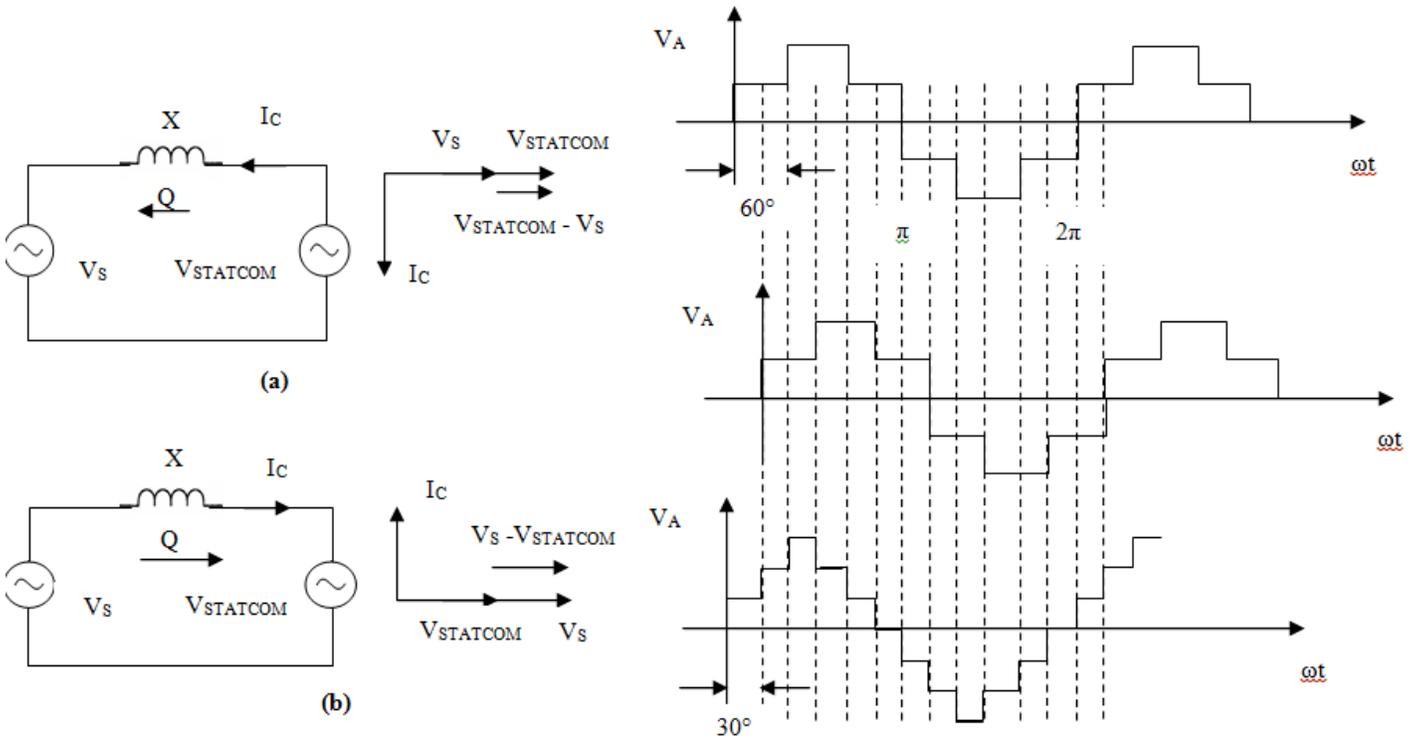
**Fig.1. Voltage Source Converter based STATCOM**

If the amplitude is increased above that of the AC system voltage, then the current flows from the STATCOM to the AC system and the device generates capacitive reactive power. If the amplitude is decreased to a level below that of the AC system, then the current flows from the AC system to STATCOM. The amount of type (capacitive or inductive) of reactive power exchange between the STATCOM and the system can be adjusted by controlling the magnitude of STATCOM output voltage with respect to that of system voltage. The reactive power supplied by the STATCOM is given by:

$$Q = \frac{V_{STATCOM} - V_S}{X} * V_S \quad (2.1)$$

Where Q is the reactive power,  $V_{STATCOM}$  is the magnitude of STATCOM output voltage,  $V_S$  is the magnitude of system voltage and X is the equivalent impedance between STATCOM and the system. When Q is positive the STATCOM supplies reactive power to the system. Otherwise, the STATCOM absorbs reactive power from the system. The DC capacitor controls the output voltage of voltage source converter. The output voltage of voltage source converter can be lead or lag with respect to AC system voltage by increased or decreased DC capacitor voltage respectively. When the voltage source converter voltage leads the bus voltage, the capacitor supplies real power to the system, acting as capacitive power source. On the other hand, when the voltage-source converter voltage lags the bus voltage, than the capacitor charged by consuming real power from the AC system having inductive reactance property, so that act as an equivalent inductor as illustrated by the phasor-diagrams shown in Fig. 2.

When the STATCOM output voltage ( $V_{STATCOM}$ ) is lower than the system bus voltage ( $V_S$ ), the STATCOM acts like an inductance absorbing reactive power from the system bus. When the STATCOM output voltage ( $V_{STATCOM}$ ) is higher than the system bus voltage ( $V_S$ ), the STATCOM acts like a capacitor generating reactive power to the system bus. In steady-state operation and due to inverter losses, the system bus voltage ( $V_S$ ) always leads the converter ac voltage by a very small angle to supply the required small active power losses.



**Fig. 2. STATCOM operation (a) Inductive operation (b) Capacitive operation**

**B. SIMULATION MODEL**

The converter based technique (STATCOM) designed to mitigate the voltage-dip of the line caused by the induction motor is based on 6,12,24 and 48-pulse converter where the parameters have been calculated according to the line voltage and the rating of the motor under consideration. Further, the other configurations of the multiple-pulse converter i.e. 6-pulse, 12-pulse, and 24-pulse have been designed and employed in the STATCOM one by one. All the responses of the system after the implementation of the four different converter-based STATCOM have been studied. The study shows the effectiveness of the selected method. The complete design of the model made for simulation and implementation is as shown in Fig.3.

**C. MULTIPLE PULSE GENERATION IN CONVERTER**

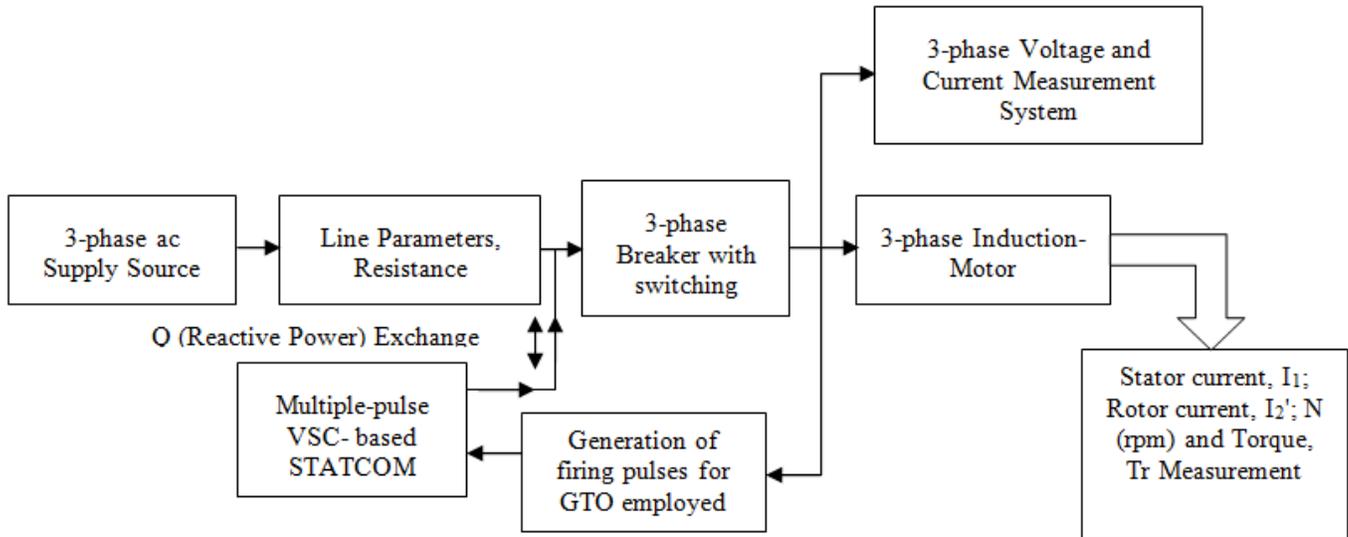
As a multiple-step voltage is obtained in the converter by providing a phase shift between the converters circuits having a lesser number of steps. A 12-pulse or 12-step alternating voltage is achieved by 30° phase-shift between 6-pulse converter outputs. Every step of the 12-step voltage is of 30° as depicted in Fig.4. The phase-shift has been provided in the present work by using phase-shifting transformer.

**Fig.4. Generation of 12-pulse by two 6-steps waveform**

Hence, 12-pulses x 30° (each pulse) = 360° (a complete cycle) is readily obtained. The harmonic content in this alternating voltage are 12n±1; n=1, 2, 3 ... along with the fundamental component as shown in eq.2.2 which is more sinusoidal as compared to conventional 6-pulse converter with less harmonic content.

$$\begin{aligned}
 v(t) &= V_m \sin \omega t + \sum_{m=12n \pm 1}^{\infty} \left( \frac{V_m}{m} V_m \sin m\omega t \right) \\
 &= V_m \sin \omega t + \frac{V_m}{11} V_m \sin 5\omega t + \frac{V_m}{13} V_m \sin 7\omega t + \\
 &\frac{V_m}{23} V_m \sin 11\omega t + \dots \dots \dots (2.2)
 \end{aligned}$$

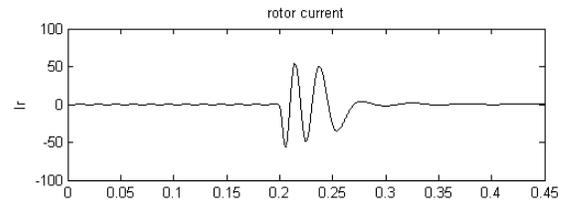
Finally, 24-pulse and 48-pulse converters are achieved by employing a phase-shift of 15° and 7.5° respectively between two 12-pulse converter configurations in the similar manner so that 24-pulses x 15° (each pulse) = 360° (a complete cycle) and 48-pulses x 7.5° (each pulse) = 360° (a complete cycle) are obtained. The firing sequences of the thyristors used are obtained according to the phase-shift and the number of pulses required. The firing sequence of the thyristor employed in the converter configuration can be get understand by the firing sequence of a conventional 6-pulse converter (T1T3T5-T4T6T2).



**Fig.3 Design of the Multiple-Pulse VSC-based STATCOM**

**III. SIMULATION RESULTS**

The complete model with the voltage-dip caused by the starting of a squirrel-cage induction motor of 100HP, 460V and 50 Hz is simulated first without STATCOM. A 3-phase breaker is chosen to start the induction motor and it is set to close at an instant  $t = 0.2$  sec. The 3-phase voltage source with a small resistance in series with each phase is taken to implement a practical supply system. The measurement of the system voltage and supply current is provided by the 3-phase V-I measurement block and the stator current, rotor current, speed of rotor and electromagnetic torque are measured at bus-selector available in asynchronous-motor block. The system-voltage and current of all three phases during the motor-start at  $t = 0.2$  sec and rotor current is as shown in Fig.5. The type of simulation used in *powergui* to simulate the problem is *continuous* with variable step-size and the solver chosen is *ode23tb* (stiff/TR-BDF2).



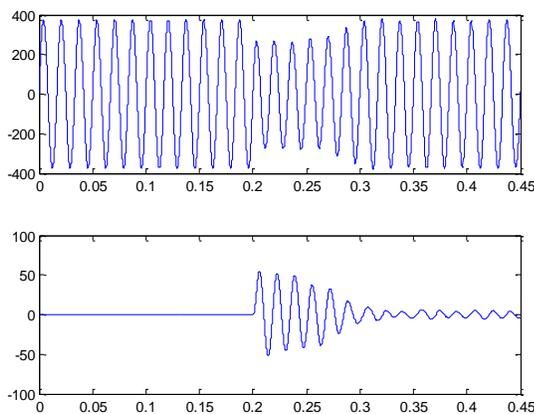
**(b)**

**Fig.5 (a) System Voltage and Current during the Starting of the Motor and (b) Rotor Current**

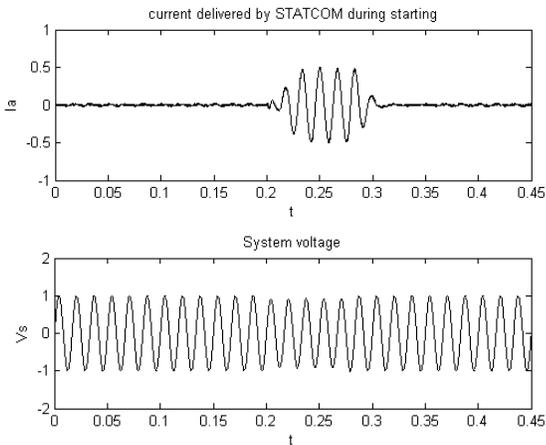
Simulation results show that a voltage dip of about 15-20% is introduced at the time of the starting of the induction motor and the motor draws a current of 5 to 6 times of the rated current as in fig.5(a). It is also depicted from the result that the rotor current is also 5 to 6 times of the rated current with lower frequency because of the introduction of the slip.

Now, the implementation of the STATCOMs consisting 6-pulse, 12-pulse, 24-pulse and 48-Pulse three-level converter has been made one by one with the model. The 48-pulse based STATCOM voltage and current delivered at load terminal during voltage dip are as shown in Fig.6 below. There is a minor difference in the capability of the voltage-dip mitigation by the different multiple-pulse STATCOMs but the content of the harmonics fed by the STATCOM voltage is very few in the case of 48-pulse configuration as in table.1.

The capacitors employed in the STATCOM act as a variable DC voltage source. Here, the capacitors modelled and simulated are initially charged (initial conditions) by the system voltage. The variable amplitude voltage produced by the inverter is synthesized from the variable DC voltage.



**(a)**



**Fig. 6 STATCOM Voltage and Current Delivered during Voltage-Dip**

As soon as the motor is started at  $t=0.2\text{sec}$ , the dip in the rms voltage introduced is mitigated well. A slight voltage-dip is there even after the implementation of the STATCOM. It is seen from the response that the current is lagging by an angle of  $90^\circ$  from system voltage i.e. a reactive power is fed to the system by the STATCOM during voltage-sag.

**Table.1. Comparative Assessment of Multiple-Pulse STATCOMs for voltage-dip mitigation**

S. No.	Configuration of the STATCOM	Voltage-dip after mitigation	%Total Harmonic Distortion
1.	6-pulse STATCOM	30.88%	4.34%
2.	12-pulse STATCOM	21.38%	4.49%
3.	24-pulse STATCOM	7.58%	4.64%
4.	48-pulse STATCOM	3.79%	4.95%

The FFT analysis of STATCOM’s output clearly shows that the 48-pulses of a cycle of output voltage containing a fewer harmonics (THD = 3.79%) as compared to the other configurations.

**IV. CONCLUSION**

The results shows that whenever an induction motor is started, a voltage-dip of up to 25% is there in the system-voltage as shown in Fig.5 (a).Now, as soon as the multiple-pulse

STATCOM is implemented into the system and comes under action, the voltage-dip, caused by the starting of the motor at  $t = 0.2\text{sec}$  onwards for 4-5 cycles, is mitigated well as the comparative results shows in table.1. above. A slight voltage-dip is found after the implementation of the STATCOM. The results also show that the voltage fed by the 48-pulse STATCOM adds a fewer harmonics into the system having THD = 3.79% which is within the accepted limit of IEEE standards.

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# Financing Medicines through Microfinance: Successes and Challenges

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**Abstract-** Objective: The objective of this paper is to understand the scope of microfinance institutions (MFI) in financing medicine for health seeker of low economic strata people. The various challenges faced by the microfinance services providers in health and medicine in particular. Some Asian countries have been chosen to observe the medicine coverage strategies. This paper will use the data from national health accounts and best published inventory data from ILO for some specific countries. This paper will enlighten the success and challenge face by various microfinance institutions.

**Method:** We used complementary data and information collection approaches: 1. Structured questionnaire with various MFI's working for health and medicinal services in Asian countries about key issues related to medicines. 2. Review of articles published in British medical journal, lancet journal, New England journal of medicine, JAMA since 2000 and documents posted online by various resources, analysis of existing data bases of GIMI, WHO, and ILO.

**Findings and conclusion:** The main results of the studies shows that MFI's Financing the medicine with financing mechanism especially Insurance and credits system are effective in brining the health and social protection to the large number of poor people. The microfinance can be a distributive channel to supply various financial products. It shows importance in medicine coverage in OPD especially essential chronic disease and tradition medicine which is demand of the community. Covering medicine within the product of insurance, voucher or credit is possible but dealing with cost of the microfinance institution will be challenging. Further more research is required to explore the alternatives to fund the microfinance institution.

**Index Terms-** Micro Finance Initiatives; Medicine; Developing countries; Chronic ; Traditional medicine

accessibility and quality have always been a barrier for the population [6]. In this condition, while the financial barriers exclude the lower income bracket from accessing private health services on the other hand the costs of health including medicine, transport, buying services and losing business make them more poor to obtain complete care . According to National Health Accounts data, out-of-pocket payments account for maximum of private health care expenditures, which themselves represent over half of total health care expenditures in low-income countries [7]. One vital component of the health care cost, is the "cost of medicine" which leads to catastrophic household expenditure or avoidance of treatment.[8]The proportion of out-of-pocket health expenditures devoted to medicines is inversely more associated with income quintiles. A single bad health shock can cost thousands of rupees, undermining saving or forcing households to take loans. The low-income population groups are likely to suffer most from low level of prepayment and thus high out-of-pocket payments. In this scenario Microfinance institutions (MFIs) are involved in addressing the health needs of low income brackets, by providing financial services to the poor on a sustainable basis. Microfinance institutions are developing financial strategies products and services for very poor or difficult to reach rural populations, reducing their vulnerability and increasing their economic power to buy health[9, 10]. In this backdrop this paper investigates the success and challenge of MFI products and services that covered cost of medicines among the low bracket income group and further its impact on their access to medicine and social protection. Specifically this paper will assess the present status of health expenditure for medicines in SE region and MFI initiatives to cover the medicine cost specifically ,and their experiences of success and challenges in this initiatives which has not be done so far.

## I. INTRODUCTION

Financing health is a vital component of health systems which is increasingly focused upon due to the increasing cost of health care globally, especially in developing countries [1]. The solutions provided by various health care delivery models in addressing health inequalities through health financing mechanisms face their ultimate challenges in addressing the health needs of the lower income bracket [2,3]. The complimentary relationship between ill health and poverty has been elaborately documented through various quantitative studies [4,5]. The public health system in the developing countries render free health services but still due to their poor availability,

## II. METHODS

Two techniques were used for this study which includes literature review and conducting secondary case studies. Literature review were done mainly using the published literatures from international labor organization STEPS initiative in inventory for microfinance in India, Bangladesh, Nepal, Pakistan and Sri Lanka[11] We have also explored the published literature from various journals like JAMA, BMJ, and science available from 2000 till 2010, using key words microfinance and medicine, health expenditures, health insurance, health resources, health services accessibility, insurance, and medicines coverage.

In addition we have also searched literature through the internet google search engines and other sources at Library of WHO [12] **Case study** of MFI's working for health and medical services was conducted using a standard methodology for four countries of Bangladesh, India, Pakistan and Sri Lanka, which all fall in the WHO South East Asia region. To have effective results within a time limit and control for the range of microfinance institution, we have targeted these countries which have the high share of disease burden and a huge population which fall under the low income bracket. These microfinance institutions working for health care services were examined to understand the business dynamics, i.e. the services available for health, mode of delivery mechanism, coverage of services among various areas. Four MFI's selected for case studies were SEWA-India, YASURI-Sri Lanka, BRAC-Bangladesh, and AGAKHAN – Pakistan. For each low-income country selected, we extracted information and data on the basis of questionnaire which had three sections. Section-I : Details of the organization, mechanisms of operation, Population coverage, Second- II Details of Budget and expenditure for health care program includes Member contributions, Expenditure on health care functions, Section- III. Details about the spending on medicines, Medicine financing and other opinion oriented question on MFI and medicine issues.

### III. RESULT

Literature review shows that key factors influencing the people's access of medicine are affordability and availability

**Availability** -While Public facilities are a primary treatment option for the poor, the availability of medicines in public sector was consistently low, which could be due to variations in the products included in national essential medicines lists or poor compliance with their recommendations[13]. Even when medicines are available for free or at low cost, access is limited by low availability. Private sector was consistently higher, in many countries it was also low, and high private sector prices could further hinder access. Generics were more widely available than brands in the private sector in low-income countries and lower-middle income countries, whereas in upper-middle income countries the availability of brands and generics was similar [14].

**Affordability**- The public system did not make enough money to pay for new drugs and administration. Reason are like huge drops of in use of health care centre, the higher treatment costs of the disease to be treated, the difficulty in monitoring the fee-for-services method and failing national drugs supply. [15]. In Benin, the *Association d'Entraide des Femmes* scheme preferentially contracts with religious health care providers, because these providers receive donations of brand name medicines that patients prefer, and sell them at discounted prices.[16]

#### **Scenario of access to essential medicines in South East Asia Region**

Access of essential medicine by WHO region of south east Asian shows not even a single country out of nine countries that have a high access of medicine which is worse than Africa which shows 3 countries in high access out of 45 countries. While 2 countries in of south east Asian out of 9 countries is having very less access (less than 50%) whereas its 14 for

Africa. The data shows 4 countries in 50 - 80 % and 3 in 81-95 % range in accessibility of medicine in south East Asia region. Population without access of medicine in the SE region is 127 million which contribute to 26% of total. WHO regional population without access to medicines, otherwise 7% of the world population without access to medicine [17,18,19]

#### **Chronic and complementary medicine**

Chronic disease medicines were unaffordable for large proportions of the population. Increased emphasis should be placed on reducing the cost of these medicines in light of the high burden of non-communicable diseases [20]. Private sector patients paid 9—25 times international reference prices for lowest-priced generic products and over 20 times international reference prices for originator products across WHO regions. Treatments for acute and chronic illness were largely unaffordable in many countries. In the private sector, wholesale mark-ups ranged from 2% to 380%, whereas retail mark-ups ranged from 10% to 552%. In countries where value added tax was applied to medicines, the amount charged varied from 4% to 15%. [21]. Complementary and alternative medicines (CAM) often play a significant role in meeting individuals' needs for affordable essential medicines. In some Asian and African countries, 80% of the population depend on traditional medicine for primary health care [22]. Household surveys in Ethiopia suggest that expenditures on traditional medicine were 20 percent of total household expenditures on health, compared with 33 percent for private doctors, and 47 percent on "modern" medicines [23].

#### **Out of pocket (OOP) expenditures and Health expenditure on medicine**

National Health Accounts data estimates that out-of-pocket payments account for 88.3% of private health care expenditures for south east Asian countries including Pakistan, which themselves represent over half of total health care expenditures in low-income countries [7].

#### **Table 1**

Table-1 shows, Indian contributes 77.5 percent OOP out of total expenditure on health, furthermore the drugs contribution in OPP is more in Bangladesh and Nepal and around 40 % in Sri Lanka and India. The WHO estimates that every year more than 100 million people are forced into poverty by illness and struggle to pay for health care[24]. Sources used to finance OOP include current income saving reimbursement from an insurance plan the sale of assets, money borrowed, and other. The literature suggests intra-household labor substitution is a commonly employed strategy to cope with both the direct and indirect costs of illness.

#### **Exploring the possibility of the medicine being financed by microfinance:**

MFI can be an effective tool to provide health services. Access to financial services – saving, credit, insurance and payment services which are important for poor people: saving provide a cushion that enables people to cope with unexpected events. The spectrum of services of Micro Insurance has constantly expanded, as schemes and terms of providing

insurances services are determined by each company individually. There are many insurance schemes running in developing countries but community health insurance plans in only one-third of low-income countries. Focus on inpatient and outpatient medicines coverage, adjusted to local circumstances, may be one strategy to encourage higher rates of voluntary enrollment in community health insurance by the poor. Medicines coverage policies have an important influence-revenue collection and strategic purchasing. Studies have shown that perceptions about quality of care affect community health insurance membership: coverage for and availability of medicines may be a key determinant of these perceptions. Community health insurance plans can also boost direct revenues by channeling subsidies from public authorities and international donors, which seems to be the case in Rwanda (25). Community health insurance plans can negotiate payments with those who purchase and supply medicines, and they can design incentives to use recommended medicines. Incentives to prescribe and use generics may help to shift market share away from commonly used brand medicines, exert pressure to reduce the prices of these brand products, and increase treatment affordability for both community health insurance plans and patients. In poor communities, Community health insurance provides a critical institutional link between patients, providers, and suppliers of medicines: it can play a key role by negotiating with medicine suppliers, by adjusting medicines coverage to local health care priorities, by disseminating education materials tailored to the community about quality use of medicines, by linking medicines coverage to treatment adherence, and by rewarding providers and community-based workers who follow treatment guidelines. The transition from collecting premium at the factory gets to group policies significantly enhanced the cost-effectiveness of the coverage (26).

### **Findings of case studies of selected MFI**

#### **Case Study I: SEWA-India working in Health**

Sewa is the oldest microfinance institution in India. Since its inception in 1974, Bank has evolved to a composite financial institution and has added insurance service in partnerships with the government (Ahmadabad Municipal Corporation), private sector and non-governmental organizations. Inspired by close studies of the needs of the clients, today SEWA Bank offers more than 40 differentiated products. SEWA Bank distinguishes three broad types of needs that necessitate different financial strategies: predictable needs, unexpected shocks, and income-generating activities. SEWA Bank offers its members the means to come out of the clutches of the moneylender by taking out a low-interest (18%) loan to pay off past debt, and by enabling the woman to create her own assets through savings and insulate her from shocks such as natural disasters and sickness through insurance. There are common life-cycle needs such as pregnancy, education, marriage, old age, and various yearly festivals and ceremonies. Due to their predictable nature, these needs can be addressed with savings and SEWA Bank has designed a variety of specialized recurring deposits to allow women to plan for their future. For unexpected shocks that may throw a family back into the poverty trap or destroy its assets, SEWA Bank provides insurance.

#### **Benefits Contributions (yearly)**

Package 1:• Up to Rs. 2000 for Medicaid expenses, Rs. 3.000 for natural death, Rs. 40.000 for accidental death, Rs. 5.000 for assets and Rs. 15.000 on widowhood

Package 2:• Up to Rs. 5.500 for Medicaid expenses, Rs. 20.000 for natural death, Rs. 65.000 for accidental death, Rs. 10.000 for assets and Rs. 15.000 on widowhood

Package 3:• Up to Rs. 10.000 for Medicaid expenses, Rs. 20.000 for natural death, Rs. 65.000 for accidental death, Rs. 20.000 for assets and Rs. 15.000 on widowhood.

#### **Case Study II: Yasiru –Sri Lanka working in Health**

Yasiru started in the middle of the 1990s as an in-house insurance service in a federation of NGOs called All Ceylon Community Development Council (ACCDC). Intended target groups/clients are the rural poor without permanent employment. Actual clients are the small scale farmers, estate workers rural people with low income. Yasiru is providing insurance to over 9 000 members through its partners. It has accumulated equity and reserves of almost LKR 5 million (\$50,000). The product covers death, disability and hospitalization and has a typical low-income profile. The monthly premiums vary from LKR 10 to 150 (\$0.1 to \$1.5) and the benefits range from LKR 3000 to 120 000 (\$30 to \$1,200).The NGOs have offices in rural areas and appoint “animators” who carry out the recruitment of clients and sales of policies in the field. Pricing for the insurance products includes with no deductibles or co-payments. Scheme covered Death.

**Hospitalization of a covered person:** Benefit is awarded once in 12 consecutive months only for one event subject to a maximum delay of 15 days per covered person. Repeat benefit claims for the same illness will be entertained once in two years. Hospitalization claims can be made only after completing 6 months of membership. If hospitalization conditions are not being met, benefit is awarded once in 12 consecutive months only for one event subject to a maximum of 10 days per covered person. Ayurvedic or similar treatment claims can be made only after completing 6 months of membership. “The main strategy for Yasiru is to cooperate with partners and to have insurance agency.. All partners offer microfinance products and are therefore well equipped to extend their services to include micro insurance. The penetration rate of the Yasiru scheme needs to be increased among the 60,000 members of its current partners. This will demand resources for marketing and for further training of staff within the partner organizations. A major challenge for Yasiru in the years to come will be to adapt to a new financial situation with reduced external support.

#### **Case Study III: BRAC ((Bangladesh Rural Advancement Committee) working in Health**

BRAC has grown to become one of the largest NGOs in the world, working in 65,000 villages in all 64 districts of Bangladesh. BRAC’s microcredit program follows the Grameen Bank group-borrowing model, delivering services through a network of 1,172 branches and 155,065 Village Organizations (VO) with 5.1 million member ships. BRAC originally introduced a health ‘insurance’ scheme in the mid 1970s as part of a project in Sulla, in the northeast of Bangladesh. The aim was to provide affordable health care to community members. In

exchange for an annual 'premium' of one kilogram of pre-husked rice, households were eligible to receive free primary health care from BRAC paramedics. The scheme was open to all sections of the society. It was discontinued when research revealed that only landowners and established farmers were taking advantage of the scheme.

From the mid 1990s, the program was extended to include curative services to complement their existing preventative services. The first BRAC health centre or 'Shushastho' was established in response to demands of BRAC's members. Their desire to reintroduce a health micro insurance scheme grew out of the need to include this neglected segment and address the issues of equity, affordability and accessibility to health care. The BRAC Health Program focuses principally on the community, with a particular focus on women and children, though men are not specifically excluded, and is implemented through three tiers. The first tier is a cadre of part-time community health workers, called "Shashtho Shebikas" (SS), mostly front-line women workers of BRAC's Health Program.. The second tier is a cadre of health paramedics, all women, called Shashtho Kormis (SK). The third tier is a network of clinical facilities, called BRAC Shushasthos. The Shushasthos provide technical and clinical backup to the SS and SK,. The Shushasthos provide treatment and diagnostic services, have comprehensive laboratory labs, outpatient facilities, and in-patient services. There are 98 Shushasthos operating in 92 Upazilas in the country.

#### Table -2

Table-2 Features the BRAC MHIB scheme (2005).Benefits BRAC MHIB has three voluntary HMI packages: the General Benefit and Ultra Poor Package, Pregnancy Related Care Package and School Health Package. BRAC MHIB's first insurance scheme, the General Benefit and Ultra Poor package, provides medical consultations at BRAC Shushastho at reduced rates, discounts on pathology tests and medicines. The ultra poor get 2 post consultation home visits, and the head of the household gets a free annual check-up. In case of referral to other clinics or hospitals, the scheme reimburses between US\$8.52 and US\$17.04. The benefits were adopted after consulting the community's disease profile and extensive consultation with target group members. The Pregnancy Related Package, which was introduced in 2002, covers the cardholder against a number of pregnancy related complication through all stages of one pregnancy. It also covers newborns against diarrhea and pneumonia. Free iron tablets, folic acid and Safe Delivery Kit are also supplied all pregnant women covered by this scheme. The major challenge faced by the three HMI schemes today is their financial viability.

**Case Study IV: Aga Khan Agency for Microfinance (AKAM)** has taken over 25 years of microfinance activities, programmes and banks that were administered by sister agencies within the Aga Khan Development Network.. In Pakistan AKAM has been working on insurance products for the poor since mid-2005. With this funding AKAM was able to open the First Micro insurance Agency Pakistan (FMiA-P). AKAM's flagship micro insurance product is hospitalization insurance. AKAM is working from the hypothesis that the most appropriate solution

for health financing involves a combination of health savings accounts and micro insurance. FMiA-P was incorporated in February 2008, offering life, savings and health insurance products to clients in Lahore, Karachi and in Northern Pakistan. As an insurance agent, FMiA-P is not the legal underwriter of the insurance policies. Rather, it manages the product development, marketing, sales, and claims management for the New Jubilee Life Insurance Company, which is majority owned by AKFED. This partnership has enabled AKAM to quickly begin providing dedicated micro insurance products to poor families.

The Aga Khan Foundation Canada and the Canadian International Development Agency are also providing some grant funding to support the "Healthy Mother/Healthy Infant" pilot project that is based on this combined savings-insurance approach. The key to providing effective insurance and a solution to the perceived health care burden is to add products and services which definitely provide value during which the premium is paid. The Medical Savings accounts with discounts on medicine purchases as well as the Dial a Doctor Service both provide value to the client during his first year of premium payment.

#### IV. DISCUSSIONS

##### **Microfinance as an option for medicine:**

Internationally, the microfinance business has outstanding achievement in extending financial services to the poor; and has demonstrated a significant ability to contribute to the Millennium Development Goals. Health Insurance can improve medicines access and use, systematic research is needed on medicine benefits and their performance, including the impacts of Community Health Insurance on access to, affordability, and use of medicines at the household level. (25) But the industry has a long way to go – and over a billion low-income people remain unable to access formal financial services Internationally several key principles for microfinance are emerging and increasingly accepted [27] Health insurance is booming in Asian countries. Prepayment schemes can take many forms on the road to universal coverage but the significance plans scheme is required to cover the benefits specially medicine without any co-payment and reduction to reduce the burden of medicine for covered people. Community health insurance plans can negotiate payments with those who purchase and supply medicines. The chronic medicine, traditional medicine and day care treatment are the three major services that hit the patient. In practice this could mean schemes to make chronic disease medicines available in the private sector at subsidized prices, or through the promotion of differential pricing schemes that offer reduced prices in poorer countries. Improved public sector support is needed for chronic disease medicines and insurance plan must covers chronic disease medicine. Several options are available to promote use of generics, including preferential registration procedures, ensuring the quality of generic products, encouraging price competition, and increasing the confidence of physicians, pharmacists, and patients in the quality of generics. Countries should develop and implement national policies to improve the availability and affordability of essential medicines [21]. Traditional medicine may be able to help reduce the government's financial health-care burden like some of the therapies have been used in Kenya

for more than 60 years. Traditional practitioners managed 68.7% of the disease burden compared with 31.3% addressed by government funded health centres. In Madagascar, the government allocates 1.3% of gross domestic product for provision of healthcare services that use traditional medicine [28]. Focus on inpatient and outpatient medicines coverage, adjusted to local circumstances, may be one strategy to encourage higher rates of voluntary enrollment in community health insurance by the poor.

**Assessment of case studies:** SEWA is based on insurance model where medicine is covered under hospitalization. SEWA is having a partnership with government and other private organization which make the organization sustainable. As insurance is having drawback of moral hazard, adverse selection and lack of collateral interest, Sewa is able to overcome observe the regularity of savings for six months, the loan size increases cycle to cycle to establish a credit history and regularity of the payments. Generally the loan is individual and keeps track of its portfolio and promptly notifies irregular borrowers. In case of YASURI, No staff in it has any professional experience in insurance. The general education level of the staff is A-levels or O-levels. They have m Ayurvedic or similar treatments of a covered person. As the data shows that the chronic medicine and traditional medicine are ignored part of medicine coverage but Yasuri is taking care of other prospect of medicine. But few of the dropouts will understand fully that although they have received no benefit, they were actually insured while they paid the premiums. As pointed our earlier, it is likely that many of the clients who terminate the insurance will tell their neighbors that they have paid for several years but received nothing. Yasiru's financial situation is, of course, positively influenced by the support it has received from the Rabobank, which has allowed Yasiru to build up reserves quickly. BRAC model covers medicine in their products as in 25% off in the retail price of 15 essential basic medicine and 10 % off in other. The burden of total coverage of medicine is still not observed from the model and that gives the insecurity to the patients to get complete coverage

### Barriers

The cost of running an MFI is a worry of many capitalist due to competitive pressures, as more entrants into the market diversify their financial product offerings and swapped out low cost, or concessional, funding for more commercial funds in the credit boom. Financial services to low-income people have great difficulty achieving profitability, especially those serving dispersed populations in rural areas. Many MFIs are organized as NGOs; they do not have a shareholding structure, so are unable to raise equity from investors. They also cannot collect and intermediate saving. Because of these factors, their sources of finance are restricted to grants, loans, and retained earnings. These NGO-MFIs often use donor-funded credit lines to start or expand their business. Other challenges faced by the community based insurance organization is the small size, multiplicity of communities where they function, and lack of infrastructure or technical capacity.

### V. CONCLUSIONS

An effective health care system is crucial to break up the vicious cycle of poverty and poor health. The Shift from user fees to pre-payment and pooling has been observed and there is a need to develop a national health insurance schemes to have more security and sustainability in expenditure in health and also the universal coverage of various Health care services.

The microfinance can be a distributive channel to supply various financial products. In medicine coverage of OPD it can of importance to essential chronic disease and traditional medicine which is the demanded by communities. Covering medicine within the product of insurance, voucher, credit is possible but dealing with cost of the microfinance institution will be challenging. Further more research is required to explore the alternatives to fund the microfinance institution.

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**Table1: Out of pocket scenario in India, Bangladesh, Nepal, Sri Lanka (World health survey 2003)**

S.No.		India (%)	Bangladesh (%)	Sri Lanka (%)	Pakistan (%)
1.	Private Health Insurance Premium As Percentage of Total Expenditure	0.5	0	0.5	0.3
2.	OOP payment as a percentage of total health expenditure	77.5	64.3	48.8	81.5%
3.	Percent Distribution Of Structure Of OOP Health Payments				
3.1	IPD	25.4	6.3	28.7	18.4
3.2	OPD	16.9	8.1	14.7	9.6
3.3	Traditional	3.3	5	1.7	3.5
3.4	Drugs	44.4	67.1	36.1	64.3
3.5	Other	9.9	13.6	18.8	4.2
3.5(a)	Financial source used by households for paying for health services				
3.5(b)	Saving	11.7	4.1	6.4	3
3.5(c)	Sold items	13.7	11.4	0.8	2.5
3.5(d)	Borrow from relative	20.6	18.6	5.2	9.2
3.5(e)	Borrow from other	28.6	23.2	2.5	1.8
3.5(f)	Health insurance	0.6	0	1.4	1.3
3.5(g)	Current income	78.2	94.1	73	82.2
3.5(i)	Other	5.3	3.6	3.1	

Note. Source [http://www.who.int/healthinfo/survey/whsresults/en/index5.html\(06/10/09\)](http://www.who.int/healthinfo/survey/whsresults/en/index5.html(06/10/09))

Pakistan- <http://www.emro.who.int/emrinfo/index.asp?Ctry=pak>

<http://www.who.int/healthinfo/survey/whsind-india.pdf>

**Table-2 Product and services of BRAC**

Product Détails	Product feature and Policies
Micro Insurance Type	Préventive and curative health care
Group or Individual Product	Individual
Term	Annual
Eligibility Requirements	Must be living in target are
Renewal requirements	None
Rejection rate	None
Voulnitary or Compulsory	Voluntary
Product coverage (benefits)	50% off pathology tests ; ultra poor80% off 10% off medication fée ; ultra poor80% off Free Annual check up for head of house hold For Ultra poor Atleast 2 post-consultation follow-up home visits. Free transportation to referral hospitals and clinics
Key Exclusions	No speicified exclusions
Pricing premiums(in US Dollars) for 1-5 members 6-8 members 9-12 members	1.7/4.26/0(VO/Non VO/Ultra poor)/Per year 2.56/5.12/0(VO/Non VO/Ultra poor)Per year 3.41/5.96/0(VO/Non VO/Ultra poor)Per year
Pricing Co-payments(in US Dollars)0	0.03/0.08/0(VO/Non VO/Ultra poor)Per year
Pricing-other fees	None
Incentive to renew	25% discort on renewal if any members does not use BRAC health services in previous year.

# Bluetooth Based Airport Enquiry System Using Python

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**Abstract-** Here we are proposing a Bluetooth based autonomous system which has features, such as; check route from one point to another within a premise, providing rate charts of the nearby coffee shops etc. We have used **Python** language to design and implement the protocols of this system due to its easy syntax and rapid prototyping features. The methodology section describes the implementation in detail and result section show that the proposed system works as per our expectation. We hope that the concept provided in this report will aid the developers' community in near future.

**Index Terms-** system description, Bluetooth, dictionary, results

## I. INTRODUCTION

The system is primarily based on Bluetooth communication with python for the software design.

**Python** is a widely used general-purpose, high-level programming language. Its design philosophy emphasizes code readability, and its syntax allows programmers to express concepts in fewer lines of code than would be possible in languages such as C. The language provides constructs intended to enable clear programs on both a small and large scale.

**Bluetooth** is a wireless technology standard for exchanging data over short distances (using short-wavelength radio transmissions in the ISM band from 2400–2480 MHz) from fixed and mobile devices, creating personal area networks (PANs) with high levels of security.

A master Bluetooth device can communicate with a maximum of seven devices in a piconet (an ad-hoc computer network using Bluetooth technology), though not all devices reach this maximum. The devices can switch roles, by agreement, and the slave can become the master (for example, a headset initiating a connection to a phone will necessarily begin as master, as initiator of the connection; but may subsequently prefer to be slave). The Bluetooth Core Specification provides for the connection of two or more piconets to form a scatternet, in which certain devices simultaneously play the master role in one piconet and the slave role in another.

## II. SYSTEM DESCRIPTION

This system is based in airport. Airport is a huge premise and it is often quiet hard for boarders to find places such as terminals, coffee shops, counters, washrooms etc and moreover their directions. Though indications through direction boards are available, but one has to search for it. According to our project, one can find their desired destination within the airport premise using preinstalled helpdesk or an enquiry booth through which one can access this system. This system consists of a displayed window with few buttons like "Terminal", "Coffeeshop", "Routemap", etc. Function of each button is as follows:

- **Button "Terminal":** Function of this button is to find the terminals and to show the list of all terminals available in that airport.
- **Button "Coffeeshop":** If clients click on this button then he/she will see the list of nearest coffee shops and below this list there is a button named "Ratechart". "Ratechart" button provides name of the available products in a particular coffee shop and also their price.
- **Button "Washroom":** It shows list of nearest washrooms.
- **Button "Medical":** It shows list of nearest medical outlets and free check-up centre's.

- **Button “Routemap”:** It is the most important button of this system. If you click this button, an entry box is opened which wants your destination name. After writing destination name if you click “ok” button, it provides you a route map or graph of your path.

More buttons can be created as per requirement.

### III. DATA STRUCTURES

This system consists of six data base files. These files are used as a dictionary in the system. Therefore data’s are stored in the file as a form of dictionary. Tuples are also used in this system, within a dictionary to show the valid information. These are frequently used to represent simple data structures. If any data of those files will change Server’s needs to update these files. All data based files are described below:

- **Terminal:** This file is content name of all the terminals. The file is shown below:  
{Mac id 1: [Terinal1, Terminal4, Terminal3], Mac id 2: [Terminal2, Terminal5 Terminal6]}  
Here the term ‘Mac id’ denotes Mac id of a particular helpdesk. Mac id 1 is Mac id of helpdesk 1. As we know helpdesk is connected with all sectors through Bluetooth communication medium. So, a particular helpdesk can find its nearest sectors. Thus, in this file, “[Terinal1, Terminal4, and Terminal3]” is the list which shows nearest terminals of helpdesk 1. By this way all data in the terminal file are stored. This file is used in the server’s system terminal function.
- **Coffee shop:** Name of all the coffee shops is stored in this file. The file shows below  
{Mac id 1: [café coffee day, coffee5, coffee6], Mac id 2: [coffee2, coffee4, coffee zone]}  
Structure of this file is same as structure of terminal file. Only difference is that it shows nearby coffee shops of a particular helpdesk.
- **Washroom:** It consists of all the washrooms. Airport is a large premises therefore sometimes it is difficult to find washrooms here. Thus in this system, name of the washrooms are stored in the washroom file. In the server’s system washroom function uses this file. This is also a data based file and the structure of the file is same as above two files.  
{Mac id 1: ["washroom1", "washroom3", "washroom5"], "mac2": ["washroom4", "washroom2"] ...}
- **Place:** Place is also a data base file but the structure of this file is little bit different with refer to above three files. This file provides coordinate of all sectors/zone in the form of dictionary. The file shows below  
{Mac id 1:[20,53],.....,Terminal1:[12,21],Terminal2:[.....],Coffee2:[45,43],.....}  
In this dictionary all sectors or zones are saved with their coordinates. Coordinates are stored in the form of list.
- **Rate:** It is a file used in the rate chart function. This file contains price and available product of all coffee shops. The structure of the file shown below  
{café coffee day:["coffee -60”, “cappuccino -150”, “biscuit -20”], coffee2:["coffee-55”, ....],..}

### IV. ALGORITHM

1. The client sends a request to the server, by clicking one of the buttons.
2. The server then verifies the request and prints the corresponding list to the client.
3. On viewing the list provided, the user re-sends further request for detailed information, such as products available, rate chart, etc. by simply typing one, in the list.
4. If the request is regarding ‘coffee shop’, it shows the list of available products, rates, etc.
5. If the request is regarding ‘terminal’, it shows the list of available terminal in the airport.
6. If the request is regarding ‘medicine’, it shows the list of available outlet and free checkup booths.
7. If the request is regarding ‘washroom’, it shows the list of nearest washrooms.

8. Now if the request is 'route map', then it exhibits the direction of the destination from that particular help desk.

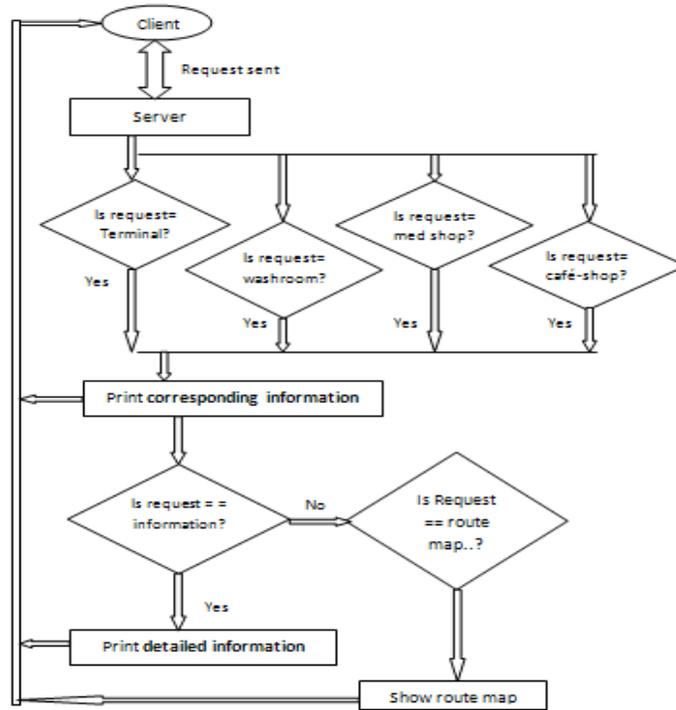


Figure 1: Flowchart demonstration of the system

## V. RESULT AND OUTCOME

In this section we will describe working methods of the software step by step with help of screenshots. At first the window in figure 2, will appear in the display of 'helpdesk'. A user can click any of them for their enquiry.



Figure 2: display window at helpdesk

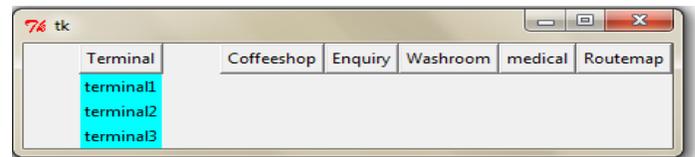


Figure 3: screen, when terminal button is clicked

Suppose a user requested for terminals. Then it will display the list of terminals nearby to that helpdesk as in figure 3. It indicates that there are three nearby terminals from this helpdesk, namely, "terminal1", "terminal2" and "terminal3".

A user may also ask for 'coffee shops'. Then name of the nearest coffee shops from that helpdesk will be shown. A button will appear also as 'rate chart'. If a user types the name of a particular coffeshop (as an example 'cafe2' as shown in figure 4) in the entry box then corresponding rate chart will be appeared in a different window.

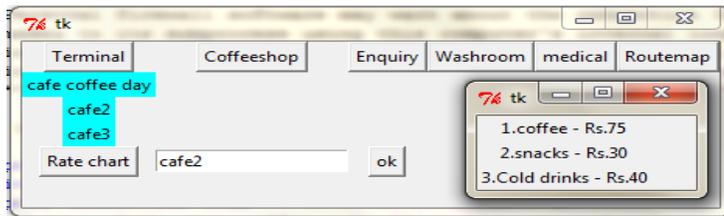


Figure 4: screen, displaying the rate chart of a coffee shop

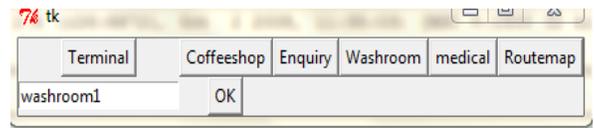


Figure 5: after clicking 'routemap' button

This software can display also route direction of a particular place from the helpdesk.

Like as below there will be 'route map' button. If clicked an entry box will get opened as shown in figure 5. Then, if the user writes the name of a particular place in the entry box and press 'ok' button, direction will be shown.

In this case the "washroom1" is in the north-east direction from that particular helpdesk. Similarly directions of other destinations can also be routed by this application.

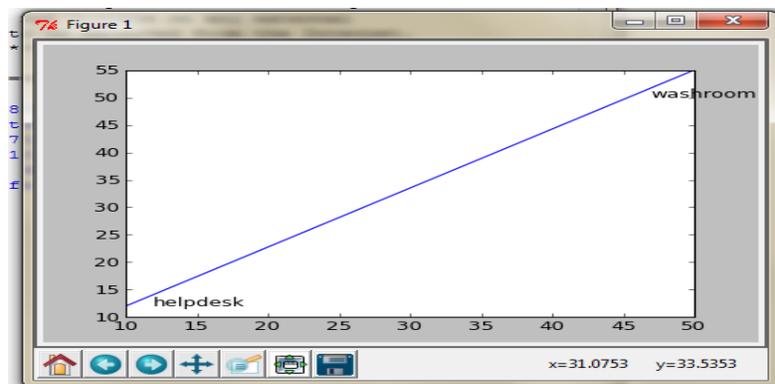


Figure 6: representing the route direction of 'washroom1'

## VI. CONCLUSION

The detail description and the concept of implementation of the proposed system are described in the methodology section. We hope that this system will be of great use in a large premise. We also hope that this system will aid the developers' community in future. This system lacks the security features. We will take security measures in order to prevent outside attacks and unauthenticated usage. Moreover the route demonstration would have been better using SQL database. Further implementation can be done based on shopping malls, stadiums, banks, railways stations, etc.

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# A Comparative Study of $\Pi$ and Split R- $\Pi$ Model for the CMOS Driver Receiver Pair for Low Energy On-Chip Interconnects

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**ABSTRACT** - Ever increasing fraction of the energy consumption of an Integrated circuit is due to the interconnect wires (and the associated driver and receiver circuits). Power dissipation from the interconnect wires amounts to up to 40% of the total on-chip power dissipation in some gate array design styles. When compared with other techniques a diode-connected driver circuit has the best attributes over other low-swing signaling techniques in terms of power, and delay. The proposed signaling schemes of symmetric low-swing driver-receiver pairs (MJ-SIB) and (MJDB) for driving signals on the global interconnect lines, which are implemented using split R- $\pi$  model for an interconnect line, provides best results.

## I. INTRODUCTION

Market is continuously demanding devices with increased functionality/unit area; these demands have been satisfied through technology scaling which, has impacted greatly on the global interconnect delay subsequently reducing system performance. Use of lower supply voltages would be one of the solutions to reduce the power dissipation of the drivers. The performance of the line drivers for global interconnects is impaired unless low-swing signaling techniques are implemented. Low-swing signaling techniques provide high speed signaling with low power consumption and therefore can be used to drive global on-chip interconnects.

The most efficient way to achieve power reduction and Power -delay product efficiency on the global interconnects is reducing the voltage swing of the signal on the wire.

Various architectures for the interconnect driver and receiver have been proposed in this report.

When compared with other techniques a diode-connected driver circuit has the best attributes over other low-swing signaling techniques in terms of power, and delay. Incorporating a diode-connected configuration connected in split R- $\pi$  model provides high speed signaling due to its high driving capability.

The conventional interconnect model usually employs a lumped RC segment however this model lacks the accuracy to model high-performance interconnect significantly with the increase in circuit operating frequency. An alternative to the lumped RC model is a distributed RC model. As the number of segments approaches infinity, the lumped approximation will converge with the true distributed circuit.

## II. LITERATURE REVIEW

Not only the interconnect wires but also the associated driver and receiver circuits are responsible for an ever increasing fraction of the energy consumption of an integrated circuit. In some gate array design styles power dissipation from the interconnect wires amounts to up to 40% of the total on-chip power dissipation [1].

Measured over a wide range of applications, more than 90% of the power dissipation of traditional FPGA devices have been reported to be due to the interconnect [6]. As technology scales down, on-chip wires become increasingly important compared with devices in terms of power, delay and density [4]. Most low-swing voltage techniques to-date rely on extra power supply, or reference voltage, multiple threshold process technology, large area penalty, and multiple wire interconnects when differential signaling is employed [5]. Low swing interconnection techniques provide an efficient way to overcome full-swing signaling in terms of delay, power and noise immunity. A high performance, adaptive low/high swing CMOS driver circuit (mj-driver), which is suitable for driving the global, interconnects with large capacitive loads is designed. When implemented, mj-driver performs 16% faster, and reduces the power consumption by 3% [9].

The Low- swing signaling circuits which are implemented using  $\pi$ -model of the interconnect [10], are now in this paper implemented using the Split R- $\pi$  model.

III. PROPOSED CIRCUITS

The split R- $\pi$  model is the approximation of the distributed RC model. Equation for delay is given as

$$\text{Delay} = (R C L^2) / 2$$

Where R= resistance of the interconnect,

C= capacitance and L= length of the interconnect

Hence, when R and C are reduced to half the original values, the delay gets reduced. Thus this concept of splitting the value of resistor and capacitor is used to reduce the delay.

Using this concept, the circuits mentioned in [10] are now modeled with split R- $\pi$  model, which has proved to be better than interconnect implemented with nominal  $\pi$ -model. All the four circuits designed below (Fig 3.1, Fig 3.2, Fig 3.3 and Fig 3.4) are implemented using split R- $\pi$  model for an interconnect

**ASFLC (Asynchronous Source Follower with Level Converter)**

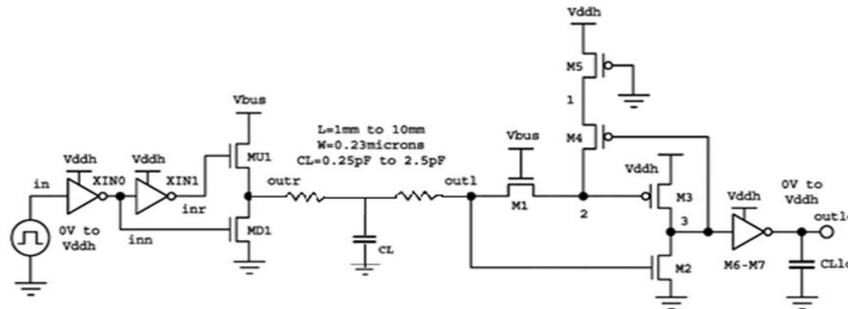


Fig 3.1 Circuit structure for the HOA CMOS driver-receiver ASF-LC, with Vddh =1.0 V, Vbus=2 V, Vtn=0.21 V, and |Vtp|=0.25 V.

In this circuit the driver is designed using a source follower. The receiver may be a simple inverter or level converter circuit. PMOS conducts when at point X1 when the value is zero, and the above PMOS is always on as it is connected to ground, and this particular operation makes the output to pass through lower transistors if the value is 1 the output follows the same direction .So the working principle behind level converter is to get the output at different time scale.

**DDCD (Dynamically Diode Connected Driver Circuit)**

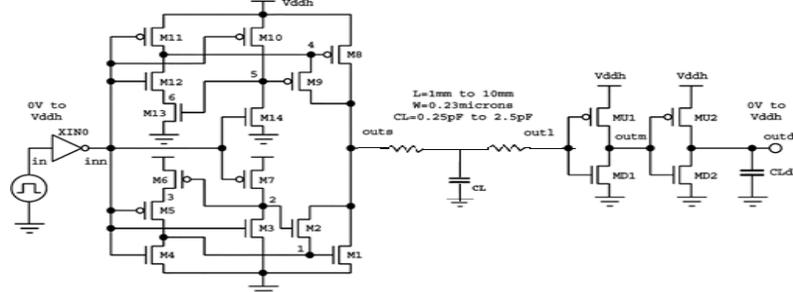


Fig 3.2 Circuit structure for the low-high offset symmetric (LHOS) CMOS driver-receiver DDC-DB, with Vdd =1.0 V, Vtn =0.21 V and Vtp=0.25 V

In the above circuit before driver circuit, a set of inverters, buffers and NAND gate is connected. The concept of merging and splitting of inverter is used, to split the current in the circuit and to increase fan-out of the circuit. The input from the previous inverter is used by the NAND gate. Basically the NAND gate sends a specific output to the next stage. The concept of dynamic diode is used to design the driver circuit (Diodes are realized using CMOS). Here we are using two dynamic diodes. In order to drive the input to output side efficiently the driver circuit is used, which is the next stage. The set of CMOS transistors are used so as to control the current in the diode, i.e his circuit is used to split the current in the diode to make it immune to excess current.

**Driver circuit**

The driving output transistor switches among three different modes: First, it is fully active, providing high drive capacity to quickly charge/discharge the line. Then, the driving transistor becomes diode-connected, limiting the line's voltage swing and offering lower

impedance then the source follower to better fight noise. The transistor finally turns off when the line is driven in the opposite direction

The working of the driver circuit is explained in there different modes,

**Input is high:** Transistors M3, M4 and M6 are on and M1 (the N driver), M2, M5 and M7 are off (M1 off).

Input transition from high to low: Transistors M4, M3 and the P driver (M8) are turned off, M5 and M6 fully charges the gate of the N driver (M1), which fully activates the output transistor (active mode). As the line is driven towards ground, M7 which is now active, turns M6 off and enables M2 to turn on. At this point of time, the gate of the N driver (M1) “holds” the charge while the line is discharging but not yet low enough to activate M2. When M2 is active, the voltage at the gate of M1 is driven to match the line (“diode-connected” mode).

**Input transition from low to high:** The same sequence as explained above is applied to the P driver (M8) side. The Dynamic Diode-Connected Driver has non-linear behavior of the energy and delay ratios with respect to V<sub>dd</sub> mainly because, when V<sub>dd</sub> is low, M9 and M2 may take longer to activate (to have enough V<sub>gs</sub>), allowing the drivers to stay active longer, increasing the voltage swing despite the reduction of V<sub>dd</sub>.

### MJSIB (Multi Junction Single Band)

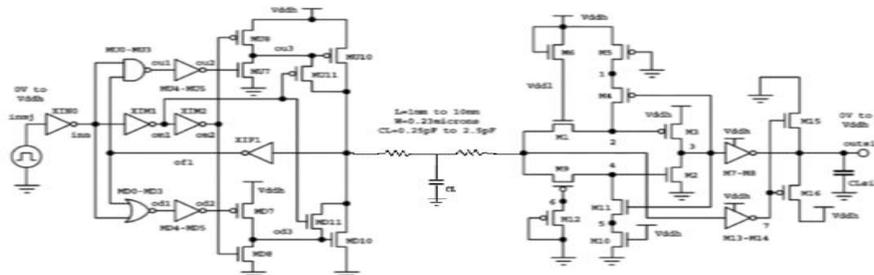


Fig 3.3 Circuit structure for the LHOS CMOS driver-receiver version I (MJ-SIB), with V<sub>ddh</sub> =1.0 V, V<sub>tn</sub>=0.21 V, and |V<sub>tp</sub>|=0.25 V.

#### Driver circuit

When the input is fed to the inverter, it increases the fan-out so as to drive three other gates i.e NOR, NAND and NOT gates. The logic gates connected before the DDC topology helps maintaining the input signal within the stable limits. The condition can be explained as follows: inn<sub>mj</sub>=0, MU11 is ON and hence the drain and gate of MU10 are at equal potential. When UD2=0, it turns MD7 OFF and MD8 ON, which results in turning OFF MD10 and MD11. The output from XIM2 = 1, turning MU8 OFF. MU10 provides a path between the out<sub>mj</sub> to the ground meaning low voltage or 0 bit is transmitted. The operation of MJ-SIB driver part of circuit in Fig. 3.3 can be explained in as follows.

**Low state at the output, out<sub>mj</sub> :** For output out<sub>mj</sub> in the low state we have inn = out<sub>mj</sub> = low, ou1 = high and ou2 = low, MU7, MU10 and MU11 off and MU8 on. In this state, the output is driven low through the diode connected pair MD10 - MD11.

**Low-to-high transition at the output, out<sub>mj</sub> :** After a low-to-high transition at inn, due to delay in the feedback loop (XIF1), ou1, and ou3 will go low, and ou2 will go high briefly. This causes MU7, and consequently MU10 to turn on and strongly pull the output node out<sub>mj</sub> to high, to charge up the output load. The feedback loop eventually turns ou3 and ou2 to their steady state values of high and low, respectively, turning MU7 off, disabling it from driving the gate of MU10. However, transistor MU11 which was turned on when out<sub>mj</sub> went low will remain on, providing a diode connected configuration (pair MU10- MU11) to maintain the output voltage nearly at (V<sub>dd</sub>-V<sub>tp</sub>)

**High state at the output, out<sub>mj</sub> :** For output out<sub>mj</sub> in the low state we have inn = out<sub>mj</sub> = high, od1 = low and ou2 = high, MD7, MD10 and MD11 off and MD8 on. In this state, the output is driven low through the diode connected pair MU10 - MU11.

**High-to-low transition at the output, out<sub>mj</sub> :** After a high-to-low transition at inn, due to delay in the feedback loop (XIF1), od1, and od3 will go high, and od2 will go low briefly. This causes MD7, and consequently MD10 to turn on and strongly pull the output node out<sub>mj</sub> to low, to discharge up the output load. The feedback loop eventually turns od3 and od2 to their steady state values of high and low, respectively, turning MD7 off, disabling it from driving the gate of MD10. However, transistor MD11 which was turned on when out<sub>mj</sub> went high will remain on, providing a diode connected configuration (pair MD10- MD11) to maintain the output voltage nearly at V<sub>tn</sub>.

**Transmission Line:** The transmission line is designed with π model analogy, consisting on cascaded resistors and capacitors. Hence our work is to find the efficient value of capacitor and resistor so that signals of any frequency can be transmitted without disturbing the key features of the signal.

**Receiver Circuit :** The operation of MJ-SIB receiver part of circuit in Fig.3.3 can be explained in as follows.

In the MJ-SIB receiver circuit, the pass transistor M1 isolates the internal node 2, from the previous stage. Without it the lower potential from the previous stage causes the current to flow from the V<sub>dd</sub> through M3 back to the driver side. With node 2 isolated, the feedback transistor M4 can pull-up the gate of M3 above the high swing voltage level at the input V<sub>in</sub>. The proposed sib-receiver uses

the inverter (M13-M14), and M15 transistor to reduce the output pull-down transition time. Splitting the pull-up for node 2 to M4, and M5 will help to reduce the load on node 3 and reduce energy consumption without hurting the performance M1 and M9 act as pass transistors and always at saturation ,hence M2 and M3 together act as an inverter. Introduction of M11 and M12 will ensure that there is no static power dissipation when M2 is not fully turned off when Vin is low. Finally, sib-receiver improves the low-to-high propagation delay through the introduction of the additional pull-up transistor M16.

The intermediate output is feedback by the two level converters. When Out1=0, the signal is sent forward through the buffer and therefore out sib=0. At the same point of time, when the expected voltage signal is not obtained, it is fed back through an inverter to the transistors M11 and M4.Now, Out1=0 implies that the output at node 3 is high, which switches M4 OFF and M11 ON. As M10 is always ON, node 4 is grounded, which turns M2 OFF.

Further, M9 and M1 being always ON will switch M3 ON and thus providing a conduction path between node3 and Vdd. The high voltage from Vdd then encounters an inverter and hence giving a low voltage signal/ bit at outsib. As for Out1 = 1, the upper level converter will be active and hence sending a high voltage signal/ bit at outsib.

**MJDB (Multi Junction Double Band)**

**Driver circuit**

When the input is fed to the inverter, it increases the fan-out so as to drive three other gates i.e NOR, NAND and NOT gates. The logic gates connected before the DDC topology helps maintaining the input signal within the stable limits. The condition can be explained as follows: inmj=0, MU11 is ON and hence the drain and gate of MU10 are at equal potential. When UD2=0, it turns MD7 OFF and MD8 ON, which results in turning OFF MD10 and MD11.The output from XIM2 = 1, turning MU8 OFF. There is path between outmj to the ground meaning, a 0 bit is transmitted, because of MU10.

**Transmission Line**

The transmission line is designed with  $\pi$  model analogy, consisting on cascaded resistors and capacitors. Hence our work is to find the efficient value of capacitor and resistor so that signals of any frequency can be transmitted without disturbing the key features of the signal.

**Receiver circuit**

The receiver has two inverters cascaded, which forms the buffer and stabilize the intermediate signal that may be affected by noise. Thus, giving the required signal at the output.

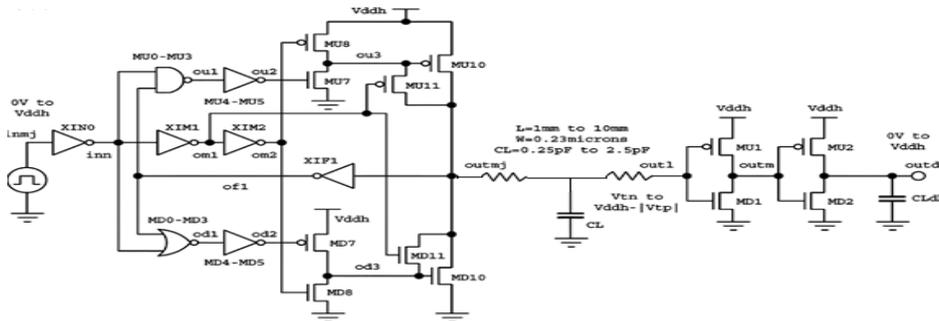


Fig 3.4 Circuit structure for the LHOS CMOS driver-receiver version II (MJDB), with Vdd=1.0 V, Vtn=0.21 V, and |Vtp|=0.25 V.

**IV RESULTS**

HOA						
PI Model				Split R- $\pi$ model		
Values of R (K $\Omega$ )	Delay (n sec)	Power Results (m W)	Power-Delay Product (p W)	Delay (n sec)	Power Results (m W)	Power-Delay Product (p W)
1	58.1	4.280	248.668	15	2.196	32.940
5	69.9	2.846	198.935	14.2	3.826	54.329
10	89	8.840	786.760	31.3	7.326	229.303
15	109.7	7.707	845.457	Waveform distorted		

20	Waveform distorted			Waveform distorted		
25	Waveform distorted			Waveform distorted		
30	Waveform distorted			Waveform distorted		
<b>DDCD</b>						
1	37.2	1.034	38.464	31.7	0.295	9.351
5	36.6	1.244	45.530	32	1.239	39.648
10	39	1.149	44.811	32.5	0.647	21.027
15	45.1	1.659	74.820	33	0.894	29.502
20	47.3	1.805	85.376	33.5	0.946	31.691
25	48	1.994	95.712	34	1.174	39.916
30	50	2.005	100.12	34.4	1.293	44.447
<b>MJ SIB</b>						
1	7.3	2.275	16.607	3.7	3.507	12.975
5	9.8	1.981	19.413	5.2	1.941	10.093
10	16.6	1.377	22.858	6.2	1.762	10.924
15	23	1.095	25.185	7.6	1.816	13.801
20	25.4	0.965	24.531	9.2	1.616	14.867
25	30.6	3.222	98.593	11.35	1.459	16.559
30	Waveform distorted			15	1.334	20.010
<b>MJ DB</b>						
1	10.8	2.220	23.976	5.8	1.014	5.881
5	15.3	1.965	30.064	7.3	1.888	13.782
10	26.8	1.333	35.724	8.75	1.707	14.936
15	37	1.056	39.072	10.84	1.492	16.173
20	40.7	0.942	38.339	14.1	1.338	18.865
25	44.8	3.264	146.227	17.7	1.203	21.293
30	45.9	3.083	141.509	21.1	1.104	23.294

#### V COMPARATIVE EVALUATION

The study of result table proves that the MJSIB and MJDB schemes when implemented with nominal  $\pi$ - interconnect model perform better than ASFLC and DDCD. However MJSIB performs better than MJDB for shorter wire lengths as evident from Fig. 5.1.

When, the above schemes are implemented with split R- $\pi$  model for the interconnect, power delay product is far better than the results obtained from nominal  $\pi$  model as shown in Fig. 5.2.

However, both MJDB and MJSIB when implemented with split R- $\pi$  model for the interconnect line shows the performance improvement. The delay obtained for MJSIB implemented in split R- $\pi$  model gives nearly 45 % improvement in delay, and 63 % improvement in power- delay product, compared to other counterparts. (Fig. 5.3)

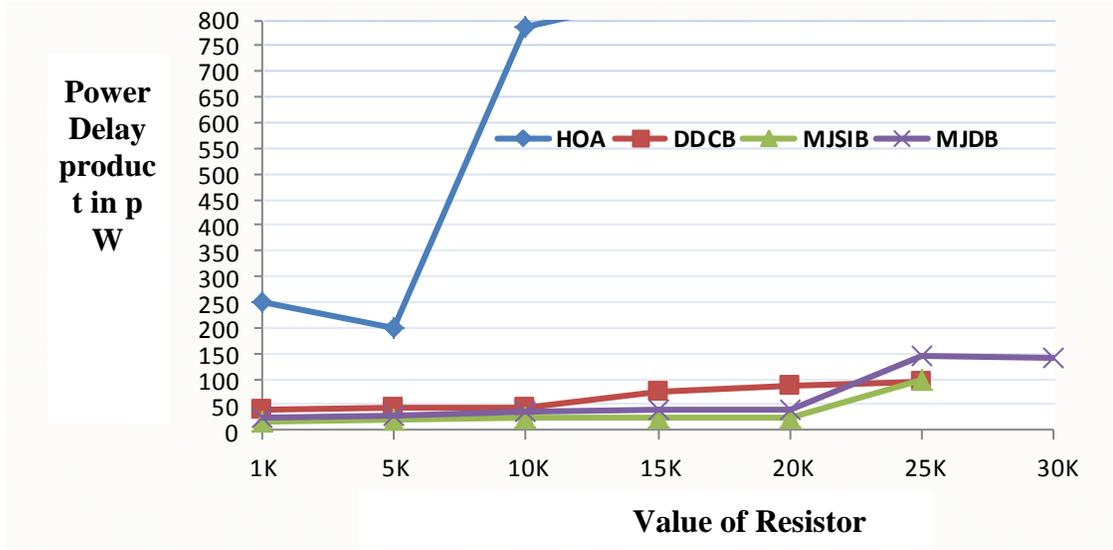


Fig. 5.1 Four schemes implemented with  $\pi$  model

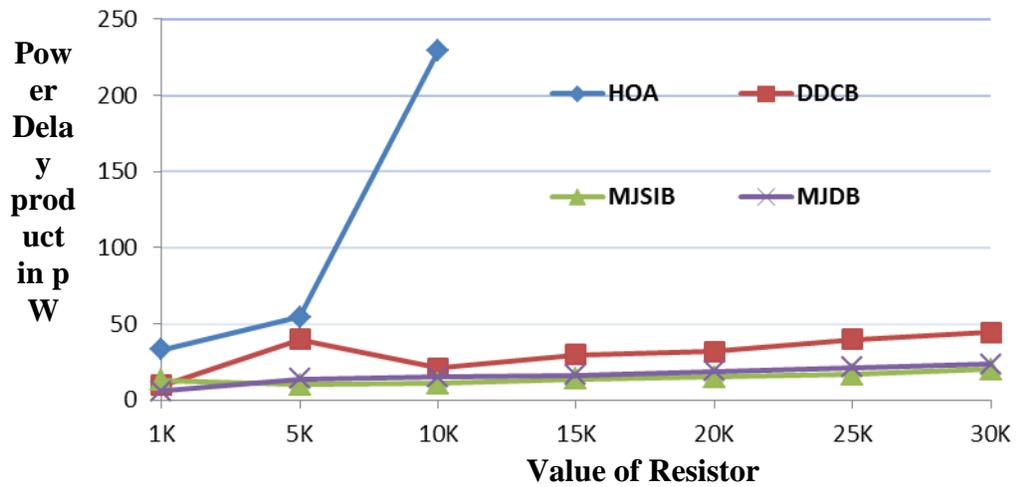


Fig. 5.2 Four schemes implemented with split R- $\pi$  model

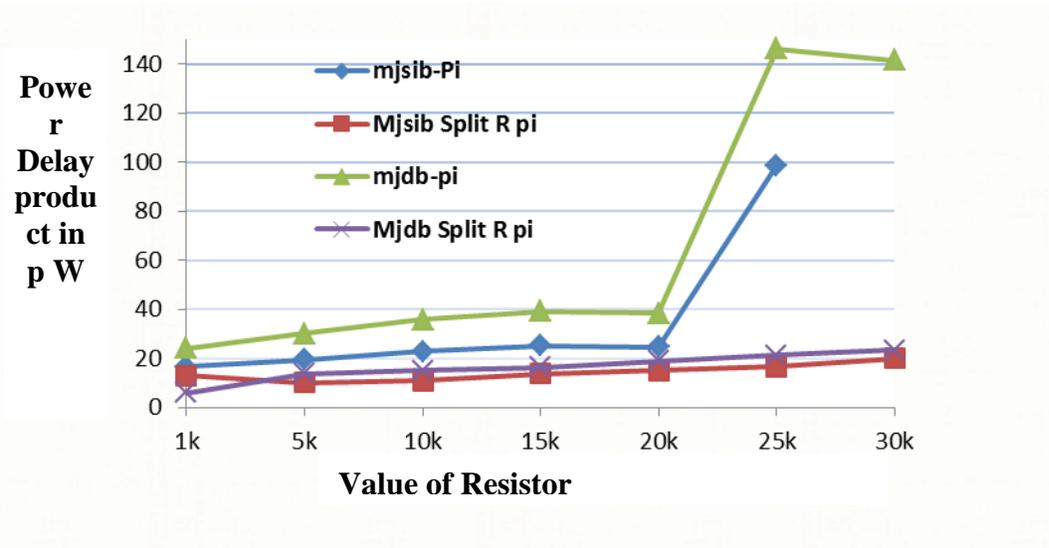


Fig. 5.3 MJDB and MJSIB schemes implemented with split R- $\pi$  model and nominal  $\pi$  model

#### VI CONCLUSION

When all the four schemes are implemented with both the models for the interconnect, MJSIB LHOS scheme proves to be the best when compared with other configurations in terms of power, delay and power-delay product, either implemented with  $\pi$ -model or with split R- $\pi$  model.

MJ-SIB scheme implemented in split R- $\pi$  model reduces delay by up to 45% and power-delay product by up to 63% when compared with other counterparts.

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# Congenitally Missing Teeth - A Rare Case Phenomenon

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**Abstract-** Congenitally missing teeth is the abnormality in the number of teeth. Also called anodontia. it can be total or partial anodontia. Studies shows that there is 35% missing of 3<sup>rd</sup> molars in the subject examined. Other commonly missing teeth are maxillary lateral incisor, & maxillary & mandibular 2<sup>nd</sup> premolars, often bilaterally. Congenitally missing deciduous teeth are uncommon but when occurring involving maxillary lateral incisor & mandibular cuspids. This paper describes the case of a young female patient with partial anodontia came for the extraction of over retained deciduous teeth followed by a proper treatment.

## I. INTRODUCTION

In dentistry hypodontia is the condition at which the patient has missing teeth as a result of failure of those teeth to develop(also called tooth agenesis). Hypodontia describes a situation where the patient is missing upto 5 permanent teeth excluding 3<sup>rd</sup> molar. Studies on the frequency of missing 3<sup>rd</sup> molars have shown this tooth to be congenitally absent in as many as 35%. Other studies have shown that the maxillary lateral incisor & maxillary & mandibular premolars are commonly missing<sup>11</sup>

## II. DENTAL NORMAL FEATURES

### A.DEVELOPMENT OF TOOTH

The tooth is formed from the ectoderm & ectomesenchyme<sup>2</sup>. The enamel is derived from the enamel organ which is differentiated from the primitive oral epithelium lining stomodeum. Dentin & pulp are derivatives of dental papilla while cementum, periodontal ligament & alveolar bone are all derivatives of dental follicle.<sup>2,7,8</sup>

Humans have two sets of teeth during a lifetime. *Deciduous dentition* which begins to form prenatally about **14 weeks in utero** & completed postnatally at about age **3**. the *permanent dentition* is completed at about age **14 to 15** except **3<sup>rd</sup> molar** which completes at **18 to 25**.<sup>1</sup>

### B.ERUPTION & SHEDDING

The eruption of teeth is a highly programmed event. The teeth developing within the bony crypt initially undergo bodily & eccentric movements & finally by eccentric movement make its appearance in oral cavity. At that time the roots are about half to two third complete<sup>2,7,8</sup>

### C.PATTERN OF TOOTH MOVEMENT<sup>2,7,8</sup>

#### Preruptive tooth movement:

When deciduous tooth germ 1<sup>st</sup> differentiate they are very small & a good deal of space is between them. This space is soon used because of rapid growth of tooth germs & crowding results. This crowding is then relieved by growth of the jaws in length which permits drifting of tooth germs. Permanent teeth with deciduous predecessors also move before they reach the position from which they will erupt.

The permanent molars which have no deciduous predecessors also exhibit movement. Preruptive tooth movement should be considered as movement positioning the tooth & its crypt within the growing jaw.

**Eruptive tooth movement:** here the tooth moves from its position within the bone of the jaw to its functional position in occlusion & the principal direction of movement is **occlusal or axial**.

**Posteruptive tooth movement:** are those that **1) maintain the position of the erupted tooth while the jaws continue to grow & 2) compensate for occlusal & proximal wear**.

### D.THEORIES OF TOOTH ERUPTION.<sup>2,7,8</sup>

There are many possible causes have been proposed, only 4 merit serious consideration: **1)bone remodelling 2)root growth 3)vascular pressure &4)ligament traction**.

**1) Bone remodelling:** it is important to permit tooth movement. Whether the bony remodelling that occurs around the teeth causes or is the effect of tooth movement is not known & both circumstances may apply. Others studies on bone remodelling have indicated that control may reside with the bone lining cells the **osteoblasts**. It is proposed that these cells under **proteolytic enzymes** to remove the osteoid layer & providing stimulus to attract **osteoclast** to its site.<sup>2</sup>

**2) root formation:** at 1<sup>st</sup> glance it would seem that root formation is the obvious cause of eruptive tooth movement. It produces enough force that leads to the resorption of bone. However this force in itself doesn't cause tooth movement. However rootless teeth also erupts.<sup>2,8</sup>

**3) vascular pressure:** it is known that tooth move in synchrony with the arterial pulse, so **called local volume changes** can produce limited tooth movement. Decreased pressure overlying the tooth & increased pressure around the tooth are major factors in tooth eruption. Remodelling of tissues around the of the developing tooth brings about an increase in pressure tooth which causes the tooth movement.<sup>2,7</sup>

**4) periodontal ligament traction:** there is a good deal of evidence that the eruptive force resides in the **dental follicle-periodontal ligament complex**. So long as the periodontal tissue is available, tooth movement occurs. Drugs that interrupt proper formation of collagen in the ligament also interfere with eruption.

Tissue culture experiments have shown that ligament fibroblasts are able to contract a collagen-gel which in turn brings about movement of a disk of root tissue attached to that gel.

Thus according to this theory, eruption of teeth could be brought about by a combination of events involving a force initiated by fibroblast. The force is transmitted to the extracellular compartment via fibronexus & to collagen fiber bundles which align in an appropriate inclination brought about by root formation, bring about tooth movement.<sup>2,7</sup>

**E. SHEDDING OF DECIDUOUS TEETH**

The physiologic process resulting in the elimination of deciduous dentition is called *shedding or exfoliation*.<sup>2</sup>

**Mechanism of resorption & shedding**<sup>2,7,8</sup>

Pressure exerted by tumours & cysts may be the cause for pathological root resorption. Unlike osteoblasts, cementoblasts covering the root are not responsive to hormones & cytokines. Therefore prior to resorption cementoblastic layer has to be damaged probably by inflammatory process.

Bone resorption is thought that the osteoblast must 1<sup>st</sup> degrade the osteoid thereby exposing mineralized bone to which osteoclast can attach.

The mechanisms of physiological root resorption & bone resorption were similar.

Whatever the preliminary steps in hard tissue resorption it is clear that the odontoclast attaches to the hard tissue surface peripherally through the clear zone thereby creating a sealed space lined by the ruffled border of the cell. In this way a microenvironment results.

The forces of mastication applied to the deciduous tooth capable of initiating resorption by giving trauma to the ligament which initiates resorption.

**F. CLINICAL CONSIDERATIONS**<sup>2</sup>

**Remnants of deciduous teeth:** sometimes part of deciduous teeth are not in the path of erupting permanent teeth & may escape resorption. Such remnants consisting of dentin & cementum may remain embedded in the jaw for a considerable time. They are most frequently found in association with the permanent premolars, especially in the region of the lower second premolars.

**Retained deciduous teeth:** such teeth are usually without permanent successors, or their successors are impacted. Most often seen are upper lateral incisor, less frequently 2<sup>nd</sup> permanent premolar & rarely the lower central incisor.

**Submerged deciduous teeth:** trauma may result in damage to either the dental follicle or the developing periodontal ligament. If this happens the eruption of the tooth ceases & it become ankylosed to the bone of the jaw.

**G. CHRONOLOGY OF ERUPTION OF PRIMARY TEETH**<sup>1,8</sup>

<u>MAXILLARY</u>	<u>MANDIBULAR</u>	<u>ERUPTION(MEAN AGE) IN MONTH</u>	
CENTRAL INCISOR	CENTRAL INCISOR	10	8
LATERAL INCISOR	LATERAL INCISOR	11	13
CANINE	CANINE	19	20
1 <sup>ST</sup> MOLAR	1 <sup>ST</sup> MOLAR	16	16
2 <sup>ND</sup> MOLAR	2 <sup>ND</sup> MOLAR	29	27

**CHRONOLOGY OF ERUPTION OF PERMANENT TEETH**<sup>1,8</sup>

<u>MAXILLARY</u>	<u>MANDIBULAR</u>	<u>EMERGENCE(ERUPTION)YEARS</u>	
CENTRAL INCISOR	CENTRAL INCISOR	7-8	6-7
LATERAL INCISOR	LATERAL INCISOR		
CANINE	CANINE	8-9	7-8
1 <sup>ST</sup> PREMOLAR	1 <sup>ST</sup> PREMOLAR	11-12	9-10
2 <sup>ND</sup> PREMOLAR	2 <sup>ND</sup> PREMOLAR	10-11	10-12
1 <sup>ST</sup> MOLAR	1 <sup>ST</sup> MOLAR	10-12	11-12
2 <sup>ND</sup> MOLAR	2 <sup>ND</sup> MOLAR	6-7	6-7
3 <sup>RD</sup> MOLAR	3 <sup>RD</sup> MOLAR	12-13	11-13
		17-21	17-21

In the absence of congenital disorders, dental diseases or trauma, the 1<sup>st</sup> teeth in the dentition begin to appear in the oral cavity at the mean age of 6 and the last at the mean age of 28 years.<sup>1</sup>

III. ABNORMALITY IN THE NUMBERS OF TEETH  
ANODONTIA

**True anodontia:** congenital absence of teeth. 2types *total & partial*.<sup>3</sup>

**True partial anodontia (hypodontia):** involves one or more teeth & is a common condition. Hypodontia is the development of an increased number of teeth & the additional number of teeth are termed as supernumerary.<sup>2</sup>

**Oligodontia:** a subdivision of hypodontia indicates lack of development of six or more teeth.<sup>4</sup>

**Pseudo anodontia:** when teeth are absent clinically because of impaction or delayed eruption<sup>5</sup>

**False anodontia:** when teeth have been exfoliated or extracted.<sup>3,4,5</sup>

Complete anodontia is rare but is often associated with a syndrome known as Hereditary Ectodermal Dysplasia.<sup>5</sup>

Hypodontia is associated with syndromes like cleft lip or palate, Crouzon syndrome, Down's syndrome, Oral facial Digital syndrome, Ectodermal Dysplasia. Femal predominance is approximately 1.5:1.

Studies show the frequency of *missing 3<sup>rd</sup> molars* are common. Other studies shown that *maxillary lateral incisor & maxillary & mandibular 2<sup>nd</sup> premolars* are commonly missing often bilaterally. Although the etiology of a single missing tooth is unknown<sup>3,4,5,6,9,10</sup>

Graber reported it as a result of one or more point mutation in a *closely linked polygenic system*. Partial anodontia is also seen in case of *Hereditary ectodermal dysplasia*. Also found in children due to exposure of *x ray radiation* at an early age<sup>3</sup>

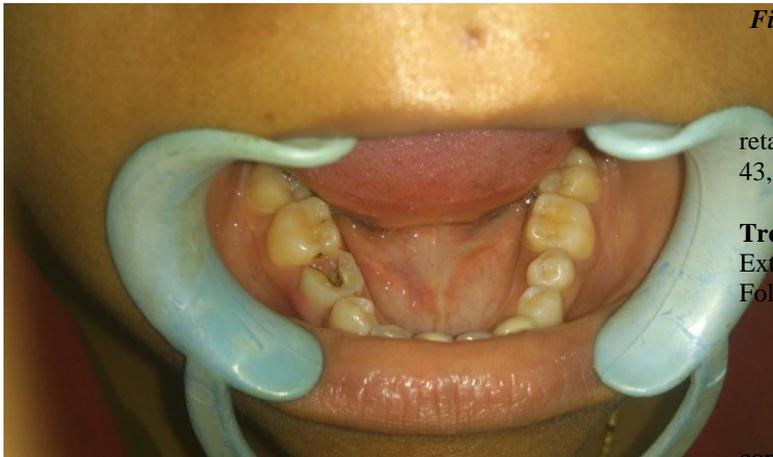
IV. CASE REPORT

A patient, 25 years female, named Runali Pattanaik came to the OPD of institute of dental sciences to the department of oral & maxillofacial department with a *chief complain of pain on the lower right back teeth region*. (Figure 1)



**Figure 1: patients photograph**

On examination shows *retained deciduous tooth 85* with dislodged restoration & secondary caries along with tender on percussion.(Figure 2)



**Figure 2: Intraoral examination showing overretained deciduous 85, with dislodged restoration & secondary caries.**

Investigation of IOPA reveals radiolucency involving enamel & dentin with periapical pathology with resorbed root & congenitally missing the tooth bud of permanent 2<sup>nd</sup> premolar 45. (Figure 3)



**Figure 3: IOPA showing retained 85 with apical pathology & congenital missing of its successor, 2<sup>nd</sup> premolar**

With the diagnosis of *partial anodontia* we advised the patient for OPG which reveals *congenitally missing 45, 43, 31, 33 & impacted 48 & 18.* (Figure 4)



**Figure 4: OPG showing congenitally missing 45, 43, 31, 33 & impacted 48, 18**

With the above mentioned case our diagnosis was over retained 85 with periapical pathology & partial anodontia i.r.t 45, 43, 31, 33.

**Treatment:**

Extraction of 85  
Followed by placement of bridge

**V. CONCLUSION**

Based on the above mentioned case report, it can be concluded that there are several etiology present behind the congenitally missing teeth. It can be due to evolutionary trend, genetic mutation, radiation or due to hereditary diseases. This above case shows the condition of congenital missing of deciduous successors in satisfactory level.

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# A Novel Tunable High Frequency Sinusoidal Oscillator Based on the Second Generation Current Controlled Conveyor (CCCII)

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**Abstract-** The field of analog VLSI design current mode devices has significantly gained importance. Current mode devices such as current conveyors have established their identity as the most demanding devices in the signal processing area due to their high bandwidth, greater linearity, larger dynamic range, low power consumption, simple circuitry and occupy less chip area. In this paper we have proposed a Tunable High Frequency Oscillator that employs the use of only Current Controlled Conveyors and Capacitors. Various simulations have been carried out to obtain the desired results. The outcomes show that by varying Bias Current and capacitor value we get oscillations of different frequencies.

**Index Terms-** Current controlled conveyor, High Frequency Sinusoidal Oscillator, CCCII.

## I. INTRODUCTION

The second generation current controlled conveyor (CCCII) has the advantage of electronic adjustability over the CCII i.e. in CCCII; adjustment of the X-terminal intrinsic resistance via a bias current is possible. The CCCII has been designed to work as a Tunable Oscillator for high frequencies. An oscillator enjoys the same status in the domain of electrical and electronics engineering as do wheels in the mechanical engineering. Sinusoidal Oscillators of variable frequency find wide range of applications in instrumentation & measuring systems, communication, control systems and signal processing.

In this paper second generation positive (CCCII+), negative (CCCII-) and dual output current controlled current conveyor (DOCCCII) is simulated by using 350nm CMOS technology and its various applications are simulated which are beneficial in the field of analog signal processing like high frequency tunable sinusoidal oscillator.

## II. BACKGROUND

Current conveyors and current mode circuits have reasonably established their identity as an important circuit. The analysis of the oscillator circuit is given below

Applying KCL at the node A

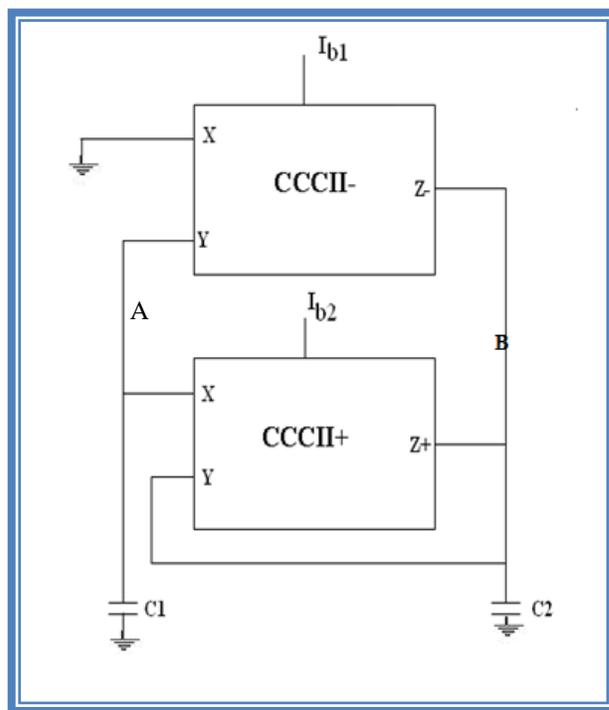
$$V_1 s C_1 = (V_2 - V_1) / R x_2 \quad (2.1)$$

$$V_2 = V_1 (1 + s C_1 R x_2) \quad (2.2)$$

Applying KCL at the node B

$$V_2 s C_1 + V_1 / R x_1 = (V_2 - V_1) / R x_2 \quad (2.3)$$

design element. The second generation current controlled conveyor (CCCII) has proven the most promising candidate over the CCII because of its advantage of electronic tunability therefore it is most frequently used in the world of current mode to design different analog circuits. The proposed oscillator realization is shown in Figure 1 where CCCII± elements are considered having ideal terminal properties. This circuit enjoys the circuit simplicity, as it utilizes a CCCII+, a CCCII- and just two capacitors. A CCCII- is different from a CCCII+ only in its output stage; otherwise, their principle architecture remains the same.



**Figure 1:** Block diagram of Sinusoidal Oscillator using CCCII±

Putting value of  $V_2$  in the above equation we get

$$V_1 \times ((1 + sC_1Rx_2) sC_2Rx_1 + 1) = V_1 \times (1 + sC_1Rx_2 - 1) Rx_1/Rx_2 \quad (2.4)$$

i.e.

$$sC_2Rx_1 + s^2C_1C_2Rx_1Rx_2 + 1 = sC_1Rx_1 \quad (2.5)$$

Finally we get

$$s^2C_1C_2Rx_1Rx_2 + sRx_1(C_2 - C_1) + 1 = 0 \quad (2.6)$$

So at  $C_1=C_2$

$$\omega_0^2 = 1/(Rx_1Rx_2C_1C_2) \quad (2.7)$$

Where  $Rx_1$  and  $Rx_2$  depends on biasing currents  $I_{b1}$  and  $I_{b2}$ . Applying the choice of equal components,

$C_1 = C_2 = C$ ;  $Rx_1 = Rx_2 = R$ , the frequency of oscillations is simplified to

$$\omega_0 = 1/RC$$

Here we have taken values as  $C_1=C_2=3pF$ ,  $I_{b1}=70\mu A$  and  $I_{b2}=70 \mu A$ . An impulse has been applied at node A and we get sinusoidal output at node B.

For realizations, of the above Sinusoidal Oscillator, CMOS design of CCCII± is adopted, and the oscillator of figure 1 is simulated on HSPICE. The simulation results of the oscillator are presented in fig 2 and fig3. Figure 2 shows the oscillations generated by the oscillator and figure 3 shows the expanded view of oscillations.

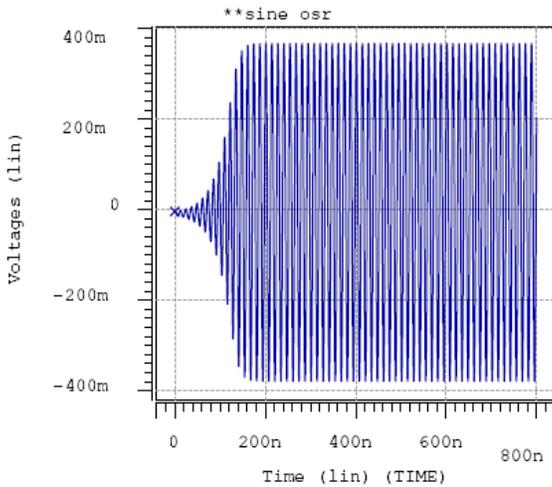


Figure 2: Output of the oscillator

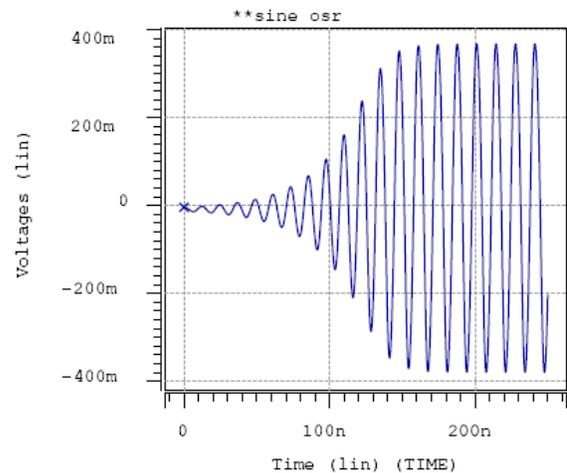
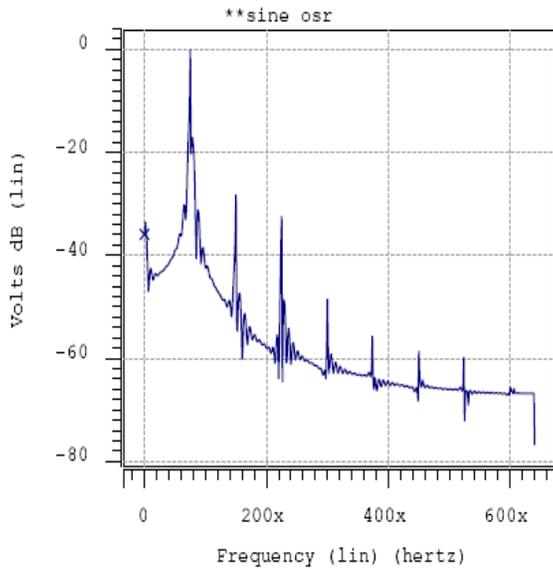


Figure 3: Expanded view of the Oscillations

Fourier analysis, with respect to the principal frequency (75MHz), is performed on the signal to ascertain the quality of the oscillations. Result of this analysis is presented in figure 4.

### III. SIMULATION RESULTS

Peaks in figure 4 correspond to the principal frequency of the oscillator and its harmonic frequencies. Estimates of the total harmonic distortion (THD) and the DC component of the signal are important quality matrices for the sinusoidal wave shape of the output signal. Both these parameters are found reasonably very low. The simulation results are summarized in Table 1.

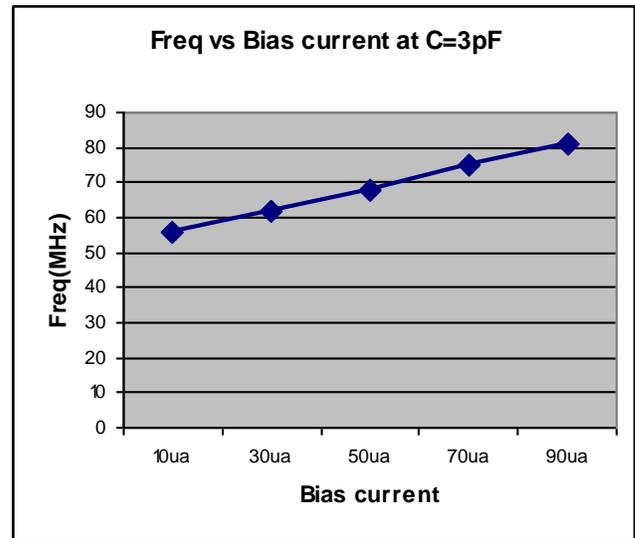


**Figure 4:** Fourier Response of the Oscillator

**Table 1:** Performance Results of the Proposed Oscillator

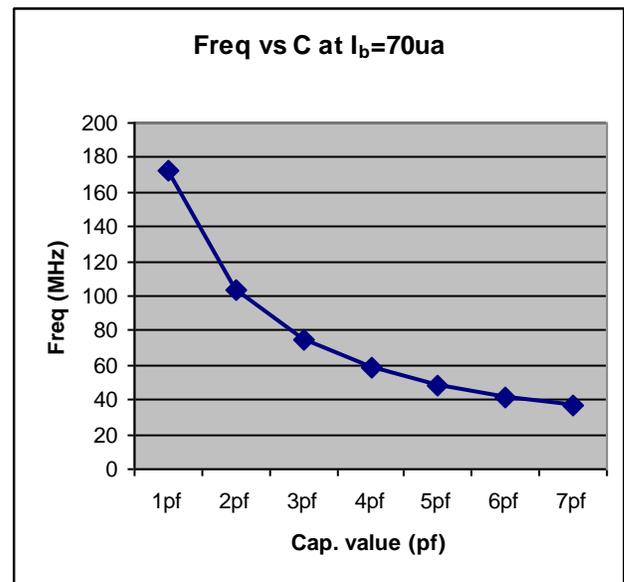
[12] Performance Parameters	[13] Details
[14] Frequency	[15] 75MHz
[16] $I_{BIAS}$	[17] 70 $\mu$ A
[18] $C_p$	[19] 3pF
[20] THD	[21] 4.67%
[22] DC Component	[23] 8.29mV
[24] Peak Amplitude	[25] 368mV
[26] Avg. Power	[27] 4.37mW

The graph shown below in figure 5 is plotted across the frequency of output signal in MHz to the device bias current in  $\mu$ A. HSPICE tool is used for extensive simulations and for these analysis capacitances are fixed at 3pF. We see that there is a significant increase in the frequency of the output signal of the oscillator when the Bias Current is increased.



**Figure 5:** Graph of frequency of output signal against the device bias current (when  $C=3pF$  is constant).

Figure 6 is the response plotted when device bias current is kept constant at 70 $\mu$ A and the capacitances are changed from 1pF to 7pF. It has been observed from the graph that there is a significant decrease in frequency with increase in capacitances.



**Figure 6:** Graph of frequency of output signal against the value of Capacitance (when  $I_b=70\mu A$  is constant).

#### IV. CONCLUSION

The simulation results show that by varying Bias Current and capacitor value we get oscillations of different frequencies. So it works as tunable oscillator of Higher Frequency range as it is of the order of few MHz.

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# Vehicle Security System Using Zigbee

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**Abstract-** The first car been stolen was reported in 1896. Since then, car safety tools and after that car security system faced a fast rapid development. The security system has become one of the key factors in car manufacturing as the demand from the buyer. The main objective of this project is to secure and monitor the car based on combination of Zigbee system, Peripheral Interface Controller (PIC) 16F877A microcontroller, vibration sensor, temperature sensor and micro switch. In order to develop a user friendly security system, it is used as a tool to send data or information to the Liquid Crystal Display (LCD) at the receiver for displaying the car situation. There are two programs used in this system which for the transmitter and the receiver. Proteus 7 Professional will be used in designing process of the circuit and to conduct simulation works. Meanwhile, PIC C Compiler software will be used to compile the C language code to Hexadecimal (HEX) code so that it is compatible to the PIC. The hardware and software issues of wireless monitoring system have been successfully developed by using Zigbee technology. This system is expected to enhance the capability of existing system and reduce cost of the system. With significant improved in range and reliable data accuracy in real time, this project promise a bright future with a high commercial value. In addition, with its compact and robust feature it attract future user in buying the product and the same time have good application value in future as well as reducing the statistic of stolen cars.

**Index Terms-** Car Security, PIC16F877A Controller, Sensor, Zigbee

## I. INTRODUCTION

The outer shell of automobiles impacts the people's life. It is becoming the needs and a symbol of modern society. Not only the demand on quality and performance of the vehicles increase rapidly, but there is also an issue increases day by day which is car stolen. Based on the official website of Polis Di Raja Malaysia (PDRM), the total numbers of vehicles that has been stolen for the year 2011 amounted to 17,474 cases. From the amount, 12,427 cases are the car theft and about 5,047 cases are for other vehicle which is includes van, lorry and etc. Although there some intelligent systems e.g. Vehicle Tracker by using Global Position System (GPS) can be used to retrieve vehicle, but people are still not using it due to the high cost purchase. By using Zigbee system network in this anti-theft system, the cost is expected to be lower compare to existing GPS anti-theft system. This project is provided a remote controlling security system for vehicle. This security system consists of vibration sensor (body),

alarm, buzzer, micro switch (engine), temperature sensor, fan and magnetic sensor (door). User will be able to control the system remotely since the data in the system will be transmitted wirelessly via Zigbee module. They also can monitor the car status by using the Liquid Crystal Display (LCD) display which attached to the controller.

According to F.R. Rashidi, et al, [1]; Bluetooth is used as communication medium in this car safety monitoring system. The Bluetooth application was used on a mobile phone to send message to the users in the event of their vehicle intrusion. Passive Infra-Red (PIR) sensor founded in the system will send a message if there is any intrusion get into the car through Bluetooth to PIC microcontroller.

Based on the journal, Shihab A. Hameed, et al [2] reported that the proposed system focuses on using the Multimedia Messaging Service (MMS) and database technology. The picture of the intruder will be sent via local Global System for Mobile Communications (GSM) / General Packet Radio Service (GPRS) service provider to the user and/or police. This project is being recommended the integration between monitoring and tracking system. The system can send Short Messaging System (SMS) and MMS to the owner to have fast response while the car is still nearby the original location. This system cannot be used at the rural place without network coverage provided.

From the journal, S.Padmapiya and Esther Annlin KalaJames [3], skin color detection is first implemented on the input color image to reduce the computational complexity. This system used the Morphological operations that give a previous knowledge for face detection using the Adaboost algorithm. By using principal component analysis (PCA) algorithm, a specific face can be recognized by matching the principal components of the current face to those of the known persons in a facial database built in advance.

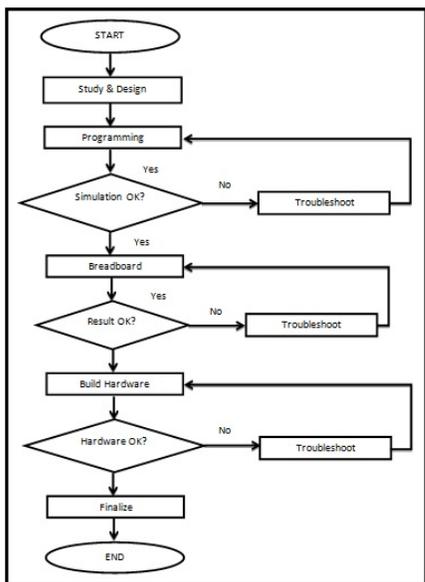
In the journal, K S Khangura, et al [4] said that his innovative system is based on a tamper-proof electronic link between the driver's key and the ignition system. This method used radio frequency technology with improves a new level of theft protection to vehicle security systems in a way that it does not require any effort from the drivers. In addition, this tactic removes the normal wear and replacement of keys common to contact based security systems.

According to Zhixiong Liu and Guiming He [5], their proposed security system are based on device vision technology acids that is a new level of theft protection to vehicle security systems in a way that does not interfering the drivers. When the case of an illegal driver drives the car, POLLUX will alarm and

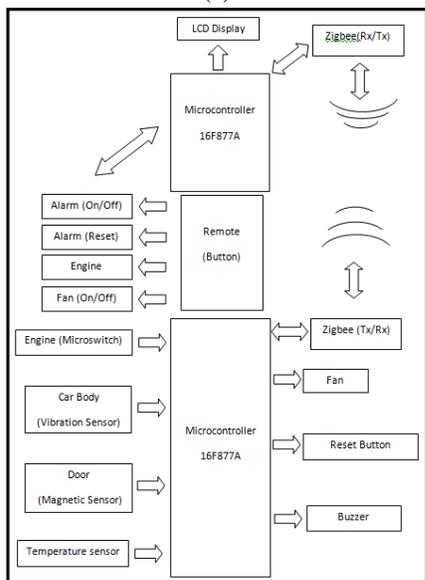
send the illegal driver's image to car owner or police through Code Division Multiple Access (CDMA) or General Packet Radio Service (GPRS) networks.

However, according to these papers, high performance of Zigbee technology together with ability to remain quiescent for long periods without communications and long power battery is required to obtain reliable experimental data. Such these high cost experimental devices will not be affordable if not supported by research fund. Thus, Zigbee communication is used as the communication medium due to the small size, good performance and acceptable price [13]. The aim of this project is to investigate and design one system that can help user easy to monitor their car by using Zigbee module with a user friendly security system.

## II. MATERIALS AND METHODS



(a)



(b)

Figure 1 (a) Project Flow chart and (b) Car Security Block Diagram

This project is divided into two parts, first is hardware development and second is software development. C language is used to execute the program in PIC which would get signal from sensors and display the status on LCD display. PIC C compiler is used to assemble the C programming [6], [7], [8], [9] file into HEX file. Meanwhile, all the simulation processes are done with ISIS 7 Professional software. The hardware part is divided into two parts which are master control and slave control where the sensor circuit is located.

The first step is to study on the literature review on the basic operation of Zigbee technology and also related research journal to this project. Next, selection and suitability of sensors that will be used in the project is reviewed. There are magnetic sensor, temperature sensor (LM35), vibration sensor, micro switch, buzzer, alarm, fan, light emitting diode (LED). The designing process will be in the next step that will be in Proteus software. Then, the programming is constructed base on the desired output. The circuit is simulated and integrated with the selected sensors after the programming has been successful constructed. In case of the simulation failed, the programming process must be redone and reviewed again. For successful simulation, the next step is to implement it on to the breadboard to check whether the circuit functional or not. The circuit must be reconstructed if the circuit failed to operate as expected. A new functional circuit will be constructed in Printed Circuit Board (PCB) for the real application.

According to the block diagram, there are four sensors which is temperature, vibration, magnetic, and micro switch. These sensor works as input in the transmitter circuit and will be interfaced with the PIC 16F877A microcontroller [10], [11], [12]. The outputs of this system are alarm, fan, and buzzer. Xbee module works as the transmission medium for which the data will be transferred wirelessly to the receiving Xbee in the transmitter circuit. The received data will then be displayed in the LCD display [13].

## III. RESULTS/FINDINGS AND DISCUSSION

### A. Zigbee Functionality Test Result

This process is for checking the functionality and testing how far the Zigbee transmitter can connect with Zigbee receiver. Before that, the Xbee module need to be configured before it can be used as serial communication medium.

The X-CTU software has several other functions beside configure the Xbee module. Each main tab has its own function to develop the communication by using the Xbee module. Below are the explanations of its function:

- i. **Personal Computer (PC) Settings**  
Allow user to choose the desired COM port and configure ports to fit the radio settings.
- ii. **Range Test**  
Allow user to achieve a range test between two radios.
- iii. **Terminal**  
Allow access to the computers COM port with a terminal emulation program.
- iv. **Modem Configuration**

Allow the ability to program the firmware settings via a graphical user interface [14], [15].

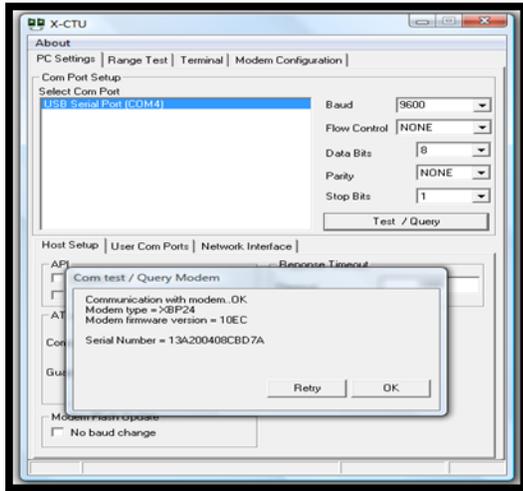


Figure 2 Port Setting

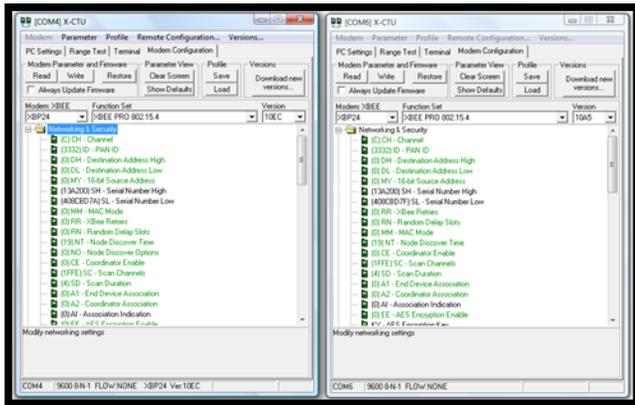


Figure 3 Configuration of Destination Address

After finished the setting both of the Zigbee [16], [17], [18] module using X-CTU software in the PC, both the Zigbee is tested whether it can communicate each other or not. It also to make sure the range of communication whether the Zigbee refer to its specification or not [19].

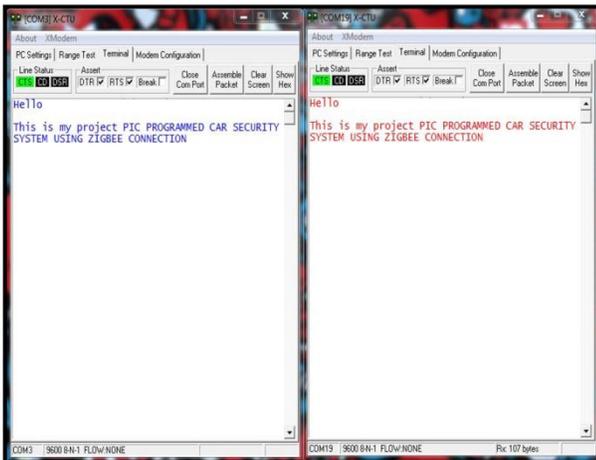


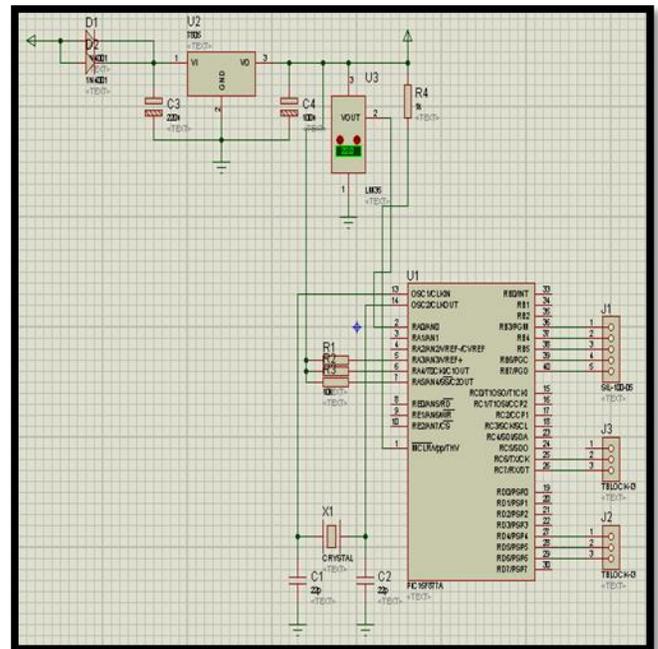
Figure 4 Data transmit (left) and receive (right)

Table 1 Collected Data Analysis

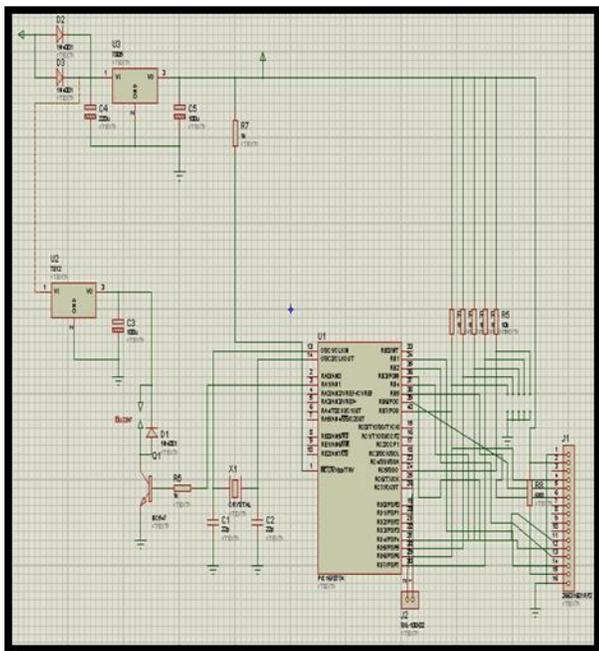
RANGE (M)	ZIGBEE ANALYSIS
Meter 0 to Meter 20	The Zigbee 2 received data from transmitter accurately and instantaneously.
Meter 0 to Meter 40	The Zigbee 2 received data from transmitter accurately
Meter 0 to Meter 60	The Zigbee 2 received data from transmitter accurately
Meter 0 to meter 80	The Zigbee 2 received data from transmitter accurately
Meter 0 to meter 100	The Zigbee 2 received data from transmitter accurately
Meter 0 to meter 120	The Zigbee 2 received data from transmitter accurately.
Meter 0 to meter 140	The Zigbee 2 received the data slowly the transmitter.
Meter 0 to meter 160	The Zigbee 2 received the data the transmitter.
Meter 0 to meter 180	The Zigbee 2 received the data from the transmitter.
Meter 0 to meter 200	The Zigbee 2 still able received the data from the transmitter.

Table 1 shows the range between Zigbee 1 and Zigbee 2 and also the result of data that received from the transmitter Zigbee. For this project, Zigbee is used as wireless communication tool. The Zigbee offers communication up to 200 meter and it can supported until the maximum range. It is due to the conducted test at the open field with able the line of sight occurs. The errors could be occurred due to surrounding factors.

B. Circuit Design Result



(a)



(b)

Figure 5 (a) Construction in ISIS for Receiver for Transmitter and (b) Receiver

LED [23] while the output part consists of buzzer and reset button. For the receiver part, it may be consider as a remote or handheld indicator and it have several element like LCD display, fan, buzzer and four push button for the alarm as to ON or OFF the system, reset button (OFF the both buzzer), engine (OFF the engine) and fan (ON / OFF the fan).



(a)

*i. Interfacing LCD Display with PIC Microcontroller*

Based on this project, the LCD display was connected with PIC 16F877A microcontroller to display the entire situation inside the car such as temperature, key, door and part of the car whether safe or unsafe.

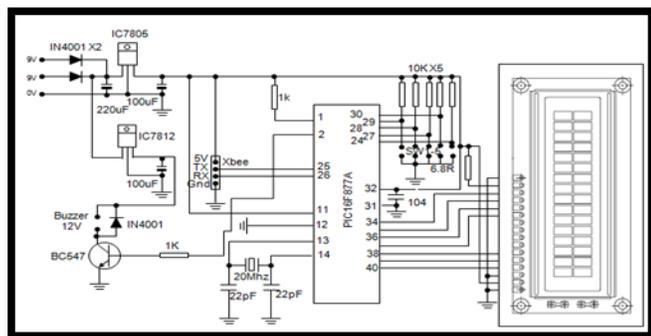


Figure 6 Schematic LCD Display Interface with PIC Microcontroller



(b)

Figure 7(a) Temperature inside the Car and (b) Fan is ON



(a)



(b)

*ii. Interfacing Sensors with PIC Microcontroller*

In this part, the sensors will interface with PIC 16F877A microcontroller to ensure that the PIC and sensors are successfully connected. If the connection between the sensors are perfect, the data can be sent and view at the LCD display. There are two partition in this system namely transmitter and receiver part. For the transmitter part, it will be embedded inside the car with four inputs and two outputs. The input of the system consists of temperature sensor [20], vibration sensor [21] (car body), magnetic sensor (door), micro switch (engine) [22] and



(c)

Figure 8(a) Vibration sensor is ON, (b) magnetic sensor is ON  
(c) and micro switch is ON

#### IV. CONCLUSIONS

In a nutshell the objectives of the project have been successfully achieved. A wireless monitoring system have been successfully developed using Zigbee technology and the result is satisfactory. With significant improved in range and reliable data accuracy in real time, this project promise a bright future with a high commercial value. In addition, with its compact and robust feature it attract future user in buying the product. Although this project has turn out to be a great success, more improvement can be done in order to create a more complete security system. Creating a more compact circuit and smaller in size is recommended in the future work. A smaller size remote controller helps user to carries it with ease. Another improvement to the project is to link it with another wireless communication system such as GSM. With this addition users can be notified through their cell phone in case the buzzer is not working properly. Further Research and Development (R&D) will ensure a complete security system with high commercialized value. This project also can be extended, not only for car security purposes but also with the right choice of sensors, this system can be implemented as home security system.

#### ACKNOWLEDGMENT

We are grateful to Universiti Teknikal Malaysia Melaka (UTeM) for their kind help for giving their laboratory facility as the place to do research and experimental works in order to complete this study. Thank you to all the supports given from our Centre of Telecommunication Research and Innovation (CeTRI) especially the knowledge and supplying the components which related to this project.

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# Performance Analysis for a Alamouti's STBC Encoded MRC Wireless Communication System over Rayleigh Fading Channel

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**Abstract-** This paper investigates the effect of antenna diversity for a double transmit and multiple receive antenna supported wireless communication system that employs single user Alamouti's space time block coding (STBC) and maximal ratio combining (MRC) scheme on secured text message transmission. The FEC encoded Alamouti-MRC transmission system under investigation implements RSA cryptographic algorithm and deploys various multi-level digital modulations (16-PSK, 16-DPSK and 16-QAM) techniques over an Additive White Gaussian Noise (AWGN) and Rayleigh Fading Channels. It has been observed from the study that in case of without receive antenna diversity the system shows comparatively worst performance in 16-DPSK scheme and satisfactory performance in 16-QAM. It is noticeable that the system performance is improved with increase in number of receive antenna. The performance analysis shows that with implemented Alamouti-MRC scheme (4 receive antenna) under 16-QAM digital modulation, the system provides excellent performance over a significant low signal to noise ratio (SNR) values.

**Index Terms-** Antenna Diversity, AWGN Channel, Bit Error Rate, MRC, Rayleigh Fading, STBC.

## I. INTRODUCTION

Communication systems using multiple antennas at the transmitter and/or the receiver have recently received increased attention due to their ability to provide substantial capacity improvements while achieving low error rate and/or high data rate by flexibly exploiting the attainable diversity gain and/or the spatial multiplexing gain (Zhang et. al., 2011). Recently much attention has been paid on transmit diversity as an efficient technique to combat fading and simplify the implementation of mobile terminals (Zhu et. al., 2011). Several methods in transmit diversity are proposed in (Zhu et. al., 2011, Alamouti 1998, Wang and Wang 2004, Derryberry et. al., 2002). Among them, Alamouti space-time block coding (STBC) (Alamouti 1998) is very simple and attractive due to its advantages of not requiring feedback of channel state information and easy implementation. So far, studies on Alamouti space-time transmit diversity (STTD) have mainly assumed binary phase shift keying (BPSK) or quadrature phase shift keying (QPSK) modulation (Alamouti 1998, Wang and Wang 2004, Derryberry et. al., 2002, Gu and Leung 2003).

Although analytical studies have been presented for BPSK-modulated STTD systems with imperfect pilot symbol channel estimation (Gu and Leung 2003). Since wireless communications is challenged by limited spectral resources, multi-user spatial multiplexing has recently received considerable attention. Multi-user MIMO systems can significantly improve system throughput via transceiver signal processing if the number of transmit antennas is much larger than the number of receive antennas (Choi et. al., 2004). Alamouti STTD has been analyzed analytically for multi-level quadrature amplitude modulation (M-QAM), which has become very attractive for wireless communications due to its high spectral efficiency, (Zhu et. al., 2011). An analytical expression for the BER of 16/64-QAM without STTD in Rayleigh fading with imperfect pilot symbol-assisted channel estimation was in (Tang et. al., 1999). However, the integration operation in the analytical formula requires heavy computation load, and thus it is impractical to extend to STTD systems. An effective approach to evaluate QAM performance analytically using the characteristic function was proposed in (Xia and Wang 2005).

We shall consider the case of the simple Alamouti's space-time block code as it is the only scheme which can provide full rate and full diversity for any signal constellations. Network security measures are provided using RSA algorithm to protect data during their transmission in the proposed scheme. Therefore, this paper focuses on the evaluation of the BER performance for the FEC encoded secured Alamouti-MRC transmission system for various multi-level digital modulations (16-PSK, 16-DPSK, 16-QAM) techniques over an Additive White Gaussian Noise (AWGN) and Rayleigh Fading Channel with the transmit diversity technique in conjunction with receive antenna diversity. The paper is organized as follows. Section 2 presents the system description, including the transmitter, channel, and coherent receiver models. Performance analysis is presented in Section 3. Finally, conclusions are drawn in Section 4.

## II. COMMUNICATION SYSTEM MODEL

The MIMO wireless communication system under consideration is shown in Figure 1. In such a communication system, a single user is transmitting the secured text messages. For secret message transmission the most widely used public-key cryptosystem RSA is used here. After encryption of plaintext the ciphertext is converted into binary messages. The transmitted

bits are channel encoded by a convolutional encoder of rate  $r = 1/2$ , interleaved for minimization of burst errors and then converted to M-ary signal. This M-ary signal is modulated using various types of multi level digital modulation techniques such as quadrature amplitude modulation (QAM), phase shift keying (PSK) and differentially phase shift keying (DPSK). The modulated digital signals are fed into the Alamouti Space Time Block Encoder, where the input stream is first segmented into

two -symbol blocks. Each two-symbol block includes the first and second symbols  $x_1$  and  $x_2$ , respectively. During the first symbol period, the encoder will send  $x_1$  and  $x_2$  to the first and second transmit antennas, respectively. During the next symbol period  $x_1^*$  and  $-x_2^*$ , where  $*$  denotes complex conjugate, will be sent to the first and second transmit antennas respectively.

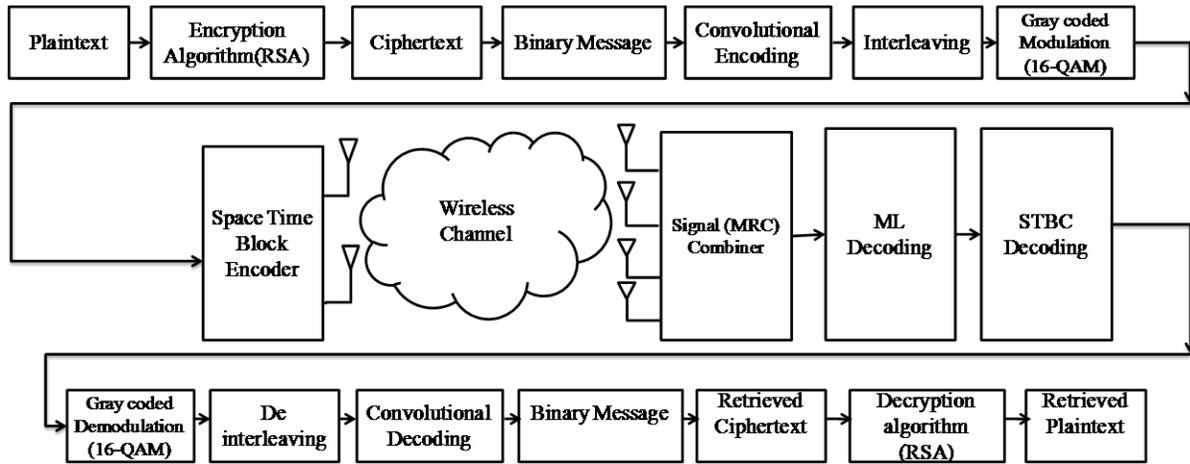


Fig1. Block diagram of FEC encoded Multi user MIMO STBC secured wireless communication system.

These two transmit antennas can either be collocated or distributed remotely if proper symbol timing synchronization scheme is adopted. Now the space-time encoded streams are sent to the wireless channels through the two transmit antennas. Assuming  $r_1^j$  and  $r_2^j$  are the received signals at the  $j$ th receive antenna at time  $t$  and  $t + T$ , respectively, then  $r_1^j$  and  $r_2^j$  are given by (Zhu et. al., 2011, Khan 2005, Mart'inez et. al., 2011).

$$r_1^j = h_{j1}x_1 + h_{j2}x_2 + n_1^j$$

$$r_2^j = -h_{j1}x_2^* + h_{j2}x_1^* + n_2^j \quad (1)$$

where  $h_{ji}$ ,  $i=1,2, j=1,2, \dots, NR$ , is the fading coefficient for the path from transmit antenna  $i$  to receive antenna  $j$ ,  $n_1^j$  and  $n_2^j$  are the noise signals for receive antenna  $j$  at time  $t$  and  $t + T$ , respectively.

The receiver constructs two decision statistics based on the linear combination of the received signal. The decision statistics are given by

$$\tilde{x}_1 = \sum_{i=1}^2 \sum_{j=1}^{NR} |h_{ji}|^2 x_1 + \sum_{j=1}^{NR} h_{ji}^* n_1^j + h_{j2} (n_2^j)^*$$

$$\tilde{x}_2 = \sum_{i=1}^2 \sum_{j=1}^{NR} |h_{ji}|^2 x_2 + \sum_{j=1}^{NR} h_{j2}^* n_1^j - h_{j1} (n_2^j)^* \quad (2)$$

The maximum likelihood decoding rules for the two independent signals  $x_1$  and  $x_2$  are then

$$\hat{x}_1 = \arg \min_{\tilde{x}_1 \in S} [(\sum_{j=1}^{NR} (|h_{j1}|^2 + |h_{j2}|^2) - 1)^2 |\hat{x}_1|^2 + d^2(\tilde{x}_1, \tilde{x}_2)]$$

$$\hat{x}_2 = \arg \min_{\tilde{x}_2 \in S} [(\sum_{j=1}^{NR} (|h_{j1}|^2 + |h_{j2}|^2) - 1)^2 |\hat{x}_2|^2 + d^2(\tilde{x}_1, \tilde{x}_2)] \quad (3)$$

where  $d^2(x, y) = (x - y)(x^* - y^*) = |x - y|^2$

The complex symbols are now digitally demodulated, de interleaved, convolutionally decoded and decrypted to recover the transmitted data.

### III. PERFORMANCE ANALYSIS

The computer simulation has been conducted to evaluate the BER performance of the FEC encoded secured Multi-user STBC encoded MIMO wireless communication system based on the parameter given in Table 1. To illustrate the effect of various multi-level digital modulations (16-PSK, 16-DPSK, and 16-QAM) techniques over an Additive White Gaussian Noise (AWGN) and Rayleigh Fading Channel first the effect of 16-DPSK modulation technique is investigated with receive diversity.

Table 1: Simulated Model parameters

Parameter	Description
Type of input signal for the single user	Secured Text Message
No. of Transmitting and Receiving antennas	2X4
Channel coding	1/2 rated Convolutional Encoding
Digital Modulation Techniques	16-QAM, 16-PSK and 16- DPSK
Public key	{7,187}
Private key	{23,187}
Channel	AWGN and Rayleigh Fading channel
Signal to noise ratio, SNR	0 to 20 dBs

Figure 2 shows the BER performance evaluation of 16-DPSK modulation technique with the transmit diversity in conjunction with the receive diversity. At the BER values of  $10^{-1}$  with the receiver diversity the SNR is reduced to about 4 dB and 7dB for 2X2 and 2X4 system, respectively. The BER performance evaluation of 16- PSK modulation technique with the transmit diversity in conjunction with the receive diversity is illustrated in figure 3. At the BER  $10^{-2}$  with the transmit and receive diversity the required SNR are 10dB, 11.5dB and 13dB for 2X4, 2X3 and 2X2 system, respectively. Figure 4 depicts the BER performance evaluation of 16-QAM modulation. At the BER  $10^{-2}$  the required SNR is reduced to 3dB when 2X2 antennas are applied compared to 2X1 antennas and for 2X4 the SNR is reduced to about 7 dB.

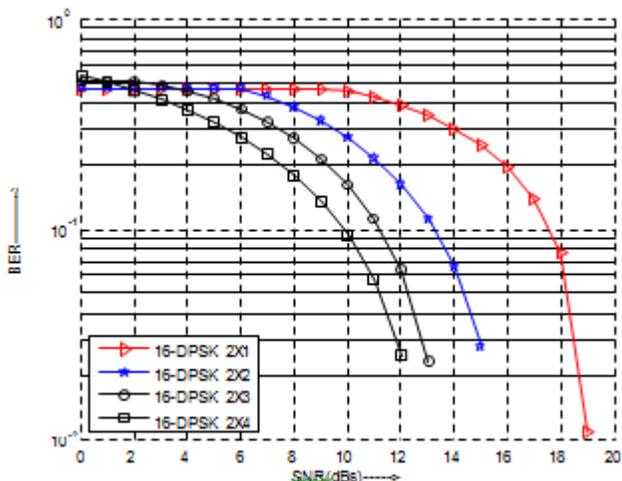


Fig 2. BER performance analysis for 16-DPSK system with transmitter and receiver diversity.

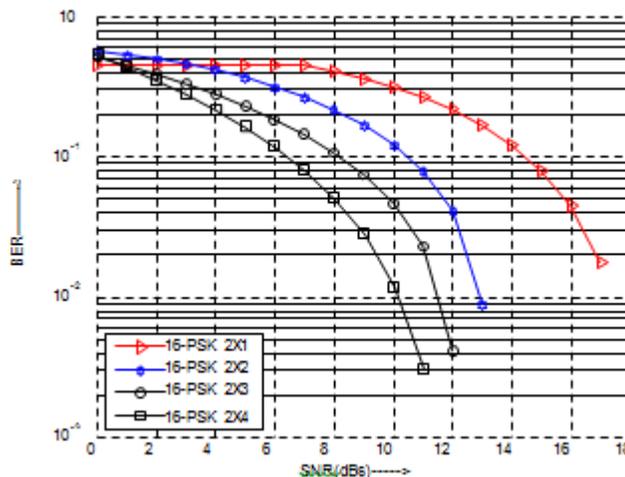


Fig 3. BER performance analysis for 16-PSK system with transmitter and receiver diversity.

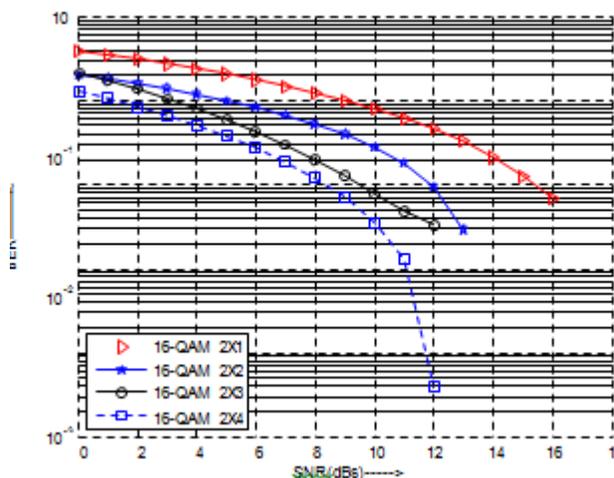


Fig4. BER performance analysis for 16-QAM system with transmitter and receiver diversity.

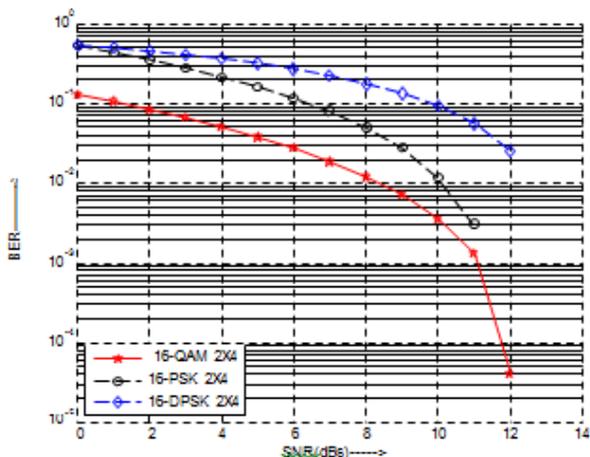


Figure 5. BER performance analysis for 16-QAM, 16-PSK and 16-DPSK system with 2X6 antennas.

Figure 5 shows the BER performance evaluation for all modulation techniques with 2x4 antennas configuration. At 9 dB SNR the BER values for 16-DPSK and 16-QAM are 0.1346 and 0.0071 respectively, viz. the BER performance is improved by 29.42dB. Under AWGN and Rayleigh fading channel environment, the transmitted and received secured text message is shown in Table 2 at 19dB SNR for the FEC encoded Alamouti- MRC transmission system for 16-DPSK modulation scheme with 2X1 antenna system. The erroneous characters in the retrieved text messages are shown in bold faces (Table 2). The error will be reduced with adaptation of 16-QAM system with more transmitter and receiver diversity.

Table 2: Message transmission in support of 16-DPSK modulation technique with 2X1 antenna system

	Transmitted secured text message and received text messages under Rayleigh fading channel
<b>Transmitted Plaintext</b>	If there were no noise, messages can be sent electronically to the outer limits of the universe by using small amount of power.
<b>Retrieved Plaintext</b>	If there were noise, messages can be sent electronically to the outer limits of the universe by using small amount of power.

#### IV. CONCLUSION

In this work, we have presented simulation results concerning the adaptation of various signal detection schemes in a single user Alamouti's STBC-MRC wireless communication system. A range of system performance results highlights the impact of signal detection scheme and antenna diversity on secured message transmission system. The system performance improved with the receiver diversity. The system performance improved further with the adaptation of 16-QAM compared to 16-DPSK and 16-PSK.

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# A New Method for Biometric Based Recognition

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**Abstract-** Biometric based recognition is the science of identifying or verifying the identity of a person based on physiological and or behavioral characteristics. Biometric recognition offers many advantages over traditional PIN number or password and token-based (e.g., ID cards) approaches. A biometric trait cannot be easily transferred, forgotten or lost, the rightful owner of the biometric template can be easily identified, and it is difficult to duplicate a biometric trait. The proposed work is centered upon collection of minutiae terms based on Region of Interest of the image of the fingerprints. Actual phases in the proposed work consist of making binary and thinning to extract the image constituents from the image details. After those minutiae terms are determined on the basis of bifurcation and termination which occurs at the ridges in the fingerprint. False minutia terms are rejected by again comparing that with ROI and user selectivity has been introduced in case user wants to select its own ROI. Thus the experimental results show that the fingerprint is very consistent with the original fingerprint and better than other existent methods.

**Index Terms-** Bifurcation, Minutiae points, Ridges, Region of interest (ROI), Termination.

## I. INTRODUCTION

A *biometric system* is essentially a pattern recognition system that operates by Acquiring biometric data from an individual, extracting a feature set from the acquired Data and comparing this feature set against the template set in the database. Depending on the application context, a biometric system may operate either in Verification mode or identification mode. The effectiveness of a biometric system can be judged by Performance and Scalability. Physiological traits are related to the physiology of the body and mainly include Fingerprint, face, DNA, ear, iris, retina, hand and palm geometry. Behavioral traits are related to behavior of a person and examples include signature, typing rhythm, gait, voice etc. There are a number of desirable properties for any chosen biometric characteristic. These include:

1. *Universality*: Every person should have the characteristic.
2. *Uniqueness*: No two persons should be the same in terms of the biometric characteristic.
3. *Permanence*: The biometric characteristics should not change, or change minimally, over time.
4. *Collectability*: The biometric characteristic should be measurable with some (practical) sensing device.
5. *Acceptability*: The user population and the public in general should have no (Strong) objection to the measuring/collection of the biometric trait.

## II. METHODOLOGIES

### II.I Fingerprints as a Biometric

A fingerprint is an impression of the friction ridges, from the surface of anger-tip. Fingerprints have been used for personal identification for many decades, more recently becoming automated due to advancements in computing capabilities. Fingerprint recognition is nowadays one of the most important and popular biometric technologies mainly because of the inherent ease in acquisition, the numerous sources (ten fingers) available for collection, and the established use and collections by law enforcement agencies. Automatic fingerprint identification is one of the most reliable biometric technologies. This is because of the well known fingerprint distinctiveness, persistence, ease of acquisition and high matching accuracy rates. Fingerprints are unique to each individual and they do not change over time. Even identical twins (who share their DNA) do not carry identical fingerprints. The uniqueness can be attributed to the fact that the ridge patterns and the details in small areas of friction ridges are never repeated.

### II.II Fingerprint Representation:-

The types of information that can be collected from a fingerprint's friction ridge impression can be categorized as Level 1, Level 2, or Level 3 features.

Level 1 feature comprises these global patterns and morphological information. They alone do not contain sufficient information to uniquely identify fingerprints but are used for broad classification.

Level 2 features or minutiae refer to the various ways that the ridges can be discontinuous. These are essentially Galton characteristics, namely ridge endings and ridge bifurcations. A ridge ending is defined as the ridge point where a ridge ends abruptly. A bifurcation is defined as the ridge point where a ridge bifurcates into two ridges.

Level 3 features are the extremely fine intra ridge details present in fingerprints. These are essentially the sweat pores and ridge contours.

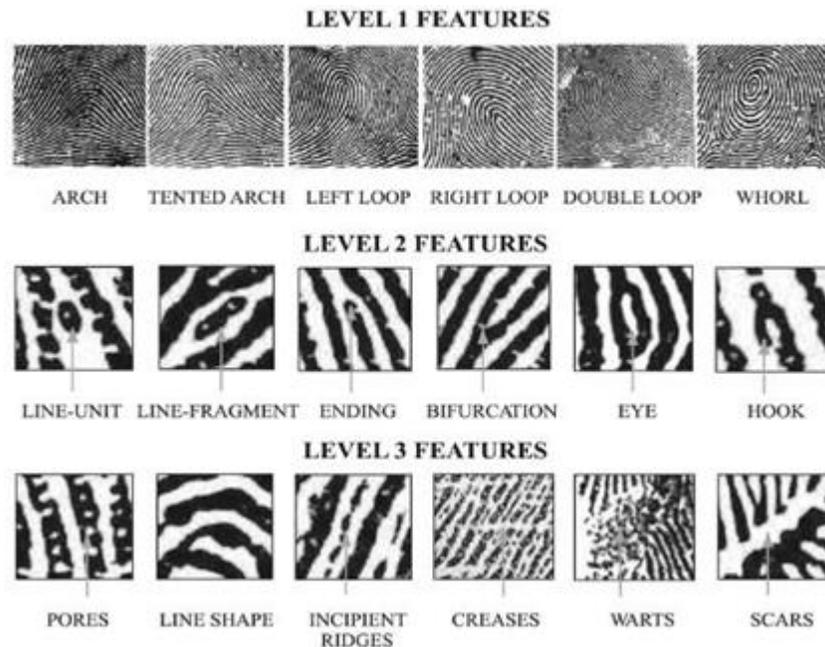


Figure1: Fingerprint features at Level 1, Level 2 and Level 3

### II.11 Minutiae Extraction

A fingerprint consists of two basic types of minutiae, ridge endings and bifurcations. The minutiae and their relative positions to each other are then used for comparisons. It is therefore evident that the more accurate the process of extraction of minutiae, the more accurate and reliable the entire automated fingerprint recognition system becomes.

### II.III Feature Extractions

Here we introduce various fingerprint representations and provide a general review of image enhancement, feature extraction, and matching techniques that are used in Minutiae-based fingerprint recognition systems.

#### A. Global Ridge Pattern

This representation relies on the ridge structure, global landmarks and ridge pattern characteristics, Such as the singular points, ridge orientation map, and the ridge frequency map.

#### B. Local Ridge Detail

This is the most widely used and studied fingerprint representation. Local ridge details are the discontinuities of local ridge structure referred to as *minutiae*. Among minutiae types, “ridge ending” and “ridge bifurcation” are the most used, since all other types of minutiae can be seen as the combinations of “ridge endings” And “ridge bifurcations”.

#### C. Intra-ridge Detail

On every ridge of the finger epidermis, there are many tiny sweat pores. Pores are considered to be highly distinctive in terms of their number, positions, and shapes. However, extracting pores is feasible only in high-resolution fingerprint images (for example 1000 DPI) and with good image quality. Therefore, this kind of representation is not practical for most applications.

## III. PROPOSED ALGORITHM

### Pseudocode for termination

1: Break the image pixel in 3X3 window.

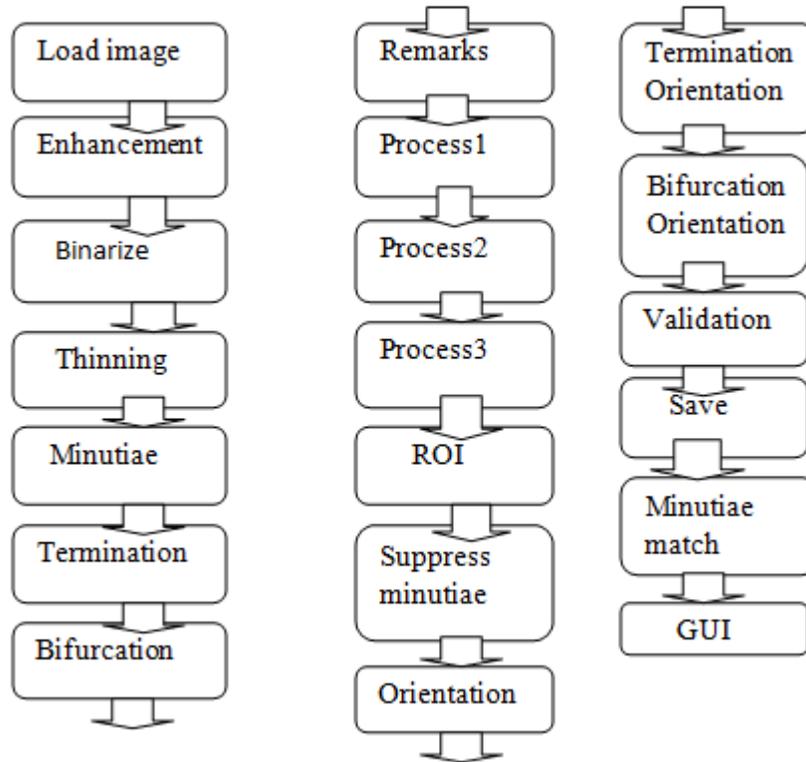
$L = \text{nlfilter}(K, [3\ 3], \text{fun});$

- 2: while all 3X3 windows are not computed repeat steps 3 and 4
- 3: check if central pixel has only one neighbor
- 4: Mark it as red circle in image and store its location attributes.
- 5: end

**Pseudocode for Bifurcation**

- 1: Break the image pixel in 3X3 window.
- L = nlfiter (K, [3 3], fun);
- 2: while all 3X3 windows are not computed repeat steps 3 and 4
- 3: check if central pixel has three neighbor pixels
- 4: Mark it as green circle in image and store its location attributes.
- 5: end.

IV. DATA FLOW DIAGRAM



V. EXPERIMENTAL RESULTS AND DISCUSSIONS

Here I have proposed some algorithms to find out the minutiae points. With the help of the algorithms, we have found the ROI (Region of interest).in the above DFD we have discussed all the stages of load image, enhancement, making binary, thinning, minutiae points etc. here we have proposed the algorithm to find out termination and bifurcation points.

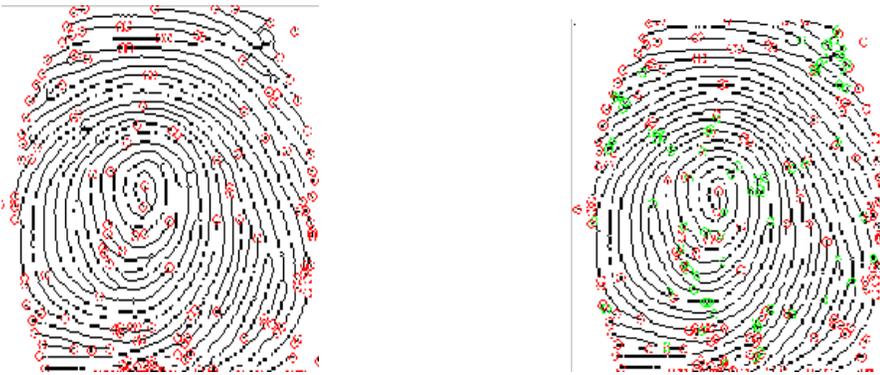


Figure 2(a) & 2(b) Here with the help of bifurcation and termination algorithm the termination and bifurcation points are found (Red circles are the termination points and green circle are the bifurcation points).

### Remarks

We have a lot of spurious minutiae. We are going to process them. Process 1: if the distance between a termination and a bifurcation is smaller than  $D$ , we remove this minutiae process 2: if the distance between two bifurcations is smaller than  $D$ , we remove this minutiae process 3: if the distance between two terminations is smaller than  $D$ , we remove this minutiae.

#### Process 1

If the distance between a termination and a bifurcation is smaller than  $D$  find minutiae and remove them for Bifurcation and termination.

#### Process 2

If the distance between two bifurcations is smaller than  $D$  find minutiae and remove them from Bifurcation and termination.

#### Process 3

If the distance between two terminations is smaller than  $D$  find minutiae and remove them from Bifurcation and termination.



Figure 3 Remark for Process 1,2 & 3.

### ROI (Region of Interest)

We have to determine a ROI. For that, we consider the binary image, and we apply a closing on this image and erosion. With the GUI, we allow the use of ROI tools of MATLAB, to define manually the ROI.

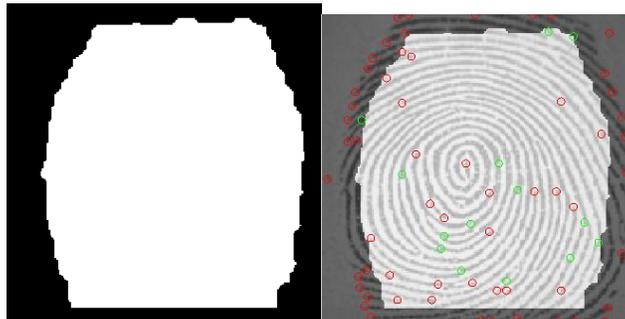


Figure 4 :ROI(Region of interest)

### Suppress extreme minutiae

Once we defined the ROI, we can suppress minutiae external to this ROI.

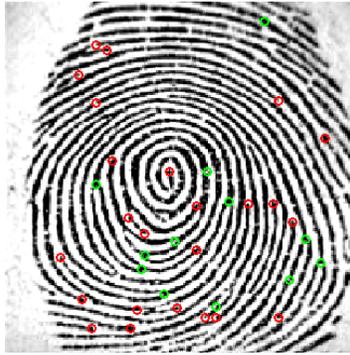


Figure 5: Special minutiae points in ROI

### Orientation

Once we determined the different minutiae, we have to find the orientation of each one.

#### Termination Orientation

We have to find the orientation of the termination. For finding that, we analyze the position of the pixel on the boundary of a 5 x 5 bounding box of the termination. We compare this position to the Table variable. The Table variable gives the angle in radian. & the table will be maintained in MATLAB.

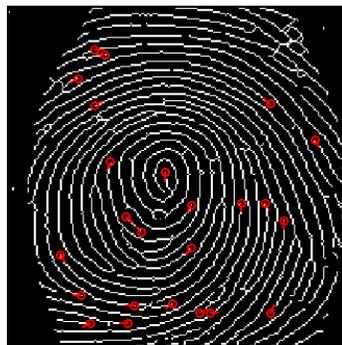


Figure 6: Termination orientation

#### Bifurcation Orientation

For each bifurcation, we have three lines. So we operate the same process than in termination case three times.

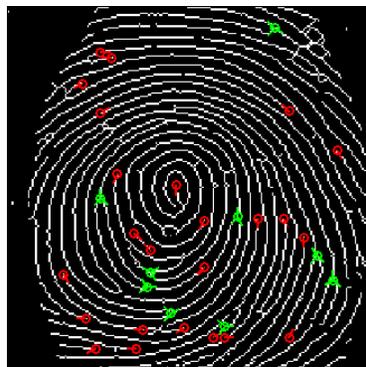


Figure 7: Bifurcation orientation

### Validation

In this step, we validate the minutiae (GUI)

### Save in a text file

In this step, we are going to save the minutiae in a file

### Minutiae Match

Given two set of minutia of two fingerprint images, the minutia match algorithm determines whether the two minutiae sets are from the same finger or not.

Two steps: 1. Alignment stage 2. Match stage

## VI. CONCLUSION & FUTURE WORK

The proposed work is centered upon collection of minutiae terms on the basis of

1. Ridge bifurcation and endings
2. False minutiae rejection based on distance from ridges.
3. Orientation field of minutiae terms based on
  - a) Termination
  - b) Bifurcation
4. ROI(Region of interest)
5. Suppress minutiae points

Among all these things, Region of Interest of the image is carried out in an autonomous way, which makes the work fitted to reconstruction and recognition phases.

Here we have proposed the fingerprint minutiae extraction idea with ROI concept which is based on Minutiae extraction and orientation detection. The experimental results show that the fingerprint is very consistent with the original fingerprint and that there is a high chance of deceiving a state of the art commercial fingerprint recognition system. The fingerprints still contain a few spurious Minutiae, especially in the high-curvature regions. To overcome this problem, a better model for the continuous phase of fingerprints of any pattern type should be developed. To obtain reconstructed fingerprint that are even more consistent with the original fingerprints, ridge frequency and minutiae type should be utilized. To make the reconstructed fingerprints appear visually more realistic, brightness, ridge thickness, pores, and noise should be modeled. The accept rate of the reconstructed fingerprints can be further improved by reducing the image quality around the spurious minutiae .In this paper the image extraction and enhancement is further more adopted to make the competitive edge on the fingerprint market. Experiments demonstrate the details of orientation and minutiae terms of a particular fingerprint image in a detailed text file which furthermore can be used for database of the persons and recognition. Results are matched with consistency and lacks in image enhancement images used are of good resolution and hence must be revised on this case for future. All these have become motivation for the development of further improved forensic techniques.

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# ELLIPTIC CURVE CRYPTOGRAPHY IN SECURING NETWORKS BY MOBILE AUTHENTICATION

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**Abstract-** This paper proposes an enhanced authentication model, which is suitable for low-power mobile devices. It uses an Extended Password Key Exchange Protocols [2] and elliptic-curve-cryptosystem based trust delegation mechanism to generate a delegation pass code for mobile station authentication, and it can effectively defend all known attacks to mobile networks including the denial-of-service attack. Moreover, the mobile station only needs to receive one message and send one message to authenticate itself to a visitor's location register, and the model only requires a single elliptic-curve scalar point multiplication on a mobile device. Therefore, this model enjoys both computation efficiency and communication efficiency as compared to known mobile authentication models.

**Index Terms-** Mobile authentication, denial-of-service attack, message en route attack, false base station attack, elliptic-curve cryptosystems

## I. INTRODUCTION

SEAMLESS inter-network operation is highly desirable to mobile users, and security such as authentication of mobile stations is challenging in this type of networks.

A mobile station (MS) out of its home network needs to be authenticated to be allowed to access a visited network; however, in general there is no trusted authentication server available to the MS out of its home network. To address this, Molva *et al.* [1], [3] proposed a Kerberos-like scheme for mobile authentication, and the scheme achieves mutual authentication between an MS and a visited location register (VLR). However, the scheme suffers from denial-of-service (DoS) attacks aimed at a home

register. In Section III, we shall point out why a Kerberos-like scheme [1], [3], [4] may not be the best solution for providing authentication services to mobile stations in wireless networks. In Section IV, we shall point out communication key between HLR and VLR may not be the best solution. So we provide the best solution using Extended Password Key Exchange (EPKE) to send Communication key from HLR to VLR.

Public key cryptosystems have been used for mobile authentication in wireless networks [3], [5], [6], [7]. He *et al.* [6] used blind signature to design a privacy protection scheme for mobile stations; the scheme also provides MS authentication and access authorization. Lee and Yeh [7] proposed a trust delegation based scheme, where an MS, is registered to a home location register (HLR) or home network, proves its registration to a VLR (or serving network). That scheme uses the hash chain technique [8], [9] and trust delegation to authenticate mobile stations for successive sessions. That scheme authenticates MS securely under the assumption that all VLRs are honest. However, due to the security implication incurred by a potential untrustworthy VLR, many existing schemes are no longer secure. In Section III, we shall give an example attack, in which an adversary, who is able to eavesdrop on the channel between an MS and a VLR, can learn the session key even though the session key is not actually transmitted.

Trust delegation has been studied in the context of proxy signature. Since the seminal work in [10] where delegation is built upon the intractability of discrete logarithm problem (DLP) over finite field [11], a smart-card version of that scheme was

presented in [12], and it was proven to be reducible to DLP when impersonation attack is concerned (cf. Theorem 4.4, Theorem 4.6, Theorem 4.8, and Theorem 4.10 of [12]). Further results (e.g. vulnerability and security analysis) related to DLP based delegation was presented in [13], [14]. In this paper, we shall use the delegation method proposed in [12] to enable a VLR to authenticate an MS after its initial HLR registration. The significant advantage of use of trust delegation on mobile authentication is that a scheme can exploit the public-key based strong security properties while achieving efficiency in communication and computation through the use of a single symmetric key. For example, an MS in such a scheme does not require to have its own private key, hence there is no incurred security complication and overhead on public-key certificate (of MS) distribution which is particularly costly in a mobile environment.

To focus on mobile authentication, we first assume that an authentication scheme is available to authenticate a VLR and an HLR, and there are many of such type of authentication schemes, e.g. Kerberos [4]. We then propose a trust-delegation based Mobile Authentication Model (MAM) which is invulnerable to all known attacks including the DoS attack, the message en route attack (the message redirection attack), and the false base station attack. After initialization, the delegation computation at an MS in MAM involves only a single scalar point multiplication operation (in an additive group over a finite field derived from an elliptic curve) which requires  $\log(p)/3$  number of point additions, where  $p$  is close to the prime order or the largest prime factor of a point  $T$ . When implemented for a proper anomalous binary curve ABC) [15] in the  $\tau$ -adic non-adjacent form, there is even no doubling needed for the point multiplication [16]. Besides of efficient process for MAM, this scheme only requires two messages on an MS while existing schemes [7], [17] require four messages, or three messages in 3GPP authentication and key agreement (AKA) [18], [19], provided that

an MS and an HLR are synchronized in advance. Hence, the proposed scheme requires significantly less communications while the computation overhead is also kept low.

In the proposed scheme, via trust delegation, an MS shares a secret with its HLR (i.e., a symmetric key). An MS in the scheme first signs a message in a similar fashion as that for trust delegation and sends it to a VLR so that a VLR can verify the validity of the delegation based on a public certificate published by HLR for this MS. Hence the VLR is able to authenticate an MS. After the verification, the VLR forwards the service request to the HLR. HLR can then forward the communication key to VLR after the shared secret is verified and VLR is authenticated.

Our contribution in this paper includes a novel mobile authentication scheme called MAM, which enjoys both computation efficiency and communication efficiency. We focused on the communication key exchanged between HLR and VLR using EPKE Protocol [2]. We have extended a smart-card delegation scheme to a delegation scheme based on the elliptic curve discrete logarithm problem, and this delegation scheme is amenable to fast implementation and it is used for the proposed mobile authentication to achieve great communication efficiency with a short key length and yet a strong level of security. Unlike previous approaches [5], [7], revocation of delegation to an MS in the proposed scheme can be simply accomplished only at HLR as HLR can check the integrity of the communication key in MAM.

Since the proposed scheme allows a VLR to authenticate an MS at the very beginning in the protocol execution, a DoS attack on an HLR through a VLR can be prevented. Notice the fact that a malicious MS has to go through a VLR to enter the network, and this MS is one hop away from the VLR, a DoS attack on an HLR can be prevented since a VLR can stop DoS traffic from entering the network. Furthermore, since a VLR is only one-hop away from mobile stations, DoS

attack on VLRs seems more difficult. Note that when a false VLR colludes with an MS, an HLR can trace the DoS traffic sources back to the false VLR, and this renders the attack much less effective. Since MAM does not require a particular VLR to forward the service request (in other words, a false VLR could perform this, and this would not affect the security of MAM), the proposed scheme is also invulnerable to the attacks focused on impersonation of VLR, e.g., redirection attack, false base station attack [17], [18].

In this paper,  $F$  denotes a Galois field which is either a prime field or an extension field of a prime field and by  $E$  an elliptic curve over  $F$ , and by  $T$  a point on  $E$ . Further assume that the order of  $T$  is a large prime  $p$  or have a large prime number factor  $p$ , and this prime number  $p$  and the ground field  $F$  is proper for the cryptographic purpose [20]. Additional notation and acronyms are defined in Table I.

The rest of the paper is organized as follows. In Section II, we present the trust and threat model, and communications model for this work. In Section III, we analyze existing approaches for an authentication service in mobile wireless networks. Our proposed scheme is shown in Section IV. Security properties of the proposed scheme are presented in Section V. In Section VI, we give comments on implementation issues of the scheme. Conclusions are drawn in Section VII.

## II. COMMUNICATIONS MODEL, TRUST AND THREAT MODEL

Since the focus of this paper is on authentication of an MS, which is out of the coverage of its home register, we assume that any message between an MS and its home register has to go through a VLR. We assume that the associated communications cost with the channel from an MS to a VLR has a high communication cost compared to the channel from a VLR to an MS, and all other communications links are symmetric. In addition, the home register of an MS is assumed to have a

communication link to the VLR that is to serve the MS.

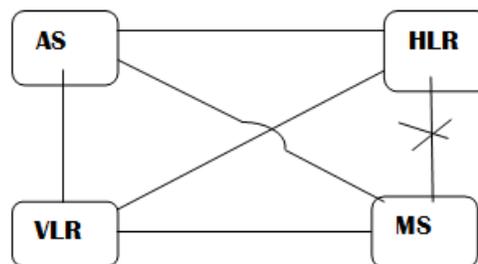


Fig. 1: Communication Model

One example of such a link could be established via a close-circuit proprietary network infrastructure. Referring to Fig. 1, there are four entities, namely, MS, VLR, HLR, and a trustworthy authentication server (AS). A link in Fig. 1 with a mark ‘×’ indicates that there is no direct communication link between these two end entities.

As shown in Fig. 1, HLR is able to access AS, so does VLR. In addition, there exists a communications link connecting VLR and HLR. MS communicates with all other entities via a VLR. Based on the communications model, since both VLR and HLR have access to AS, they can establish a secure channel between them, for example, via Kerberos [4]. Therefore hereafter we assume that there is a session key for secure communications between VLR and HLR.

For the trust model, we refer to Fig. 2, where a dashed line marked with a ‘×’ indicates that there is no mutual trust established between the two end entities, and an arrow at the end of dashed line indicates a one-way trust. Although in this paper mutual authentication is of interest, a similar trust model can be used for one-way authentication especially in the case when the authentication of MS by VLR is not required. Following Fig. 2, MS cannot trust VLR and vice versa; likewise there is no mutual trust between VLR and HLR. MS can trust AS and HLR even though there is no direct communications channel between them upon proper

authentication. All other trusting pairs connected via lines in Fig. 2 are straightforward to follow.

## NOTATION AND ACRONYMS

$E/F$	:	additive group derived from $E$ and $F$ with respect to $T$ for a cryptographic use
MS	:	a mobile station
Register	:	a base station function unit on mobile information management
HLR	:	home location register which is the local serving network of a mobile station
VLR	:	visited location register which is the remote serving network of a mobile station
FHLR	:	False Home Location Register under control by an adversary
$p$	:	the largest prime factor of the order of $T$ , non-smooth and of length at least 163 bits
$Z^*x$	:	a cyclic group of order $x - 1$ for prime number $x$
$-$	:	a point addition operator in $E/F$
$xT$	:	a scalar point multiplication of $x \in Z^*p$ to $T$ in $E/F$
$h(\cdot)$	:	a collision resistant one-way hash function from $Z^*p$ to $Z^*p$
$mw$	:	a warrant containing its generator's restrictions imposed to the delegation holder
(or ',')	:	concatenation operators of two bit strings whenever the context is clear
$K(V,H)$	:	a session key between VLR and HLR
$KV$	:	a secret key of VLR registered at AS
$KH$	:	a secret key of HLR registered at AS
$\{x\}$	:	a message labelled by $x$
IDV	:	identity (a number in $Z^*p$ ) of VLR
IDH	:	identity (a number in $Z^*p$ ) of HLR
IDM	:	identity (a number in $Z^*p$ ) of MS
IDF	:	identity (a number in $Z^*p$ ) of FHLR
'ts'	:	timestamp
'ck'	:	a symmetric communication key used for message encryption and decryption
'N'	:	nonce, a random number that is not used more than once
$T_{exp}$	:	expiration time of a session key
$[m]K$	:	a message 'm' enciphered under a symmetric key $K$
$\Pi(\cdot)$	:	a point representation function: $E/F \rightarrow Z^*p$
$[x \rightarrow y, \{z\}]$	:	$x$ sends $y$ Message $\{z\}$

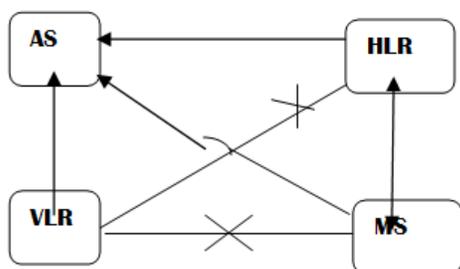


Fig. 2: Trustworthy models

In this paper, we consider three major types of threats to mobile authentication, namely, message en route threat, false base station threat, and mobile DoS attacks to a base station. This message en route threat includes that an adversary relays and/or redirects a message. The false base station threat includes the case where an adversary could impersonate a VLR/HLR, as well as the case where base stations under the control of an adversary collude. Mobile DoS attack refers to the overwhelming service requests from mobile stations in the purpose of blocking services from an honest base station. In this paper, we do not consider DoS attack to a VLR from other false base stations as this is similar to DoS attack in a wireline network). In this paper, in addition we assume that message nonces are added into a message with the ‘not-more-than-once’ semantics guaranteed, and their integrity is properly maintained during data packetization, network packet fragmentation, re-assembly and other packet-level processes.

### III. SECURITY AND EFFICIENCY IN MOBILE AUTHENTICATION

We first consider the application of Kerberos [4], [21] scheme to mobile authentication. We name this ‘Kerberos for mobile authentication’ or KMA in short. Assume that HLR and VLR have established a secure session with the help of an AS. Referring to Fig. 3,  $\sigma$  here is simply a shared secret between MS and HLR without trust delegation, and lines indicate that messages cannot be sent directly. In Fig. 3, MS can send a request in message  $\{K1\}$  to

HLR (via VLR), and HLR will then generate a session key  $K(V,M)$  for MS to communicate with VLR and send it to MS (via VLR) while a duplicated copy of the  $K(V,M)$  encrypted by  $K(V,H)$  is also forwarded to VLR by MS along with the communication key ‘ck’ selected by MS. To authenticate itself to MS, VLR then sends back MS the encrypted ‘ts’ in message  $\{K4\}$ . After  $\{K4\}$ , a mutual authentication between MS and VLR is then established. This scheme requires total six transmissions since  $\{K1\}$  and  $\{K2\}$  each requires two transmissions where VLR as to relay these two messages. In particular, there are four transmissions required between VLR and MS. This makes KMA not efficient on communications for an MS as communications from MS to VLR (i.e., uplink) is especially expensive in wireless networks.

Note that the session key  $H(V,H)$  between HLR and VLR can be established with the aid of an AS, hence they can be mutually authenticated in advance. This session key then can be cached for later uses. However, in KMA, a VLR has to forward MS’s request to HLR even before MS is authenticated by VLR. VLR can only authenticate MS after  $\{K3\}$  is received and correctly decoded. The significant implication of this drawback is that DoS attack to HLR is possible. In general, a purely symmetric key based scheme (with regard to MS) on mobile authentication (e.g. [18], [19], [3]) also suffer from this type of DoS attack because VLRs cannot discriminate legitimate requests from requests coming from DoS attackers (to HLR), in other words, HLR has to be involved for each online authentication request (authentic or false). We will use trust delegation technique to solve this forwarding problem and in the meantime make the proposed scheme more efficient in terms of communications and computation.

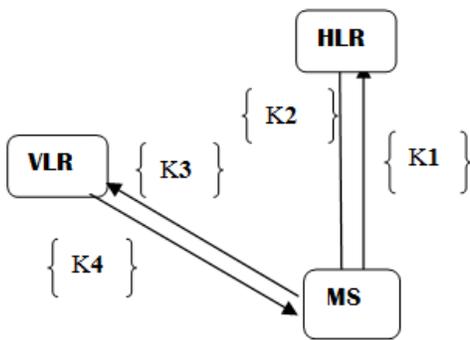


Fig 3. KMA: Kerberos for Mobile Authentication

We next start with a brief review of the scheme in [7]. Let  $t$  be a random number in the working Galois field with generator  $g$  (with properly selected security parameters, details omitted here),  $r = gt$ ,  $s = \sigma h(n1/n2/IDV) + rt$ , and  $r, s$  are computed by MS, where,  $n1$  is a random number selected by MS,  $n2$  is a random number selected by VLR, and  $\sigma$  is the shared secret between MS and its HLR via the delegation scheme from [10].

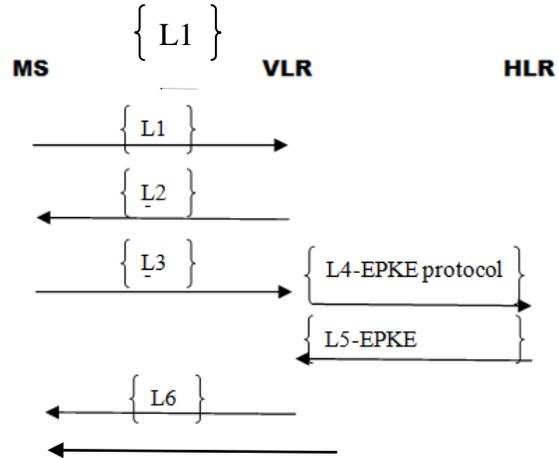
Referring to Fig. 4, the final session key  $C1 = h(n1/n2/\sigma)$  which is computed by the HLR. Since MS can compute this key itself, VLR does not need to forward  $C1$  to MS. In Fig. 4, session key  $C1$  depends only on  $n1, n2$  and  $\sigma$ ; therefore, it can be internally determined by MS after  $\{L2\}$  is received. An attacker can first divert the VLR to an HLR under control of the adversary, and we denote this impersonated HLR by FHLR with identification IDF. The attacker modifies IDH in  $\{L3\}$  to IDF. The modified message  $\{L_3\}$  is defined in  $\{L_3\}: r, s, K, n1, IDF, IDV$  (1) After the diversion, the attacker, *that acts as a VLR*, then obtains a session key  $K(F,H)$  with the legitimate HLR of the MS in question, and sends  $\{L_4\}$  defined as in (2) instead of  $\{L4\}$  to the legitimate HLR.

$$\{L_4\}: [n1/n2/K]K(F,H), IDF, IDV \quad (2)$$

After the attacker receives  $\{L_5\}$  (from HLR), which is defined as in (3), where  $m1$  is a random number selected by HLR, the attacker successfully

obtains the session key  $C1$ .  $\{L_5\}: [[n1/m1]\sigma/n2/l/C1]K(F,H), IDF, IDV$  (3)

Let  $K(V,F)$  be the session key between VLR and FHLR, by following the protocol, after processing  $\{L_3\}$ , VLR can generate  $\{L4\}$  as defined in (4) and sends it to FHLR that is under control of the attacker. FHLR that now acts as an HLR to the MS in question can then reply to VLR a newly



- $\{L1\}: K$
- $\{L2\}: n2, IDV$
- $\{L3\}: r, s, K, n1, IDF, IDV$
- $\{L4\}: [n1/n2/K]K(V,F), IDF, IDV$
- $\{L5\}: [[n1/m1]\sigma/n2/l/C1]K(V,H), IDF, IDV$
- $\{L6\}: [n1/m1] \sigma \cdot IDV$

Fig . 4 Mobile Authentication Scheme of [7]

composed  $\{L5\}$  as defined in (5). This is straightforward since FHLR has the encrypted  $[n1/m1]\sigma$ , the random number  $n2$ , the hashed value  $l$  and the session key  $C1$  between MS and VLR.

$$\{L4\}: [n1/n2/K]K(V,F), IDF, IDV \quad (4)$$

$$\{L5\}: [[n1/m1]\sigma/n2/l/C1]K(V,F), IDF, IDV \quad (5)$$

Now that VLR and MS follow the protocol and proceed to the remaining steps of the on-line and off-line authentication

of [7]. Figure 5 shows the messages used in this attack.

The attack can start via sending out  $\{L_4\}$  as soon as these

two parameters  $(n_1, n_2)$ , which are used for generating the session key between MS and VLR, are made public, note that Message  $\{L_4\}$  does not need to be processed by FHLR. It is straightforward to see that the legitimate HLR, VLR and MS cannot know the fact that the session key  $C_1$  is compromised.

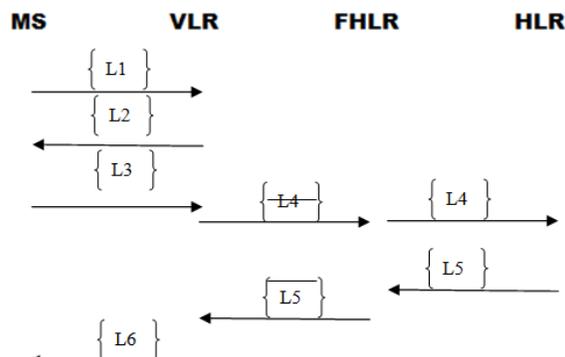
#### IV. PROPOSED MOBILE AUTHENTICATION MODEL

In this section, we present the proposed Mobile Authentication Model (MAM). MAM consists of two main phases, namely, trust delegation initialization (TDI), Efficient Mobile Authentication (EMA). It has an optional third phase called HLR offline authentication (HOA) on MS if successive mobile authentications are required in the same serving network.

Let  $Y$  be the public key of HLR whose private key is  $x \in Z^*p$  and  $Y = xT \in E/F$ . The public key  $Y$  is certified and made available to VLR and MS in advance of the execution of MAM. Additional public information  $\Gamma$  as defined by (6) and the shared secret  $\sigma$  as defined by (7) are generated and verified by Protocol 1 as follows.

##### Protocol 1: TDI

- [at HLR] HLR performs the following steps:
  - sets key usage restrictions on IDM in  $mw$



- $\{L1\}:K$
- $\{L2\}:n_2, IDV$
- $\{L3\}:r, s, K, n_1, IDF, IDV$
- $\{L4\}: [n_1|n_2|K]K_{(V,F)}, IDF, IDV$
- $\{L5\}: [[n_1|m_1]_{\sigma}|n_2|l|C_1]K_{(V,F)}, IDV, IDF$
- $\{L'4\}: [n_1|n_2|K] K_{(F,H)}, IDH, IDF$
- $\{L'5\}: [[n_1|m_1]_{\sigma}|n_2|l|C_1]K_{(F,H)}, IDF, IDV$
- $\{L6\}: [n_1|m_1]_{\sigma}, IDV$

Fig. 5 Attack on Mobile Authentication Scheme of [7]

converts  $(IDM/mw)$  to an element in  $Z^*p$ , and computes  $h(IDM/mw)$  – selects a random number  $\kappa \in Z^*p$ , and produces  $(\Gamma, \sigma)$  (where  $\Gamma \in E/F$  and  $\sigma \in Z^*p$ ) as follows:

$$\Gamma = (h(IDM/mw)T) \_ (\kappa T) \text{ (in } E/F) \quad (6) \quad \sigma = -xh(\Pi(\Gamma)) \_ \kappa \text{ (in } Z^*p) \quad (7)$$

where,  $h(\Pi(\Gamma))$  in (7) is performed in  $Z^*$

$p$  after the mapping on an appropriate point representation of

$\Gamma$ . – puts  $(\Gamma, IDM, mw)$  in public. – delivers  $(\sigma, mw)$  to MS securely. 2. [at MS] MS accepts the delegation key  $\sigma$  if (8) holds.  $h(IDM/mw)T = (\sigma T) \_ (h(\Pi(\Gamma))Y) \_ \Gamma$  (8) where, (8) is evaluated in  $E/F$ . – Note that if the secret is generated by HLR whose public key is  $Y$ , Equation (8) holds as follows:

$$\begin{aligned} h(IDM/mw)T &= (-\kappa T) \_ \Gamma \\ &= (-xh(\Pi(\Gamma))T) \_ (-\kappa T) \_ (xh(\Pi(\Gamma))T) \_ \Gamma \\ &= (\sigma T) \_ (h(\Pi(\Gamma))Y) \_ \Gamma \end{aligned}$$

Protocol 1 enables the ECDLP based trust delegation, and it follows the Scheme 1 (parameter generation) of [12]. This revision of Protocol 1 is

also invulnerable to the impersonation attacks and enjoys the strong unforgeability. The proof to that Protocol 1 is reducible to ECDLP follows essentially the same arguments as those in [12], hence it is omitted here. Referring to Fig. 6 for the message exchanges in MAM, where the session key  $K(V,H)$  is created with the aid of AS, the proposed protocol consists of four messages as  $\{S1\}$ ,  $\{S2\}$ ,  $\{S3\}$ ,  $\{S4\}$ . Message  $\{S1\}$  is for the request to communicate with VLR, and for MS's authentication to VLR via trust delegation. Message  $\{S2\}$  is for the request to HLR for the communication key with MS. Message  $\{S3\}$  is used to deliver the communication key back to VLR. Message  $\{S4\}$  authenticates VLR to MS. These additional messages  $\{S1\}$ ,  $\{S2\}$ , and  $\{S3\}$  are used to establish the secure channel between VLR and HLR in advance of authentication of MS and VLR. Protocol 2 shows the details of the proposed scheme.

**Protocol 2: EMA**

1. [at MS]: MS picks two random numbers  $k,N \in \mathbb{Z}^*p$ , and generates the communication key  $ck$  (upon one session use or timing based invalidation), then computes  $R$  and  $s$  as in (9) and (10), respectively.

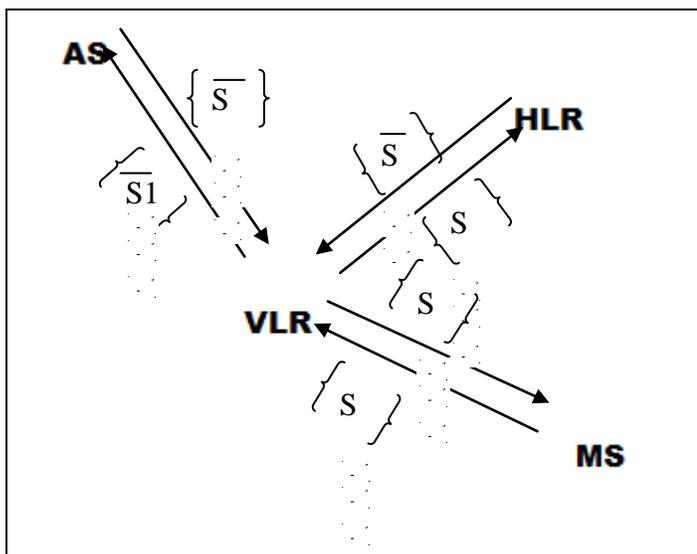


Fig. 6 messages in MAM

$$R = kT \text{ (in } E/F \text{)} \quad (9)$$

$$s = \sigma - kh(\Pi(R)/N) \text{ (in } \mathbb{Z}^*p \text{)} \quad (10)$$

– MS generates a certificate  $[ck, ts, Texp, N]\sigma$  and then composes  $\{S1\}$  as shown in Fig. 6.

– [MS  $\rightarrow$  VLR,  $\{S1\}$ ]: MS initiates the protocol by sending  $\{S1\}$ .

– [VLR  $\rightarrow$  MS,  $\{S4\}$ ]: MS decodes  $\{S4\}$  for IDV,  $N$ , and checks if nonce are consistent.

2. [at VLR]: on receipt of message  $\{S1\}$ , VLR checks warrant  $mw$  for restrictions and verifies if (11) holds  $(sT) \_ \Gamma \_ (h(\Pi(\Gamma))Y) \_ (h(\Pi(R)/N)R) = h(IDM/mw)T$  (11)

– VLR composes  $\{S2\}$  on receipt of  $\{S1\}$ , and composes  $\{S4\}$  on receipt of  $\{S3\}$ .

– [VLR  $\rightarrow$  HLR,  $\{S2\}$ ]: VLR requests to HLR for a communication key with MS.

[HLR  $\rightarrow$  VLR,  $\{S3\}$ ]: VLR decodes  $\{S3\}$  for  $ck$ , and checks expiration timestamp and consistence of nonce.

– [VLR  $\rightarrow$  MS,  $\{S4\}$ ]: VLR authenticates to MS via sending  $\{S4\}$  which is encrypted by the communication key  $ck$  which can be decrypted by MS.

3. [at HLR]: – [VLR  $\rightarrow$  HLR,  $\{S2\}$ ]: HLR processes  $\{S2\}$  using  $\sigma$ , then retrieves  $K(V,H)$  and validates restrictions on  $mw$  (saved copy at HLR for IDM during parameter generation phase) of IDM.

– HLR composes  $\{S3\}$  using  $\sigma$  and  $K(V,H)$ .

– [HLR  $\rightarrow$  VLR,  $\{S3\}$ ]: HLR forwards the communication

key. *Lemma 1:* If VLR has the certificated  $\Gamma, Y$ , and if MS knows the secret  $\sigma$  exclusively shared with HLR, Equation (11) holds. *Proof:* Since (8) holds, and the following equation (12) holds,  $(sT) \_ (h(\Pi(\Gamma))Y) \_ (h(\Pi(R)/N)R) = (\sigma T) \_ (h(\Pi(\Gamma))Y)$  (12) Lemma 1 follows.

By Lemma 1, VLR can verify the legitimacy of trust delegation on MS using (11). Note that the return channel in Protocol 2 from HLR to VLR is a secure channel which is established by AS via

messages  $\{S1\}$ ,  $\{S2\}$ , and  $\{S3\}$  which follow Kerberos. Furthermore, HLR also authenticates itself to

VLR via any  $\{S3\}$ . Another note on MAM is that there are many ways to generate the communication key  $ck$  at MS. One efficient approach could be the hash chain technique proposed in [9], [1] using a collision resistant one-way hash function. In Protocol 2, the key request message  $\{S2\}$  from VLR to HLR is sent in plain text. The message  $[TV,H]KH$  containing key  $K(V,H)$  sent by AS, which is encrypted using HLR's secret key, can be delivered in one message piggybacked to Message  $\{S2\}$ . The session key  $K(V,H)$  in EMA may be created in advance and cached for later use, hence it is not necessary that every  $\{S3\}$  is piggybacked with  $\{S2\}$ . EMA functions equally well without an AS as long as a session key  $K(V,H)$  between VLR and HLR is available. In Protocol 2, the serving VLR is not required to forward the request from MS. In fact, any VLR can generate Message  $\{S2\}$  when given the  $\sigma$ -encrypted message, and sends it to the designated HLR, the redirection attack and false base station attack is not possible. This becomes clearer in Section V on the security analysis. After the first run of Protocol 2 that HLR participates (or HLR online authentication), the same VLR can directly authenticate the same MS without the involvement of its HLR (or HLR offline authentication) provided that the certified public key of HLR and the certified delegation public information remain the same. Protocol 3 shows the steps needed for the HLR offline authentication (HOA) on MS. This is possible since after the first run of MAM, the serving network is already authenticated by the MS, and only MS is needed to be authenticated for successive sessions. In contrast, in 3GPP AKA, the number of available authentication vectors at VLR must not be less than the number of intended sessions, otherwise additional request or online authentication for more authentication vectors is needed since each session consumes

one authentication vector. Verification performed by VLR merely requires four scalar point multiplication operations, where each scalar point multiplication operation takes time in sub-millisecond on even a low-end server, thus HOA does not add serious burden to a VLR.

*Protocol 3: HOA*

1. [at MS] If  $ck$  is not expired based on  $ts$  and  $Texp$  associated with  $ck$ , MS picks two random numbers  $k, N$  (another nonce)  $\in Z^*p$ , computes  $R, s$  as given respectively in (13) and (14), then sends Message  $\{O1\}$  as given in (15) to VLR.

$$R = kT \text{ (in } E/F \text{)} \quad (13)$$

$$s = \sigma - k_h(\Pi(R)/N) \text{ (in } Z^*p \text{)} \quad (14)$$

$$\{O1\} = [mw/R/s/IDH/N] \quad (15)$$

2. [at VLR] on receipt of Message  $\{O1\}$ , VLR verifies  $mw$  restrictions and checks  $ck$  expiration timestamp, and then checks if (16) holds

$$(sT - \Gamma - (h(\Pi(\Gamma))Y) - (h(\Pi(R)/N)R) = h(IDM/mw)T \quad (16)$$

If all checks are passed, MS is authenticated by VLR, and  $ck$  is used for the session. Mobile privacy in MAM can be efficiently and securely addressed by the one-time alias approach. Refer to [3], [22], [23] for details on privacy issues in wireless mobile networks.

## V. SECURITY PROPERTIES OF MAM

There are a few possible attacks under the threat model defined in Section II on the mobile authentication scheme using trust delegation, namely, impersonation on HLR, VLR or MS, replay attacks on used messages, message redirection/relay attack, collusion related attacks. Additionally, other attacks may utilize these primitive attacks. The basic requirements on mobile authentication under MAM (after execution) are (C1) to (C4) as given below. Only when these requirements are satisfied, can a scheme safely guard the mobile system against these attacks. (C1) When MS, VLR and HLR are all honest, MS and VLR can be mutually authenticated. (C2) When MS and VLR are honest,

an HLR cannot obtain any information of the shared secret  $\sigma$  unless it is the HLR that MS was registered to. (C3) When MS and HLR are honest, MS will not trust a VLR unless that the VLR is mutually authenticated with HLR. (C4) When VLR and HLR are honest, an MS can be authenticated by a VLR unless the MS shares a secret with the HLR. There are three cases of collusion in mobile authentication: (i) MS and VLR collude to gain trust of HLR, (ii) MS and HLR collude to induce an honest VLR to trust a dishonest MS, and (iii) VLR and HLR collude to trick an MS to trust a dishonest VLR. However, due to the use of trust delegation, an honest HLR will not trust any MS that is not registered in Case (i), a dishonest HLR will not be able to gain the trust of an honest MS in Case (iii). For Case (ii), by the well-defined mutual authentication property of the Needham-Schroeder scheme [21], VLR will not authenticate the dishonest HLR. We henceforth assume that there is at most one dishonest party in MAM as otherwise it is much less interesting in practice. Since all protocol messages are marked by nonce, replay of the protocol messages is not possible. When  $ck$  is compromised, replay of old protocol messages is still not possible since  $[N, [TV, M]\sigma]ck$  in  $\{S4\}$  is encrypted by using  $ck$ , and  $[TV, M]$  contains  $N$ . Study of replay attack under the condition that  $ck$  is compromised is presented in [24] where timestamp is used. (Note that in MAM, timestamp is used instead for the freshness of communication key). Since different communication keys are used for different sessions, replay on user data messages is not a concern either. Injection of another nonce in  $\{S1\}$  and  $\{S4\}$  is not possible since VLR will receive the nonce from HLR in  $\{S3\}$  in any case; furthermore, nonce in  $\{S4\}$  can be self-checked (i.e. nonce outside  $[TV, M]\sigma$  will be checked with the nonce inside  $TV, M$ ). When an encryption algorithm, which is invulnerable to the prefix attack (i.e. attacks utilize the encryption prefix property that prefixes of encryptions are encryptions of prefixes), e.g., AES [25], is used in MAM, in what follows,

we can safely assume that replay of protocol messages or segments of protocol messages is not possible. To address the security concern of MAM with regard to the above four criteria (C1 to C4), we first take three views on MAM from the perspectives of HLR, VLR and MS. For MS, there are two guarantees (G1): only HLR who knows  $\sigma$  can retrieve  $ck$  from Message  $\{S2\}$ , and (G2): only HLR can encrypt  $[TV, M]\sigma$  with the consistent  $N$ . For VLR who possesses the certified public key of HLR, there is another guarantee (G3): only MS can generate  $R$  and  $s$  which satisfy (11). Likewise, for HLR, there is also the fourth guarantee (G4): only the registered MS can encrypt  $[ck, ts, Tex, N]\sigma$  received from VLR via Message  $\{S2\}$ .

By the properties of Needham and Schroeder authentication scheme [21], the mutual authentication property denoted by (M1) between HLR and VLR in MAM is straightforward provided that impersonation on AS is not possible. Given mutual authentication between VLR and HLR, then Proposition 1 holds as follows.

*Proposition 1:* If MS can decrypt  $[N, IDV, [TV, M]\sigma]ck$  in Message  $\{S4\}$  successfully, then for MS, the VLR to whom

HLR is authenticated has the same identity as the one which

is contained in  $TV, M$  (received by MS), i.e. the VLR is the intended visited register of MS.

*Proof:* Let VLR<sub>be</sub> be the visited register to whom HLR is authenticated by (M1), and the identity of VLR<sub>be</sub> be IDV<sub>be</sub>. Notice that  $[TV, M]\sigma$  is generated by HLR to whom this MS is registered. Notice the fact that HLR must use the same IDV for retrieving the session key  $K(V, H)$  and compose  $[TV, M]$ , so this invariant  $IDV = IDV_{be}$  holds.

Assume that there be another VLR with identity IDV, and it sends a well-formed  $\{S4\}$  with consistent nonce to MS. By (G2), this  $[TV, M]\sigma$  of  $\{S4\}$  must be originated from HLR. By (M1), HLR only sends  $[TV, M]\sigma$  via a secret channels to VLR whose identity is IDV. So the other invariant  $IDV = IDV$  holds. Combining both these invariants above,

$IDV_ = IDV$  then holds, and the proposition follows. Note that in the proof of Proposition 1, the fact that HLR uses the same IDV for retrieving  $K(V,H)$ , and for forming  $TV,M$  is exploited. Proposition 2 gives the secrecy property of the communication key  $ck$ . *Proposition 2:* Communication key  $ck$  is known only to MS, VLR (with whom HLR is mutually authenticated), and to HLR (to whom the MS is registered). *Proof:* By (G1) and (G4), from Message  $\{S1\}$  to Message  $\{S2\}$ , no one else can obtain  $ck$ , and  $ck$  is known to HLR to whom the MS is registered after Message  $\{S2\}$  is received by HLR. Since HLR only forwards  $ck$  to the authenticated VLR, the VLR knows  $ck$ , but no one else does by following the similar argument in the proof of Proposition 1. Since  $ck$  is not exposed on the simplex channel from VLR back to MS, no one can obtain  $ck$  in plain text form. Note that Proposition 2 holds regardless if VLR and MS are mutually authenticated, and the proof does not assume that MS and VLR are already mutually authenticated. To show the mutual authentication property of MAM, we first prove the following Lemma 2. *Lemma 2:* If MS can correctly decode Message  $\{S4\}$  which is consistent on nonces and IDV, Message  $\{S4\}$  has to come from VLR that is mutually authenticated with HLR. *Proof:* Message  $\{S4\}$  contains  $TV,M$  which is encrypted by the mutually shared secret  $\sigma$  between HLR and MS. Therefore, this encrypted message  $[TV,M]\sigma$  comes from HLR and is forwarded by the VLR that is mutually authenticated with HLR. The identity contained in  $TV,M$  must be same identity labeled by IDV which is encrypted by the communication key  $ck$  in Message  $\{S4\}$ . Notice that  $ck$  is only sent to the VLR which is authenticated by HLR following Proposition 2, hence the lemma follows. Proposition 3 shows that VLR and MS are mutually authenticated.

*Proposition 3:* MAM enables mutual authentication between MS and VLR.

*Proof:* By (G3) which is derived from the property of trust delegation, VLR authenticates MS after verified Message  $\{S1\}$ . Since MS can ensure that the identity of the VLR from which Message  $\{S4\}$  is originated matches IDV in  $TV,M$ , by Lemma 2, VLR is also authenticated by MS. Hence mutual authentication between MS and VLR is achieved.

A somewhat surprise result which can be inferred from

Proposition 3 is that efficient mutual authentication between

VLR and MS are possible provided that mutual authentication between VLR and HLR can be assured. However, the necessity of mutual authentication between HLR and VLR on that between MS and VLR is unknown. There are some other features of MAM. For the nonrepudiation of that VLR receives  $ck$  from MS, i.e. VLR cannot later deny the fact that MS has shared a communication key with the VLR, the first part of Message  $\{S3\}$  can serve as a witness for HLR, and Message  $\{S4\}$  can serve as a witness for MS. Delegation revocation can also be easily added to HLR in Protocol 2. Since HLR controls the issuance of the final communication key to VLR, HLR can refuse to forward the communication key  $ck$  generated by any MS using expired delegation secret  $\sigma$ . Hence HLR can invalidate old delegation and then notify VLR the changes of delegation to its MS. Security on Needham-Schroeder scheme [21] and Kerberos [4] has been well evaluated in the literature and in practice (e.g. [24], [26]). Among the applicable attacks, the most noticeable one is the chosen plaintext attacks and the chosen ciphertext attacks on the encrypted session key and communication key, and they are relevant to MAM as well. Practical engineering approaches have to be employed to avoid these attacks to MAM, for example, HLR can take precaution to avoid serving as an oracle for an adversary to encode communication key to fulfill a response to a VLR. Other attacks on message concatenation and session key spoof can likewise be avoided.

## VI. EFFICIENCY AND IMPLEMENTATION ISSUES OF MAM

Computation and communication overhead for HLR and VLR in MAM are reasonable; especially the computation processing overhead incurred at HLR is very low since HLR does not need to perform any point arithmetic operation. This certainly helps MAM scale. Since VLR and HLR are normally stationary, overhead on mobile stations imposed by MAM is the focus in this section. We next shall analyze the communication and communication overhead of MAM on MS. Then we give comments on latency and memory requirement of MAM. In this section, the performance is based on an NIST B-163 ABC curve [15]. To generate  $R$  and  $s$  in Message  $\{S1\}$ , MS needs to perform one scalar point multiplication operation tantamount to  $O(\log(p))$  number of point addition operations. All other processing including hash, encryption and decryption that MS involves takes time at most quadratic on key length of  $\log(p)$  on finite field arithmetic operations. Practical embedded devices with application specific chipset or embedded processors (e.g. ARM SC200) can easily perform these MS's processing tasks at a sub-second level. For example, the estimated time (based on ARM SC200 110 MHz with constrained memory availability) of scalar point multiplication on NIST B-163 ABC curve is less than 10 microseconds (cf. Table 8 of [27]). For the communication part, only one reception and one transmission are needed on MS. The message length of the received message and the transmitted message are about  $5 \log(p)$  (with base 2), roughly 100 bytes. Note that the initial verification performed by MS requires two scalar point multiplication operations in (8). However, this computation is computed once and can be performed off-line.

Latency performance is an important metric on mobile authentication service as many services in mobile networks are normally for real-time applications. The latency comes from computation

processing delays at MS, VLR and HLR, and message round-trip times between VLR and MS, and between VLR and HLR. Note that VLR and HLR are normally multiple hops away, and this HLR and VLR round-trip time should be taken into account. The overall delay comprises a round-trip time between VLR and MS, a round-trip time between VLR and HLR, message generation times of  $\{S1\}$ ,  $\{S2\}$ ,  $\{S3\}$  and  $\{S4\}$ , verification time at VLR on  $\{S1\}$ . When no packet loss occurs in the network, one round-trip time between VLR and HLR plus one round-trip time between VLR and MS in MAM is the total time needed to achieve mutual authentication between VLR and MS. As packet propagation latency is bounded by the physics law and network load, latency improvement taken by MAM has instead focused on the time reduction on the processing part and reduction on the number of messages involved. The processing overhead on MS in MAM is rather low with a single scalar point multiplication operation at the level of sub-millisecond on a typical embedded processor, e.g., ARM SC200. Compared with 3GPP-AKA and other scheme [3], the latency reduction by MAM is mainly due to overall smaller round-trip time on messages (i.e., a fewer number of messages) and efficient authenticating process on MS. Due to the use of elliptic curve based delegation, the key length can be set as short as 163 bits (for communication keys of block cipher with a key length around 80 bits [27]) while the scheme still enjoys strong security. The memory requirement on MS includes storage for the base nonce (from which new nonces are generated incrementally) in the message space  $Z^*p$  with space around 20 bytes, the shared secret in  $Z^*p$  with space around 20 bytes, a sufficient message buffer with space around 180 bytes, and a temporary space requirement for intermediate variables around 40 bytes. Therefore, the total memory requirement on MS is less than 500 bytes for mobile authentication in the worst case.

### VII. IMPLEMENTATION ISSUES OF THE SCHEME

Our goal is also to gracefully handle passwords of large-entropy too. When considering theft of a host-stored hashed-password database, large passwords still provide more security than small, but strong methods don't fall to network attack when password entropy is less than optimal. Known methods that presume both parties share the same secret include:

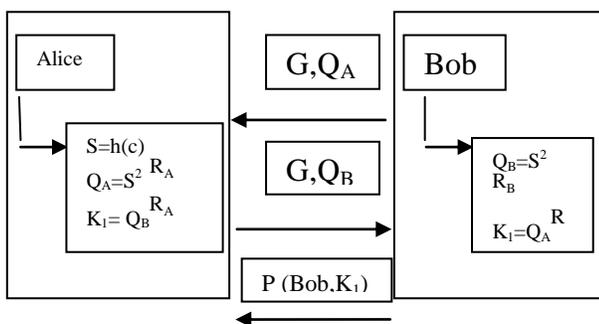
- EKE -- Encrypted Key Exchange [BM92]
- The "secret public key" methods [GLNS93]
- SPEKE -- Simple Password Exponential Key Exchange [Jab96], and
- OKE -- Open Key Exchange [Luc97].

In EPKE, prior to the protocol exchange, Alice and Bob agree to use the shared secret  $S$  to determine the parameters for the DH protocol. A simple example uses  $Z_p^*$ , with prime  $p$ , where  $p = 2q+1$  for a prime  $q$ .

Alice □ Bob:  $h(S)^2 RA$

Bob □ Alice:  $h(S)^2 RB$

$RA$  and  $RB$  are random numbers, and all exponentiation is performed modulo  $p$ . Both parties compute  $K = h(S)(4 RA RB) \text{ mod } p$ , and exchange proofs of knowledge of  $K$ . The 2 in the exponent forces the exponential to be a generator of the subgroup of order  $q$ , and the result  $K$  is tested to insure that it's not 1. Further details can be found in [Jab96].



**Extension "B"**

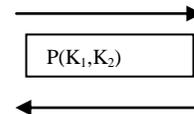
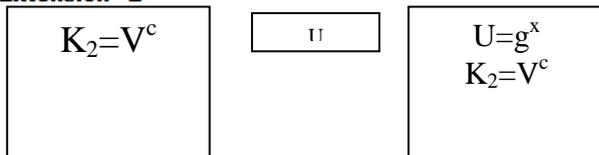


Fig. 7 Session Key distribution in EPKE Protocol

show here how to keep it in check. EPKE doesn't use a symmetric cryptosystem, but it does use a function to convert the password into a generator of a group. If the DH base is chosen as  $gS$  for a well-known  $g$ , as regrettably suggested in [Jab96], an attacker can perform a dictionary attack after participating in one failed protocol exchange.

Alice:  $Q = (gS)RA$

Alice □ Bob:  $Q$

Bob:  $K = QRB$

### VIII. CONCLUSION

In this paper, a novel and Mobile Authentication Model is proposed, and its security property has been analyzed. The scheme requires one scalar point multiplication operation and two short messages on mobile stations for each session establishment after the initial one-time delegation key verification. It is well suited for low-power mobile devices in wireless networks.

As mobile privacy is becoming a crucial issue for emerging wireless services, our future work includes privacy protection for mobile stations, particularly privacy protection provision for mobile stations using MAM. In MAM, using EPKE protocol we protect VLR and HLR by transferring session key between them. As a general requirement, such protection should not sacrifice authentication efficiency nor introduce potential security vulnerability to the underlying authentication scheme.

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# LITERATURE REVIEW OF APPLICATIONS OF NEURAL NETWORK IN CONTROL SYSTEMS

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**Abstract:** In this literature review the literature available for the neural networks in general, feed forward neural networks in particular are briefly discussed. The application of neural networks in the control systems, direct and Indirect Adaptive Controls, closed loop and fixed gain controller are also reviewed. Important conclusions are drawn and the advantages and limitation are highlighted.

**Index Terms-** Neural network, back propagation, feed forward neural network, perceptron, learning, weights, training, adaptive control

## I. INTRODUCTION

By the derivation of back propagation, the modern era of neural networks started in 1986. A good amount of literature survey has been carried out on neural networks [1]. Neural networks find applications in variety of subjects like control systems, weather forecast, etc. It is a tedious job to take the deep depth of available material. To understand the evolution of neural networks brief history of neural networks has been written. To study the back propagation algorithm and feed forward neural network a detailed review has been written. In this study, papers on various topics are detailed to explain the need for the proposed work. There are limited numbers of books in the area of neural networks, which are distinguished itself as the leading authority in the past ten years.

## II. Neural Networks history

By modeling the neuron, neural network history can be traced back. The first model of a neuron was used by physiologists, McCulloch and Pitts. The first modeled neuron was with one output and two inputs. They found that with only one input active, the neuron

would not become active. Binary output was found for input were of equal weight, the output found to be zero till the inputs summed up to a thresh hold value. The neuron developed by McCulloch and Pitts' neuron today is the logic circuit [2].

Rosenblatt developed *perceptron* as the next model to achieve "learning." Rosenblatt used trial and error method and interconnected perceptrons randomly to change the weights. The better model for the electrochemical process is the model developed by McCulloch and Pitts'. This neuron is the basis in the field of modern day neural networks. Neuron works like a voltage-to-frequency translator due to electrochemical process of a neuron. Neuron discharges due to chemical reaction when the certain threshold is build by the neuron, then fires at a higher frequency. Though higher inputs come into the neuron but the magnitude of the output from the neuron is the same [3].

Model of the perceptron can be traced back to the model of the neuron with multiple inputs and a single output. Perceptron seems to resemble the neuron but perceptron similarity does not model the complex electrochemical processes that actually go on inside a neuron. Very simple mathematical representation of the neuron is the perceptron. By trial-and-error method weights in a neuron are adjusted by Rosenblatt. weight space idea to the perceptron was brought by Selfridge [4]. By choosing a direction vector Selfridge adjusted weights of neuron. Weights were returned to their previous values, if the performance did not improve, and a new random direction vector was chosen. The above is the process which is referred as *climbing the mountain*. Since energy is minimized it is referred as *descending on the gradient*. A mathematical method was developed for adapting the weights by Nguyen and Hoff [5 ]. Based on minimizing the error squared and Assuming a

desired response existed, a gradient search method was implemented. Later this algorithm is known as Least Mean Squares (LMS). In the last few years LMS and its variations are extensively used in a variety of applications. For minimizing the error mathematical method was provided. By gradient search method, trial-and-error process is not learning. With Selfridge's work computational time decreased, but the amount of computational time decreased even more by LMS method by making use of feasible perceptrons.

In 1960's, articles about robots that could think, filled the newspapers. Any problem can be solved by perceptron, it seems, by one book by Minsky and Papert [6]. They brought the research to an halt. Linearly separable problems could be solved by perceptrons.  $n-1$  nodes are needed to solve  $n$  separable problems and this was shown by Perceptrons'. 2-separable problem or a linearly separable problem can be solved by a perceptron. Research went unfunded in the field of neural networks after Perceptrons was published, it would continue until to solve  $n$ -separable problems a method develops. Back propagation algorithm was first developed by Werbos Parker and Rumelhart and McClelland [7] simultaneously rediscovered independently.  $N-1$  node neural network could be constructed and trained by training perceptrons in a multilayer configuration, Widrow-Hoff LMS algorithm by knowing the error between the some known desired output and output. The weights that are starting with the output layer weights are adjusted according to back propagation through the hidden layer till the input layer is reached. Schematic of the perceptron can be changed by back propagation algorithm using sigmoidal function as the squashing function. Signum function was used by the perceptron of earlier versions. Sigmoidal function is differentiable where as signum function has the advantage to allow the neural network to converge to a local minimum. Gradient information can be transferred using nonlinear squashing function by back propagation algorithm. Anderson and Rosenfeld is an excellent source of the work [8].

In the field of neural networks the collection of papers is very good. About 25 years ago golden age of neural network research ended. Now the research in this area is re-energized after the discovery of back propagation. Interconnection of perceptrons is used by the feed-forward neural network and many reviewers

used this. Neural network will be the cornerstone of the work done in this study for the feed-forward neural network and the back propagation algorithm.

### III. Feed-Forward Neural Network

With a differentiable squashing function usually the sigmoidal function, the feed-forward neural network is a network of perceptrons. Using the idea of minimizing the error squared, the back propagation algorithm adjusts the weights. For adjusting the weights across multiple hidden layers the back propagation algorithm allows the differentiable squashing function. To adjust the weights  $n$ -separable problems can be solved. Exclusive-OR, or the XOR problem can be solved by having multiple nodes on each layer. From input to output feed-forward neural network is connected and on the adjacent layers each node is connected to every node.

The representative of the neuron is the individual perceptrons or nodes. The output from a previous layer is the input to the node if the node is on the output layer or hidden layer and input to the neural network is the input to the node. To train the neural network key is the node. At a time, the weights of one individual node can be changed by changing the weights using back propagation algorithm. The difference between output and the desired response is calculated in each iteration. The output of one individual node depends on inputs which are nothing but the outputs of nodes on the previous layer of the entire neural network. In the case of a single output, manageable training process becomes possible by the neural network, by breaking neural network down to the nodes. For updating the weights, the back propagation algorithm is an LMS-like algorithm. Rumelhart and McClell minimized the square error by derivation of the back propagation algorithm.

At the first layer of nodes the inputs get summed after entering at the neural network. During the training process at the second layer of nodes the first layer outputs get summed up until the output comes from the neural network process. The error is calculated by comparing the desired output with the actual output. After output comes from the output node for adjusting the weights backwards through the neural network, the error is used. One shortcoming weight adjustment equation is that the weights of all the nodes on the same layer cannot be the same, because the weights

will be adjusted with the weight for each node that has identical weights on each layer. on each layer the weights would be adjusted If all of the neural network's weights were initially set at zero. Equivalent Mathematical model is having per layer a single node. Hence neural network weights, when neural network with multi-layer, need to be randomly initialized. To search the weight space properly, initializing the weights randomly is the other reason .The randomly initialized weights makes it very difficult to estimate the initial performance of the control system .

#### IV. Neural Networks in Control Applications

Neural networks find its application in the area of control systems. When any methodology is applied controls has its own unique set of problems to solve. To conform to a set of specifications the performance needs to be changed, is the principle behind controls. Due to non-linearity and uncertainties the goal of the control becomes complicated. Methodologies are developed to handle uncertainties is tried by Control theory. When there is no system priori knowledge, neural networks finds its applications. System partial model is available often, where as the system complete model is available rarely.

For nonlinear plants adaptive control schemes are initiated by Narendra and Parthasarathy [9]. Identification and control of neural networks applications are dealt by Many of Narendra's papers. There was work done on self-learning control systems by Nguyen and Widrow. Using neural networks identification problems and control problems a Long history was given by Windrow's papers. Windrow's work was on open-loop control and with no priori knowledge. Closed-loop feedback was not included in Windrow's work. To achieve the specified performance, he stabilized an unstable system with feedback and then used neural network. Application of neural network is the suggestion given by Windrow's work. In the field of control based on neural network, ground work is done by Narendra and Widrow. Work done by them on neural network was reviewed in most of the papers in control applications. Neural networks topics are given in the following sections. About any system limited amount

information going to be known. Any knowledge about the priori system leaving is not a good design.

In several places it has been suggested the use of a priori information and integration of the information about the system to control by neural network, before applying to the actual system. Neural network controller trained the neural network off-line with known dynamics of the system according to Selinsky and Guez [10]. Through the training algorithm modification, Joerding and Meador[11], using a priori knowledge, constrained the weights of the neural network through a parallel control path. A priori knowledge was incorporated by Nordgren and Meckl [12] . Neural network structure to the topographical weight map was developed by Miller, Sutton and Werbos [13]. Functional links are used to replace the linear inputs by Pao [14]. He developed a technique for enhancing the initial representation of the data to the neural network. A priori knowledge was incorporated as the output layer of the neural network into the system by Brown, Ruchti, and Feng [15]. To design a fast, effective controller it is very important to have priori knowledge linsky and Guez. In neural network it is very common practice to train the neural network off-line, use of a priori knowledge are found in papers by Selinsky's and Iiguni's. Their idea is to train the neural network by creating a model with more details available. The colored noise is the input for the training set. Neural network after training is connected to the actual system. The neural network may not perform as expected due to the nonlinearities is the problem with this method, if the model is not precisely correct.

Narendra and Parthasarathy used same idea and it is used by many other researchers. Model of the neural network was created by the assumed access to the actual system. Neural network controller is trained by the model of the neural network. Training, using the actual system, works well using a neural network. Creating a good model of the system is the first problem. Finding correlation between the outputs and the inputs is relied on the neural network. Correlation is the second problem to influence the working of the controller with neural network. Piori information was not used by the above two methods. Using a priori knowledge to the constrained weights of the neural network was used by Joerding and Meador. The problem of priori knowledge incorporating about an output optimal function into specific constraints is

addressed by them. Weight Constraint method and an Architecture Constraint method are the two general approaches. Monotonic and concavity which are the forms of the optimal output function was assumed by both the methods. Slope does not change sign in monotonic function where as slope that increases (or decreases) as the function arguments increase the neural network desired output is constrained to these function types. With a hyperbolic tangent squashing function for feed-forward neural network to exploit the mathematical nature, two methods are used. Hyperbolic tangent sign is the same as argument sign. Hyperbolic tangent is one which is monotonic and concave optimal function derivative plus back propagation constitute the modified training algorithm. To the neural network, priori information encoding idea is interesting for system modeling. Thus the above methods work well but for controller application they are not translatable directly.

For representing a nonlinear function, complex function  $f(s)$  neural network is a table look-up technique according to Miller, Glanz, and Kraft[16]. Albus did the original work on CMAC neural network by using functional links to replace the linear inputs. A technique was developed by Pao for enhancing neural network initial data representation. To find simple mathematical correlations between the output and input, such as higher-order terms or periodicity an attempt is made with functional links. For the neural network data preprocessing, functional links are very important. A functional link is also sometimes called *conditioning the input* between neural networks and adaptive control. There is a parallel input to the adaptive controller, which is limited to an order of magnitude of zero and this method in adaptive control is called *the MIT rule*. Without the magnitude of the input overwhelming the coefficients to adaptive scheme, the MIT rule can constrain the input of the neural network. A functional link in its simplest form is used. The functional link makes the neural network input more usable if the neural network input is ill-conditioned by structuring the input. The amount of work done by the neural network can be decreased by functional links such that it is easier to see by the neural network the correlation between the output and input. Function link is very useful if the prior knowledge of the system contains information. The functional link is limited if a priori knowledge does not exist.

A gray layer is a method which is developed by Brown, Ruchti, and Feng to incorporate a priori information of the system. Output of the neural network was used by the gray layer to propagate the error through the gray layer to the weights. Changes in the training method are included in Brown, Ruchti, and Feng's paper. To converge neural network weights through the gray layer, the error needs to be propagated. In the identification of nonlinear uncertain systems advantage is decided by the gray layer. Such information exploitation is usually beneficial, resulting in the selection of more accurate identification models and a faster rate of parameter convergence exerted by the authors. The most difficult part of a model is to obtain knowledge of the non-linearity, which is required by the gray layer. CMAC neural networks and functional links in the appropriate situations are all very useful. Incorporating a priori knowledge into the neural network, many methods are available. Specific kind of knowledge seems to be needed by each method. Each can be used to a limited degree in many situations to reduce the pseudo-linear problems. Gray layers, CMAC and functional links can be used if the system nonlinearities are known. Often system linear parameters are known. It is possible to add the neural network controller parallel to the classical controller in the control of the system.

## V. Direct and Indirect Adaptive Control

Neural networks apply two methods, namely, indirect adaptive control and direct adaptive control. When a plant viable model exists direct adaptive control can be applied by a second neural network. When a model must be developed, indirect adaptive control is applied. Parthasarathy and Narendra originally did the work for the two methods using neural networks. The above work has followed up by several other researchers to the inverted pendulum problem. Tanomaru and Omatu [17] applied two methods to a two link robot arm. Indirect adaptive control was applied by Greene and Tan [18]. To adjust the weights of the neural networks Back propagation was used by both the method. To develop a gradient for convergence Jacobian was used in the update algorithm model adapted by the controller. Error must be back propagated through the plant's Jacobian matrix because the plant lies between output error that

is to be minimized and the adaptive neural network. Jacobian knowledge is required for this procedure. To replace Jacobian for SISO plants the partial derivatives can be used. Some knowledge requirement about plant is the direct adaptive control's serious drawback. The same is not required in the indirect adaptive control scheme. Two neural networks: a plant emulator and a controller are required in indirect adaptive control scheme. Emulator is a feed-forward neural network, and plant emulator should be trained off-line with a sufficiently large data. To allow for identification via back propagation, and to calculate the plants derivatives, an efficient way is provided by the emulator. By considering bigger ones as two networks, the parameters of the controller need to be adjusted. On-line training process can be performed on both networks. With dynamic and static back propagation, Parthasarathy and Narendra developed convergence process. For the dynamic back propagation, the derivatives of the output of the plant are calculated. When there is no plant model control approach static back propagation can be used to update the controller weights. The indirect adaptive control is particularly interesting for a wide variety of control problems. Indirect adaptive control and the direct adaptive control methods finds application if the plant and plant model have Jacobian matrices which are similar. The control by direct adaptive works very well to create a model off-line. If sufficient data is available, then the indirect method works well. To converge neural networks weights both indirect method and direct adaptive rely on back propagation. Research in the area of direct adaptive on control was carried out inside a closed loop with the addition of fixed-gain controller.

## VI. Closed-Loop, Fixed-Gain Controller

In a parallel path to the neural network controller classical PID controller is used. To control the actual system, a classical controller is built using priori information to create a system model, and from that model it is built to increase system performance, and to supplement the classical controller, along with a parallel path to the classical controller a neural network controller is placed. On the plant, as well as on the systems priori knowledge, the adaptive law is based. In Chen and Chang Jin, Pipe and Winfield [19] the above idea can be seen. Method of priori

knowledge incorporated in the classical controller. By giving neural network an unknown initial gain, neural network is randomly initialized. It is difficult to predict systems stability and performance. The controller with the neural network has to find correlation in the data of its own Meckl and Nordgrento.

Nonlinear plant control neural networks use three independent neural networks. Pre-filter, a feed-forward controller and a feedback controller are the three neural networks. Neural networks are trained by different learning techniques. To teach feed-forward controller, the pre-filter general learning architectures and indirect learning are used. Feedback controller is taught using specialized learning architecture. Neural network is trained using a new algorithm developed by them with the nonlinearities of the plant knowledge. The new algorithm thinks of the plant as another layer to the neural network, and the partial derivatives of the plant at its operating point are used to train through the plant. This method requires knowledge of the nonlinearities of the plant [20].

## Conclusions:

In this work, an extensive literature survey is conducted for the application of neural networks in applications related to control systems. Various models are discussed in detail and its suitability for specific application is highlighted. The importance of back propagation algorithm is emphasized. The algorithms available to control non-linear plants are also discussed. The gaps in these algorithms are identified and remedies are discussed.

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# A Study on Bank Erosion by the River Baralia (Bhairatolajan) in Melkipara Village of Hajo Revenue Circle, Kamrupdistrict, Assam, India

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**Abstract-** Among the various hazards created by nature on the earth's surface, the one caused by flood and river bank erosion is more common and quite devastating. Like, earthquake and volcanic eruptions, it also affects human activities in various ways wherever it occurs. Erosion, transportation and deposition are the main functions of a river. Through these activities, it creates different landforms and brings about changes in its course. When it overflows its banks, it creates natural calamities, like flood, erosion and sedimentation, which adversely affect human occupancies of the floodplain. The economic activities carried out in floodplains largely dependent on the nature and frequency of these hazards. In some parts of the floodplain tract bank erosion may create serious problem for the people living there destroying their homes and hearths and damage their crops. The degree of damage depends upon the degree of its magnitude, intensity and duration. The study areas provides a typical example of this dynamicity and devastation where large tracts of fertile agricultural land and densely settled villages have been eroded away, thousands of people are rendered homeless and forced to migrate to other areas – both in the immediate neighbourhood and quite a far.

**Index Terms-** Bank Erosion, Flood, Socio-economic Impact.

## I. INTRODUCTION

Flood and bank erosion both are related natural hazard. Erosion has been a part and parcel of the flood hazard. There may be heavy bank erosion during and after the flood which will lead to bank line migration. Bank erosion is a geomorphic process through which there takes place changes in channel dimensions by lateral widening. The lateral widening which occurs spatio-temporarily is generally caused by braiding. Generally bank erosion is a process commonly associated with migrating meandering streams or laterally shifting streams. Migrating streams tend to erode the banks and widen the channels by undercutting and bank caving the eroded material is then washed away by the flow. Bank erosion may also occur when a streams shift laterally along the dip of the rocks leading to concentrated erosion on one of the channel banks. The textural and stratigraphical characteristics of the material, as well as the presence of vegetation determine the bank resistance and stability.

The formation of sandbars within the river bed due to flood deposits may cause intense braiding of the channel. Such braiding process may further enhance lateral erosion and channel

widening also in the case of a meander river the flood sometimes causes heavy erosion along the bank which is already active in erosion. Bank erosion seems to be a function of hydraulic character of flow and engineering properties of bank materials. Shear failure in the upper bank materials appear to be by far the most widespread mode of bank failure in the river. These are caused either by undercutting of the upper bank materials by channels during the high flood producing an overhanging cantilevered block that eventual fails in by over steeping of bank materials due to migration of the thalweg to the bank during the falling stages. Large scale slumping of bank observed during the falling stages of the river may be associated with return flows in the permeable alluvium. High moisture content, low proportion of clay and good sorting of bank make the bank highly susceptible to erosion by the river. The drastic changes in channel configuration observed in the erosion prone areas along the river indicate the dynamic nature of river morphology and the intense of erosion caused by it.

The pattern of human occupation of a floodplain in thereof heavily dependent on the magnitude, extent and frequency of flood and erosion of the particular river. Enquiries pertaining to river - man relationship as depicted on settlements and landuse patterns are thereof of great interest to the social scientists as well as planners and engineers. A major consideration in selecting the topic for the present study is the systematic study of bank erosion and also the shifting courses of the Baralia River. This study, therefore, examines and analyses a vital problem that plagues this region.

The shifting bank line of the Baralia River basically controls the location and distribution of settlement and landuse of the study area. The magnitude of the erosion hazard has a great influence on the pattern of occupation of the floodplain.

## II. OBJECTIVES OF THE STUDY

The study area is situated along the bank of Baralia River in the district of Kamrup. As it is a highly erosion prone area, it is selected to examine effects of river erosion on human occupation of the floodplain viz, its settlement and landuse. The study is confined mainly to the period .Principal objectives of the present study are:

- i. To study the migration of the Baralia River bank line in the study area.
- ii. To examine the effects of erosion on the study area.

- iii. To analyse the pattern and process of erosion hazard.
- iv. To examine the protection measure taken by the government.

### III. METHODS OF STUDY AND DATA BASE

Both empirical and field survey is done for collecting various types of data. There were two principal sources of data Viz, secondary data comprising maps, statistics, official reports etc and primary data obtained from direct field observation and survey.

In the first stage of the work, available literature on the subject have been studied for a good background and better understanding of the problem. For the purpose, the university as well as the departmental library facilities have been used. Then the data from secondary sources such as census reports, distinct gazettiers, maps and statistical handbooks etc are collected from various government departments and private agencies like the water Resource Department, Brahmaputra Board, the Revenue Department, E & D office, census office, ARSAC (Assam Remote Sensing Application Centre) etc.

Finally, direct field observations were made and data collection out and also for photographs of erosion prone site. The data collected from both primary and secondary sources are then processed, tabulated, analysed and interpreted.

### IV. SIGNIFICANCE OF THE STUDY

River bank erosion has great impact on floodplain occupance. It effects adversely the settlements, landuse, culture and economy of the area, as well as the economy of the country. As already mentioned due to availability of fertile lands for agriculture and other facilities it always attracts people to settle on it. The area covered by the present study is a highly flood and erosion prone belt along the river Baralia. The area is important for high agriculture productivity and is thickly populated. After the construction of Bhairatola Jan in 1985 to reduce the effect of Baralia river near Bhairatola, Bijulighat, the study area faces, heavy erosion in the area resulting in heavy loss of agricultural land and settlement areas. The suffering of the people in these areas knowns no bound. The rationale behind selecting this area for the present study is to examine the effects of bank erosion on land use and settlement pattern and the nature and level of adjustment of the people to the hazards of erosion in this area. As large parts of the floodplains area in Assam is affected by river erosion, this research represents a case study, the findings and the data of which will provide guidelines for such studies elsewhere in the valley. The study is a modest attempt to find of generalized conclusions regarding intensity of the hazard and human adjustment to the erosion problem in the flood prone areas along the Baralia River in Assam.

### V. GEOGRAPHICAL ACCOUNTS OF THE STUDY AREA

#### *Physiographic Conditions:*

The study area lies between latitude 26° 17'02" N to and 91° 28' 86" E .The study area lies to the left bank of Bhairatola Jan (Baralia river), under Saniyadi G P, of Hajo C. D. Block in the Kamrup District of Assam. It is about 2 km from Hajo-Mukalmua PWD road. It covers an area of 2 Km<sup>2</sup> with a population of 600.The Baralia river originates from the Bhutan hills. The river has all the characteristics of a flashy river like Pagladiya.It also meanders freely and has many loops, the slope being somewhat flatter in the lower reaches. In the upper reach the Baralia river bed is built up of boulders, shingle and sand with steep slope, while lower down it is in the alluvial stage.The area is a riverine tract along the Baralia River .The Baralia River has developed a crescent shaped relief particularly on the area from Bhutan foot-hill to the Bhabar alluvial zone. Relief characteristics of the study area is almost plain. The maximum is 50m from the mean sea level and the lowest elevation is only 45-48m.The slope is decline from north to south.

The Baralia river has four physiographic division from upper to lower part. These are-

- Bhutan foot-hills Belt
- Bhabar- Tarai Belt
- The North Built-up strip
- The active flood plain zone

Physiography of the area is characterised by plain topography. There is no very complexity of physiographic feature and there is not any physiographic division. The altitude of study area is comparatively high to north and slope gradually decreases towards south.The area under investigation is a floodplain which mainly composed of tertiary alluvium.

Geologically the Baralia – River especially its northern margin is closely linked with Himalayan geology .The Baralia river is mainly composed of recent and sub-recent deposits. It can be sub divided into

- (i) Older alluvium
- (ii) Newer alluvium

The Newer alluvium consists of sand, silt, shingle and clay in the alluvial plains at the lower reach of upper basin .The northern part of the basin shows a distinct layer of tertiary mainly used for bricks making .Like the rest of Assam , the area lies in the tectonic zones . Amongst the recorded earthquake the most important ones are the earthquake of 1897 and 1950.

Floodplain is a highly dynamic topography surface .So, the floodplain may be of as both a product and functional part of the whole stream environment .The study area is basically controlled by the river Baralia .The river originates from the Bhutan hills, and it flows in a southern direction for a few km and it takes westerly turn and after winding its way falls into the Pagladia river .Due to severity of flood hazard in the areas like Dusutimukh, Boulighat,Bhairatola, a jan of about 15 km was constructed in 1985 from Bhairatola to the Velkar and the jan falls into the Puthimari river.

The climate is the important phenomena of the earth atmosphere. The different area enjoys the different climatic condition on the earth surface .The climate of the study area is intermediate between those of the South Bhutan and Assam valley. While the former has a distinct hot season with the day

temperatures in April and May higher than in the rest of the year, hottest season the year.  
in the Assam valley the South West monsoon season is the

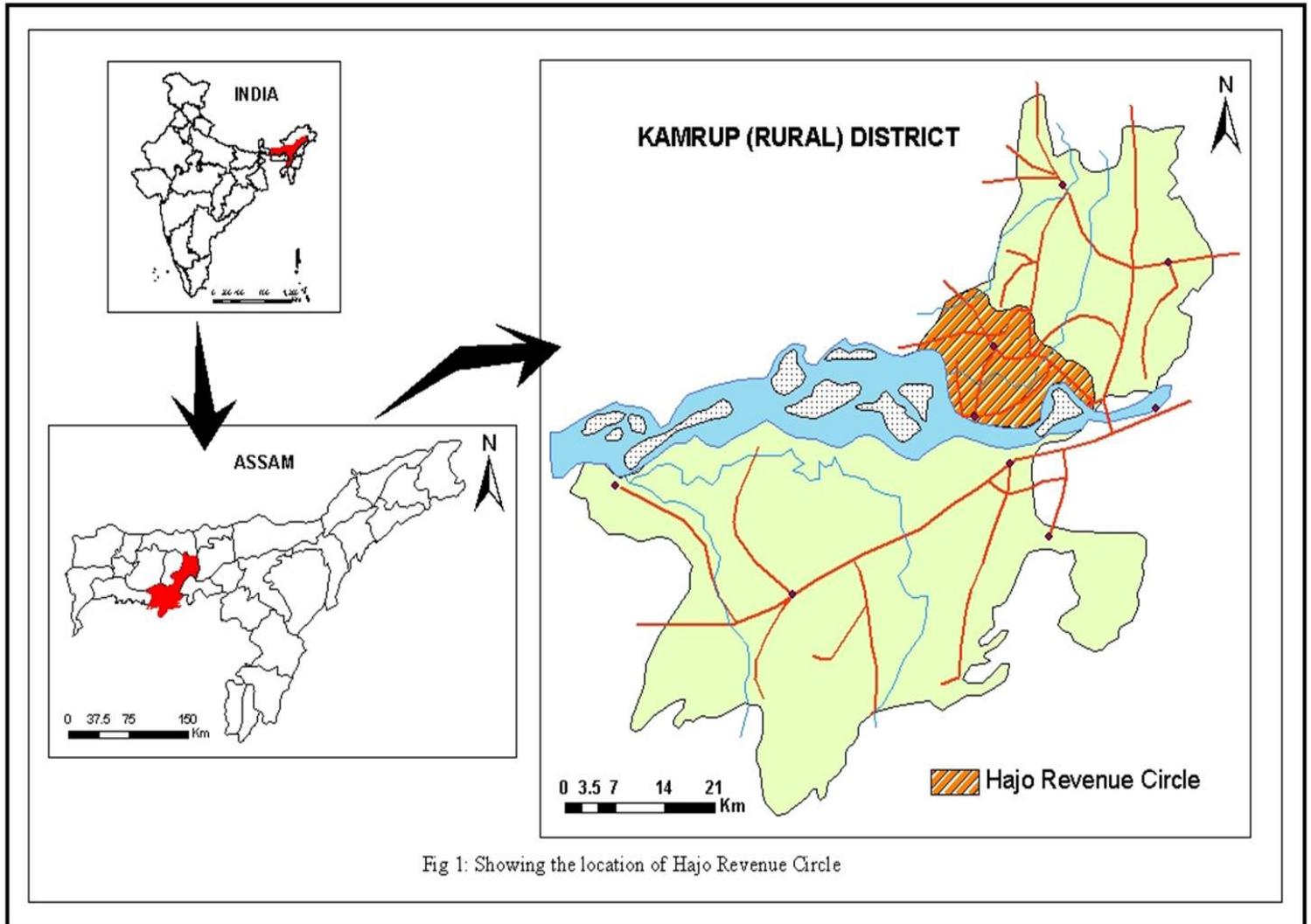


Fig 1: Showing the location of Hajo Revenue Circle

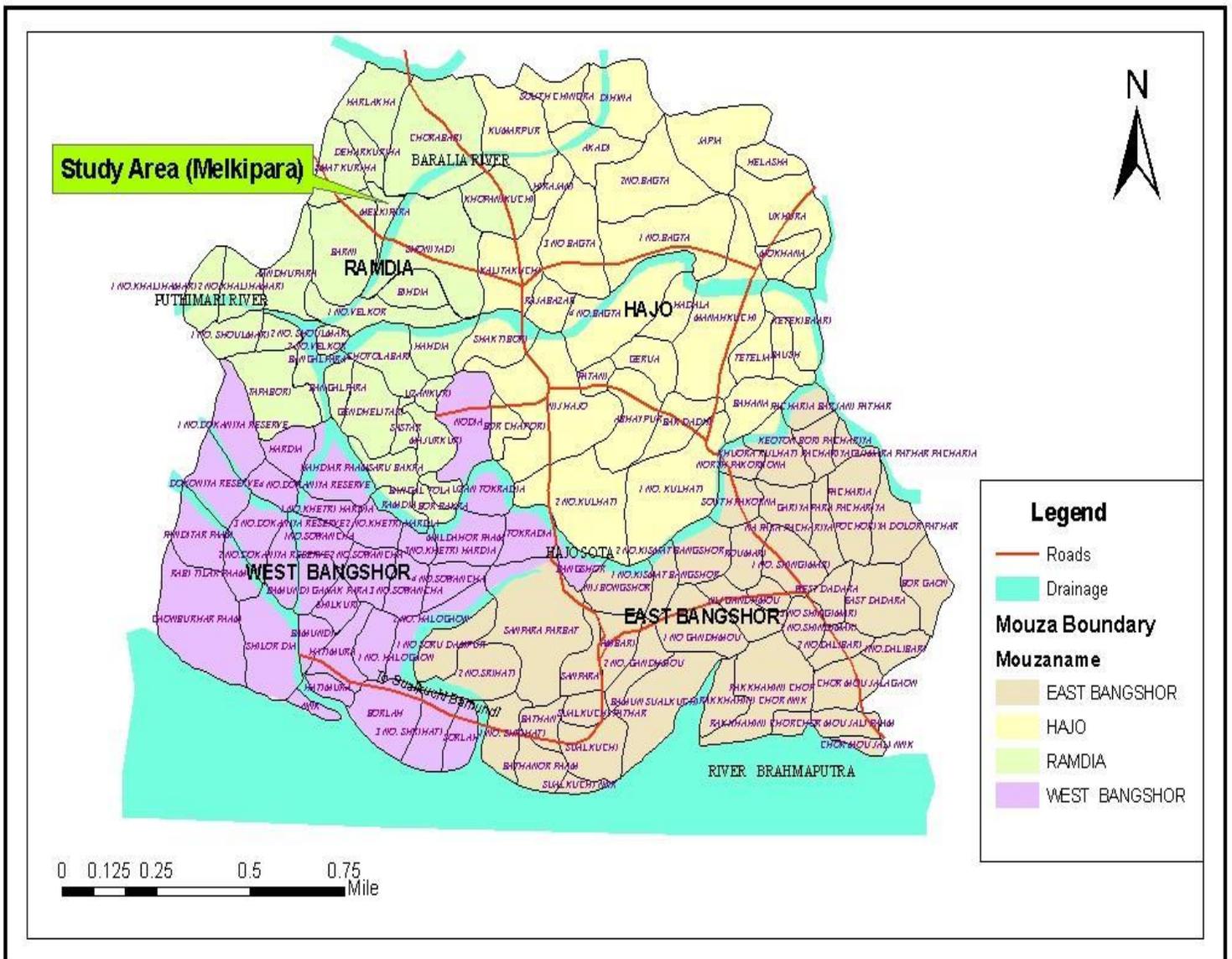
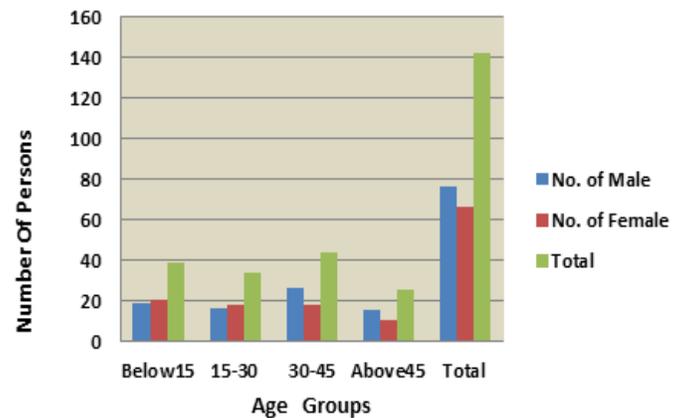


Fig 2: Showing the location of Study Area in the Hajo Revenue Circle.

**Table1: Age group wise population structure of the Melkipara village**

Age Group	No. of Male	No. of Female	Total
0-15	19	20	39
15-30	16	18	34
30-45	26	18	44
Above 45	15	10	25
<b>Total</b>	<b>76</b>	<b>66</b>	<b>142</b>

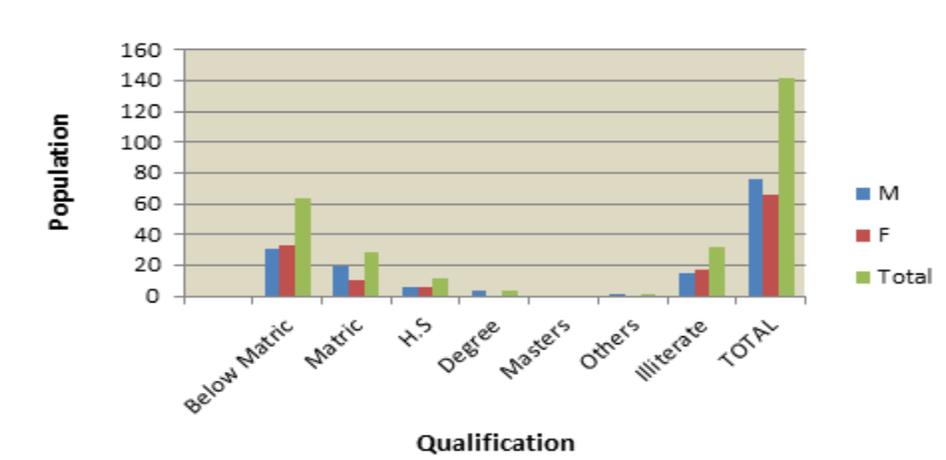
Source: Field Survey Data



**Fig 3: Showing the Demographic Structure of the study area**

**Table2: Educational Status of the Melkipara village**

Sl No.	Qualification	M	F	Total	Percentage
1	Below Matric	31	33	64	45.07042254
2	Matric	19	10	29	20.42253521
3	H.S	6	6	12	8.450704225
4	Degree	4	0	4	2.816901408
5	Masters	0	0	0	0
6	Others	1	0	1	0.704225352
7	Illiterate	15	17	32	22.53521127
<b>8</b>	<b>TOTAL</b>	<b>76</b>	<b>66</b>	<b>142</b>	<b>100</b>



**Fig 4: Showing the Educational Status of the study area**

The village is mainly dominated by the muslim population. In the study area most of the people are dependent on agriculture. They cultivate on the alluvial tract of the river Baralia which was badly affected due to erosion. Few people are engaged in secondary and tertiary activities. Primary activities like fishing are also seen in the area.

In the Melkipara village houses are Assam type and few houses are also made of bamboo and thatch. The area is poor in respect of transport and communication facilities. The Hajo-Mukalmua road is about 2km away from the village. The PWD road connecting village to the Hajo-Mukalmua road is badly affected due to river bank erosion. In the village few kaccha roads and cart tracks are also seen.

The economic condition of the village is severely affected due to river bank erosion. Erosion of agricultural land compels the villagers to settle in the government land. Many villagers shifted to safer places and engaged themselves in other secondary and tertiary activities.

**BANK EROSION SITES AND THEIR DISTRIBUTION**

The morphology and behavior of river Baralia undergo drastic changes in response to various flow regime. After the diversion of Baralia river from Bhairatola upto the Velkar the river falls into the Phutimari river whereas earlier it falls into the Pagladiya rivers which falls ultimately into the Brahmaputra River. Due to severity of flood and Bank Erosion of Baralia river in Uttarkuchi, Simula, Deharkuchi, Balikuchi, Bar Bukla, Bar Gachha Bhairatola jan was constructed in 1985 to divert the excess water from the Bhairatola point upto velkar. The jan is approximately 15 km long and it falls into the Phutimari river.

As a result the entire Baralia River change its course and flows through the Bhairatola jan and during the monsoonal seasons it flows tremendously from Bhutan Hills and flows through the Bhairatola jan and causes severe flood and bank erosion in the areas like Melkipara, Dhina, Hainadi, Akadi, Dakhin Singra, Chorabari, Andhupara, Borni. Erosion has been a part and parcel of the flood hazard that gives rise to a miserable situation in the study area. Though it is possible to adjust with flood; it is not same in the case of erosion hazard. It is thereafter after the construction of Bhairatola Jan the erosion becomes a chronic problem. Moreover due to erosion, number of times engulfing a

vast agricultural and homestead land. The entire area from Akadi to Velkar is under the grip of erosion of river Baralia (Bhairatola jan) River.

**EXTENT AND MAGNITUDE OF THE EROSION**

For a riverine location flood and erosion is a common phenomena. But it becomes a matter of serious concern when it takes the form of disaster. The study area also suffers from devastating flood. But the situation in the area is more grave due to severe erosion along with flood. The study area lies in the left bank of the river Baralia. During the monsoon season, enormous amount of water and sediments comes from the rivers coming from Bhutan hills and the entire channel area becomes full of water. Due to creation of the chars it affects the stability off the channels and the bankline. The erosion in this reach is quite intensive. Large scale displacement of people due to bankline recession is still going on in the area. From 1985 to 2012 as many as 17 villages were partly eroded. The heavy erosion started in the area after the construction of Bhairatola jan which carries enormous water from Baralia river flowing from the Bhutan hills. About 10,000 families of Dhina, Hainadi, Akadi, Dakshin Singra, Bagta No-2, Bagta No-3, Hirageni, Kumarpara, Sonarbari, Khuponikuchi, Saniadi, Deharkuria, Borni, Bihdia, Bhalkor No-1, Bhalkor No-2, Andhupara.

**PATTERN OF BARALIA BANKLINE SHIFTING**

The bankline of the Baralia River in study area is extremely stable and bank failure rampant in numerous vulnerable section along the river during the monsoon season. These failures seem to be a function of hydraulic character of flow and engineering properties of bank materials. Shear failure in the upper bank materials appear to be by far the most widespread erode of bank failure in the river. These are caused by undercutting of the upper bank materials appear to be by far the most widespread erode of bank failure in the river. These are caused either by undercutting of the upper bank materials by channels during the high floods producing on overhanging cantilevered block that eventually fails or by oversteepening of bank materials due to migration of the thalweg closer to the peak during the falling stages. Large scale slumping of bank observed during the falling stages of the river may be associated with return flows in the permeable

alluvium. High moisture content, low proportion of clay and good sorting of bank materials make the bankline highly susceptible to erosion by the river. The drastic changes in channel configuration observed in the erosion prone areas along the river indicate the dynamic nature of river morphology and the intensity of erosion caused by it. The drastic shifts of the river bankline at Melkipara during the period 2008-09 through 2012 are shown in Table 4:

**EROSION IN TEMPORAL PERSPECTIVES**

Channel migration of the river in the study area is drastic. Generally during the falling river stage bank line erosion becomes heavy. The most important reason responsible for heavy erosion in the study area is that the soil forming the bank of the river is mostly fine sand and silt, that cannot resist erosion. The study of bank position of 2008-09 and present one i.e. , of 2012 (Fig.5 ) , it is found out that about 14 meters had been eroded away in the upstream and about 17 meters in the downstream section.

**Table 3: Erosion Chart of Melkipara Village during different period**

Name of the River	Location	Depth of Erosion	
		Year	Depth in meters
<i>Baralia River (Bhairatolajan)</i>	<i>Melkipara U/S</i>	2008-09	4.00
		2009-10	3.00
		2010-11	2.00
		2011-12	5.00
		<b>Total</b>	<b>14.00</b>
	<i>Melkipara D/S</i>	2008-09	5.00
		2009-10	3.50
		2010-11	2.50
		2011-12	6.00
		<b>Total</b>	<b>17.00</b>

Source: WRD, Ghy West Division

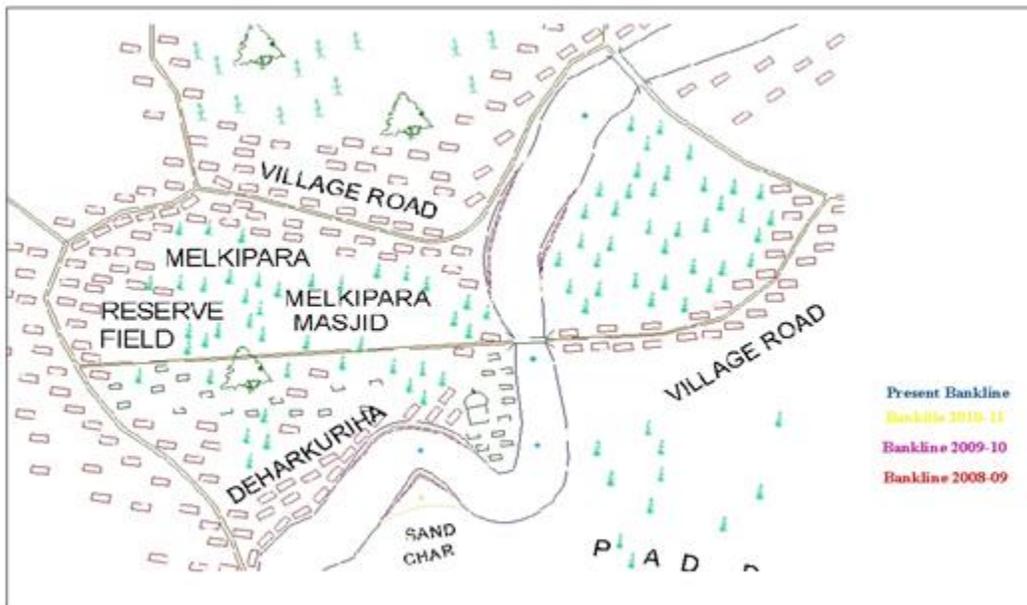


Fig. 5: Composite Bankline of study area from 2008-2012

**MECHANICS OF BANK EROSION**

Bank erosion is geomorphic process. Bank erosion is a process through which there takes place changes in channel

dimensions by lateral widening. Bank erosion is severe in the study area and due to migrating Streams River tends to erode the banks and widen the channel by undercutting and bank caving. The bankline in the study area is extremely unstable and bank

failures rampant in various areas along the river Baralia during the monsoon season. The causes of failure of river banks can be seen by the following ways:

- Underwater erosion along the toe of bank during the falling stage of the river.
- Direct erosion of the river bank
- Sloughing of saturated bank caused by rapid drawdown.
- Liquefaction of saturated silty and sandy bank material.
- Erosion due to seepage from banks at low river discharge.
- Scour along waterline due to wind or wave wash of passing vessels.

### IMPACT AND CAUSES OF BANK EROSION

Hazard implies the probability of a destructive phenomenon occurring at a particular place. If the destructive phenomena are a product of nature such as a landslide, a flood, erosion and a volcanic eruption, it is a natural hazard. The most conspicuous factor revealed by this investigation is that heavy erosion in the study area has been a part and parcel of the flood hazard that gives rise to a miserable situation. Generally, the sudden reduction in the gradient of the river drastically reduces the flow velocity causing massive aggradation of the river bed, extensive undercutting of river bank and frequent shifting of river channels. This area is subject to annual inundation by the river Baralia. Of course, the occurrences of heavy flood do not show any regularity. Some of the devastating floods, for example, occurred during 1931, 1933, 1946, 1954, 1962, 1973, 1988 and 2004 in this region. These floods caused great damage to crop lands and settlement areas of this region and triggered heavy erosion of the river bank. Thousands of people have been rendered homeless, thousands of acres of fertile croplands were destroyed and scores of cattle and even human lives were lost. Acute shortages of food stuff and diseases gripped this region and forced many people to move out of the area in their quest for survival. The large majority who are still clinging to their fast vanishing and highly unreliable little chunks of land have hardly anything as their own except the terrible hunger and the grinding poverty.

### EFFECTS OF BANK EROSION

The erosion in the study area is quite intensive and its effects on the people of the area is quite severe. From the study of bank position of 200-8-09 and the present one i.e., of 2012, it is found out that 5 to 17 metres width of fertile land had been eroded away in this area. Actually the heavy erosion started in the area after the construction of Bhairatola jan and convert the direction of Baralia river in the year 1985. The area eroded away by the river was thickly populated and highly fertile. It is worth mentioning that the area was in fact a granary of food crops. According to 2011 census the area was inhabited by about 600 people, it is impossible to estimate exactly the number of people that are rendered homeless due to erosion from 1985.

For empirical observation as well as from personal experience in the field, it is seen that a heavy influx of population is taking place in the neighbouring erosion-free villages. Many people are rendered homeless most of whom have moved out of this locality to resettle in different villages and urban places both far and near such as in Hajo, Nalbari, Kalitakuchi and Guwahati etc and in the reserve lands allocated by the government. Bank

by the Baralia river has thus created an acute socio-economic problem in the study area affecting thousands of people. The socio-economic dimension of the bank-erosion problem is therefore need a fairly thorough treatment.

**Table 4: Severely erosion affected Household in the study area from 2009-2012**

Categories	Name of the Village (Melkipara)	
	No.of Households	Percentage
Nil	15	10.563
Less than 1 Bigha	29	20.422
1Bigha-2.5 Bigha	25	17.60
2.5Bigha-5 Bigha	31	21.83
Above 5 Bigha	42	29.58
<b>Total</b>	<b>142</b>	<b>100.0</b>

*Source: Field Survey Data*

### CAUSES OF BANK EROSION

It is noteworthy that devastating floods are always accompanied by severe erosion. Since time immemorial, the flow of excess water from the Bhutan hills in the monsoon season in the Baralia River causes serious havoc in the areas like Uttarkuchi, Simula, Deharkuchi, Balikuchi, Bar Bukla, Bar Gachha Bhairatola jan was constructed in 1985 to divert the excess water from the Bhairatola point upto velkar. The jan is approximately 15 km long and it falls into the Phutimari river. As a result the entire Baralia River change its course and flows through the Bhairatola jan and during the monsoonal seasons it flows tremendously from Bhutan Hills and flows through the Bhairatola jan and causes severe flood and bank erosion in the areas like Melkipara, Dhina, Hainadi, Akadi, Dakhin Singra, Chorabari, Andhupara, Borni. Erosion has been a part and parcel of the flood hazard that gives rise to a miserable situation in the study area. Though it is possible to adjust with flood; it is not same in the case of erosion hazard. It is thereafter after the construction of Bhairatola Jan the erosion becomes a chronic problem. Moreover due to erosion, number of times engulfing a vast agricultural and homestead land. The entire area from Akadi to Velkar is under the grip of erosion of river Baralia (Bhairatola jan) River.

The other possible causes of bankline migration may be summarized as follows:

- Rate of rise and fall of waterlevel in the river.
- Rate of scour and deposition that occurs during flood.
- Formation and movement of large bedforms.
- Cohesion and variability in composition of bank materials.
- Intensity of bank slumping.

### MEASURES TAKEN TO CHECK BANK EROSION

The study area which is an extremely flood and erosion prone reach of the Baralia river demands urgent remedies. The measures taken to protect the area from the hazard are not seems to be adequate at all. Unabated erosion is going on still which makes adjustment meaningless for the poor erosion affected people. Although the measures adopted by the government to protect the area from flood and erosion, are not truly effective in most of the cases (Fig 18). Revetment, impermeable spurs, are

used at various vulnerable point but most of them are eroded away by the flood water. Porcupines made of bamboo and concrete was constructed as anti-erosion measure. Also additional protection is necessary to protect the shank against outflanking by embayment.

### FUTURE GOVERNMENT PLAN TO CHECK BANK EROSION

The Water Resources Department, Govt. of Assam has been adopting a policy to take up flood control measures such as construction of embankment, anti-erosion measures etc. in the study area. No central agencies or aid are playing any role so far

in construction of the embankment, anti-erosion measures etc which probably are the most important aspect to be attended for backward and flood prone state like Assam. The state Govt. of Assam and Central Govt. of India are the only agencies involved in the process of embankment activities.

Another important measures to check erosion is floodplain joining. The study area which is frequently visited by devastating flood and erosion cause tremendous damage to crop is a regular feature. So, floodplain zoning is very important which includes regulation of land use, changing of crop pattern etc.

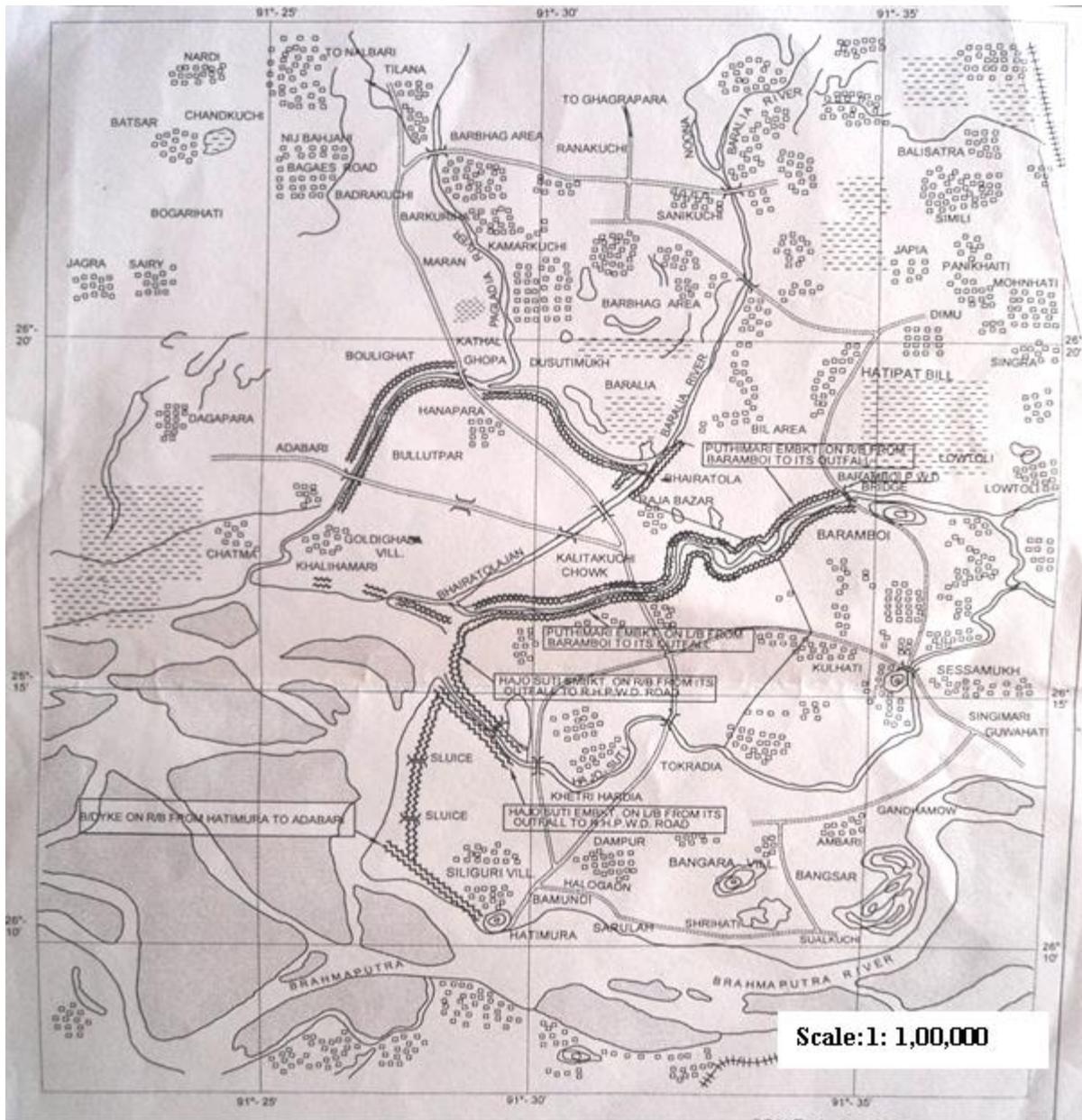


Fig 6: Anti erosion and flood measures taken by government in and around the study area.

The ravaging flood and erosion hazard always causes great damage to standing crops. The changing in the cropping pattern and proper land use regulation may be a suitable strategy to adjust with hazard. The area may be divided into some regions according to hazard intensity.

- Erosion free area.
- Slightly erosion affected area.
- Moderately erosion affected area
- Severely erosion affected area.

Besides these other measures used to check bank erosion are boulder protection, solid stone spurs, timber pile spurs, river revetment, marginal embankments, porcupine made of bamboos and other short term devices.

## VI. CONCLUSION

The foregoing study concludes that the position of the study area is severe. Erosion here is quite intensive and thousands of people are rendered homeless. Bankline migration of the Baralia River (Bhairatola Jan) has thus created an acute socio-economic problem in the study area. Anti-erosion measures adopted by the government are proved to be not truly effective.

Some suggestions may therefore be forwarded along with the concluding remarks. The first and foremost strategy is developing strong awareness programmes about importance of trees, afforestation and reforestation. Afforestation reduces soil erosion and as a result accumulation of sediment on the river bed reduce, which lessen the effects of flood and bank erosion. Adequate attention must be paid while taking up developmental activities so that natural catchments areas and drainage systems, including wetlands, are not disturbed. Haphazard development must be replaced by power planning.

Approximate soil conservation measures to check bank erosion need to be intensified. Involvement of the community will help in achieving success in such measures. Although embankments/bunds have led to more problems than solutions, yet it would be helpful if embankments are made stronger. The most plausible measure for control of floods and bank erosion stated to be the construction of dams and taming of rivers. Studies are needed on the rivers and the tributary systems in the state for taking up such projects.

The suggestion discussed above in Assam alone will not solve the problems. The cost involved will be enormous. The Central Government will have to take the major initiative and tackle these issues. It must be treated as a crucial national problem. A rational co-operation among general people, N.G.Os and the Government is very much needful for a co-hesive as well as integrated development of the study area. Relief and rehabilitation works during and after bank erosion and flood is an emergency service for the affected people. But this is not a permanent solution. An effective disaster management programme as per the Disaster Management Act, using the latest technologies, is an emergent need. The need of the hour is to prepare flood and drainage congested area mapping, flood forecasting, identification of erosion prone areas, flood and bank erosion damage assessment and relief and others by using the remote sensing satellite data.

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# Proper Environmental management is the proper way to poverty Eradication; A case study of South of West Bengal & Bangladesh

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**Abstract-** The paper indicates a prolonged research work conducted by the researcher. The climatic character of West Bengal is extremely variegated in nature. Drought and Flood are the normal occurrence since so many years. Not only that human interference also effects the area to a greater extend. The paper has tried to resolve all these vagaries

and development and building strategy for our betterment without thinking about the future. The various phases of development are directly or indirectly hampering environmental balance as well as ecological balance. We are also extending our cruel hands towards the heritage bio-diversity region of Sundarban also. What we are doing actually? Actually we are preparing our own grave and sitting on that we are thinking for the future development. I may side some important examples of it:-

## I. OBJECTIVE

The main objective of the study is

- 1) To study the causes of vagaries in the study area.
- 2) To draw a proper solution plan for the area.
- 3) To prepare of better direction plan for the alleviation of poverty.

i) Global warming was a blessing for the countries located in the cool temperate belts of the world because it was decreasing the prolonged winter of that area. But what happened actually in the last 5 to 6 years maximum ice fall have occurred in various parts of the cool temperate belts just like a little ice age. It is causing excessive contrast of temperature in the upper and lower layer's as well as unequal radio active decay of minerals of the earth's interior, increasing the mobility of the plates and are causing vigorous earthquakes. The global warming is also increasing the sea-level by melting the various ice sheets and glaciers in the various parts of the globe. That is why, since long time, it is observed that water quality in the coastal area is degrading quickly. We, the people residing at the coastal area will not get pure water for our drinking in near future. These in turn will increase poverty and will cause vagaries to the general people also.

## II. METHODOLOGY

In the study the researcher has followed three phase Methodology :

- 1) In the pre-field phase the researcher has collected map of the area and has also collected so many books related to the study.
- 2) In the phase of the field the researcher has conducted survey work in various parts of West Bengal and has collected various data and information.
- 3) In the third phase depending on the survey data and information researcher has analysed the changeable nature of the climate and as well as the various types of vagaries and has also tried to co-relate all these vagaries with the unplanned growth and development in the anthropogenic environment.

ii) The unrestricted growth and development & growth of population have caused excessive pressure on natural resources. Development and growth of urban center and growth centres developing the urban sprawl and land use pattern. Developing multi storied building and various other unusual structures by damaging the isostatic balance of the surface. Not only they are hampering the isostatic balance but also hampering the recharge and discharge of ground water flow of surface run-off and as well as normal rhythm of the hydrological cycle.

iii) Soil erosion and pollution, water quality degradation may easily hamper the agricultural productivity and also may cause health hazard. These in- turn may cause vagaries and increase poverty at a quicker rate in West Bengal and Bangladesh.

## III. ANALYSIS

Being a person of geography and environmental science I think that all the questions in the analysis of poverty have their own answer in the nature. Further I also think that if we may control the causes of poverty by the proper management plan of the nature then there is no need of any type of financial help, Government subsidies and any type of sympathy from any body and any authorities. But once we have to take a proper, perfect and planned step.

Environmental awareness has become an important part and parcel of our daily life. We are running towards the growth

## IV. LACK OF LONG TERM PREDICTION IN FIELD OF PHYSICAL ENVIRONMENT

India and Bangladesh is a land of monsoon. Its vagaries are known to every body. It happens probably due to the lack of prediction in the field of physical environment. The departments of meteorology give a predication of 24 to 48 hours in the

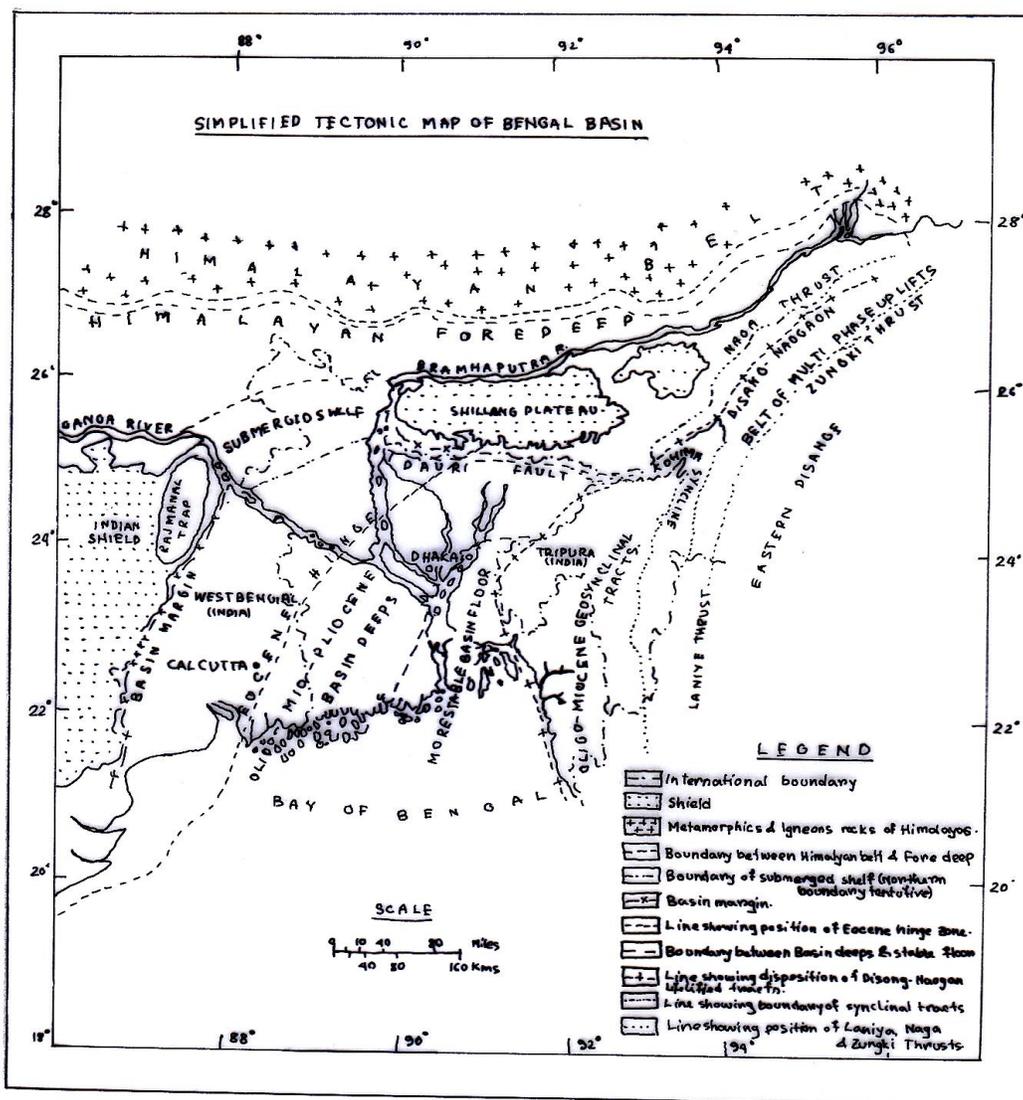
meteorological phenomena but it is too little in the field of agricultural planning. We can not get any specific information well before the beginning of any proposed agricultural activities and at the same time it is also hampering the cropping pattern and crop calendar. That is why crop failure is the normal occurrence which is increasing the level of poverty.

At last but not the least I may raise an example of Bengal delta where the lack of environmental awareness is causing the traditional poverty.

If we think for the evolution of Bengal Delta then it is observed that it has evolved in successive stages and phases. Thus the lithological arrangements have occurred over the Bengal Fan. All the water bearing stratas are extended horizontally over this fan which may carry water as the

ephemeral stream of water or sub-surface flow of water. Such typical rock layers are not capable to hold water which is causing seasonal fluctuation of ground water table in various parts of South Bengal and Bangladesh & is also hampering agricultural productivity.

Since long time various planners and authorities have tried their level best to control the flood and drought of South Bengal and Bangladesh & they have developed various dams on river Damodar, On Ganga at Farakka and on Thista with out thinking about the regulation on the recharge of ground water. We are thinking about the water distribution policies in the national and international level. But the vagaries are beyond our limit and the poverty is increasing by leaps and bounce.



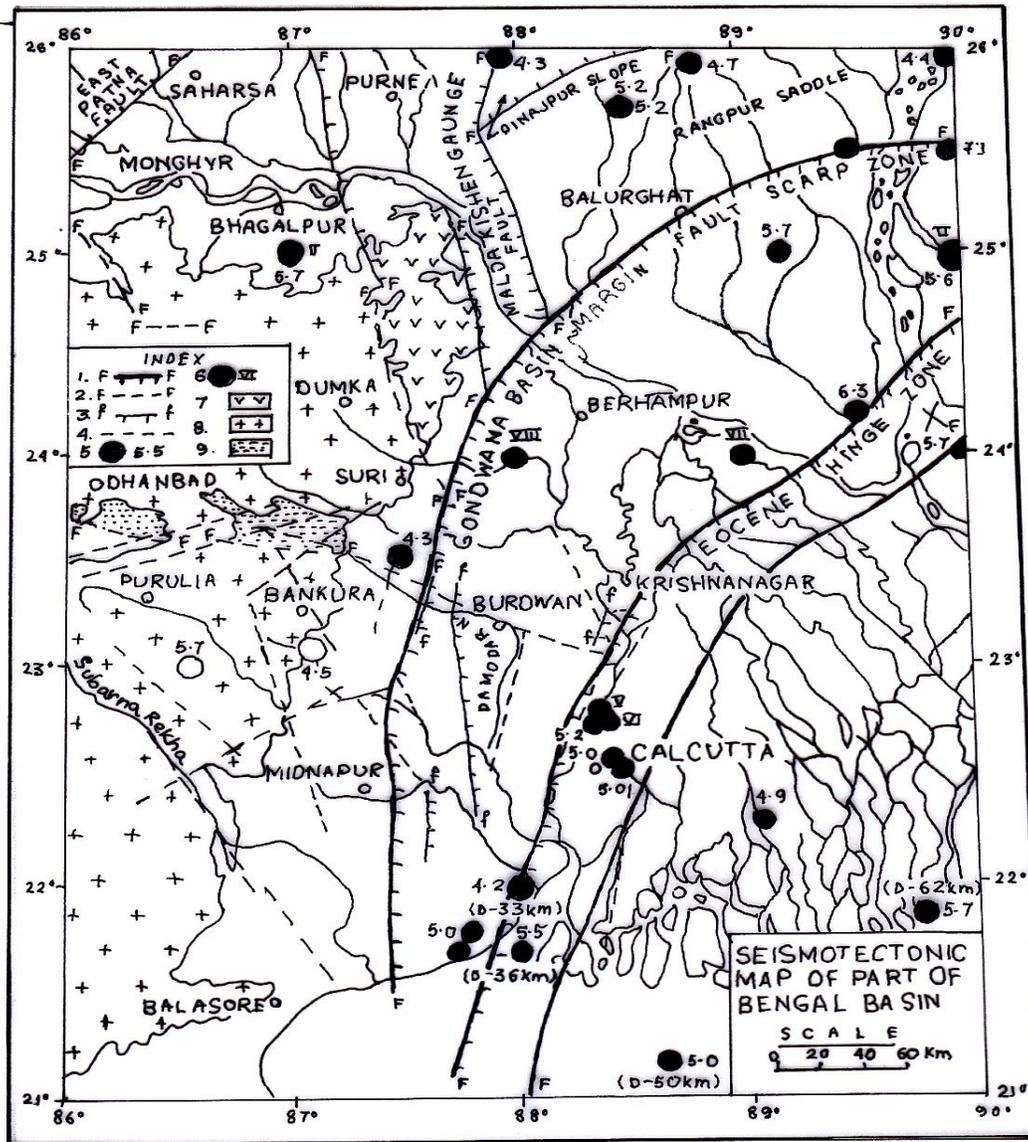
Simplified tectonic map of the northern part of the Bengal Basin

Here in this context if we go through the actual geological structure of Bengal Delta then it will be observed that in the various phases of the evolution of Delta series of faults have

developed in various parts. These faults have distorted the lithological arrangements to a greater extent. Depending on these fault lines mainly BASIN- MARGIN fault, EOCENE HINGE,

MID-PLIOCENE fault and PADMA-PABNA fault etc can easily indicate the physiographic variations in the context of the evolution. If government planners in various level can develop some under ground barricade through these fault lines up to 40 to 50 metres deep they will control the subsurface flow and ephemeral streams then these barricades can easily control the movement of surface and sub- surface flow, not only that they may also balance the seasonal fluctuation of ground water table.

After wards it will be observed that no dams on the natural flow is necessary. It may also be able to balance Arsenic contamination of ground water and salinity of water in the saturated and un saturated layers of water specifically Arsenic and Salinity are hampering the daily life in various parts of South Bengal and Bangladesh as well as causing failure in Agriculture and Health hazard.



On the other hand if we develop important roads upon these barricade then we may easily connect the various parts of India with Bangladesh, Shilong, Tripura, and Mayanmar within a very short span of time because these roads will decrease the distance between the important towns to a greater extent. This may increase the importance of the space. Our "Sundry Kolkata" & "The Beautiful Dhaka Town" will be the main business center of north-east India and South-East Asia.

As the Ganga delta is made up of loose sand and clay, so, it is clear that any type of seismic shock can easily disrupt the

layers of sediments and propagate the sliding nature of the alluvium of the delta. That is why minor Earthquakes may also have vigorous impact on this area. It is observed that there are series of faults at the delta fronts which may cause Earth quake in the sundarban area also at any time. These barricades may easily save the delta from powerful Earthquake by controlling the movement of rock layers. At the same time the whole North-East India will also be saved from such seismic activity.

In this way such condition will save delta from its vulnerability and will increase the sustainability of Kolkata,

Dhaka, Guahati and Shilong town etc. So, multipurpose and multidimensional landscape planning is necessary for the sustainability of a region as well as for the balanced growth and the development and eradication of poverty.

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# Politics in the media, Media in the society, the culture of the society

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**Abstract-** Cognitive researchers support that media has a considerable effect on social behavior of its viewers. Media practices in portrayals of specific images and messages depicted in the content of media, be it in films, documentaries, news, etc, affect people's behavior. The highly polarization of Albanian media gives credits to politics as a conduit that might affect social behavior.

Political news is the main interest for the Albanian media, therefore putting it at number one of the public agenda, producing a similarly polarized society. But, in a political reality that offers hard images, language, unethical treatment of the other, we can assume with certainty that the politicized media is projecting to this politicized society a model that is not the best. According to the cultivation theory, media consumption in general and especially the effect of television, provide audiences with a consistent set of messages that, over time and with persistent exposure, influence consumer's real word social perception, such as the more a viewer watches, the more the views reflect those presented by TV, regardless of the veracity of the message (Gerbner et al. 2002, citet by Mastro 2009). Therefore, I raise the question whether the media has fueled the outrage that is sometimes reflected in the society? Is media using its power to watchdog politics and educate society? The paper examines these issues, attempting to make an analysis of the impact politics have on society through media.

**Index Terms-** media, politics, society

## I. Politics and society

It will not be wrong to claim that Albanian media is captivated by politics, making them the main news in television, radio, newspapers. People's main discussions in cafeterias while drinking a morning coffee, or during lunch break revolve around politics. But the presence of politics in the media might sound normal and within the reason of media existence.

What appears to be an issue for the Albanian society is the intrusion of a violent political reality in our daily lives and private spaces, through media, where its increasing frequency only intensifies the effects of it.

Today, political debates, the life of public figures, or political gossips are part of people's lives, in such a level that one would know all the member of the family of the Prime Minister as it was his own. On the other hand, the personal life of a politician goes public rapidly and is unethically used as a tool to promote

the other candidate's values. Ruthless political behavior has substituted and deviated from constructive political debate for some years now. Accusations like: "who you are married to", "whom your sister is married to", "your uncle was a war criminal", "your grandparent was a collaborator with the enemy", "you have paid to take your diploma", "whose money are those you bought your villa in the Riviera", "your brother goes in vacation with the mafia of Cosa Nostra" etc, have been publicized for most political figures active in the political arena.

It looks like politics have become so personal, that family conversations would end up discussing about political issues. Not to mention that some parliamentary sessions would be so important that are fully in live broadcast from media outlets.

Not only the intensified presence of politics in the media, but also the tense political environment in the Albanian society has transformed politics to entertaining shows that in fact are harmful to the individual in particular and to the society in general. Most Albanians would sit solemnly to watch plenary sessions, especially when important decisions have to be taken. And the end is almost predictable; boycotts, vigorous debating that might end to verbal and in some cases physical violence. Because of this standstill position of politics, in the last two years not one political decision has been made, development and democratic processes are halted and economy has impoverished. Consequently, as an important factor of country's development, and their relation to people's wellbeing, political news do interest Albanian citizens. Therefore, it is the audiences demand that appeals for media content.

However, in the contexts of ethics and communication culture, especially the culture of political debate, media, especially television has unselectively broadcasted a lot of aggressions, accusations, offences, violence; physical or verbal, all formulated in such a common language, inappropriate even for the most random public space. In fact, Albanians have witnessed a lot of the above indiscretions coming out from the house of representative, that supposedly sacred place, where our governors are elected to represent us and discuss constructively and take decisions for our wellbeing. Instead, the parliament of the last 5 years has been transformed in an arena of kung fu fighting and slang terminology, sometimes improper, unethical and offensive. These kind of violent actions have been mediated and sometimes transmitted live in the media and then repeated continuously in every news editions, all day long and the next day in all newspapers, and repeated again for some days.

Albanians viewers have been exposed to scenes filled with conflict, be it physical and verbal. The high level of exposure to violent information creates a tense socio-microenvironment that at some stage starts to be perceived as normal, and no one reacts to change it. People become desensitized towards this violence and in the worst case it may become subject to imitation. Audiences are just simply viewers of the violent acts. Cognitive psychologist and media researcher have long acknowledged the effects of media in social behavior. This means that individuals that are exposed to violent acts, tend to mimic the act. When the action then, comes from a legal authority, e.g. a physical violence or an unethical terminology, it is prone to imitation.

## II. Media' social effect

Social psychologists have dealt with media influence on people's behaviors, attitudes, and their predisposition to evaluate or imitate others. People are aware of and can report most of their attitudes, but sometimes people come to favorable or unfavorable predispositions of which they might not be aware or deny<sup>7</sup>. The attitude construct assumes that a person's attitude – whether implicit or explicit- is an important mediated variable between exposure to new and old information on one hand and behavioral change on the other.

Therefore, media use and its content create a mental model that reinforce the cultivation of models, which are considered as cognitive devices that allow viewers to incorporate subjective and objective components of mediated information into malleable versions of knowledge, or mental representation for use in interpreting incoming messages. In other words, how much people watch and how they perceive what they are seeing in the content contribute to the formation of behavioral models.

### a. Exposure/Repetition

Political news are in the media in high quantity, exposure and voltage in our daily life. Further below I will give some figures on political news in news editions which illustrate the level at which information gets to our homes every day.

The communication matrix model (McGuire 1985, 1989), contends that in order for effective influence to occur, a person first need to be exposed to the same news information. Also, by deciding what to present, those who control the mass media help define the range of issues to which the public is *exposed* (Iyengar, Kinder, Peters, & Krosnick, 1984, cited by Petty, Brinol, Priester 2009). Then the person must *attend* the information presented and according to the relevance of the issue with the person's personal interests the information gets absorbed and becomes personal, making a person develop *interest* on the information. The level at which the information becomes personal depends on the stress media puts on it and on the

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<sup>7</sup>Petty, Richard, Brinol, Pablo, Priester Joseph, Media attitude change, Implications of elaboration likelihood model of persuasion, cited in the book 'Media effects. Advances in theory and research' Bryant, Jennings, Oliver, Mary Beth, third edition, 2009, Routledge, UK, pg 127

relevance of the information to our interest and concerns. Then the person will start to understand and learn the information. So, when information is *comprehended* and *acquired* the attitude change or *yielding* will occur. Once the person accepts the information he will store involving *memory*. At a certain moment, when the need arises the person will *retrieve* the information and attitude that it supports from memory and would perform the *action*. And then is *reinforcement* and *consolidation* that have to do with the person's behavior toward the attitude and the reaction that the attitude takes (reward or punishment)

### b. Social diffusion.

As social psychologist claim, the images offered by the media are subject to imitation by the viewer therefore constructing a typology of the society that is induced by models offered by media. Even though, they admit that the society has the mechanisms to evaluate the information that would construct the behavior, in the condition that it (the society) is suppressed by the influx of information it should not be blamed for its behavior. Its relation with the medium becomes almost unconscious<sup>8</sup>. Public reaction toward that information that is irrelevant to the society is almost inexistent. Its consciousness is not interested to distinguish between what is normal and what is not. It tends to imitate as if being hypnotized.

Social diffusion is a process that fosters adoption of mediated issues to functional adaptations. When violent information is exposed to the media repetitively for a considerable time, it will be functionally adapted by the individuals causing them to imitate it. When dominating news in the media is politics, and when this politics is highly unethical, violent verbally and physically, the message conveyed from the legitimate authority through another legitimate authority, from parliament through the media, to the public is socially very meaningful for the numbed senses of the society. In this case people will behave in a way they deny if a legitimate authority sanctions their conduct, as they do not feel responsible for their action that spring from the dictate of others (Milgram 1974, Bandura 2009).

### c. Numbness of the public

Imagine somebody or a group of people screaming (not just tell – but tell with temper) in your ear the same words. It becomes psychically tiring and unbearable to hear the voices or watch the images that are emotionally unhealthy. But, after some time the public becomes accustomed to them. Similarly, a person who works in a factory, or people who live close to airports are no longer disturbed by the noises and become used to it. In a way, they become so addicted to information that they lose their selective skill; can not live without it and absorbs everything in offer.

The repetitive informative frenzy becomes a normal environment of the function of the individual senses and his psychology. This is a dead end where the person feels pressed by the informative

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<sup>8</sup> Fuga, Artan, Lexime mbi komunikimin, pg 220 Ora, 2005

influx offered by the media but at the same time cannot live without it. So, the person cannot react against any inappropriate information, such as violence etc, and he starts to perceive it as a normal situation. As long as these images get in our homes daily they look like normal, his conscious is numbed, his senses anesthetized and he starts to imitate.

#### **d. Desensitization**

Media audiences' number is by millions. Therefore, it can be said that every small statistical effect can translate into an important social problem. And media can not simply be a transmitter of the information, but should adhere to its principle as an informer and educator.

Media violence in films, entertaining programs, debate, news might increase aggressive behavior because it causes emotional desensitization. So, with repeated exposure to this violence, psychological saturation or emotional adjustment takes place such that initial levels of tension, anxiety, disgust etc. diminish or weaken. As people's sensitivity to violence becomes increasingly dull, violent behavior may increase, in part, because it is simply not recognized any longer as behavior that should be curtailed (Sparks, Sparks and Sparks 2009).<sup>9</sup>

So, with the media getting so deep in the details of a crime the readers/viewers lose sensitivity. This is even more dangerous when a child might be in front of television by accident (apparently news editions should be classified as not appropriate for children), because watching violence on television can affect the way children view the world and the way they relate to others. It can anesthetize their responses to cruelty and suffering or make them excessively fearful.

According to the cultivation theory, media consumption in general and especially the effect of television, provide audiences with a consistent set of messages that, over time and with persistent exposure, influence consumer's real word social perception, such as the more a viewer watches, the more the views reflect those presented by TV, regardless of the veracity of the message (Gerbner et al. 2002, citet by Mastro 2009)

### **III. Social issues vs. political issues**

#### **e. The impact of media content in social behavior**

Most of political actions and power relationships operate at the societal level. Failure to link social problems with societal and political responsibility extends to poverty, racism, crime, etc. This supports the fact that most social problems, that are

abundant in the Albanian society, come by the displacement of responsibilities by the legitimate actor. Economic and societal problems of Albania are blurred by violent and controversy of politics, which are reflected also in the media. As mentioned in this study, media can be a contributor to the way social issues are perceived by the society.

Similarly to the violent political content present in the news, the social life appears to be frustrated. Last year, statistics of crime in Albania were significantly high. Let aside organized crime, a concerning issue has become criminality in the street, in family, suicide, etc., which gives the impression that life in Albania has started to look so scarce. Despite this, in the news edition politics takes up most of the space. According to a survey undertaken by The Forum of Free Thought and the Institute for Contemporary Studies in 2010 politics dominates the media landscape. Although, Albanian society has a lot of concerning social issues to be covered, media shows little interest for those. According to the survey, respondents have admitted that political news are important for them and the society, because politics determines other aspects of development such as economy. However, respondents complain that media pays more attention than necessary to political news. For example, if a news edition is 25 minutes, it is estimated that 12 – 15 minutes is dedicated to politics, which is 48 – 65 % of the total time of the news. The rest of the news time remains for crime (13 – 16%), then is economy (12 – 13), and in the lower proportion are social issues, culture, and etc.

The situation is the same 3 years later. According to a student survey of the Department of Communication, political news take up 63% of news edition followed by crime, business and other news sectors. Crime news take up the second position in level of importance in the news editions in television or in newspapers, after political news. On the other hand, news about social issues take up only a small percentage of the overall news edition or newspaper pages. But adhering to the role of media, its duty is not only to inform, but also to educate. Media reporting on criminal issues does not have the social gravity, instead crime is reported as a simple occurrence of the day. Furthermore, it describes all the details of the felony accompanied by inappropriate images, treating the personal stories of people as interesting news to increase medium's audience ratings rather than address social problems. There is no reporting on the increase of this phenomenon from the standpoint of the society. Imagine an article reporting on a suicide, describing details and the way (knot a tie or the poison used) the act has been performed. It is not a news informative, but a 'how to' manual for those desperate with their lives. And when the repetition of these kind of news to all media available, print, broadcast and online, at any time of day, people with suicide or criminal predisposition would involuntary be pushed to criminal actions This concern has also been expressed in a study by the Albanian Media Institute that analyses the content of social issues in the media. They are taken to such action by the immense effects of media that, numbs mind and pushes people to imitation.

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<sup>9</sup>Glen Sparks, Cheri Sparks & Erin Sparks, Media violence (2009), Media effects: Advances in theory and research: 3<sup>rd</sup> ed (edited by Jennings Bryant, Mary Beth Olivr), Taylor & Francis

It looks like media in Albania is weak to play its watchdog role. Politics are imposed to the media that submerges itself to the power of the elected few. This increased influence is because media outlets are peripheral businesses of their owners, who opened up a media, as a mean to create advantages for their primary businesses. This factor has submerged media in the pressure of politics behaving like a servant or a spokesperson of political actors, who seek public advantages by misbehaviors of their opponents. And media easily succumbs to their wits and desires. And in an environment where politics is characterized by violent actions, foul language, anger toward the opposing party, where tolerance, compromise, compassion, morals, and rules are inexistent, it looks like social life is reflecting it.

A few years ago, an armed member of parliament shoots his colleague because of a political argument. A year ago scenes of MP-s 'kung fu' fighting with each other became so common that they started to look normal. Boycott, punches, offences and other unethical and outrageous behaviors were anticipated and apparently imitated. Similarly there have been reports of people getting killed after quarrelling for a piece of land, a husband slaughtering his wife because of suspicions of infidelity, a young man shooting his friend because he loses in a chess game, an old man chopping a young woman whom he claims owed him 300 euro, a group of youngsters running over a Greek- ethnic minority man because he speaks Greek. Life spared for nothing.

#### **IV. Media programming culture in the Albanian society**

According to academics, media not only offers knowledge informing us for what happens, but they also classify and structure the political reality by defining if news are more or less significant by the level they are present or not in the media program.

Because of the relevance of political decision-making to our lives, political news attract a large number of audiences. Therefore, political news are placed in television throughout the day, from the first hour of the morning. The morning programs are a mix of soft news, political news, actuality, accidents, etc., exposing people to the hard realities before facing the day. If somebody chooses to read the newspaper it is the same reality. Then, throughout the day, repeated editions in TV would keep the audience 'informed' about the events of the day and/or repeat those of the previous one. The influx of political information is enormous and the repetition of it even more troublesome. In more than half of the time of the whole news edition televisions would broadcast parliamentary meetings held in tension and vigorous debates with offences and accusations, refusals and boycotts etc.

Adhering to the informative pressure of the media and the need to be informed, the individual can do nothing but accept the information offered. This fact may explain the impact that politics had in people's lives during communism in Albania. Since then, with a thirst for information, the Albanian society of the immediate post-communism period was a willing frequent client of cafeterias where people would gather to read

newspapers and debate on the news that sometimes would deteriorate to verbal and physical confrontations.

#### **V. Conclusions**

Because Albanian media is merely a watchdog, and it has surrendered itself to the hand of politics, it is the latter that makes up and defines the quality of the media. Information that is exposed in the media is massive in terms of quantity but void in terms of quality, consequently affecting societal construction. Therefore, the question in the today Albanian media is not only 'what' are we watching, but also 'how' and 'why' is it selected for transmission? Referring to the quality of the media we can deduct that little thought is put to answer this question. Most evidence shows that the influence of politics in the media is the main factor for media quality.

The political dependence of Albanian media and its interest to convey ideological messages to the public, has made media a spokesperson of politicians who accuse, offend, fight, harass their counterparts, and all this is broadcasted uncensored. This tense political environment comes through the media to our homes and remains there. Facts and images conveyed by the media form a social construction of the reality influencing people's conception of the world around them. Images that come through television have an immense contribution on this. The mass media conveys basic images about the social and political structure of society, their ideological orientation, conventional composure of different groups and the power or relations among them.

In term of social behavior, media influences in shaping and changing individual behavior. Repeated exposure to violence, especially to violence that comes from a legitimate authority, can be reproduced in real life as it starts to be perceived as a normal occurrence. Recurrent exposure can numb the senses and desensitize and habituate people to cruelty. They are no longer upset by it. They will experience launch of emotional arousal and tolerance to some level of aggression depicted by media violence until they are lead to aggression. This effect contributes to shaping a public consciousness. Media has a say in this. Therefore, we can assume that media is the mirror of society

Despite concerning issues that are apparent in the media landscape, the problem should not be fully placed on the media. Given that the Albanian media landscape is still generalized, all of them have almost the same informative and thematic structure, oriented to the same public that is only different as far as political ideology concerns. For this reason, news are intensively repeted in all print or electronic media outlets. Profiled media would probably be a solution to this unified way of information, that most probably would distract audiences attention from political news the generalized media offer.

However, in a highly politicized media, where owner's interest prevail, and in a highly politicized society, politics will continue to dominate the news editions or newspaper pages. It is then, the quality of politics, followed by the media attitude and its criteria of news selection that will determine societal behavior.

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# High School Students' Attitude towards Learning English Language

Gajalakshmi

**Abstract:** A study was attempted to investigate the IX-standard students' attitude towards learning English language. A standardized questionnaire was administered in the form of normative survey to 600 IX standard students (selected randomly from various high and higher secondary schools in Puducherry region) to collect their attitude towards learning English language. The collected data was statistically analyzed by SPSS ver-16. The results revealed that there is a significant difference based on the gender, locality of the school, type of school, type of management. Hence it was concluded that more classroom activities in the study of English enhance pupils' attitude to learn English.

## I. INTRODUCTION

Education is the powerful tool which helps to modify the behavior of the child according to the needs and expectancy of the society. Student's attitude is an integral part of learning and that it should, therefore become an essential component of second language learning pedagogy. Attitudes toward learning are believed to influence behaviors such as selecting and reading books, speaking in a foreign language etc. Especially in Education, if the students have positive attitude towards any subject, they can achieve many things in that specific area. There is an interaction between language learning and the environmental components in which the students were grown up. Both negative and positive attitudes have a strong impact on the success of language learning.

“Attitude is determined by the individual's beliefs about outcomes or attributes of performing the behavior (behavioral beliefs), weighted by evaluations of those outcomes or attributes. Thus, a person who holds strong beliefs that positively valued outcomes will result from performing the behavior will have a positive attitude toward the behavior. Conversely, a person who holds strong beliefs that negatively valued outcomes will result from the behavior will have a negative attitude.” Attitude concept can be viewed from these three dimensions. Each one of these dimensions has different features to bring out language attitude results. Accordingly, the attitude concept has three components i.e., behavioral, cognitive and affective. These three attitudinal aspects are based on the three theoretical approaches of behaviorism, cognitivism and humanism respectively.

## II. BEHAVIORAL ASPECT OF ATTITUDE

The behavioral aspect of attitude deals with the way one behaves and reacts in particular situations. In fact, the successful language learning enhances the learners to identify themselves with the native

speakers of that language and acquire or adopt various aspects of behaviors which characterize the members of the target language community.

### **Cognitive Aspect of Attitude**

This aspect of attitude involves the beliefs of the language learners about the knowledge that they receive and their understanding in the process of language learning. The cognitive attitude can be classified into four steps of connecting the previous knowledge and the new one, creating new knowledge, checking new knowledge, and applying the new knowledge in many situations

### **Emotional Aspect of Attitude**

**Feng .R and Chen .H (2009)** stated that, “Learning process is an emotional process. It is affected by different emotional factors. The teacher and his students engage in various emotional activities in it and varied fruits of emotions are yield.” Attitude can help the learners to express whether they like or dislike the objects or surrounding situations. It is agreed that the inner feelings and emotions of learners influence their perspectives and their attitudes towards the target language (**Choy S.C & Troudi .S, 2006**).

## III. NEED FOR THE STUDY

Though the 10+2+3 pattern of education had introduced in Tamilnadu as early as 1978, not many empirical studies have been conducted on the various aspects of this newly introduced pattern of education. It is well known that this pattern of education was introduced in a hurry without caring for even the most essential of the hour. Hence the investigator has made an attempt in this study. It has become imperative to study the level of students’ attitude towards English as it has become a main subject of competency. As a subject it has become a pivotal in the education system. It is also important to study the methods and approaches in learning English. The level of 9<sup>th</sup> standard school students’ standard in English and study their attitude become the need of the hour. Hence the investigator has made an attempt in this study. High school period is an important stage to the students to face lot of competition and it is a gate way for them to enter into the higher studies. So they are aware of the importance of English, how it is mainly helpful to them to do well in the academic study and their professional life in future. Since they want to continue their higher studies in Puducherry, the English is considered as the second language in every school. It is tough for the students to understand the English language. Hence the investigator feels that the class room activities in the study of English should develop the pupils’ attitude towards the study of English and it should help them to enhance interest to learn English.

## IV. OBJECTIVES OF THE STUDY

1. To find out the 9<sup>th</sup> standard school students’ attitude towards English.
2. To find out the attitude of 9<sup>th</sup> standard school students towards English in relation to the following variables.

- Gender
- Medium of Instruction
- Religion
- Locality of the school
- Type of school
- Type of management

#### V. HYPOTHESES OF THE STUDY

1. The attitude of the 9<sup>th</sup> standard students in English is high.
2. There is no significant difference in the attitude of 9<sup>th</sup> standard students in learning English with respect to the following variables
  - a. Gender (male/female)
  - b. Medium of Instruction (Tamil and English medium)
  - d. Religion (Hindu/Christian/Muslim)
  - e. Locality of the school.(Rural/Urban)
  - f. Type of school (Boys/Girls/Co-Educational)
  - g. Type of management.(Government/Private)

#### VI. TOOL USED

Likert type of attitude scale designed with the help of the standardized tool prepared by Dr. Lilly Epsy Bhai and S. Magethiran was used for this normative survey. The five point scale consists of 28 test items with 14 favorable and 14 unfavorable statements against five different responses viz "strongly agree" (SA) "Agree" (A) Undecided (UD), Disagree (DA) and "Strongly Disagree" (SD).

#### VII. SCORING PROCEDURE

A score of '4', '3', '2', '1', and '0' are given to the responses of the sample in the given order for the favorable statements and they are reversed for the unfavorable statements. The grant score was used to interpret the overall attitude of the individual.

#### **RELIABILITY AND VALIDITY**

To measure the reliability of the tool, the researcher has adopted retest method. The same attitude scale is administered to different occasions for the same population with a month interval. The 't' value for the scale was found to be significant at 0.01 level. To measure the validity of the tool the researcher has received opinions and judgment from experts and authorities. In this way the validity of the tool is measured.

**SAMPLE OF THE STUDY**

Random Sampling method was used to select the samples. 600 IX standard students (include both gender) are selected from 14 High School and Higher Secondary Schools in Puducherry region was used as the sample for the present study.

VIII. RESULT AND DISCUSSION

The data collected from the sample are statistically analyzed by using SPSS Ver.16 package. The results are presented in the following tables 1 and 2.

**Table – 1: The Mean, Standard Deviation Scores of The 9<sup>th</sup> Standard Students Attitude Towards English**

GROUPS	N	MEAN	STANDARD DEVIATION
Total	600	54.41	32.69

The above table shows Mean, SD of 9<sup>th</sup> standard students attitude towards English subject. The result reveals that, students have average attitude towards English. Hence the above stated hypothesis is rejected.

**Table-2: Shows the attitude of 9<sup>th</sup> standard students towards English related to their demographic variables**

VARIABLES	SUB VARIABLES	N	MEAN	SD	t-VALUE	SIGNIFICANCE AT THE 0.05 LEVEL
Gender	Male	216	57.91	35.82	2.88	Significant
	Female	384	52.44	30.67		
Medium of Instruction	Tamil Medium	59	52.56	33.13	0.452	Not Significant
	English Medium	541	54.61	32.67		
Religion	Hindu	541	54.04	32.91	1.032	Not Significant
	Christian	38	58.76	26.87		
	Hindu	541	54.04	32.91	0.249	Not Significant
	Muslim	21	56.10	37.33		
	Christian	38	58.76	26.87		
	Muslim	21	56.10	37.33		
Locality of the School	Rural	185	50.65	26.11	2.103	Significant
	Urban	415	56.08	35.13		
Type of School	Boys	91	55.31	27.51	1.595	Not Significant

	Girls	216	49.65	30.40		
Type of School	Boys	91	55.31	27.51	0.656	Not Significant
	Co-education	293	57.63	35.37		
	Girls	216	49.65	30.40	2.732	Significant
	Co-education	293	57.63	35.37		
Type Management	Government	300	59.23	35.53	3.651	Significant
	Private	300	49.58	28.85		

From the above table -2, it is observed that there is significant difference at 0.05 level in the attitude of the sample towards learning English language with respect to Gender, Type of management, Locality of the school and type of school (girls/Co-education type).

The Medium of instruction, Religion, Type of school (Boys/girls; boys/co-education) does not have an significant impact upon the attitude of the sample towards learning English language.

**IMPORTANT FINDINGS**

- Male students have high attitude towards English than female students. (Mean value Male: 57.91, Female: 52.44).
- Urban area students have high attitude towards English than rural area students. (Mean value Urban: 56.08, Rural: 50.65).
- Co-Educational school students have high attitude towards English than other school students. (Mean value Co-Educational Students: 57.63 Boys: 55.31, Girls: 49.65).
- Government school students have high attitude towards English than private school students. (Mean value Government School: 59.23, Private School: 49.58).

**EDUCATIONAL IMPLICATIONS**

1. Teachers can make a valuable contribution in developing a friendly relationship with their students, in order to develop a positive attitude towards learning English language,
2. Positive psychological classroom atmosphere needed for learning language, and the errors are considered as a natural part of the process of learning English language.

3. Teachers should motivate the students to learn better English, by highlighting its importance as they need English for getting employment purpose in future.
4. Educators and parents should always encourage learners to read materials written in English like newspapers and magazines.
5. Educators who qualify to teach English must have received a relevant training and qualification in English. If the above condition is taken care of learners would receive proper knowledge which would help them to develop confidence and they will be competent in the world.

#### IX. CONCLUSION

The Government, Educationalist and Teaching Community are interested in providing quality education, which will lead to produce more achievement. Students are significantly differing in their attitude based on the gender, locality of the school, type of school, type of management and also in father's and mother's occupation. This clearly underlines the need for special attention in this area. As in depth study may be conducted to find out the reasons for significant differences in their attitude. It is widely accepted that an important predictor of success in learning English language is the attitude of the students.

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# Low cost wireless control and monitoring using PLC and SCADA

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**Abstract-** PLC is a controller used to automate the industrial process and monitor itself. Programmable logic controller is used in many industries to control the whole process automatically with less human intervention and to avoid errors. With the rapid growth in technology wireless instrumentation has come into existence to avoid cabling infrastructure and to obtain efficient control. In order to have a wireless control the existing plcs have to be replaced with wireless plcs. PLCs are also used in homes and small scale industries to automate small process applications. So it is undesirable to invest on wireless PLCs which are expensive for home based applications. In this paper we present a novel approach of converting the existing wired plc into wireless plc by configuring XBEE in direct mode using X-CTU software as communication interface between plc and process, the process used here is batch process and controlled through SCADA.

and can be monitored and controlled by observing the flow of the process designed.

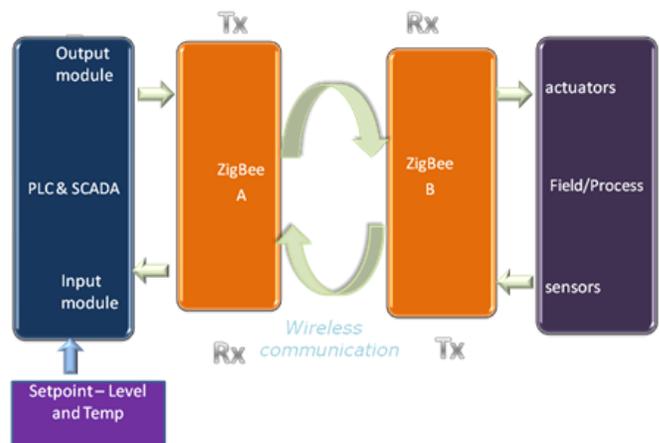


Fig1: Block diagram of proposed system.

**Index Terms:** PLC, XBEE, X-CTU software and SCADA

## I. INTRODUCTION

A Programmable logic controller (PLC) is a device that was invented to replace the necessary sequential relay circuits for relay control. The plc we used here is ge-fanuc in which the ladder diagram is designed for the batch process. As the wireless plcs use modem for transmitting signals from plc to the process here we are using Xbee as the communication interface which is used for transmitting and receiving the signals from the plc to process and vice-versa. The X-ctu software is used for configuring the xbee from uart mode to direct mode. In our process we use two xbee's one is for the process side and the other is for plc. The two xbee's are configured with same pan id and addressing to communicate each other. With respect to desired operation the pins are configured using x-ctu software. The process is monitored and controlled using the proficy hmi/scada- cimplicity software in which the whole process is designed and interfaced with versapro ladder diagram designed earlier.

## II. BLOCK DIAGRAM OF PROCESS:

We have created a batch process in which the temperature and level are the main parameters to be controlled and the setpoint for these two parameters are given by the operator/user in the SCADA HMI interface. As in the block diagram the process is in one side and the plc & SCADA on the other side transfer and receives the signals through the xbee's placed in between. The process is initiated by the user from the SCADA HMI interface

## III. OVERVIEW OF XBEE

ZigBee is a wireless technology developed as an open global standard to address the unique needs of low-cost and low-power wireless personal area networks (WPANs). The ZigBee standard takes full advantage of the IEEE 802.15.4 physical layer specification and operates in unlicensed bands worldwide at the following frequencies: 2.400 – 2.484 GHz, 902 – 928 MHz and 868.0 – 868.6 MHz. ZigBee may operate in different kinds of networks: in *star network* the ZigBee coordinator starts the network and all the other nodes are directly associated with the ZigBee coordinator. In the other two types of networks there is a third type of ZigBee nodes, ZigBee routers, to which end devices can associate. The ZigBee routers can associate themselves to other ZigBee routers or the ZigBee coordinator. In *tree networks* the ZigBee routers form a tree that is rooted at the ZigBee coordinator. In the *mesh networks*, the network topology might be a general mesh network involving ZigBee routers and the ZigBee coordinator. There are two methods for reading the data as it comes to xbee:-

1. By default it is done through the **UART**.
2. By **XBEE DIRECT**: support ADC and digital I/O line passing.

When the appropriate DI pin is toggled, the module will toggle the corresponding DO pin on the base module.

#### IV. ROLE OF X-CTU SOFTWARE

X-CTU is a Windows-based application provided by Digi shown in fig 2. This program was designed to interact with the firmware files found on Digi's RF products and to provide a simple-to-use graphical user interface to them.

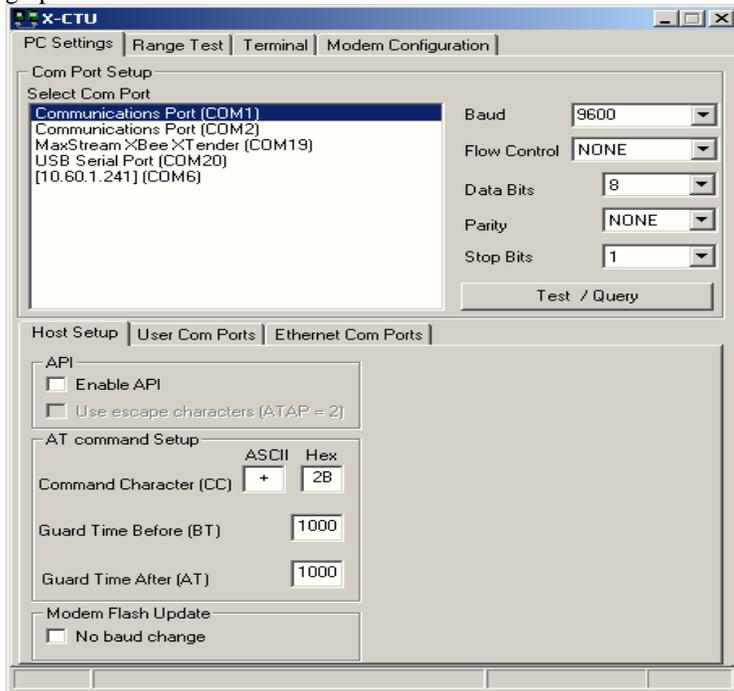


Fig 2: X-CTU software

When launched, four tabs will be seen across the top of the program

1. **PC Settings:** Allows a customer to select the desired COM port and configure that port to fit the radios settings
2. **Range Test:** Allows a customer to perform a range test between two radios.
3. **Terminal:** Allows access to the computers COM port with a terminal emulation program. This tab also allows the ability to access the radios' firmware using AT commands.
4. **Modem Configuration:** Allows the ability to program the radios' firmware settings via a graphical interface. This tab also allows customers the ability to change firmware versions

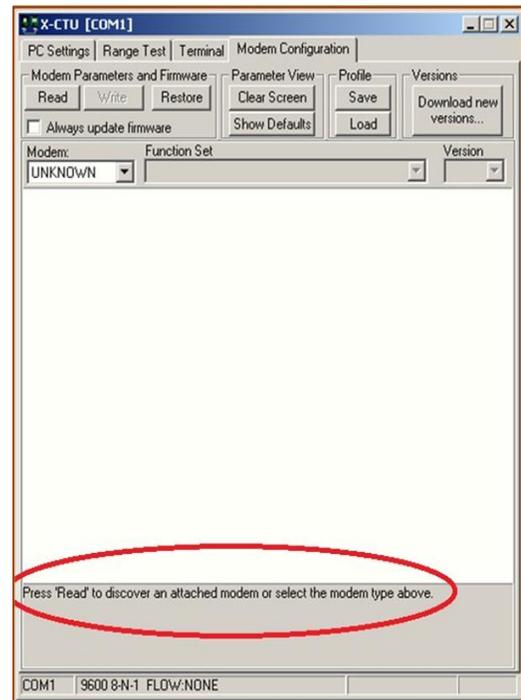


Fig 3: before reading the xbee connected to pc.

When the read button is pressed after connecting the xbee to pc the configuration parameters of xbee are seen on the screen to change accordingly as shown in fig 3.

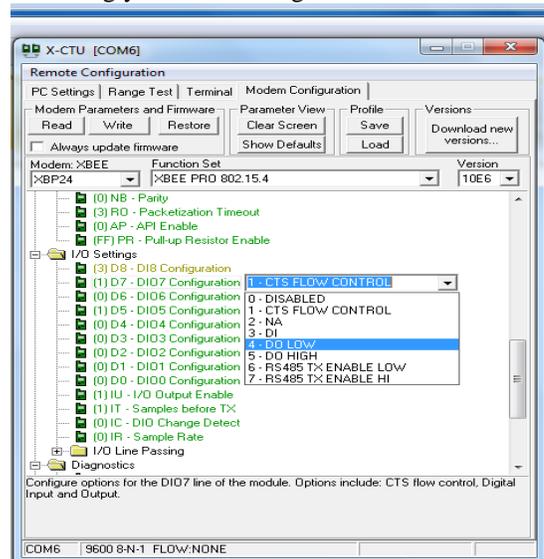


Fig 4: after reading the xbee connected to pc

#### V. OVERVIEW OF SCADA

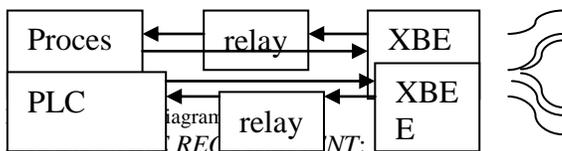
SCADA is used to monitor and control the process parameters in a pc, to access data accurately, to make informed decisions in real time and the power & security to precisely monitor and control every aspect of the process. The SCADA software being used is proficy cimplicity. It is a proven client/server-based HMI/SCADA software solution that collects and shares real-time and historical data across all levels and provides actionable visibility to monitor and control plant processes, equipment and resources. Helps to visualize, control, analyze and optimize

production data across your operations, CIMPLICITY delivers value-added results for a competitive edge:

- Enhanced decision making.
- Faster time-to-market.
- Improved productivity.
- Reduced development costs.
- Lower total cost of ownership.

### VI. DESIGN AND IMPLEMENTATION

The PLCs provide analog and digital series input/output that can be used to control the field devices. For the PLC to be made to control data wirelessly, a wireless interface is needed. The messages from the controller are sent to PLCs through the RF transceivers. Thus, two RF transceiver circuits have to be developed such that they are able to communicate with each other as shown in figure 5.



1. **PLC:** Versamax PLC manufactured by GE-Fanuc has been selected for this project. It is a fixed type plc with 14 digital, 2 analog inputs and 10 digital and 1 analog output.
2. **RF Transceivers:** Digi zigbee module which supports 9 digital i/o and 2 analog i/o in direct xbee mode.
3. **Relays:** used to step up 3.3 v output voltage from zigbee to 24 v for the PLC input module and to required voltage for the actuators.
4. **Sensors:** E-TAPE level sensor is used for level measurement, float switches for sensing the high and low levels in the reservoirs and RTD for temperature measurement.

#### B. SOFTWARE REQUIREMENT:

1. **X-CTU:** The software used to configure the Digi Xbee module from uart mode to direct xbee mode and to assign the i/o pins.
2. **Versa pro:** this software is used to design ladder diagram for the process.
3. **proficy HMI/SCADA-cimplicity:** used for supervisory control and data acquisition.

#### C. HARDWARE SETUP:

#### 1. Batch process prototype:

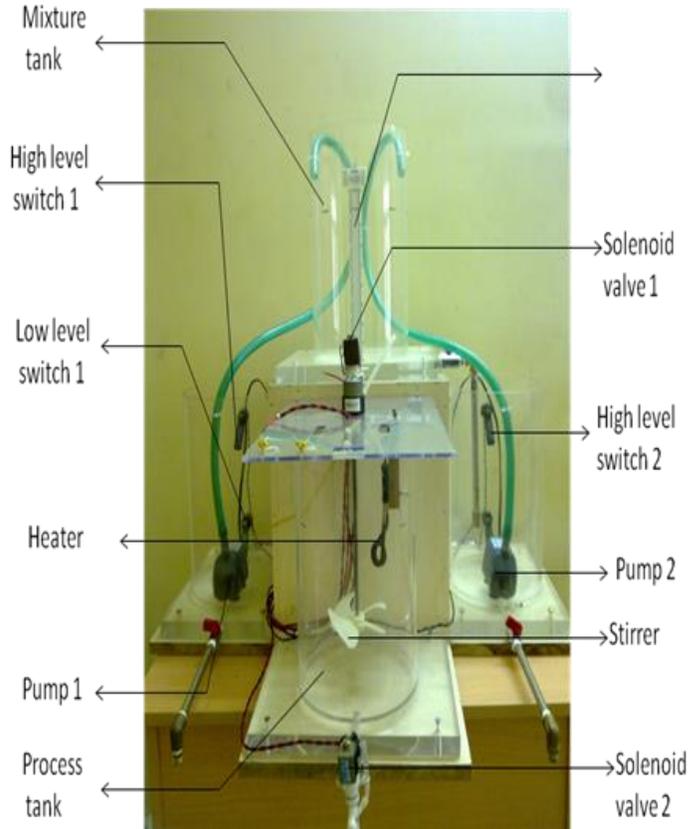


Fig 6: Batch Process.

#### 2. Connections:

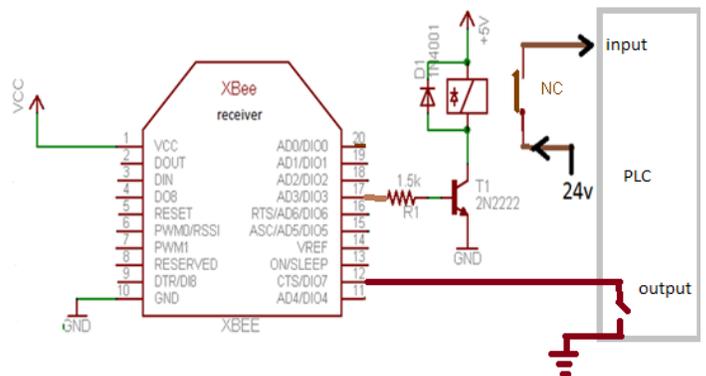


Fig 7: Base module connection.

Input pin DIO 12 of base module is connected to the plc output and output pin DIO 17 is connected to the PLC through a relay circuit.

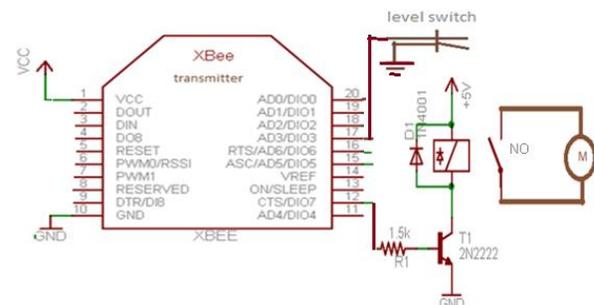


Fig 8: Remote module connection.

Corresponding DIO 12 pin of remote module gives the output signal of PLC to the actuator through the relay circuit and the sensor signal is given to the DIO 17 pin of remote module.

### 3. XBEE configuration:

The pin signals (high or low) from one radio will be passed to the other after configuring.

#### 3.1. On base module:-

- Under modem configuration- read settings.
- under I/O settings, set the pins that will be transmitted to "3-DI"(data in), set the pins that will receive to "4 or 5"(data out) and "2" (ADC).
- set IR – sample rate to 20 ms(hex 14).
- set IT- samples before Tx to 5.
- write settings.

#### 3.2 On remote module:

- Under modem configuration- read settings.
- under I/O settings, set the corresponding pins that will be transmitted to "3-DI"(data in), set the pins that will receive to "4 or 5"(data out).
- Set IU to "1" (enable).
- set IR – sample rate to 20 ms(hex 14).
- set IT- samples before Tx to 5.
- Under i/o line passing set PO to "2"(PWM output).
- Set IA- to "FFFF"
- Write settings.

### D. SCADA INTERFACE:

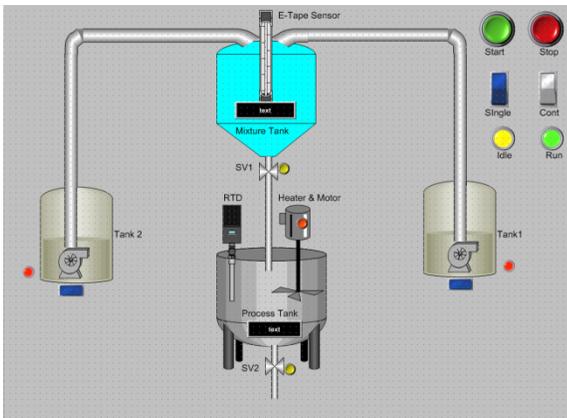


Fig 9: Process diagram.

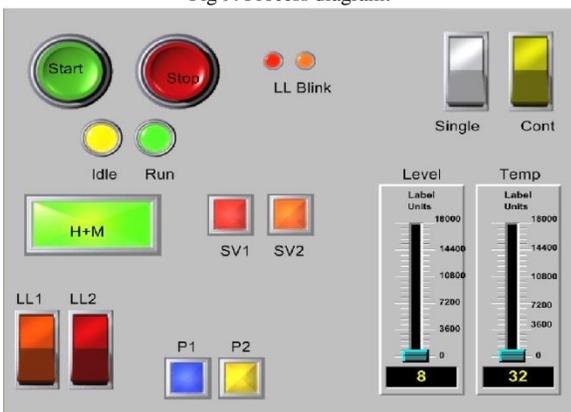


Fig 10: Basic input and outputs

## VII. CONCLUSION

The prime focus of this paper is replace the existing home and small scale industries based wired plc system into wireless plc system using xbee as communication interface by configuring it with x-ctu software because the wireless plcs modules are very expensive and is not desired in replacing for small applications. Using xbee as communication interface between process and plc is one of the approach for operating wired plc as wireless to automate small applications.

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- [3] X\_CTU test utility and configuration software manual.

# Feminist Methodological Approach towards Focus Group Interview Research

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**Abstract-** In this paper an attempt was made to analyse how focus group discussion can be used as a method of data collection in Feminist Research? How to collect data related to gender using Focus Group discussion? Why feminist researcher use focus group discussion? What all points have to be considered while designing, sampling and moderator control? These objectives were analysed with the help of detailed description and preparations that were done for conducting focus group discussions with a feminist perspective as part of the study conducted in one of the panchayat in Kerala for framing gender budget.

## I INTRODUCTION

In the present scenario gender inclusion is the most discussed term in both academic and non academic arena. Discussion about gender inclusive policies and programmes in society always ends in pin-pointing the need for scientific studies and research in gender issues. In order to address gender related issues new methodological approach has to be incorporated in theoretical research. There comes the significance of feminist approach in research methodology. Feminist Research Methodology is in the continuous process of formulation by serious additions and omissions by traditional research methodological positions.

Feminist Research Methodology is an epistemological intervention to make change in the existing gender relations. In that sense Feminist Research is radical, which question the existing system and there by creates new methods to address the gender issues. So questioning is the main tool adopted in Feminist Research. It question sexist approaches in the traditional research methodology and epistemology in general. By raising as many questions it creates new scholarship as a response to other researches which has been conducted till now in the concept of gender (in traditional research). Those who work in feminist methodology is constantly in the process of using existing methods in research in a gender sensitive way and also creating some new methods to combat gender issues in a scientific way.

Data collection methods which is been used in traditional research methodology is been questioned by academicians interested in feminist research methodology, since it has a very crucial role in shaping the entire research. The choice of one method over another is not simply a technical decision, but an epistemological and theoretical one. Feminist research studies give due preference to address the power dynamics that often occurs in researches. Unless the data collection methods are democratic and transparent power hierarchies which may often occur in research couldn't be well addressed. This means that, as feminists considering the use of innovative or unusual methods, we need (as much as with conventional methods) to be aware of the epistemological commitments and value assumptions they make (Riger, 1992). Focus Group discussion is one of the tools used in research to collect data from a group

in general. A focus groups is-at its simplest-"an informal discussion among selected individuals about specific topics" (Beck, Trombetta, and Share, 1986). This method is useful in collecting additional information in order to make existing data more resourceful. Focus Group discussion is one of the frequently used methods to collect data from a group especially in visual media and certain surveys (both governmental and others). And there is a preconceived notion that it's a very simple method of data collection and no expertise and preparations are not needed except good communication skills. In this context comes the relevance of this study.

Kerala is well noted for its remarkable achievement in making local governance effective in Local Self Government Institutions (LSGI's) compared to other Indian states. So many research studies have been taking place in LSGI's to further strengthen the local governance. One such initiative is to frame gender budget. In 2004 Ministry of Women and Child Development (MWCD) recognised Gender Budgeting as an important tool for women's empowerment, and as a way for addressing the observed inequality. "Gender Budgeting is a process that entails incorporating a gender perspective at various stages- planning/ policy/ programme formulation, assessment of needs of target groups, allocation of resources, implementation, impact assessment, reprioritization of resources". In order to achieve this goal Government of India has adopted many measures for incorporating gender sensitive approach to the budgeting process. It was in the concern an action research was planned to assist those panchayats which shows willingness to adopt gender budgeting as a pilot study.

Many methods have been used to collect data for the study. As a first step women's status study was conducted to assess the status of women in that particular panchayat. For this a structured questionnaire was prepared to collect the data. In order to strengthen women's status study data, gender analysis of institutions that comes under the control of panchayat, gender analysis of the previous year's budget, review of previous year's women component plan, focus group interview among various identified sectors, secondary data collected from register office, passport office and other institutions were also carried out. The entire research was planned to be conducted by people of the concerned panchayat itself, in order to make the people aware about the significance of gender needs while framing the budget. So making people convinced about the seriousness of the project and to make them actively involved in the research process was the real issue which I have to face.

In this paper an attempt was made to analyse how focus group discussion can be used as a method of data collection in Feminist Research? How to collect data related to gender using Focus Group discussion? Why feminist researcher use focus group discussion? What all points have to be considered while designing, sampling and moderator control? These objectives

were analysed with the help of detailed description and preparations that were done for conducting focus group discussions with a feminist perspective as part of the study conducted in one of the panchayat in Kerala for framing gender budget.

## II THE PRACTICE OF FEMINIST FOCUS GROUP INTERVIEW RESEARCH

Focus groups differ from in-depth interviews in that multiple respondents are interviewed together in a group setting. Focus group is one of the effective methods used in community programs. Other part is that focus group discussion is used as an additional method to collect data which could not be covered by in-depth interviews and quantitative surveys. As part of Women's Status Study which has been conducted in the selected Panchayats of Kerala, focus group discussion was conducted in order to collect additional information which couldn't be covered by various data collection methods. Due care was given to conduct maximum number of focus group discussions in each sector to get additional information considering the nature of panchayat. This exercise was done in order to get detailed information regarding the status of women in particular panchayat and there by incorporating these identified issues into panchayat budget as an attempt to solve these issues. This study brought the actual condition of women in each panchayat.

Kitzinger (1994) shows that focus group interviews are particularly helpful in gaining data from "difficult" populations. By "difficult" Kitzinger is referring to people who may feel disenfranchised, unsafe, or otherwise weary of participating in a research study. Additionally, focus groups are useful in accessing the attitudes, feelings, and experiences of groups who have been marginalized or silenced within society. In that sense woman being a marginalized and silenced group within the society focus group discussion can be considered as one of the method which can be adopted to collect data in feminist research.

### • How are focus groups useful in gaining knowledge from marginalized groups?

Focus group interview was conducted among women who work in unorganised sector in a particular panchayat. In one of the panchayat selected for the study majority of women were engaged in the work of coir making from coconut husk fibres as cottage industry. Since there are lot of backwaters and small canals in that panchayat, most of the houses have small scale coir industry associated with it. Most of the people belong to lower class and mainly women of each family were associated with this work, were men work in other fields. Most women do this work as an extension of household chores. Even high class families are also engaged in coir making, but they used to heir women of lower class/caste for this. From the questionnaire administered in the panchayat to collect data regarding women's status data's regarding occupational hazardous and diseases were not fully drawn, for this a focus group interview was conducted in panchayat among women engaged in coir making.

In order to organise a focus group interview to fix a convenient time was the major problem which I faced. But somehow women cooperated to fix a common time since they were very much enthusiastic because it was for the first time they get an invitation to participate in a meeting. In the first focus group interview I played the role of moderator and since I was an outsider some sort of problem was happening and so women didn't open up freely. Since we couldn't continue the

interview much longer because of rain, I felt that it was real blessing to our study since I got much more time to reorganise the entire thing. So I felt that a woman from their area has to play the role of moderator in order to avoid the issues of outsider-insider conflict which make them uncomfortable to share their issues. Woman elected representative of that panchayat, who is also a coir worker were selected to serve the role of moderator and she was given training to moderate the discussion while sticking to the major research objectives. And I was reporting the whole process and it helped a lot to reduce the power hierarchy. Even though initially women have some problem in opening up their issues, but eventually they began to participate actively in the discussion.

The meeting was conducted in one of the work site of women which also created a pleasant atmosphere for data collection. After the interview a sense of solidarity began to develop among the women coir workers when they realise that they share common problems. The outcome of that focus group interview was really stronger than our perceived objectives. Those women who participated in the focus group interview began to mobilise other women coir workers of that area began to discuss about their issues to other women and began to function as a pressure group and to claim for their rights in grama sabha and other decision making bodies. They even start raising their issues in their workers union and even began to claim for women representatives in the workers union. In that way this kind of group interaction and narrative that occurs within focus group interviews helps the researcher who is interested in addressing subjugated knowledge and thereby creating new models which would give further insights into framing and conducting further researches.

By analysing the above mentioned study one can understand that sudden involvement of an outsider could disturb the whole process of data collection in focus group method. Even including me all were women even then some sort of hierarchies began to work which disturbs the democratic atmosphere of research process. It helps such to reveals the fact that hierarchy can even work among same sex, it show the actual impact of class, caste, regional and other differences in establishing the power dynamics between the researcher and researched. At the same time same sex even contributed in collecting data since all were women and even moderator is also one among them problem in speaking in group was solved to some extent. The instructions were even given to moderator to make each and every person speak was the another strategy used in order to reduce the power dynamics. So it created a sort of belief among the responded that we are giving attention to each and every one's problem also contributed to the success of the study. So here group dynamics help us to make the data more resourceful. The group environment also helps one to feel that all of their issues are equally addressed. Likewise, the group interaction also gives courage to respondents to raise voices and challenge issues which were naturalised by the society in general. These were some of the feminist strategies adopted in focus group discussion which can be considered as the major element which deals with the success of the study.

Another observation which can be drawn from the analysis of above mentioned study is that focus group discussion can be used as an effective tool to get detailed information which is not covered in-depth interview and other data's collected from the sources. Along with that I have also given due care in selecting the respondents, nature of respondents and the role of moderator.

### III FEMINIST APPROACH IN DESIGNING THE FOCUS GROUP INTERVIEW

#### Sampling

Sampling refers to who the members of our focus group will be. This has to be done very carefully since it is one of the major aspects in focus group or in any other research. Feminists give due importance in the selection of the sample since their major intension to bring the issues of marginalised/disenfranchised section into the fore front. In the above mentioned study due care was given to include women from all sectors of the society, in order to bring the issues of each section who are engaged in coir making. Even in higher class and higher caste families coir making is considered as an extension of women's house hold job and the marketing and other issues associated with this cottage industry were managed by male members. While in lower class/ caste families whole work is being managed by women itself. So all women engaged in coir making were included as sample irrespective of their caste/class. This was done in order to get different dimensions of the issues from each and every section in order to maintain the holistic perspective. Likewise, nature of respondents were given due preference even though only 20 women were included in the focus group interview. So homogeneity among the respondents was maintained by carefully selecting the respondents for the study.

#### Role of moderator

How one moderator the discussion is also very important in feminist research? So in order to make the environment comfortable due care was given to make the whole atmosphere democratic. It was with this intension one among them was selected to play the role of moderator thereby reducing the gap between researched and researcher. It helps to reduce the power hierarchies in the whole process of research. By incorporating researched into the research process is done in order to make the research process rich in true sense reflecting the lived experience and real demands in general, which is one of the feminist research stand point. In order to bring out the subjugated knowledge lower level of moderation can be used as an effective method.

#### Knowledge regarding the intension of the research

Another major strategy used in feminist research is to make the researched aware about the intension of the study. By disclosing the aim and objectives of the study, cooperation and interest of the researched could be raised. Here in order to make the study effective researched were given a major role even in framing their needs into the whole process of the study. Researched were involved even in interpretation of the data which make the whole research process democratic. After the compilation of the data researched prepare projects to solve the issues which have been identified by them.

#### Formulating Research Question

Formulating research question plays a significant position in feminist research. Here in the above mentioned study research questions were formulated by researched and researcher together. In that way entire process was made clear to the researched that helps a lot in neutralising the power hierarchy within the entire process of research, which is also a method of feminist research. Making the whole process known to researched is the method which can be used in feminist research to increases the effectiveness of the research. So here researched is given equal importance as that of researched which is one of the factor that leads to the success of the study. By adopting this method the capacities of the researched in finding solutions to their own problems could be developed

and which in turn fosters their talents and vision. Here due care was given to the group activity and thereby making them capable enough to address their issues by themselves. So by involving researched in the research process the liberation of researched is taking place which is the main aim of feminist research. By engaging the researched in each and every process of research leads to empowerment of researched, which is the ultimate aim of feminist research.

### IV CONCLUSION

In conclusion focus group interview can be used as one of the methods of feminist research which is always considered as insignificant method in social sciences. How one approach and frame the focus group interview is all that matters. If properly planned some of the issues that often occurs in data collection such as artificiality, exploitation and power dynamics between the researcher and the researched could be reduced to some extent. This will ultimately leads to the consciousness raising, liberation and empowerment of both researched and researcher. The issues identified in this study were put together to frame projects visioning towards gender budgeting. In general, focus group method is well suited to research questions involving the elicitation and clarification of perspectives, the construction and negotiation of meanings, the generation and elaboration of hypotheses, and a whole range of exploratory analyses. It needs to harness "varied epistemological forces from empiricism and materialism to utopianism and postmodernism, in order to construct *feminist science*" (Morawski and Agronick 1991,575), and it needs to demonstrate a commitment to "developing and testing innovative concepts, methods and applications for understanding and empowering women" (Russo 1995,1). The continued use and development of focus group method offer feminist research an excellent opportunity in the near future.

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# An Environmental Information System and applications in Jharkhand “A case study of Spatial Modeling for Coal Mines Exploration through Multilevel Data Integration in CMPDIL”.

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**Abstract-** Environmental Information System (ENVIS) is a Gateway on Environment Information, which aims to reach a wider spectrum of the society and strengthen the environmental management capacity in the country. It has launched a major initiative to expand the network and reach through involvement of additional institutions/organizations in Governments, academic, corporate and NGO sector and others as ENVIS centre. The project aims to focus at different subject areas, themes, local conditions, issues, information related to the environment through introduction of modern means of Information and Communication Technologies (ICTs). The Ministry has started this project under the World Bank assisted Environmental Management Capacity Building Technical Assistance Project since January 2002.

The Environmental Information System (ENVIS) is a project of the Ministry of Environment & Forest, Govt. of India to facilitate generation & dissemination of information on Environmental issues. The World Bank Project though has concluded but the Government of India has extended financial support. The State Government is desirous of using the facility to meet the objectives envisaged in the project.

CMPDI (Central Mines Planning and Designing Institute) has been regularly dealing with multi-dimensional environment complexities existing in coal and other mineral sector to make each project environmentally compatible.

CMPDI undertakes land use studies through satellite, airborne scanner, aerial photography and ground survey for the specific project as well as for urban and regional planning. Environmental audit and monitoring waste management and industrial / domestic effluent treatment are also carried out.

**Index Terms-** ENVIS, ITC, CMPDIL, DVC

## I. INTRODUCTION

The ENVIS is the part of the Department of Forest & Environment; Govt. of Jharkhand has been setup with the subject area of State Environment Issues. The activities of the centre include:

- Establishing linkages with users/organisations

- Create and maintain databank on Environment Forests, Wildlife and Biodiversity.
- Launching of website in the subject area allotted with regional language interface and develop linkages with ENVIS centres .
- Information on queries to Departments, Organisations, Scientific Institutions etc.
- Building up inventory of information material
- Supply information to the ENVIS Programme
- Identify data gaps and knowledge gaps in the subject area and take action to fill the gaps.
- Collect reports & journals in the subject area for requisite database.

The Chhota Nagpur plateau is the richest mineral belt in India, and it is responsible for a significant share (by value) of the country's mineral yield. Jharkhand produces almost the entire national output of copper, kyanite (used in the manufacture of heat-resistant porcelain), pyrite (used to make sulfuric acid), and phosphate, as well as much of the output of bauxite (a source of aluminium), mica, kaolin and other clays, and iron ore. Most of these minerals are mined in the districts of East and West Singhbhum. Coal, however, accounts for the bulk of Jharkhand's mineral production. The principal coalfields, all in the Damodar River valley in eastern Jharkhand, supply most of the coking coal of India.

The Damodar Valley Corporation (DVC) is the most prominent multipurpose power project of Jharkhand. The corporation operates several thermal plants and hydroelectric dams not only in Jharkhand but also in neighbouring West Bengal; all the stations are networked within the DVC grid, which serves urban and rural areas in both states.

## II. MINERALS AND MINES IN JHARKHAND

Jharkhand mines and minerals seem to be synonymous with the territory of Jharkhand. Jharkhand possesses a large reserve of mineral wealth within the territory: coal, iron ore, copper ore, bauxite, mica, graphite, kainite, sillimanite, limestone, etc. form an integral part of mining industry in Jharkhand.

An estimate of the major mines and minerals of Jharkhand are as follows:

<b>District</b>	<b>Important Minerals in Jharkhand</b>	<b>Other Minerals</b>
Deoghar, Dhanbad.	Coal	Fire Clay, Silver.
Garwa.	Coal	Dolomite.
Bokaro.	Coal	-
Godda.	Coal	-
Hazaribagh.	Coal	Fire-Clay, Feldspar, Mica, Lime stone, Stone-chips.
Dumka.	Coal	-
Sahibganj.	-	Silica Sand, Kaolin, Stone chips.
Giridih.	Coal	Mica.
Latehar, Lohardaga.	Bauxite	-
Gumla.	Bauxite	-
Palamau.	Iron Ore	Fire Clay, Graphite, Dolomite, Feldspar, Limestone, Manganese.
Ranchi.	-	Lime stone, Kaolin
Jamtara, Kodarma.	-	Mica, Stone-chips.
East Singhbhum.	Uranium, Copper	Quartzite, Kaolin, Gold, Silver, Fire Clay, Steatite.
West Singhbhum.	Iron Ore	Dolomite, Limestone, Manganese, Kyanite.
Sarikela Kharswan, Simdega.	-	Stone chips.
Pakur.	-	Stone-chips.

### III. ENVIRONMENTAL STUDIES OF MINED OUT AREA

CMPDI has a well equipped environmental laboratory to undertake the entire spectrum of environmental studies.

#### Services Offered:

<b>SERVICES</b>	<b>FIELDS IMPLEMENTED</b>
<b>Base line data generation</b>	Meteorological data Land use plan Air quality - ambient & work zone Water quality Noise measurement Soil sampling & analysis Flora and fauna studies
<b>Environmental impact assessment</b>	Land degradation Impact on flora and fauna Air, water and noise pollution Social impact
<b>Environmental Management Plan</b>	Land reclamation plan Air, water & noise abatement measures Green belt development
<b>Rehabilitation &amp; resettlement plan</b>	Subsidence prediction studies and management Ecological restoration
<b>Environmental Monitoring and Audit</b>	
<b>Biological Reclamation Studies</b>	
<b>Thematic Mapping</b>	through Satellite and Air- borne

	Scanning
<b>multifaceted Major Environmental Project Implemented</b>	
<b>Mining Project (EIA)</b>	Gevra, Jayant, Piparwar Coal Open cast Moonidih, Chasnalla Underground Coal  Mine Pyrite Mine, Amjhor, Rare Earth Mine, Kudiraimozhi Gypsum Mines, Rajasthan
<b>Beneficiation Project (EIA)</b>	Rajrappa, Kalinga Coal beneficiation plants Mineral Separation Plant, Kudiraimozhi
<b>Thermal Project (EIA)</b>	Kathara Captive Thermal Power Plant
<b>Coalfield wise Study (EIA)</b>	North Karanpura, East Bokaro, Ib Valley
<b>Sanitation Project</b>	Rajrappa Sewerage Scheme
<b>Effluent Treatment Plant</b>	Ledo Acid Mine Water Treatment Plant Rajrappa Mine Water Treatment Plant Kathara Washery Effluent Treatment Plant
<b>Water Supply Scheme</b>	Singrauli & Talcher Coalfield Water Supply Scheme
<b>Bio-reclamation Project</b>	
<b>Survey &amp; Exploration Microptic Theodolite with EDM</b>	North seeking GYRO with Theodolite
<b>Total Workstation</b>	GPS and GIS Geophysical loggers Seismographs Daedalus AADS 1268 ATM Scanner Gravimeters & Magnetometers Drilling Rigs (Rotary, DTH, Coring) Resistivity Meters, etc. Borehole deviation unit Aquifer testing equipment Mine Laboratory Facilities for Uniaxial compressive strength Tensile strength Shears strength Young's modulus and poisson's ratio
<b>Bulk density</b>	Proto dyakonov index, Impact strength index, Point load index and cone indenter index Triaxial compressive strength, cohesion and angle of internal friction Slake durability index Cerchar index of abrasivity
<b>Environmental Laboratory Facilities for Air Analysis</b>	Suspended Particulate Matter Oxides of Sulphur (SO <sub>x</sub> )

	<p>Oxides of Nitrogen (NO<sub>x</sub>) Carbon Monoxide (CO) Total Hydro Carbon (CH<sub>n</sub>) Total Dust (Settlabb) Carbon Dioxide</p>
<b>Water Analysis</b>	<p>Physical parameter - pH, Colour, Temp, Turbidity Suspended solids, dissolved solids, etc. Chemical and Biological</p>
<b>Soil Analysis</b>	<p>Physical and Chemical</p>
<b>Noise</b>	<p>Noise intensity survey Leq Value of Noise Frequency analysis Noise intensity prediction</p>
<b>Coal Preparation &amp; Utilization Laboratory Facilities for Sub sampling and sample preparation</b>	<p>Crushing of ROM Coal to different sizes Screening of Coal at various sizes Pulverisation Grinding by Ball Mill/Rod Mill Washability (Float &amp; Sink) Test Proximate Analysis Ultimate Analysis Calorific Value Determination of sulphur Ash Fusion Temperature</p>
<b>Determination of characteristics of fine coal</b>	<p>Froth flotation Filtration Sedimentation pH Size analysis by weight sieving</p>
<b>Determination of shattering, pulverising &amp; abrasion characteristics of coal</b>	<p>Drop shatter test Abrasion test Hardgrove grindability index Typical drum tumbler test</p>
<b>Determination of caking characteristics of coal</b>	<p>Caking index Swelling index Gray King Assay (L.T.) coke type</p>
<b>Petrographic Analyses</b>	<p>Reflectance measurement</p>
<b>Maceral analysis</b>	<p>Analysis of visible minerals in coal</p>
<b>Other Laboratory Facilities for</b>	<p>Non-destructive testing of mine winders, cage suspension gears, heavy earth moving machines Development &amp; repair of electronic control cards for HEMM, Washery equipment etc.</p>

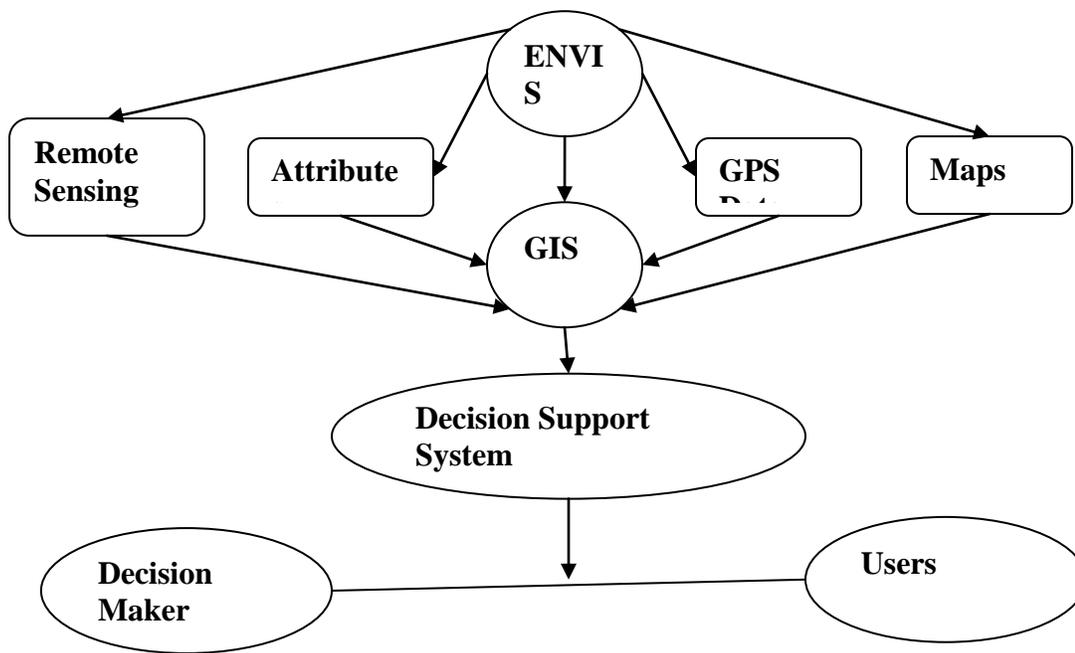
#### IV. DRILLING CAMPS OF CMPDIL

CMPDI has completed over 500 coal exploration projects in India in all types of terrain and geological set-up. This has resulted in providing 80 billion tonnes of coal. CMPDI has expanded its activities to Manganese, Iron Ore and Rock Phosphate. Exploration has also been carried out in Tanzania.

Annually, CMPDI carries out about 200,000 metres of drilling spread over six States in India through 23 drilling camps.

- i. Specialized Services offered in Exploration
- ii. Satellite and Air-borne Remote Sensing
- iii. High Resolution Shallow Seismic (HRSS) Reflection
- iv. Seismic Refraction
- v. In-seam Seismic Survey
- vi. Hydro-geological Assessment, Reserve Assessment, Modelling and Documentation
- vii. Coal Petrography Study for characterisation and classification of Coal and Lignite
- viii. Geological Structure and Geo-technical Mapping
- ix. Drilling - Coring and Non-coring
- x. Hydrogeological Assessment
- xi. Water budgeting and management
- xii. Groundwater budgeting and management
- xiii. Waterwell drilling, development and construction
- xiv. Acquirer testing
- xv. Water supply for rural and urban population
- xvi. Mine inflow study
- xvii. Coal Chemical Analysis
- xviii. Resource Assessment, Modelling and Documentation
- xix. Geological Structure and Geo-technical management

**How ENVIS Works?**



**INVENTORY OF GEOLOGICAL RESOURCE OF INDIAN COAL**

(As on 01.04.2009)

(Resource in million tonne)

Type of Coal	Depth	Proved	Indicated	Inferred (Exploration)	Inferred (Mapping)	Total
1	2	3	4	5	6	7

**JHARKHAND**

**01. RANIGANJ COALFIELD**

Medium Coking	0-300	220.00	8.87	0.00	228.87
	300-600	49.23	8.30	0.00	57.53
Total Medium Coking		269.23	17.17	0.00	286.40
Semi Coking	0-300	51.40	0.00	0.00	51.40
	300-600	0.00	40.00	0.00	40.00
Total Semi Coking		51.40	40.00	0.00	91.40
Non Coking	0-300	1111.53	89.32	29.55	1230.40
	300-600	106.03	320.07	2.00	428.10
Total NonCoking		1217.56	409.39	31.55	1658.50
<b>TOTAL FOR RANIGANJ</b>		1538.19	466.56	31.55	2036.30

**02. JHARIA COALFIELD**

Prime Coking	0-600	4039.41	4.01	0.00	4043.42
	600-1200	574.94	694.70	0.00	1269.64
Total Prime Coking		4614.35	698.71	0.00	5313.06
Medium Coking	0-600	4064.18	2.82	0.00	4067.00
	600-1200	296.30	1800.70	0.00	2097.00
Total Medium Coking		4360.48	1803.52	0.00	6164.00
Non Coking	0-600	5606.74	495.26	0.00	6102.00
	600-1200	496.00	1355.00	0.00	1851.00
Total Non Coking		6102.74	1850.26	0.00	7953.00
<b>TOTAL FOR JHARIA</b>		15077.57	4352.49	0.00	19430.06

**03. EAST BOKARO COALFIELD**

Medium Coking	0-300	2607.20	1269.94	18.71	3895.85
	300-600	384.67	1203.06	58.53	1646.26
	600-1200	255.93	1332.60	786.08	2374.61
Total Medium Coking		3247.80	3805.60	863.32	7916.72
Non Coking	0-300	95.17	56.81	0.00	151.98
	300-600	8.90	5.69	0.00	14.59
Total Non Coking		104.07	62.50	0.00	166.57

iii) Priority area selection for biodiversity conservation using GIS.

**V. BIODIVERSITY CHARACTERISATION**

It is the best measure of influence of human being on nature. It is important as it provides stability to ecosystem and supplies vital requirement of human being, i.e. water and oxygen there are threat to biodiversity through resource over – exploitation, pollution, climate change etc. Department of Space has taken a project of biodiversity characterisation at landscape level using remote sensing and GIS. This project is being executed at different parts of the country. The project ENVIS

- i) preparation of biome/ecological details zone map using satellite remote sensing data incorporating topographic details
- ii) landscape characterisation to identify disturbance gradients using GIS

**VI. CONCLUSION**

ENVIS is the project dealing with both Spatial and Non spatial information .It includes various disciplines such as Geological Information system (GIS), Remote Sensing, Global Positioning System, Digital Cartography, Database management System etc. It is very reliable and Comprehensive information System. Flow of information in real time to the decision makers and availability of analytical tools to weigh pros and cons of a particular measure, before implementing, are also equally important. It helps in creating spatial information system. These information systems can be good interface tools between providers (government) and recipients of services. Such an interface helps reducing the distance between those who are

governing and those who are governing and those who are governed through the use of various information systems.

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# Bilateral Post-Traumatic Osteonecrosis of the Trochlea – A Rare Case Report

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**Abstract-** A rare case of bilateral osteonecrosis of the trochlea following supracondylar fracture is presented. The patient presented with bilateral cubitus varus deformity three years after trauma.

**Index Terms-** trochlea, cubitus varus, supracondylar fracture.

## VII. INTRODUCTION

Supracondylar fracture of the humerus is a common pediatric injury around the elbow that is historically associated with morbidity due to malunion, neurovascular complications, and compartment syndrome. Malunion which is a common occurrence can result in a cubitus varus deformity which remains static and has cosmetic implications in majority of the cases.

A rare complication of these fractures is the occurrence of osteonecrosis of the trochlea which may present clinically as a progressive varus deformity depending upon the skeletal age of the patient.

## I. CASE REPORT

A 10 year old male child was brought to our hospital by his parents with the chief complaints of bilateral deformity (bowing) of his elbows following trauma to both elbows 7 years back. At the age of 7 years the child had sustained a bilateral supracondylar fracture of the humerus that was managed by closed reduction and posterior splint for 3 weeks. The deformity was noticed by his parents 2 year back and was gradually progressing with no functional limitations, and the bowing of the limbs being the only reason for attending our orthopaedic hospital.

On clinical examination patient had a bilateral cubitus varus deformity more on right side with varus angle of 30° on right side and 20° on left side (Fig. 1A, 1B). Range of motion was from 0° to 135° with hyperextension of 10° on both sides. Supination and pronation was normal with intact distal neurovascularity on both sides. Rest of the physical examination revealed no significant finding.

Radiographs revealed a bilateral cubitus varus with complete resorption of bilateral trochlea (Fig. 2A, 2B).

Patient was offered surgery in form of bilateral lateral closing osteotomy for correction of his deformity which was refused by his parents.

## II. DISCUSSION

Osteonecrosis or avascular necrosis is a condition resulting from cellular death of bone components as a result of a temporary or permanent interruption in blood supply.

Osteonecrosis around the elbow joint is very infrequent. Of these, avascular necrosis (AVN) of humerus is more common in capitellum (so called Panner Disease)<sup>1,2</sup>. Olecranon<sup>3</sup>, radial head<sup>4,5,6</sup> and humeral epicondyles<sup>7</sup> may also undergo AVN.

Osteonecrosis of the trochlea (Hegemann's disease) is very rare with incidence rates varying between 0.27%<sup>8</sup> to less than 0.001%<sup>9</sup> in different studies. It was first reported as a clinical entity by Uhrmacher<sup>2</sup> in 1933, who reported on 2 cases of osteonecrosis, in patients aged 7 and 9 respectively. It has been seen to occur predominantly in pre-adolescent and adolescent boys. Presenting symptoms are mainly swelling and restricted range of motion of the elbow, pain is rare<sup>10</sup>. Clinically it can be differentiated from osteochondritis dissecans by the absence of locking in elbow joint<sup>11</sup>. Definite associations of osteonecrosis of trochlea have been made to trauma<sup>12,13</sup> (acute or remote) and chemotherapeutic agents<sup>14,15</sup>.

Osteonecrosis affects bones with a single terminal blood supply with limited or absent collaterals, such as the femoral head, carpals, talus, and humerus. Interruption of the vascular supply results in necrosis of marrow, medullary bone, and cortex. The peculiar vascular anatomy of the trochlea has been a predisposing factor. Haraldsson<sup>16,17</sup>, in 1957, demonstrated that the medial crista of the trochlea is supplied by two different vessels. The lateral vessels, lying just below the articular surface, supply the trochlear apex and lateral aspect of the medial crista and the medial vessels, entering through the non articulating surface of the trochlea, supply the medial aspect of the trochlea. There is no anastomosis between these two sets of vessels.

It has been proposed that the result of traumatic disruption of these vessels may vary with age, as the appearance and development of ossification centers is subject to adequate blood supply. In younger children, before the appearance of ossification centers, trauma may lead to only a delay in appearance of ossification centre whereas in older children, with well developed ossification centers, trauma may lead to a full blown picture of avascular necrosis<sup>18</sup>.

Osteonecrosis of the trochlea may be only partial, affecting only the apex or the lateral portion of medial crista of trochlea (Type A or fish-tail deformity) or it may involve the whole of trochlea including portion of the metaphysis (Type B or malignant varus deformity)<sup>18</sup>. Patients with the so called fish-tail

deformity are usually asymptomatic and without any angular deformities whereas those with type B osteonecrosis usually develop a progressive varus deformity at the elbow, with significant loss of range of motion and early progress to secondary osteoarthritis.

Tardy ulnar nerve palsy is one of the known complications. It is thought to be due to a multiplicity of factors which include joint malalignment, abnormal position of the ulnar nerve and triceps tendon, loss of protection by a deep ulnar groove, and the acute angle of entrance of the two heads of the flexor carpi ulnaris<sup>19,20,21</sup>.

### III. CONCLUSION

Trochlear Osteonecrosis following trauma is a very rare entity with only few case reports. Our case is an interesting case with bilateral trochlear AVN following supracondylar fracture. It's probable that some underlying predisposing factor was responsible for trochlear necrosis in our case with bilateral involvement. Further studies on identifying these etiological factors is suggested.

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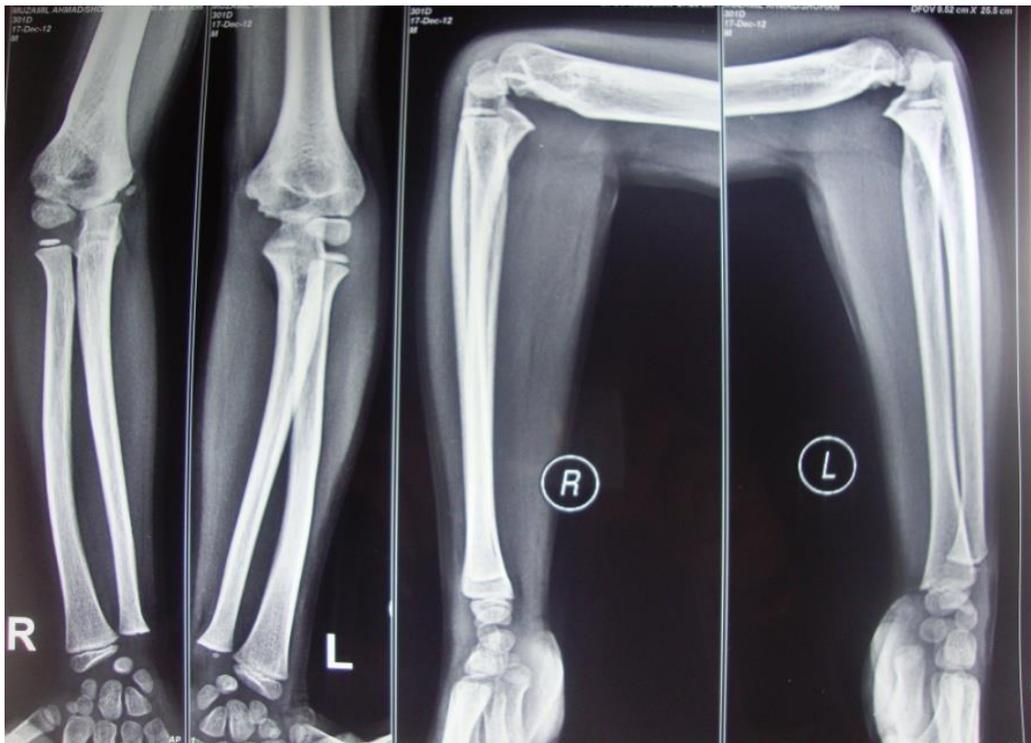
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**Figure 1 Clinical Photograph of the patient showing Bilateral Cubitus varus deformity.**



**Figure 2 Radiographs of the same patient A/P and Lateral views showing complete dissolution of trochlea on both sides.**



# Bluetooth Based Departmental Store Supporting System

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**Abstract-** This technical report describes the design and implementation of a Bluetooth based departmental store support system. It has been seen that shop lifting is a common phenomenon in case of the departmental stores and the shopping mall and to prevent it a large number of employees and a great number of CCTVs are installed which costs a lot to the stores or the shopping malls.

In this system a Bluetooth enabled radio device along with a display will be given to every customer when they will enter into the shop. In the shop demo products and shopping items will be placed rather than the all. The customer will choose the required products by observing the demo items and can place order through their respective devices and send the list to the server placed at the counter. Each Bluetooth device is equipped with a unique MAC ID and a bill will be generated against the MAC ID. At the counter the customer will pay the bill and also deposit his/her device.

As a matter of fact several problems may arrive such as a master Bluetooth device can communicate with a maximum of seven devices in a piconet so we can overcome this problem by installing several servers with same MAC ID.

The following methodology and result sections of this report show that the system works as per our expectation.

## I. MOTIVATION

As the day passes the appearance of conventional shops become changed to make the life of people easier and smooth. In this context the concepts of shopping malls or multiplexes or departmental stores have come. The meaning of multiplex is many shops in one complex, where a person can buy different things such as cloths, food items, cosmetics and other useful things from one complex no need to go to different shops. But it is seen that, every day, some percentages of different items have stolen from the departmental stores besides having tight security and a number of attendants. Our motivation of doing this project is to minimize stealing of items from the stores. In our project, every customer who is entering in the store has given a Bluetooth radio having a unique address (Mac id). The customer can order anything from the Bluetooth radio. In the store, only some samples (2 or 3) are there, the customers can order their required items by only seeing the samples. As there are some restricted number of samples, stealing is reduced. Not only that this device also reduced the employment cost of the attendants. The device work as follows: when the customer switched on the Bluetooth radio, different categories of items are shown to the customer (such as food, clothes, vegetables etc.). From that list the customers have selected his required category, and then the list of available items with their specification of the selected category has shown to the customer. The customer then ordered

items from that list and the order is directly fed to the server. At the server the bill is produced automatically, no need to calculate the bill for individual. This project minimizes manual interference and makes the process smoother. There are various advantages to use Bluetooth connectivity between the server and customer Bluetooth radio. Firstly, it will be very cost-effective. The cost of Bluetooth radio is nearly Rs.800/-, which is affordable. Bluetooth is also friendly with heart patients and the patient who having pacemaker, as it does not interfere with pacemaker. The system is very easy to implement and it does not require continuous maintenance. Finally we can say that the project is very much advantageous in all respect, and very much user friendly.

## II. ADVANTAGES OF BLUETOOTH

Bluetooth is a proprietary open wireless technology standard for exchanging data over short distances (using short wavelength radio transmissions in the ISM band from 2400-2480 MHz) from fixed and mobile devices, creating personal area networks (PANs) with high levels of security. Created by telecoms vendor Ericsson in 1994, it was originally conceived as a wireless alternative to RS-232 data cables. It can connect several devices, overcoming problems of synchronization.

### 1. Wireless

There are many benefits and advantages of using wireless devices. Along with improving safety as a result of eliminating wires you don't need, wireless also offers you plenty of other advantages. When travelling with your laptop or other wireless devices, you'll no longer have to worry about bringing connection cables. Thus we achieve more mobility and flexibility by using wireless technologies.

### 2. Inexpensive

Bluetooth technology is cheap for companies to implement, which results in lower over-all manufacturing costs. These savings are then passed on to you, the consumer. The end result: Bluetooth devices are relatively inexpensive. The maintenance cost is also low for Bluetooth based systems.

### 3. Automatic

Bluetooth doesn't require you to think about setting up a connection by pushing too many buttons. When two or more Bluetooth devices enter a range (Up to 30 feet) of one another, one just needs to make the device discoverable and begin the communication with some simple steps, without you having to do anything extra.

### 4. Standardized protocol – Interoperability

Bluetooth is standardized wireless, meaning that a high level of compatibility among devices is guaranteed. Bluetooth will connect devices to each other, even if they aren't the same model.

### 5. Low Interference (If Any)

Bluetooth devices avoid interference with other wireless devices by:

- a) Using a technique known as spread-spectrum frequency hopping, and
- b) Using low power wireless signals

#### 6. Low energy consumption

As a result of Bluetooth using low power signals, the technology requires very little energy and will use less battery or electrical power as a result. This is an excellent benefit for mobile devices, as Bluetooth won't drain the battery.

#### 7. Sharing voice and data

The standard for Bluetooth will allow compatible devices to share data and voice communications. This is great for mobile phones and headsets, as Bluetooth simplifies driving and talking on your cell phone.

#### 8. Instant Personal Area Network (PAN)

Up to seven compatible Bluetooth devices can connect to one another within proximity of up to 30 feet, forming a PAN or piconet. Multiple piconets can be automatically setup for a single room.

#### 9. Upgradeable

The Bluetooth standard is upgradeable. A development group at the Bluetooth Special Interest Group (SIG) has been given the task of working on the new Bluetooth version 2, which offers several new advantages and is backward compatible with the older versions.

#### 10. The Technology is here to Stay

Bluetooth is a universal, world-wide, wireless standard. Therefore, you can count on it being around for years to come. As more devices begin to use Bluetooth technology, electronics manufacturers will be increasingly eager to make their products compatible, using Bluetooth. A chain reaction is inevitable, in fact, it has already begun.

### III. INTRODUCTION

#### BLUETOOTH:

The word "Bluetooth" is an anglicised version of the Scandinavian *Blåtand/Blåtann*, the epithet of the tenth-century king Harald I of Denmark and parts of Norway who united dissonant Danish tribes into a single kingdom. The idea of this name was proposed by Jim Kardach who developed a system that would allow mobile phones to communicate with computers (at the time he was reading Frans Gunnar Bengtsson's historical novel *The Long Ships* about Vikings and king Harald Bluetooth) The implication is that Bluetooth does the same with communications protocols, uniting them into one universal standard

Bluetooth uses a radio technology called frequency-hopping spread spectrum, which chops up the data being sent and transmits chunks of it on up to 79 bands (1 MHz each; centered from 2402 to 2480 MHz) in the range 2,400–2,483.5 MHz (allowing for guard bands). This range is in the globally unlicensed Industrial, Scientific and Medical (ISM) 2.4 GHz

short-range radio frequency band. It usually performs 800 hops per second, with Adaptive Frequency-Hopping (AFH) enabled.



Figure 1: Bluetooth logo

#### PYTHON:

**Python** is a widely used general-purpose, high-level programming language. Its design philosophy emphasizes code readability, and its syntax allows programmers to express concepts in fewer lines of code than would be possible in languages such as C. The language provides constructs intended to enable clear programs on both a small and large scale.

Python supports multiple programming paradigms, including object-oriented, imperative and functional programming styles. It features a dynamic type system and automatic memory management and has a large and comprehensive standard library.

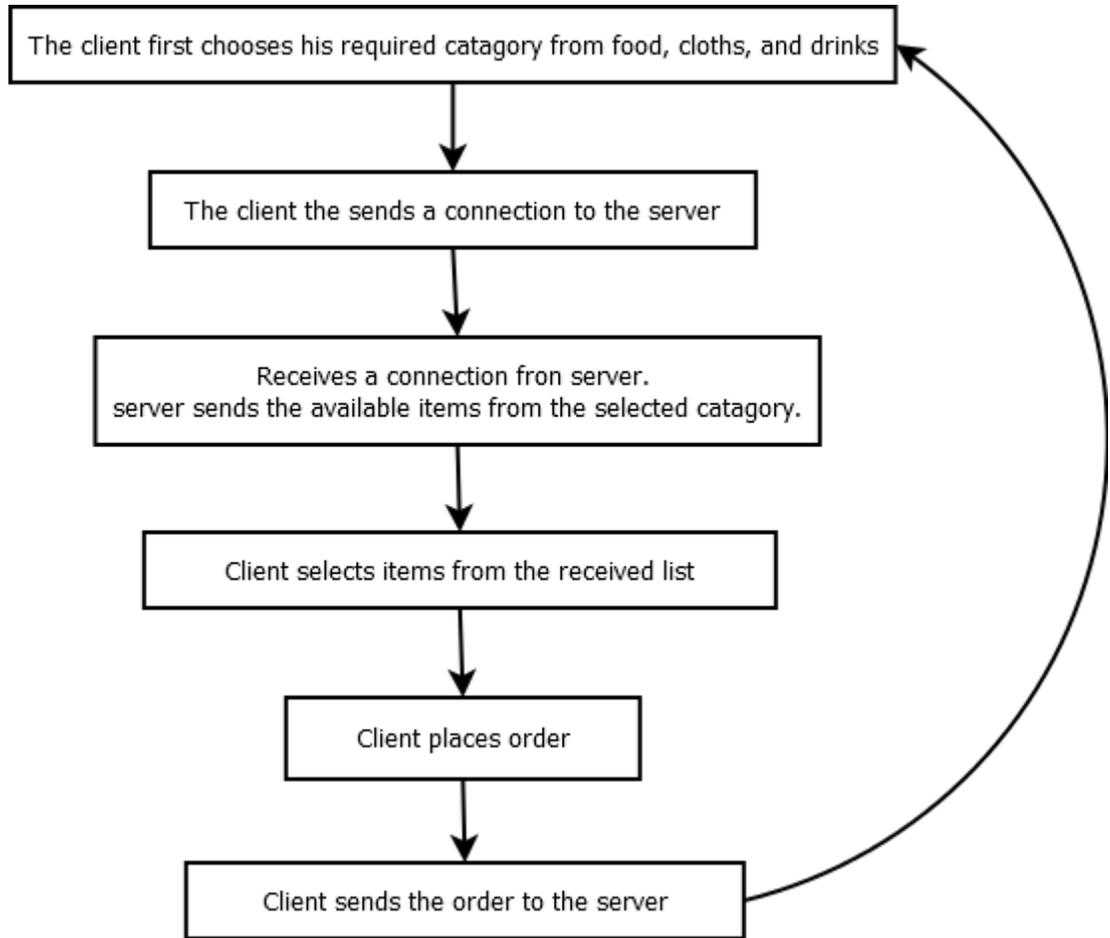
Like other dynamic languages, Python is often used as a scripting language, but is also used in a wide range of non-scripting contexts. Using third-party tools, Python code can be packaged into standalone executable programs. Python interpreters are available for many operating systems.

C Python, the reference implementation of Python, is free and open source software and has a community-based development model, as do nearly all of its alternative implementations. C Python is managed by the non-profit Python Software Foundation.

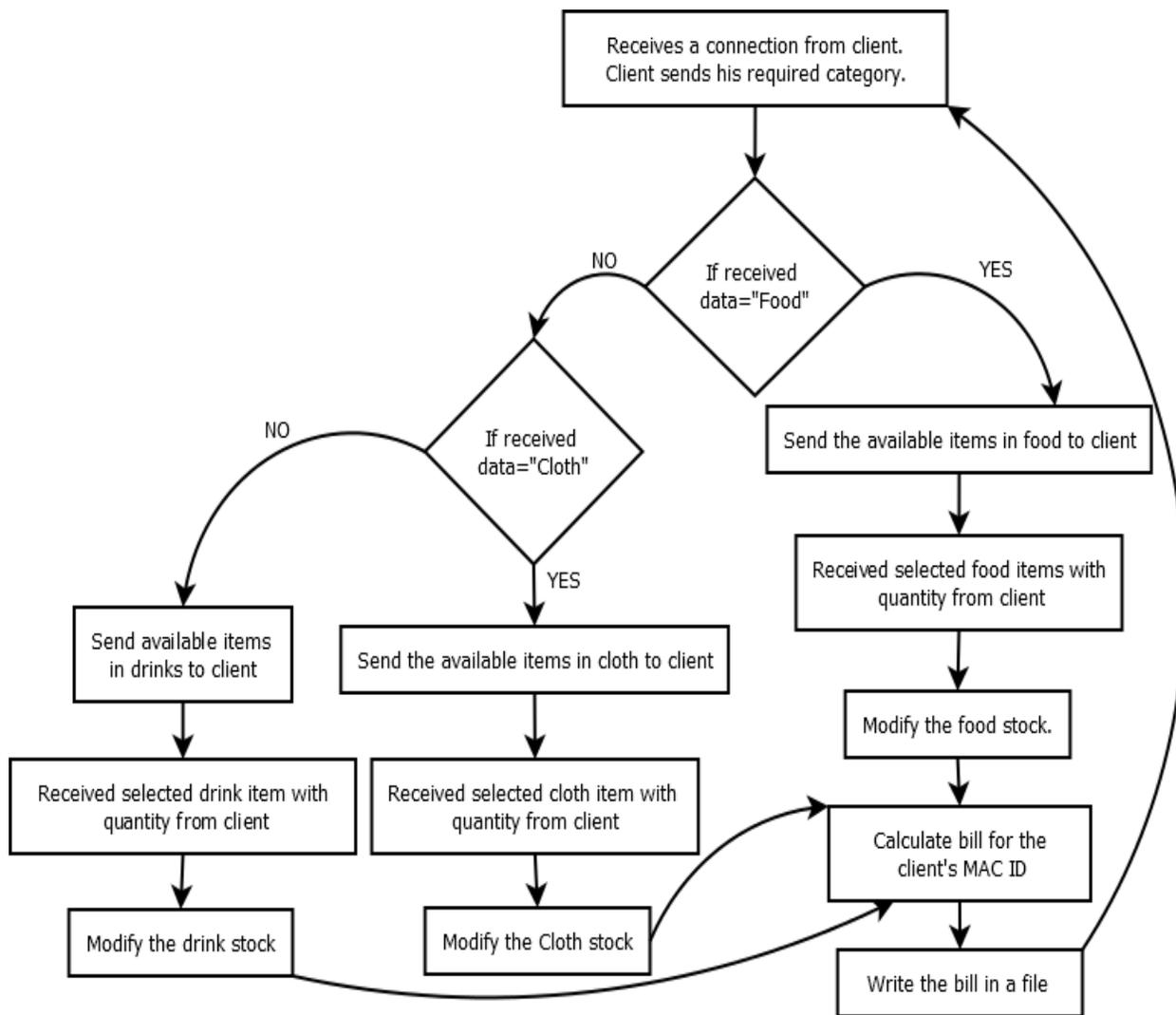
#### Some features of "Python" are enlisted below:

- Python is a multi-paradigm programming language: object-oriented programming and structured programming are fully supported, and there are a number of language features which support functional programming and aspect-oriented programming (including by programming and by magic methods). Many other paradigms are supported using extensions, including design by contract and logic programming.
- Python uses dynamic typing and a combination of reference counting and a cycle-detecting garbage collector for memory management. An important feature of Python

#### IV. METHODOLOGY



**Block diagram of Client programme**



**Block diagram of Server programme**

**V. STEP ALGORITHM**

1. The client chooses a category of items like food, clothes, and drinks.
2. If the client chooses from either of the categories, the server receives a connection from the client.
3. Now, a list of items appears in the client device within the chosen category.
4. On pressing the button 'PLACE ORDER', a window appears where order for the required items to be purchased is placed.
5. After placing orders, the client presses 'OK' button.
6. If the chosen items exist in the list and the total number of items does not exceed the available quantity, then purchased items appear in the server.
7. The server then enters the MAC ID of the client and prints the bill by pressing the 'PRINT BILL' button.
8. On pressing the 'PRINT BILL' button, the bill of the purchased items is generated in the form of .html file.
9. On pressing the 'OK' button, the client returns to the main menu.
10. The same process is followed if client wants to place further orders.
11. Before closing time of the mall, a program is run which empties the dictionary where purchased items are stored.

## VI. DATA STRUCTURE

The most basic data structure in Python is the **sequence**. Each element of a sequence is assigned a number - its position, or index. The first index is zero, the second index is one, and so forth.

Python has six built-in types of sequences, but the most common ones are lists and tuples which we have used in our project

### Python Lists:

The list is a most versatile data type available in Python, which can be written as a list of comma-separated values (items) between square brackets. Good thing about a list that items in a list need not all have the same type.

Creating a list is as simple as putting different comma-separated values between square brackets.

```
Item= ['ParleG', 5,100]
```

Here mixed data types are the members of the list named item, where 'ParleG' is a string and 5 and 100 are the int values holding position 0, 1, 2 in the list.

We can access the different elements by the following code

```
Item [0] = 'ParleG'
```

```
Item [1] =5
```

A list can be updated by append method

```
Item.append ('food')
```

```
Now Item= ['ParleG', 5, 100,'food']
```

### Python Tuple:

A tuple is a sequence of immutable Python objects. Tuples are sequences, just like lists. The only difference is that tuples can't be changed ie. tuples are immutable and tuples use parentheses and lists use square brackets.

Creating a tuple is as simple as putting different comma-separated values and a tuple, a list can also be the members of the tuple.

```
tup=(12,14,9,(12,123),[1,2,3])
```

```
tup [0] =12
```

### Python Dictionary:

A dictionary is mutable and is another container type that can store any number of Python objects, including other container types. Dictionaries consist of pairs (called items) of keys and their corresponding values.

Python dictionaries are also known as associative arrays or hash tables. The general syntax of a dictionary is as follows:

```
food={'Item1':['ParleG',5,100],'Item2':['Lays',10,100],'Item3':['Cadbury Silk',70,100] }
```

Each key is separated from its value by a colon (:), the items are separated by commas, and the whole thing is enclosed in curly braces. An empty dictionary without any items is written with just two curly braces, like this: {}. Here key values are Item1, Item 2 and Item 3. Keys are unique within a dictionary while values may not be. The values of a dictionary can be of any type, but the keys must be of an immutable data type such as strings, numbers, or tuples.

To access dictionary elements, we can use the familiar square brackets along with the key to obtain its value. Following is a simple example:

```
food ['Item1'] = ['ParleG',5,100]
```

To access dictionary elements, we can use the familiar square brackets along with the key to obtain its value. Following is a simple example:

```
food['Item4']= ['Cadbury Cracker',70,100]
```

Now the modifying dictionary will be

```
food={'Item1':['ParleG',5,100],'Item2':['Lays',10,100],'Item3':['CadburySilk',70,100],
```

```
'Item4':['Cadbury Cracker',70,100] }
```

Properties of dictionary keys

Dictionary values have no restrictions. They can be any arbitrary Python object, either standard objects or user-defined objects. However, same is not true for the keys.

There are two important points to remember about dictionary keys:

- (a) More than one entry per key not allowed. Which means no duplicate key is allowed. When duplicate keys encountered during assignment, the last assignment wins.
- (b) Keys must be immutable. Which means you can use strings, numbers, or tuples as dictionary keys but something like ['key'] is not allowed.

In this project we have used three types of sequences as lists, tuples, and dictionary. When the client machine sends request to server to see the items in the shop then the server send the item list through a dictionary.

```
food={'Item1':['ParleG',5,100],'Item2':['Lays',10,100],'Item3':['Cadbury Silk',70,100] }
```

```
cloth={'Item1':['Tshirt',500,100],'Item2':['Trousers',1000,100],'Item3':['Jeans',2000,100] }
```

```
drinks={'Item1':['Pepsi',30,100],'Item2':['Limca',30,100],'Item3':['7up',30,100] }
```

We have used dictionary as it works like a container and we can access the keys to get the values assigned against the key value.

Dictionary\_name.keys () returns all the key values present in that dictionary

We have put the values as form of list against the key as Item1:['ParleG',5,100] ,where Item1[0] product name , Item1[1] unit price of the product and Item[2] quantity available.

We can use tuples instead of list but each time when a customer buy some product the quantity is decremented as tuple elements cannot be updated we have used list as it can be modified

VII. RESULTS AND EXPLANATION



Figure 2: Screen shot of the starting screen

- Entering in the store when the customer first switches on the Bluetooth radio the above window is displayed in the Bluetooth radio screen. From this category of items customer chooses “food item”, which is send to the server.

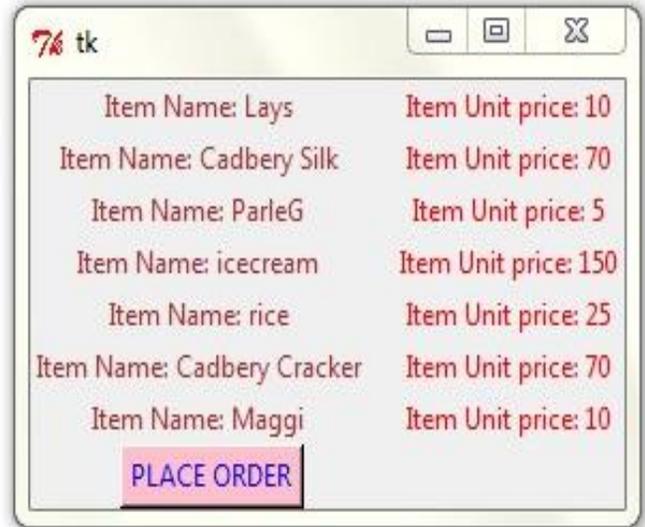


Figure 3: Screen shot of display list

- Server accepts the connection from customer. Server sends the available food items to the customer with their unit price. Now the customer can order his required food items by clicking in the “PLACE ORDER” button.

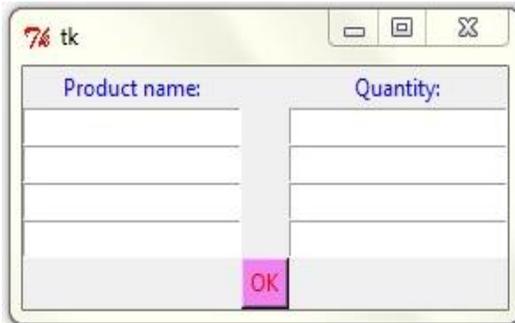


Figure 4: Screen shot of client device

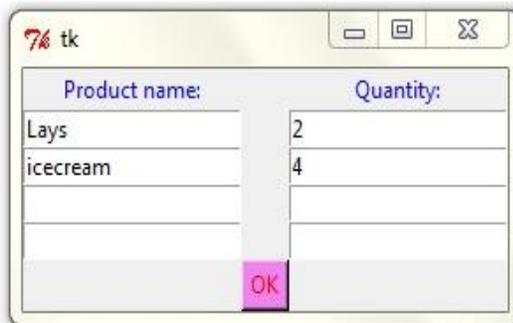


Figure 5: Screen shot of client device during shopping

- After pressing PLACE ORDER button the window (a) will appear in the screen of Bluetooth radio. Then the customer order required things and at last he will press

the “OK” button, it will look like window (b). Here the customer has ordered 2 packets of Lays and 4 ice creams.

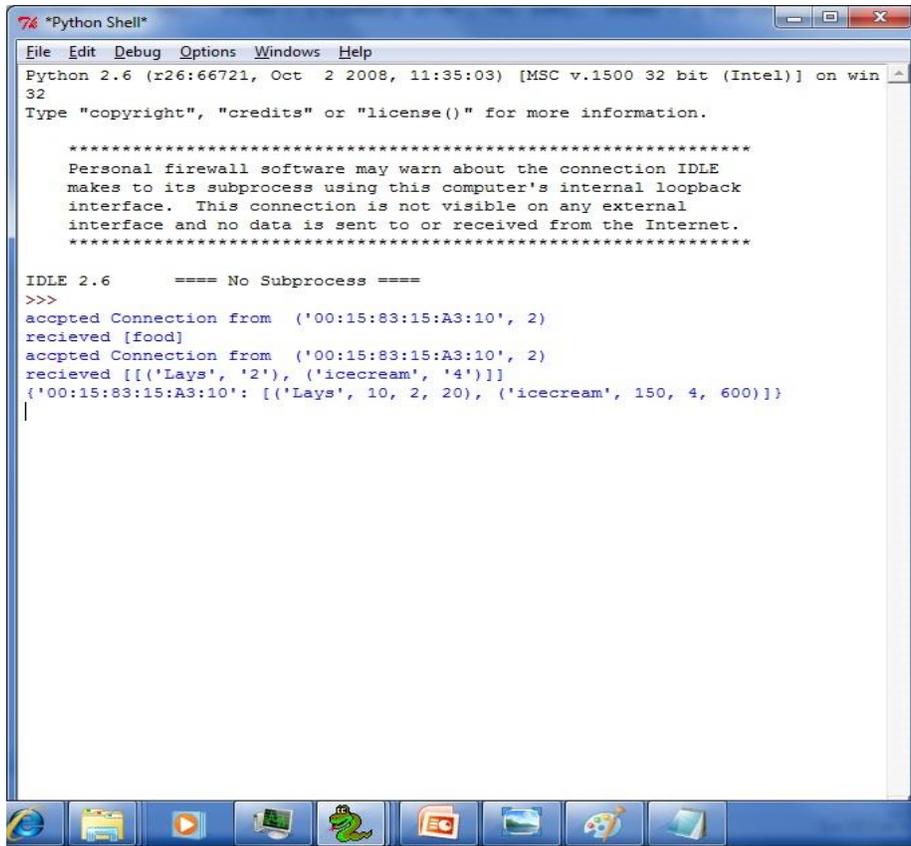
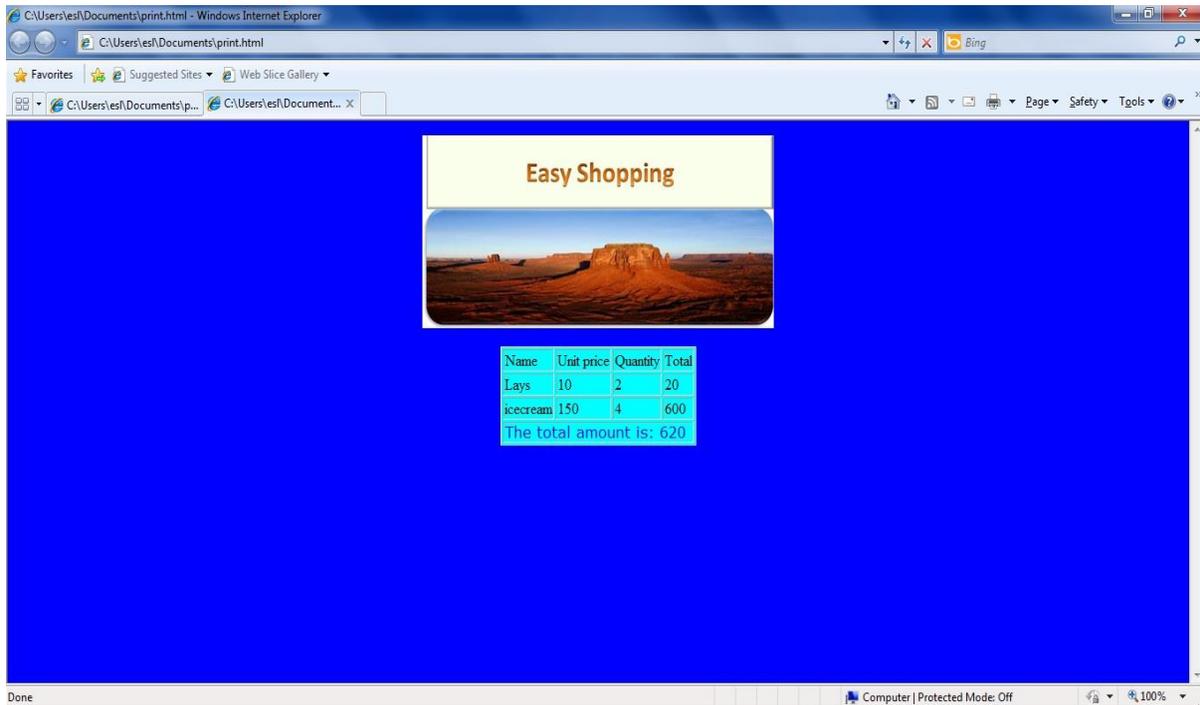


Figure 6: Screen shot of client device

- Server accepts connection from client device. The order from the customer is sent to the server. According to the order server produces bill and modify the stock.
- For printing bill, server put the customer’s MAC ID in the entry box and after clicking the button “PRINT BILL”, the bill for a specific customer (MAC ID) will save in html format. The bill is shown below-

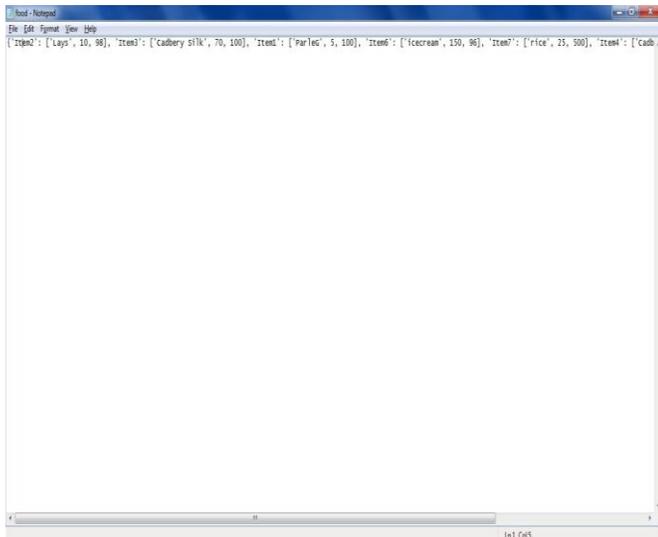


Figure 7: Screen shot of print device



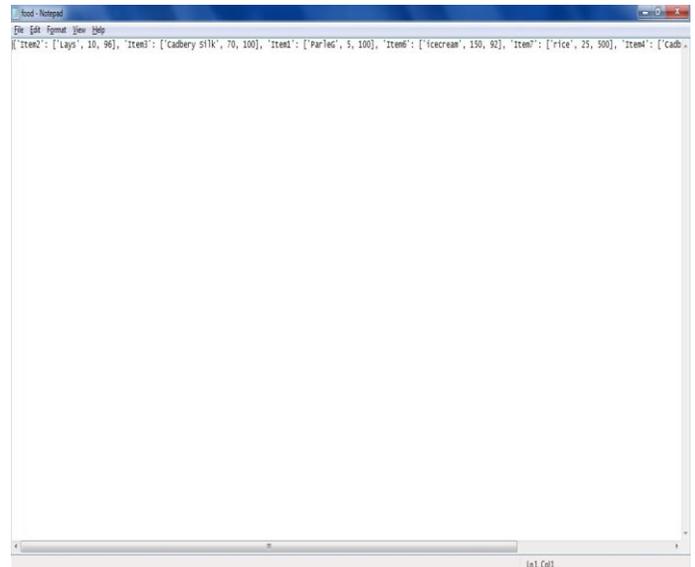
**Figure 8: Screen shot of printed bill**

- This is the bill for a specific customer.
- The food stock also modified according to the purchased quantity.



**Figure 9: Screen shot before purchasing**

- This the food stock before purchasing.



**Figure 9: Screen shot before purchasing**

- This is the food stock after purchasing where the quantity of Lays and ice cream is reduced according to the purchased quantity.

## VIII. APPENDIX

### Code for Client:

```
from Tkinter import *
import bluetooth
f=0
```

```
def ord_final():
    global root,a,a1,a2,a3,a4,a5,b1,b2,b3,b4,b5,b,root2
    temp=[]

    if (a.get()!=""):
        temp.append((a.get(),b.get()))
    if (a1.get()!=""):
        temp.append((a1.get(),b1.get()))
    if (a2.get()!=""):
        temp.append((a2.get(),b2.get()))
    if (a3.get()!=""):
        temp.append((a3.get(),b3.get()))
    bd_addr="00:15:83:3D:0A:57"
    port=2
    sock=bluetooth.BluetoothSocket(bluetooth.RFCOMM)
    sock.connect((bd_addr,port))
    sock.send(str(temp))
    sock.close()
    root11.destroy()
    root2.destroy()
    main()

def order():
    global root,a,a1,a2,a3,a4,a5,b1,b2,b3,b4,b5,b,f,root11
    f=1
    root11=Tk()
    Label(root11,text="Product
name:",fg="blue").grid(row=0,column=0)

Label(root11,text="Quantity:",fg="blue").grid(row=0,column=2)
a=Entry(root11)
a.grid(row=1,column=0)
b=Entry(root11)
b.grid(row=1,column=2)

a1=Entry(root11)
a1.grid(row=2,column=0)
b1=Entry(root11)
b1.grid(row=2,column=2)

a2=Entry(root11)
a2.grid(row=3,column=0)
b2=Entry(root11)
b2.grid(row=3,column=2)
a3=Entry(root11)
a3.grid(row=4,column=0)
b3=Entry(root11)
b3.grid(row=4,column=2)
Button(root11,text="OK",fg="red",bg="violet",command=ord_fi
nal).grid(row=5,column=1)
root11.mainloop()

def food():
    global root1,stock,root,root2
    root1.destroy()
    root2=Tk()
    bd_addr="00:15:83:3D:0A:57"
    port=2
    sock=bluetooth.BluetoothSocket(bluetooth.RFCOMM)
```

```
sock.connect((bd_addr,port))
sock.send("food")
sock.close()

server_sock=bluetooth.BluetoothSocket(bluetooth.RFCOMM)
port =2
server_sock.bind(("",port))
server_sock.listen(1)
client_sock, address=server_sock.accept()
print "accepted Connection from ", address
mac=address[0]
data =client_sock.recv(1024)
print "recieved [%s]" %data
food=eval(data)
client_sock.close()
server_sock.close()
r=0
for i in food.keys():
    Label(root2,text="Item      Name:      "+food[i][0]+"
",fg="brown").grid(row=r,column=0)
    Label(root2,text="Item      Unit      price:
"+str(food[i][1]),fg="red").grid(row=r,column=1)
    r=r+3
    Button(root2,text="PLACE
ORDER",command=order,bg="pink",fg="blue")
.grid(row=25,column=3)
root2.mainloop()

def clothes():
    global root1,stock,root,f,root2
    root1.destroy()
    root2=Tk()
    bd_addr="00:15:83:3D:0A:57"
    port=2
    sock=bluetooth.BluetoothSocket(bluetooth.RFCOMM)
    sock.connect((bd_addr,port))
    sock.send("cloth")
    sock.close()

server_sock=bluetooth.BluetoothSocket(bluetooth.RFCOMM)
port =2
server_sock.bind(("",port))
server_sock.listen(1)
client_sock, address=server_sock.accept()
print "accepted Connection from ", address
mac=address[0]
data =client_sock.recv(1024)
print "recieved [%s]" %data
cloth=eval(data)
client_sock.close()
server_sock.close()
r=0
for i in cloth.keys():
    Label(root2,text="Item      Name:      "+cloth[i][0]+"
",fg="brown").grid(row=r,column=0)
    Label(root2,text="Item      Unit      price:
"+str(cloth[i][1]),fg="red").grid(row=r,column=1)
    r=r+3
```

```
Button(root2,text="PLACE
ORDER",command=order,bg="pink",fg="blue")

.grid(row=25,column=0)
root2.mainloop()

def drinks():
    global root1,stock,root,f,root2
    root1.destroy()
    root2=Tk()
    bd_addr="00:15:83:3D:0A:57"
    port=2
    sock=bluetooth.BluetoothSocket(bluetooth.RFCOMM)
    sock.connect((bd_addr,port))
    sock.send("drinks")
    sock.close()
    server_sock=bluetooth.BluetoothSocket(bluetooth.RFCOMM)
    port =2
    server_sock.bind(("",port))
    server_sock.listen(1)
    client_sock, address=server_sock.accept()
    print "accepted Connection from ", address
    mac=address[0]
    data =client_sock.recv(1024)
    print "recieved [%s]" %data
    drinks=eval(data)
    client_sock.close()
    server_sock.close()
    r=0
    for i in drinks.keys():
        Label(root2,text="Item      Name:      "+drinks[i][0]+"
",fg="brown").grid(row=r,column=0)
        Label(root2,text="Item      Unit      price:      "+str
(drinks[i][1]),fg="red").grid(row=r,column=1)
        r=r+3
        Button(root2,text="PLACE
ORDER",command=order,bg="pink",fg="blue")

.grid(row=25,column=0)
root.mainloop()

def main():
    global root1,root
    root1=Tk()

Label(root1,text="Welcome",fg="blue").grid(row=0,column=1)
    Button(root1,text="Food
item",command=food).grid(row=1,column=0)

Button(root1,text="clothes",command=clothes).grid(row=1,colu
mn=1)

Button(root1,text="Drinks",command=drinks).grid(row=1,colum
n=2)
    root1.mainloop()
main()
```

#### **Code for Server:**

```
import bluetooth
```

```
from Tkinter import *

def main():
    global address,data
    while(1):
        global a

server_sock=bluetooth.BluetoothSocket(bluetooth.RFCOMM)
    port =2
    server_sock.bind(("",port))
    server_sock.listen(1)
    client_sock, address=server_sock.accept()
    print "accepted Connection from ", address
    mac=address[0]
    data =client_sock.recv(2048)
    print "recieved [%s]" %data
    client_sock.close()
    server_sock.close()

    if (data=="food"):
        bd_addr=mac
        port=2
        sock=bluetooth.BluetoothSocket(bluetooth.RFCOMM)
        sock.connect((bd_addr,port))
        sock.send(str(food))
        sock.close()

server_sock=bluetooth.BluetoothSocket(bluetooth.RFCOMM)
    port =2
    server_sock.bind(("",port))
    server_sock.listen(1)
    client_sock, address=server_sock.accept()
    print "accepted Connection from ", address
    mac=address[0]
    data =client_sock.recv(1024)
    print "recieved [%s]" %data
    final_food=eval(data)
    client_sock.close()
    server_sock.close()
    for j in food.keys():
        for k in final_food:
            if(k[0]==food[j][0]):
                food[j][2]-=int(k[1])

    for i in food.keys():
        for j in final_food:
            if (j[0]==food[i][0]):
                b=(j[0],food[i][1],int(j[1]),food[i][1]*int(j[1]))
                bill[mac].append(b)
    print bill
    f=open("bill.txt","w")
    f.write(str(bill))
    f.close()
    f=open("food.txt","w")
    f.write(str(food))
    f.close()
```

```
if (data=="cloth"):
    bd_addr=mac
    port=2
    sock=bluetooth.BluetoothSocket(bluetooth.RFCOMM)
    sock.connect((bd_addr,port))
    sock.send(str(cloth))
    sock.close()

server_sock=bluetooth.BluetoothSocket(bluetooth.RFCOMM)
port =2
server_sock.bind(("",port))
server_sock.listen(1)
client_sock, address=server_sock.accept()
print "accepted Connection from ", address
mac=address[0]
data =client_sock.recv(1024)
print "recieved [%s]" %data
final_cloth=eval(data)
client_sock.close()
server_sock.close()

for i in cloth.keys():
    for j in final_cloth:
        if (j[0]==cloth[i][0]):
            b=(j[0],cloth[i][1],int(j[1]),cloth[i][1]*int(j[1]))
            bill[mac].append(b)
    print bill
    f=open("bill.txt","w")
    f.write(str(bill))
    f.close()
    f=open("cloth.txt","w")
    f.write(str(food))
    f.close()

if (data=="drinks"):
    bd_addr=mac
    port=2
    sock=bluetooth.BluetoothSocket(bluetooth.RFCOMM)
    sock.connect((bd_addr,port))
    sock.send(str(drinks))
    sock.close()

server_sock=bluetooth.BluetoothSocket(bluetooth.RFCOMM)
port =2
server_sock.bind(("",port))
server_sock.listen(1)
client_sock, address=server_sock.accept()
print "accepted Connection from ", address
mac=address[0]
data =client_sock.recv(1024)
print "recieved [%s]" %data
final_drinks=eval(data)
client_sock.close()
server_sock.close()

for i in drinks.keys():
    for j in final_drinks:
        if (j[0]==drinks[i][0]):
            b=(j[0],drinks[i][1],int(j[1]),drinks[i][1]*int(j[1]))
            bill[mac].append(b)
    print bill
    f=open("bill.txt","w")
    f.write(str(bill))
    f.close()
    f=open("drinks.txt","w")
    f.write(str(food))
    f.close()

def bill1():
    global root,a
    root=Tk()
    a=Entry(root)
    a.grid(row=0,column=0)
    Button(root,text="PRINT
BILL",command=show_bill).grid(row=1,column=0)
    root.mainloop()
def show_bill():
    global root,a
    print a.get()
    f=open("bill.txt","r")
    d=eval(f.read())
    temp=""
    total=0
    temp='<body bgcolor=blue><center><img src=Desert.jpg
height=200width=400>
</center><br><table align=center bgcolor=cyan
border=1><tr><td>Name
</td>'+<td>Unit
price</td>'+<td>Quantity</td>'+<td>Total</td></tr>'
    for i in d[a.get()]:
        temp+='<tr><td>'+i[0]+'</td><td>'+str(i[1])+'</td><td>'+str(
i[2])+'</td>
<td>'+str(i[3])+'</td></tr>'
        total+=i[3]
    temp+='<tr><td colspan=4><font color=blue face=verdana
size=3>
The total amount is: '+str(total)+'</font></td></tr>'
    temp+='</table>'
    g=open("print.html","w")
    g.write(temp)
    g.close()
    main()
food1=open("food.txt","r")
food=eval(food1.read())
cloth1=open("cloth.txt","r")
cloth=eval(cloth1.read())
drinks1=open("drinks.txt","r")
drinks=eval(drinks1.read())
f=open("bill.txt","r")
bill=eval(f.read())
main()
#bill1()
```

### IX. FUTURE WORK

1. The project can be improved more and more by including compact security system.
2. Encryption and decryption can be incorporated to the data records to improve the security based on a keyword at the server and client part. By adding this facility we will prevent the problem of hacking.

### X. CONCLUSION

After completing the project it can be concluded that using Bluetooth technology makes this system cost effective. It is based on departmental store support system, which in turn reduces the number of employees and prevents item missing from store. This system will provide efficient order and automatic billing system corresponding to the MAC ID generated from Bluetooth devices provided for each customer. Moreover using this system will also be helpful for maintaining records at the server. The main problem or disadvantage associated with Bluetooth is that it cannot be connected to more than seven devices, to overcome this problem we have to use several servers to maintain connections. This technique is easy, inexpensive and efficient to implement and maintain.

### ACKNOWLEDGMENT

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extensive, is always in adequate and this acknowledgement is no exception.

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# Automated Traffic Control Network Using Secure Wireless

SWARNABHA SINHA, NILANJAN PAUL, ANUJA PATEL, ABID KHAN, SANJIT GUPTA

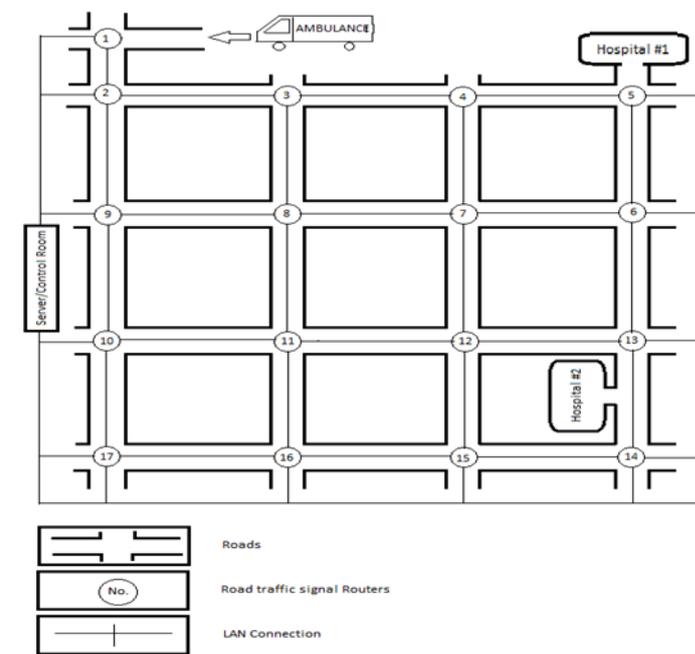
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**Abstract-** Traffic being the most serious problem in the present overcrowded world, several mishaps occurs in our day to day life. In this paper we have tried to develop an algorithm which will try to overcome this problem. The algorithm that we developed tracks the incoming ambulance or fire engine and the traffic signal automatically turns green and hence provide a smooth flow of these vehicles in even heavy traffic. Original signal is restored as soon as the vehicle moves out of the scanning vicinity of the traffic signal. Moreover, to avoid being stuck in congestion on a particular route, the user can just enter the destination and the program shall provide the user with the optimum path both in terms of traffic congestion and distance, along with other possible paths.

**Index items**– Automated traffic control, Bluetooth, cryptography, python programming, and wireless network.

## MOTIVATION

In India rapid growth of population coupled with high rate of industrialization has resulted in unmanageable increase in traffic volume, especially in metropolitan cities and urban areas. Due to this increase in traffic density several valuable lives are lost due to delay in receiving medical attention. So we designed a system which prioritizes emergency vehicles like ambulances, fire engines and provide them with a congestion free path to reach its destination as soon as possible.



## PROBLEMS:

One of the most challenging problems of urban civilization is directly or indirectly related to population explosion, traffic congestion being one of the most persistent one. Not only it wastes our valuable time but also in some cases situations can go critical.

- Traffic congestion hampers the speed of vehicles which also include emergency vehicles like ambulances, police van and fire engines whose delay can put life of many at risk.
- Unnecessary waiting at the traffic signals due to unequal traffic density
- Absence of knowledge about the routes of a city.
- Handling huge traffics can get daunting at times.

It's the emergency services which pay the maximum price when caught in traffic jams especially the ambulance services where situations can be very critical. To solve this problem we have come up with the solution of **automated traffic control using secure wireless network.**

Using this technology we make traffic signals automatically green as any ambulance comes in its vicinity, thereby minimizing the unnecessary time spent in traffic jams. As a result it gets a clear path to carry the patient to a nearby hospital which can be at times quite vital to save one's life. Moreover we find all the available paths from the current position of the vehicle to the hospital, highlighting the shortest or optimal path., this facility can also make up for the meager knowledge of routes of the driver. It also solves the problem of language barrier which is experienced by many drivers who are new to a completely cultural diverse location where our program proves to be quite useful.

Since the changing of signals is completely automated we make the task of traffic operators quite hassle free and comfortable.

This facility further enables us to deal traffic according to its density. It's unnecessary to keep a whole lot of vehicles waiting at a 'red' signal for 60secs than letting few vehicles pass through 'green' signal for that equal amount of time. The path which has higher traffic density faces 'red' signal for lesser time and more of green signal and vice versa. This greatly enhances the mobility of the vehicles

As automated systems are taking over the manual ones due to their increased efficiency and human error free nature, introduction of this technology takes it to an advanced level.

## XI. INTRODUCTION

We aim to develop an automatic traffic control system which can function independent of any outside help. Our traffic control system is equipped with a distinct feature especially for ambulance through which it is being assigned priority in terms of getting a green signal ahead of normal vehicles. Along with that we are also determining the optimum path between any source and destination. But the most crucial point is that we are providing all these facilities with the help of very cheap and widely available technologies, which makes us distinct from others.

We implemented the following technologies in this project:

- Python (as coding language)
- Bluetooth(as a mode of communication)
- Cryptography(to enhance system security)

## PYTHON

What is Python?

Python is a general-purpose, high-level programming language whose design philosophy emphasizes code readability. Python language stands out in comparison with respect to other programming languages as it:

- Has a vast array of standard library
- Has code readability.
- Supports multiple programming paradigms
- Includes object-oriented, imperative and functional programming styles
- Is compact -  
Unlike its predecessors like java and C++, in python the length of code to perform an equivalent task is less so it reduces the memory consumption.
- Can be packaged into standalone executable file which can cater to our several needs by using third party tools
- Provides a simpler and better way to represent data in graphical form-  
Modules like matplotlib, visual provides us with the facility of mapping data in 2-D and 3-D form.
- Supports meta class based meta programming.
- Has an environment that is reasonably secure from tampering. Pre-compiled python modules can be distributed to prevent altering the source code
- Is an interpreted language, that allows for rapid, flexible, exploratory software development
- Is an example of a FLOSS (Free/Libra and Open Source Software)

Why python?

Python language stands out in comparison with respect to other programming languages in terms of its vast array of standard library and code readability. We chose it over other languages as it is more compact and also by using third party tools python code can be packaged into standalone executable file which can cater to our several needs. We have used third party modules like Bluetooth, matplotlib, pysqlite, cipher and visual. Bluetooth module helps us to perform the scanning and tracking operation. Python provides a simpler and better way to represent data in graphical form, in comparison to any other programming language. We did the implementation of the above with the help of module matplotlib. We have connected database to python with the module pysqlite as we need database connection in our project to bring

coordination between the traffic signals. To provide security to the files used in the project from unscrupulous elements, we used the module cipher. Along with 2D projection of graph, python also provides a more user friendly and sophisticated 3D projection technology using the module visual. By this module, we can easily form a sphere or other known figure in only a single statement, which in comparison, takes several steps in other programming language to accomplish.

### Python over Java

- **Concise Coding style:** The code in Python is typically much more concise than that of Java, with much lesser verbosity.
- **Dynamic Typing:** No requirement of declaring data types in Python making sure that the inheritance hierarchies especially for all the interfaces and implementations are well laid out.
- **Easier Runtime Reflection:** Java has most of the reflection capabilities but they are harder to use as compared to Python.
- **Built in language capabilities:** Python has more built in language capabilities than Java. Items such as list comprehensions, ability to deal with functions as first class objects gives a broader vocabulary to work with.
- **Clean indentation:** Indentation of the code is required in Python which may be considered as a drawback over Java, but the clean indented code is much easier to read and handle with errors.

### DISADVANTAGE OF PYTHON-

- Because Python is an interpreted language the programs written using it can be slower for certain classes of problems. For example, doing some intense computations.
- No access specifiers and hence viable to security issues

### What is Bluetooth?

Bluetooth is a wireless technology standard for exchanging data over a short distance in a very efficient and lucid way. It is a technology standard for exchanging data over short distances (using short-wavelength radio transmissions in the ISM band from 2400–2480 MHz) from fixed and mobile devices, creating personal area network (PANs) with high levels of security. Created by telecom vendor

Ericson in 1994 it was originally conceived as a wireless alternative to RS-232 data cables.

### Why Bluetooth?

- It is very cheap and easily available  
-A Bluetooth adapter costs very less (around 200 INR) and can be found easily in the market. Therefore its maintenance can be done easily
- It can connect several devices, overcoming problems of synchronization-
- It is very easy to install-  
Unlike its other connecting devices it consumes very less power so it can operate without an external source.
- Quite efficient and robust-  
A Bluetooth device is not affected by any external agent like weather conditions, presence of other devices.
- Delay in scanning turns out to be beneficial for our project-  
In our project Bluetooth scanners are installed at every node which is scanning for the vehicles continuously .A time lag of eight seconds between any two subsequent scans gives us suitable response time for changing the signals. In an average case, a vehicle within 30 feet of the junction of a crossroad will take less than eight seconds to move out of the coverage area. Thus this delay helps us to eliminate the repeated detection of same vehicle within a span of time.
- Limited area of access proves to be quite an advantage for our project-  
Detecting a vehicle at a distance greater than 50 feet away seems to be quite unnecessary as it will keep the signal 'green' for a longer period of time than desired. So a 30-foot range of access proves to be quiet appropriate.
- Does not interfere with normal signaling of devices-

Since our project mainly deals with ambulance and other emergency vehicles which can contain sophisticated and sensitive devices. These devices can get easily affected by the interference of an external signal and Bluetooth just avoids that.

#### Why better than Wi-Fi?

- **Cost effective-**  
Cost of setting a Bluetooth in comparison to Wi-Fi is much less.
- **Interferes with external signaling of devices-**  
At the time of functioning, Wi-Fi devices tend to interfere with signaling of surrounding devices which can prove quite harmful in several cases when dealing with certain sophisticated and life saving devices.
- **Lower power consumption and easy to maintain-**  
A portable device's primary need is that it should consume less amount of power, but Wi-Fi devices require larger amount of power to function properly which makes it quite inappropriate within the context of our project.

#### Why better than RFID?

- **Data transfer rate comparatively faster-**  
In RFID bit wise data transfer takes place but in Bluetooth a bulk of data can be transferred in no time which makes it better in cases which require a large amount of information storing and sharing.
- **Area of access too small for our project;**  
RFID can be accessed for a very small distance which is quite impractical with respect to our project.

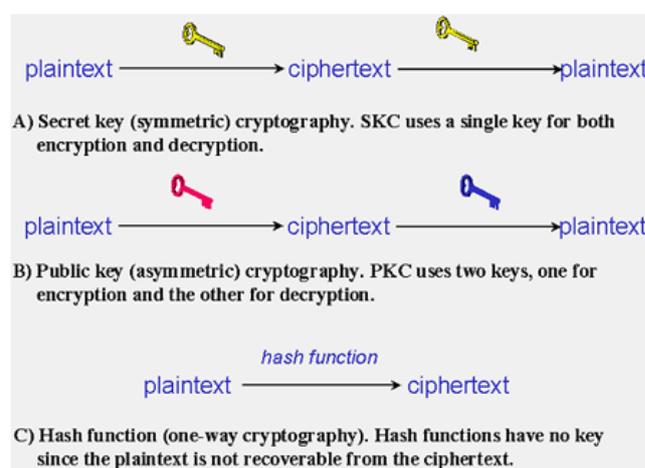
#### What is cryptography?

Cryptography is the science of information security. It is about construction or formation of some basic protocols to overcome the influence of adversaries. Modern cryptography concerns itself with the following four objectives:

- **Confidentiality** -the information cannot be understood by anyone for whom it was unintended.
- **Integrity** -the information cannot be altered in storage or transit between sender and intended receiver without the alteration being detected.
- **Non-repudiation** -the sender of the information cannot deny at a later stage his or her intentions in the creation or transmission of the information.
- **Authentication** -the sender and receiver can confirm each other's identity and the origin & destination of the information.

Generally there are three types of cryptography techniques-

- **Secret Key Cryptography (SKC):** Uses a single key for both encryption and decryption
- **Public Key Cryptography (PKC):** Uses one key for encryption and another for decryption
- **Hash Functions:** Uses a mathematical transformation to irreversibly "encrypt" information



#### How cryptography actually works?

The word 'crypto' means hidden. Encryption is the process of converting ordinary information called plaintext into unintelligible gibberish called ciphertext and decryption that is the reverse, in other words, moving from the unintelligible cipher text back to plaintext. The set of algorithms or functions that are responsible for encryption and decryption sequence is called key.

The encryption and decryption process can be performed using various methods or standards. In this project we are using Data Encryption Standards

(DES).DES is the archetypal block cipher with block size is 64 bits. The key used in DES ostensibly consists of 64 bits; however, only 56 of these are actually used by the algorithm. Eight bits are used solely for checking parity, and are thereafter discarded. Hence the effective key length is 56 bits, and it is always quoted as such. Every 8th bit of the selected key is discarded, that is, positions 8, 16, 24, 32, 40, 48, 56, 64 are removed from the 64 bit key leaving behind only the 56 bit key.

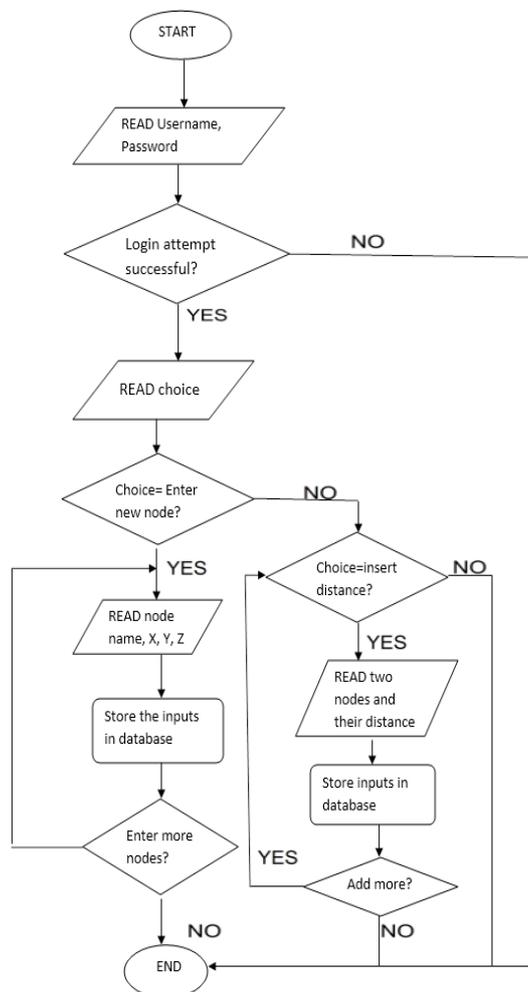
What is the need of cryptography?

Our project deals with full automation of traffic signals which is vulnerable to any kind of anti-social

lights any interference from any foreign unscrupulous element will make the whole situation more chaotic and can disrupt the whole traffic system. So by securing it we are trying to avert or avoid any such activities.

## XII. RESEARCH ELABORATION

In this section we mention about previous works which have motivated us in implementing this project. We have seen a number of projects which used Bluetooth Scanning devices for various purposes. Coding of various projects is also done using python. The combination of Bluetooth and python has helped in developing different types of projects. In the paper ‘WRife:a’ wireless epidemic



activities which can prove quite troublesome. At the time when database is edited through scanner which is the deciding factor in management of the traffic

data collection protocol suitable for medical monitoring’ by students of Texas University, we see that patient’s health related data is collected using

medical sensors. Fixed and mobile radio devices are used for disseminating information from medical sensors to the servers. In this project Wi Fi could have been used but RF radiation emitted by it interferes with medical devices and may also cause health hazards. The bandwidth requirement of Bluetooth is much less than that of Wi fi and is also low power consuming device, thereby reducing interference and safety concerns. Moreover in this project poisoning where attackers inject corrupted data causing the loss or modification of original message sample, various cryptographic ciphers have been used. So we have also encrypted our database file before sending it to the client. The client can decrypt the file using the key. In another project ‘A deadline driven epidemic data collection protocol suitable for tracking inter personnel rendezvous’ we can see the application of Bluetooth for peer to peer wireless data collection algorithm.

In our project we have three components-ambulance which acts as the client, scanners which act as Bluetooth access points and master servers. When the ambulance sends signal to the scanner in order to get the database for finding the shortest path leading to the hospital, the scanner sends the database to the ambulance in an encrypted format. This similar approach is observed in another work ‘In-Building Location using Bluetooth’. In this project the location of any mobile device can be detected using Bluetooth scanners. The received signal strength from each coordinate is sent to the server by the scanners. The server has a map of RSSI (Received Signal Strength Indication) at different coordinates. Thus it gives the deduced location of the mobile device by the use of the received RSSI and triangulation technique.

### XIII. METHODOLOGY

#### A: ADMINISTRATION:

##### 1. FLOW DIAGRAM:

##### 2. STEP ALGORITHMS:

###### Step 1: START

**Step 2:** Login window opens  
Enter user name: name  
Enter password: pass

**Step 3:** If username exist in table:

If password==pass:  
//login successful  
//Another window opens  
To enter new node GOTO

###### Step 4

To insert distance between two nodes GOTO Step 7

Else:

//login unsuccessful  
GOTO Step 2

#### //ENTER A NEW NODE

**Step 4:** click” ENTER NEW NODE” button in new window

//another window opens  
GOTO Step 5

**Step 5:** Enter new node: node

Enter X co-ordinate: x

Enter Y co-ordinate: y

Enter Z co-ordinate: z

“Submit” button is pressed

**Step 6:**”ENTER ANOTHER NODE” button is pressed

//to insert another node  
//another window opens  
GOTO Step 5

#### //INSERT DISTANCE BETWEEN NODES

**Step 7:**”enter distance between paths” button is pressed

//another window opens  
GOTO Step 8

**Step 8:**Enter source: source

Enter destination: destination

Enter distance: distance

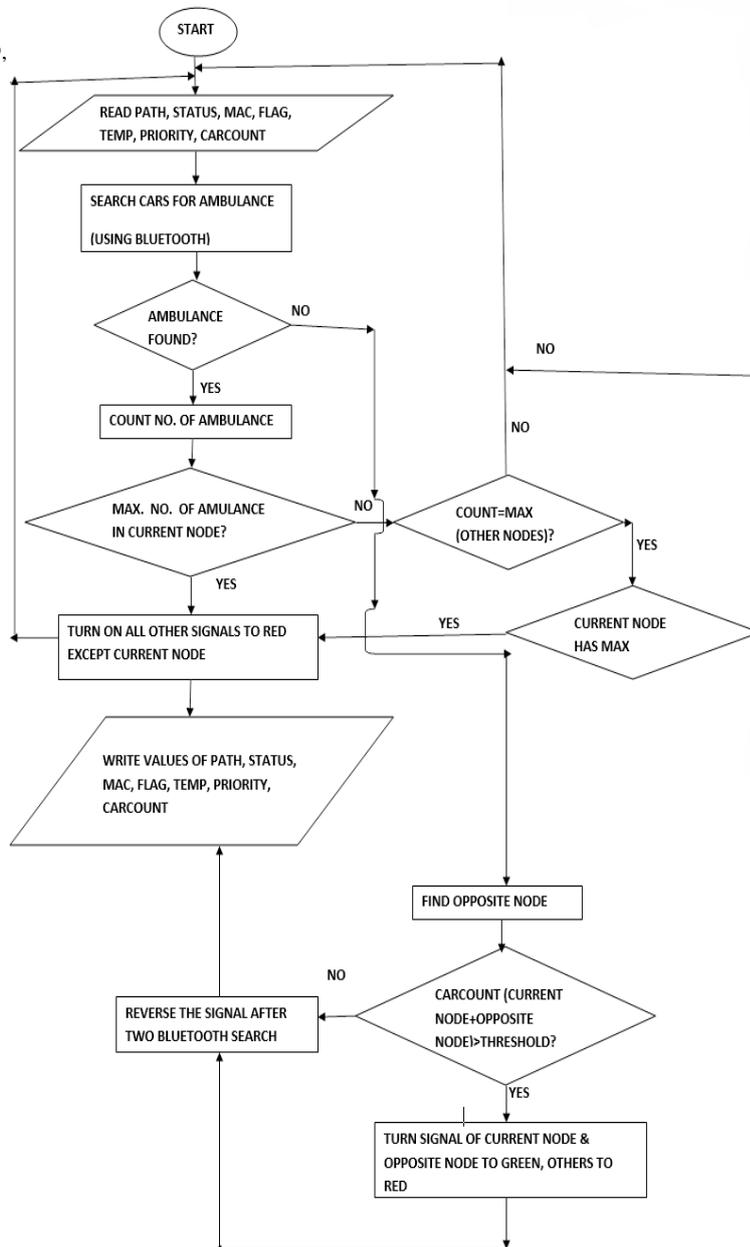
“Submit” button is pressed

**Step 9:**”ENTER ANOTHER DISTANCE” is pressed

//to insert distance of other two nodes  
GOTO Step 8

#### B: AMBULANCE:

##### 1. FLOW DIAGRAM:



**Step 1:** START

**Step 2:** read path, status, mac, flag, temp, priority, car count from file

**Step 3:** search cars (Bluetooth devices) at a particular node

**Step 4:** if mac address of ambulance is found in search:

GOTO Step 5

Else:

GOTO Step 13

**Step 5:**Count number of ambulance present in current node

**Step 6:** find number of ambulance present in every other nodes

**Step 7:** if maximum number of ambulance is present in current node:

## 2. STEP ALGORITHMS:

GOTO Step 8

Else:

GOTO Step 9

**Step 8:** Turn all node-signal RED except current node, which is turned GREEN

GOTO Step 12

**Step9:** if number of ambulance present in current node is same as any other node and that is maximum value of ambulance in any node:

GOTO Step 10

Else:

GOTO Step 2

**Step 10:** check priority of each node

**Step 11:** if priority of current node is maximum:

GOTO Step 8

Else:

GOTO Step 2

**Step 12:** write updated values of path, status, mac, flag, temp, carcount into file

GOTO Step 2

**Step 13:** find opposite node of current node

**Step 14:** check if sum of carcount of current node and opposite node is greater than threshold

Value then:

GOTO Step 15

Else:

GOTO Step 16

**Step 15:** turn on current node and opposite node-signal to GREEN and others to RED

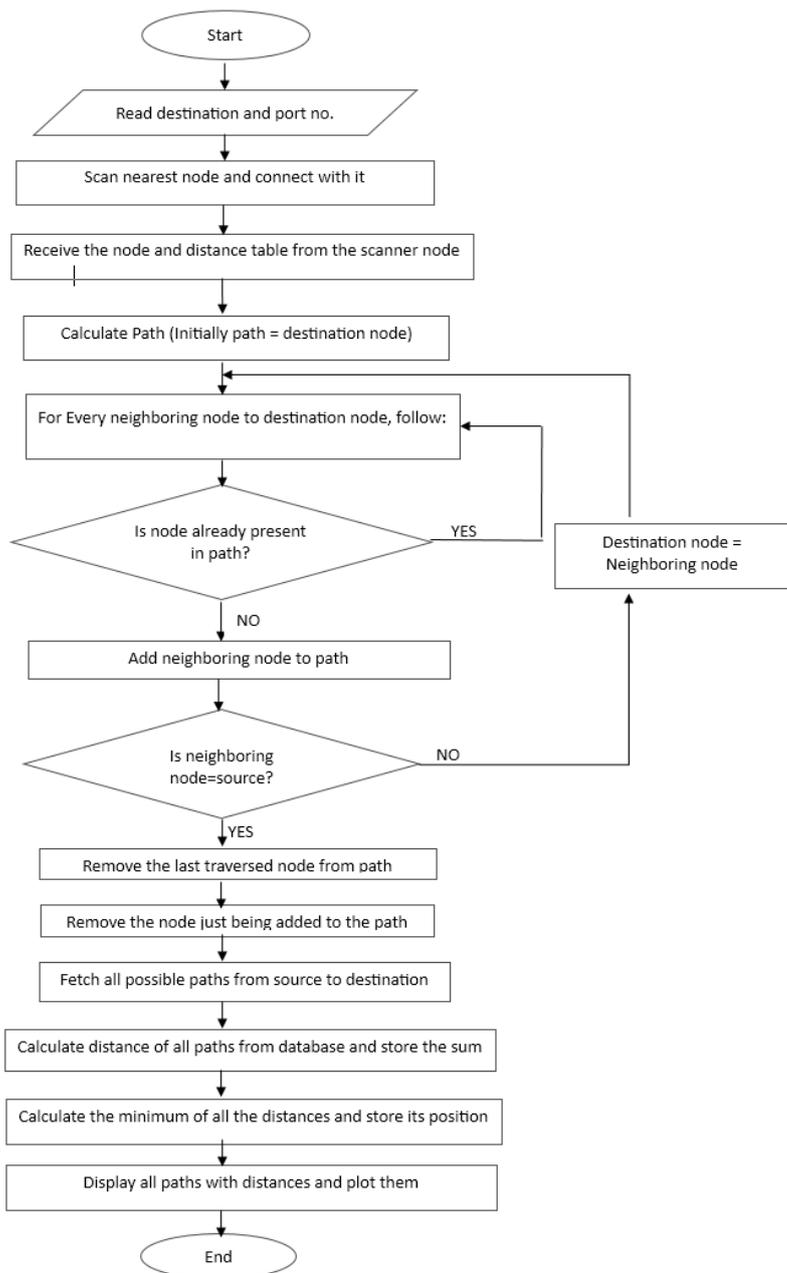
GOTO Step 12

**Step 16:** reverse node-signal of each node after 2 bluetooth search time (1 bluetooth search time requires approximately 8 seconds)

GOTO Step 12

C:PROCEDURE PATH:

1. FLOW DIAGRAM:



2. STEP ALGORITHMS:

**Step 1:** Start.

**Step 2:** Read the destination and the port number through which you want to communicate.

**Step 3:** Scan the nearest node/traffic signal scanner.

**Step 4:** Connect to the node scanner with the chosen port number, and send it a message.

**Step 5:** Receive the node and distance tables (database) in encrypted form from the scanner node, along with the name of the scanner.

**Step 6:** Decrypt the tables to get the actual values.

**Step 7:** Calculate the path using the procedure Calculate Path (source node name, destination node name and path). Initially variable path contains the destination node.

**//PROCEDURE CALCULATE PATH:**

**Step 8:** For every neighboring node to the current destination node, carry out the following steps.

**Step 9:** If this node is already present in the path:  
     Go to step 8 and continue execution with the next value.  
     Else:

Go to step 10.

**Step 10:** Add the neighboring node to the path.

**Step 11:** If this neighboring node is the source:  
Go to step 12.  
Else:  
Go to step 15.

**Step 12:** Store the path.

**Step 13:** From the path, remove the last node traversed.

**Step 14:** Go to step 8.

**Step 15:** Go to procedure CALCULATE PATH with only the destination node parameter being replaced by the neighboring node.

**Step 16:** Remove the node just being added to the path.

**Step 17:** Return from the procedure CALCULATE PATH, fetching all the paths possible to go from the source to the destination.

**Step 18:** For all paths obtained between the source and the destination through the above procedure, calculate their respective distances with the help of the database.

**Step 19:** Store these distances in a list for later usage.

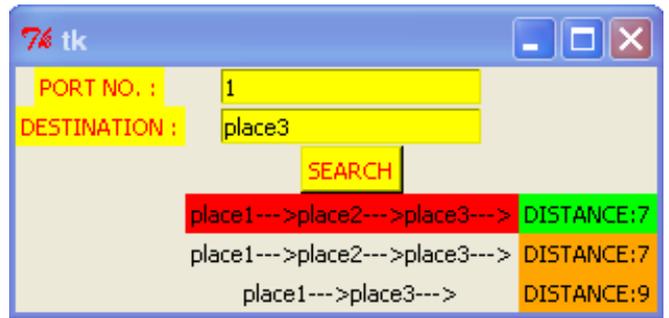
**Step 20:** Calculate the minimum distance of all the distance of the paths and store its position.

**Step 21:** Display all the paths, along with its distances in the window, where the paths are searched.

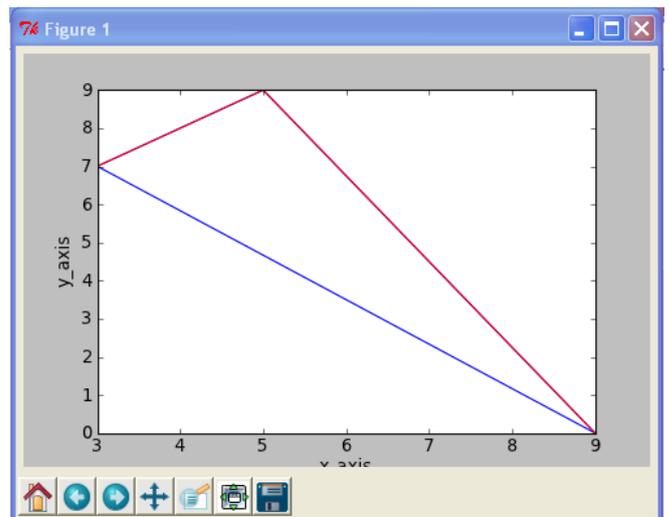
**Step 22:** Using the modules matplotlib (pyplot) and visual, plot the two dimensional and three dimensional views of the paths with respect to the co-ordinates of the nodes obtained from the database. The minimum distance path is differentiated by coloring it red while the rest are blue.

**Step 23:** End.

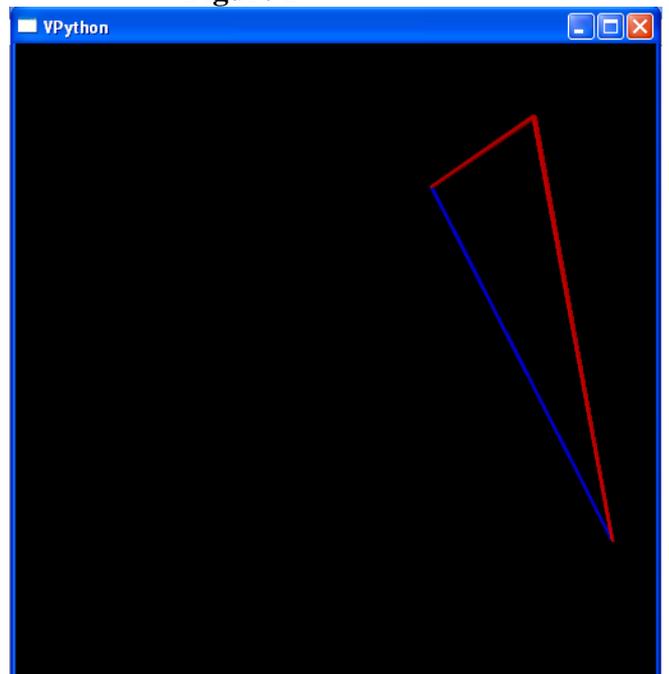
## XIV. RESULTS



**Figure 1**



**Figure 2**



**Figure 3**

Figure 1: shows every possible path with distance along with the shortest path separately

*Figure 2: shows every paths along with shortest path in 2D plot*

*Figure 3: shows every path along with shortest path in 3D plot*

## XV. FUTURE WORK

Our project can be enhanced by working in the following area,

- Encryption
- Tracking of vehicles
- Generalizing the ambulance concept
- Stoppage time

1. Encryption: We can increase the level of security of our system by making the encryption key even more secure because only the secrecy of the key provides security and it's better to assume that the intruder knows the system. We can make the system even more secure by encoding the encryption key. We can do it by using a separate key(second level key) to encrypt the basic encryption key. Hence to decrypt the file containing the information we have first decrypt the basic key using second level key and then decrypt the file using the decrypted basic key. This is known as second level encryption-decryption. Similarly we can increase the level of encryption-decryption by increasing the number of keys, each key, barring the final key, is encrypted.

If we use AES instead of DES it will enhance the level of security of the system. We can also increase the size of the key from 128 to 256 bits but it will require higher hardware configuration which in turn increases the cost of the project.

2. Tracking of vehicles: we can track any vehicle as every vehicle will have an inbuilt Bluetooth device having unique MAC id. The Bluetooth scanners installed in the traffic signals will monitor the vehicle and the vehicle's path can be derived by fetching the time and the position of the bluetooth scanners which are scanning the vehicle. Hence, we can derive the path of the vehicle by comparing the scanning time of the

different Bluetooth scanners.

3. Generalizing the ambulance concept: In our project the system give special preference to ambulance, where the signal allows it's smooth mobility, blocking other signals. This concept can also be applied to fire engines and for the vehicles of VVIP's. The work load of traffic police is substantially reduced, thereby, less number of traffic police can be deployed.
4. Stoppage time: We often encounter road blocks during maintenance, special occasions, procession etc. To avoid this kind of trouble we can introduce a new concept of "stoppage time", which is the time difference between the actual time and the ideal time taken by a vehicle to cover a certain path. We can incorporate this stoppage time concept along with the shortage path algorithm to find the real time optimal path.

## XVI. CONCLUSION

From a proper analysis of positive points and constraints of the system it is inferred that the system is working as per the objectives of the project. Installation and maintenance of the system is cost effective and takes less time. The system-user interface is user friendly and does not require specialized training or skills to operate it.

The project has been designed to substantially enhance the performance by ensuring smooth mobility of emergency services (like ambulance, fire engines, etc.). The system also reduces the workload of traffic personnel, as well as is of great help to the drivers with regard to the shortest among all possible routes between any two junctions.

Being an automated signaling system it eliminates the chances of human error which often results in road accidents and mishaps.

As discussed earlier, this project transforms the shortcomings (in terms of range and scanning time) of Bluetooth Technology into its strength thereby consolidating its applicability.

Thus this project is practically feasible, economically viable, and reliable in nature. Summing up we can say that this project with its ready to apply technology, invariably finds its application in our traffic signaling system.

An improvisation of the project and subsequent modification of the system can serve our purpose as and when needed in near future.

### ACKNOWLEDGMENT

The satisfaction that accompanies that the successful completion of any task would be incomplete without the mention of people whose ceaseless cooperation made it possible , whose constant guidance and encouragement crowned all efforts with success.

We are grateful to our project guide Mr Avranil Tah and Mr Abhishek Mallik for the guidance, inspiration and constructive suggestion that helped us in the preparation of this project.

We would like to thank E-School Learning and Institute of Engineering and Management for allowing us to do this project successfully.

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# Compensation of Impacts of Distributed Generation Using Smart Grid Technology

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**Abstract-** The evolution of current centralized generation in the form of distributed generation and Smart Grids provide a great opportunity to eradicate several issues associated with energy efficiency, energy security, power quality and the drawback of aging power system infrastructures. In order to meet the rising electrical power demand and increase service quality as well as reduce pollution, the existing power grid infrastructure should be developed into a Smart Grid that has the flexibility to allow interconnection with the distributed generation.

However, integrating distributed generation to power systems causes several technical issues, especially system stability. Therefore, to fully address the issue, current existing power systems should be up-graded to Smart Grid. To make the power grid become 'smarter', particularly in terms of stability and flexibility, Flexible AC Transmission System (FACTS) devices, especially Static Synchronous Compensators (STATCOM) are used.

This paper discusses the need and impacts of distributed generation in Smart Grid technology, in particular it identifies and determines whether the system remains stable or not after installing distributed generation into Smart Grid systems. Further, an attempt has been made to show that the STATCOM makes the grid become smarter. It is actually a voltage-source converter which can act as either a source or sink of reactive AC power to an electricity network.

**Index Terms-** power quality issues, distributed generation, smart grid, FACTS, STATCOM

## I. INTRODUCTION

Currently, the main source of electrical power generation is fossil fuel producing carbon dioxide (CO<sub>2</sub>) emission and other gases, which leads to global warming. Due to environmental issues in reducing greenhouse gases (GHG), the utilization of renewable energy sources (RES) is now growing rapidly and is being widely accepted as an alternative power supply. An important phenomenon in this regard for further future electric power generation is distributed generation, which is also known as embedded generation, dispersed generation or decentralized generation. Distributed generation in simple term can be defined as a small-scale generation. It is active power generating unit that is connected at distribution level. In order to meet the rising electrical power demand and increasing service quality demands, as well as reduce pollution, the existing infrastructure should be flexible for interconnectivity with distributed generation, such as wind turbines and solar power. However, integrating this concept of distributed generation into Smart Grid systems will increase many complex issues on real time operation, such as on power flow direction, protection, voltage profile, power quality and stability.

## II. IMPACTS OF DISTRIBUTED GENERATION

The following is a simple model of power flow diagram in a transmission system with two power generators with voltages  $E_1$  and  $E_2$  integrated by a transmission line, which may be interconnecting points or may have load. The transmission line is assumed lossless and represented by the reactance  $X$ . The corresponding phasor diagram is also shown below.

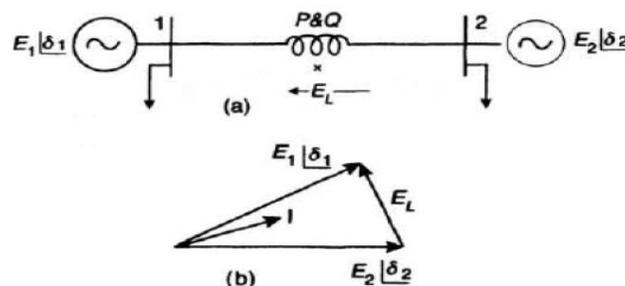


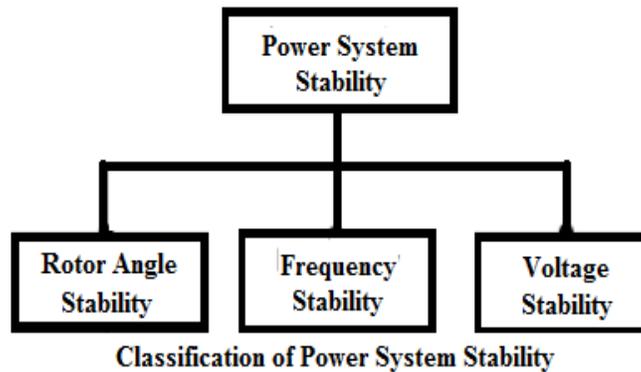
Figure 1: Line Diagram

As per the earlier work carried out on Distributed Generation and Power Quality, Some of the Various Issues involved with distributed generation are: Voltage Regulation, DG Grounding Issue, Harmonic Distortion, Flicker, Islanding, Protection System, False tripping of feeders, Fuse coordination problems, Unwanted tripping of production units, Blinding of protection, Increased or decreased fault levels, Unwanted islanding, Prohibition of automatic reclosing etc.;

### III. POWER QUALITY ISSUES

Moreover, the major issue that would have an immediate effect on the performance of the electrical system in terms of the power system stability can be put in to the following categories:

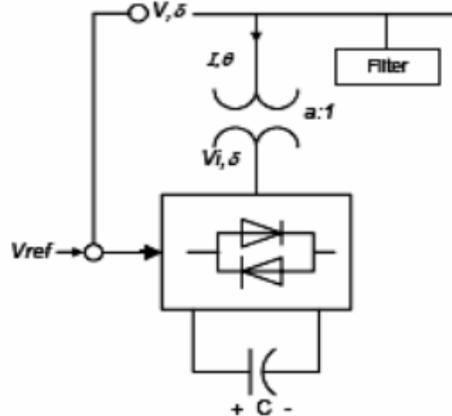
- Rotor Angle Stability
- Frequency Stability
- Voltage Stability



**Figure 2: Stability Block diagram**

### IV. COMPENSATION USING SMART GRID TECHNOLOGY

STATCOM is a Voltage-Source Inverter (VSI), which converts a DC input voltage into AC output voltage in order to compensate the active and reactive power needed by the system. Figures show the Basic structure and typical steady state V-I characteristic of STATCOM. From figure, STATCOM is a shunt-connected device, which controls the voltage at the connected bus to thereference value by adjusting voltage and angle of internal voltage source.



**Figure 3: STATCOM Structural Diagram**

As seen in figure 3, The VSC is the basic electronic part of a STATCOM, which converts the dc voltage into a three-phase set of output voltages with desired amplitude, frequency, and phase. There are different methods to realize a voltage-sourced converter for power utility application. Based on harmonics and loss considerations, pulse width modulation (PWM) or multiple converters are used. Inherently, STATCOMs have a symmetrical rating with respect to inductive and capacitive reactive power.

For example, the rating can be 100 Mvar inductive and 100 Mvar capacitive. For asymmetric rating, STATCOMs need a complementary reactive power source. This can be realized for example with MSCs

The fundamental Block diagram which represents the controlling action of a FACTS based semiconductor device namely STATCOM is also shown below.

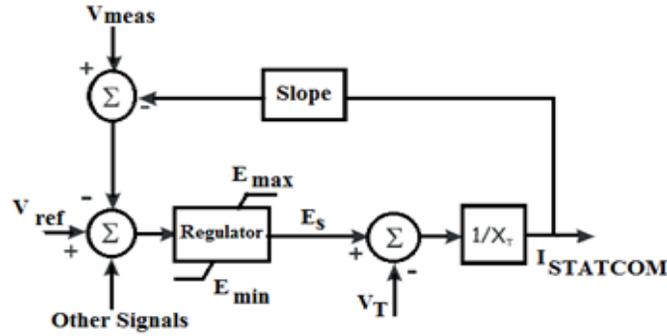


Figure 4: STATCOM Block Diagram

In a real installation, the magnitude of the source voltage is controlled through dc voltage across the capacitor. Since this loop is very fast, the dc capacitor does not need to be modelled for dynamic stability studies. The regulator keeps the STATCOM current within the current limit (IMAX).

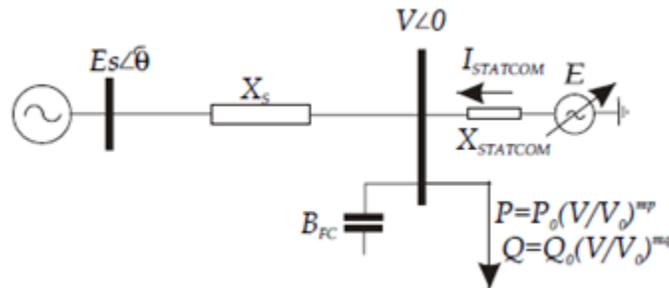


Figure 5: One line diagram of STATCOM system

A similar control of the other two parameters of stability, namely rotor angle and frequency stability can be obtained and analysed which indicates that the variations in these parameters are controlled, and also helps in improving power quality of the system. Below shown are the typical V-I characteristics of a STATCOM in figure 6. Here, STATCOM exhibits constant current characteristics when the voltage is low/high under/over the limit. This allows STATCOM to deliver constant reactive power at the limits compared to SVC.

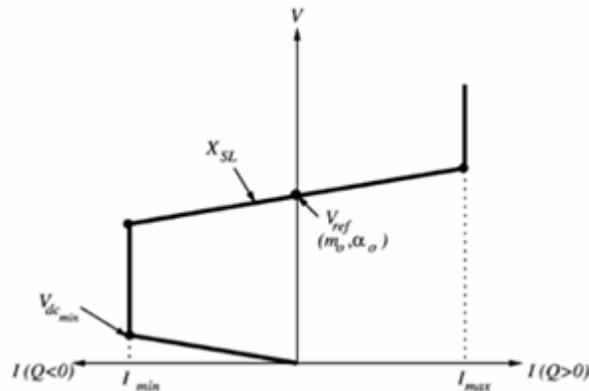
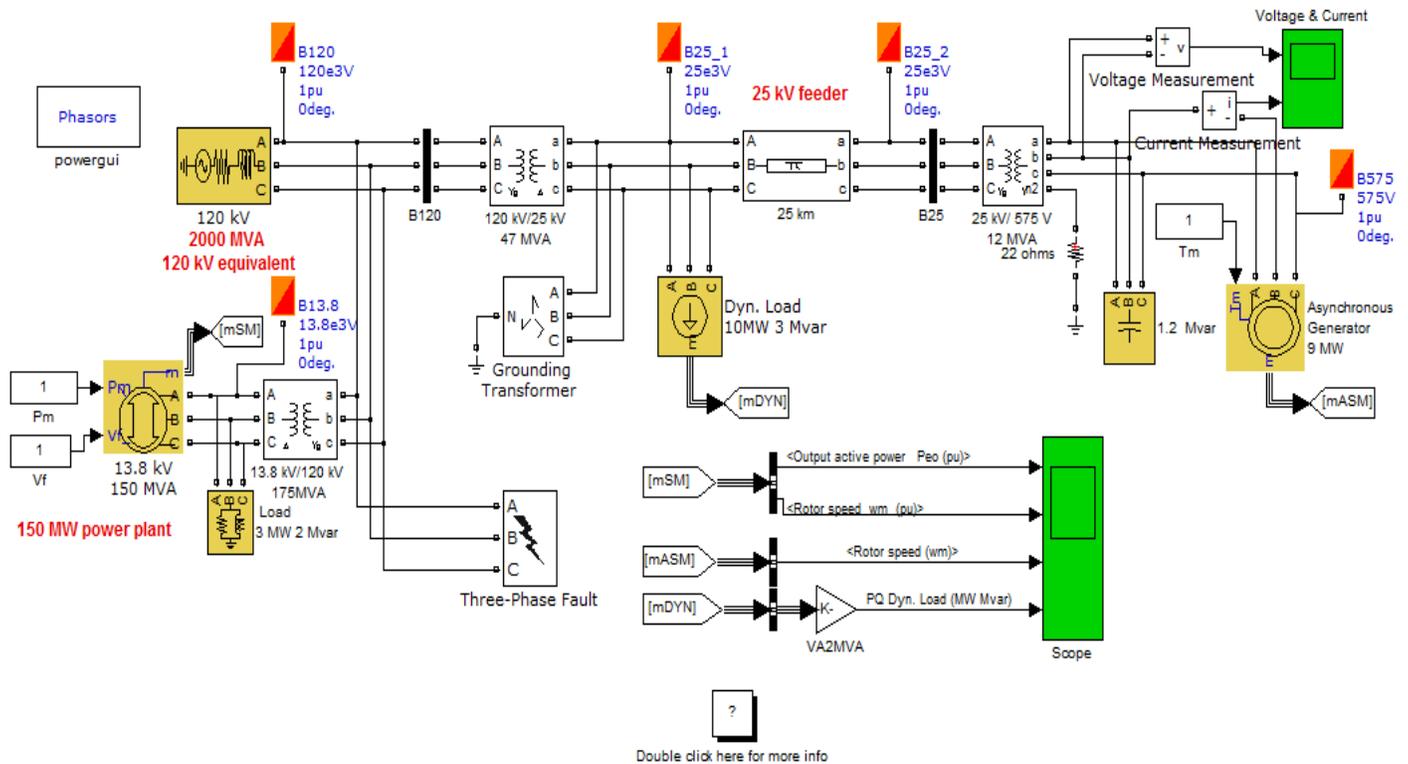


Figure 6: Typical V-I Characteristics of a STATCOM

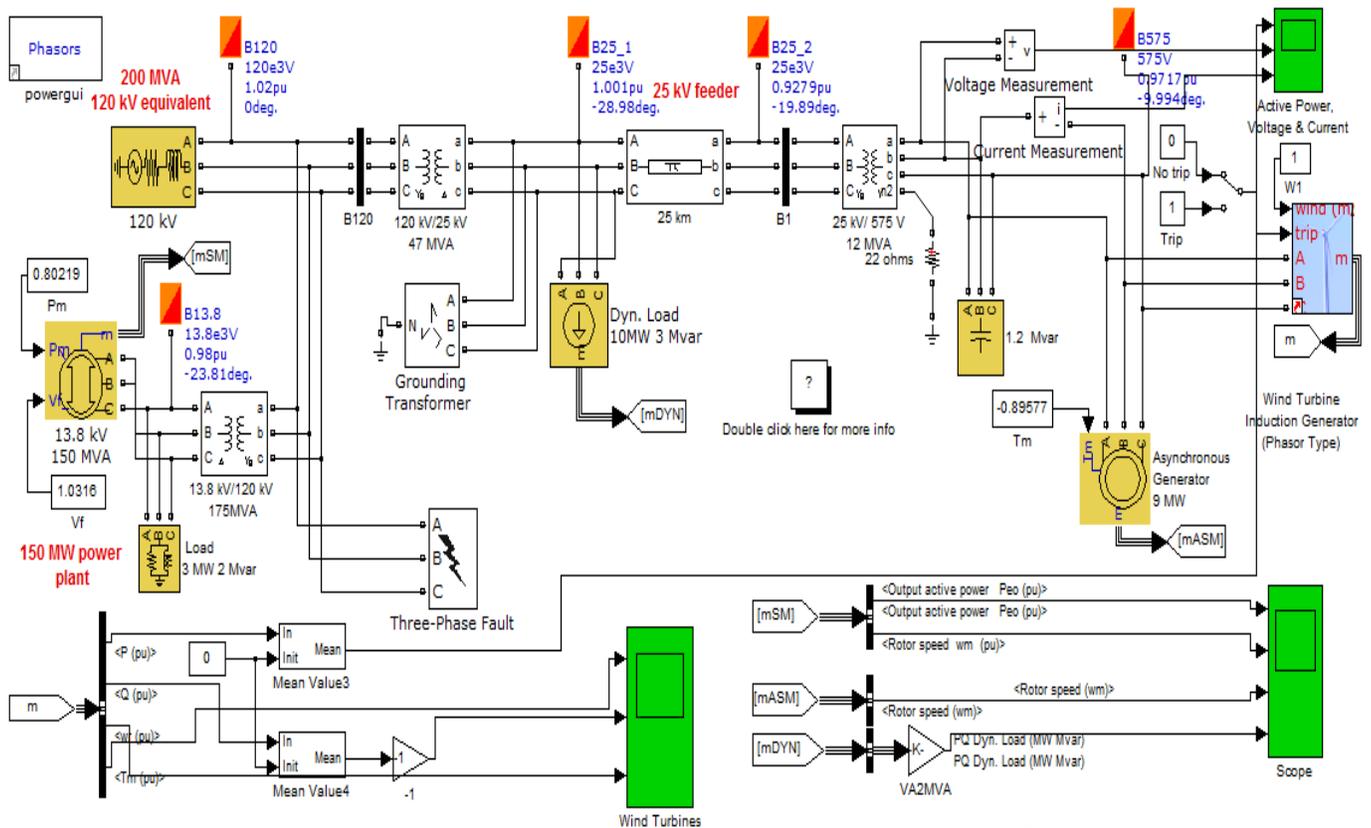
## V. METHODOLOGY DIAGRAMS

The following are the methodology diagrams drawn in three stages:

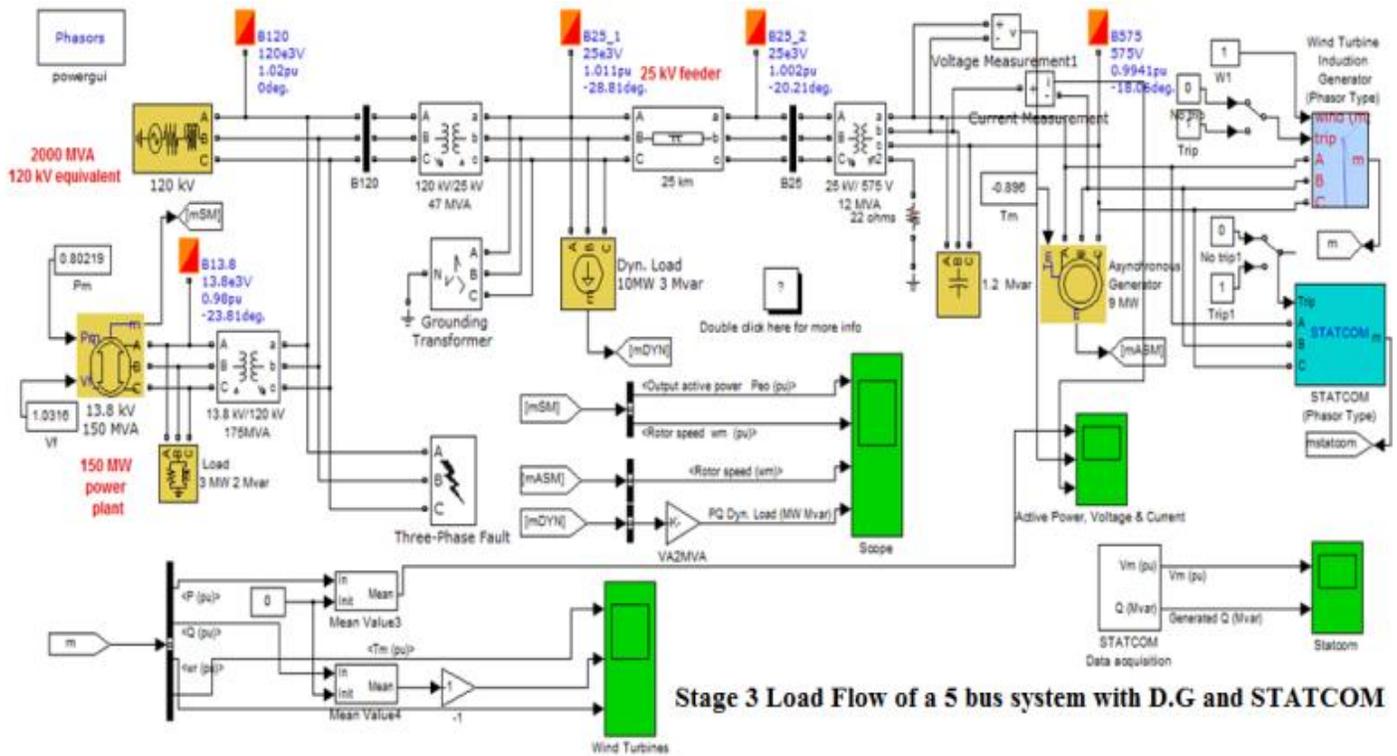
- Stage 1: 5 Bus system without distributed generation and STATCOM
- Stage 2: 5 Bus system with distributed generation and without STATCOM
- Stage 3: 5 Bus system with distributed generation and STATCOM



Stage 1 Loadflow study of a 5 Bus Test system without D.G



Stage 2: Loadflow study of a 5 Bus Test system with D.G



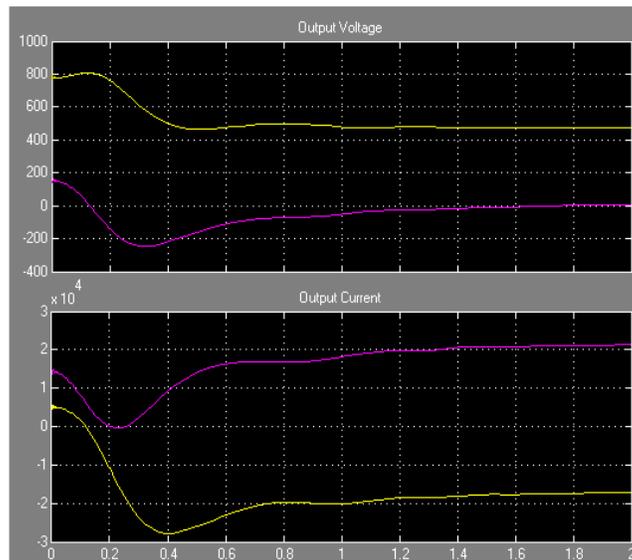
VI. RESULT & ANALYSIS

The following are a set of graphs that have been plotted from the MATLAB Simulink platform in an attempt to summarize the impacts of a distributed generation on a simple 5 bus system.

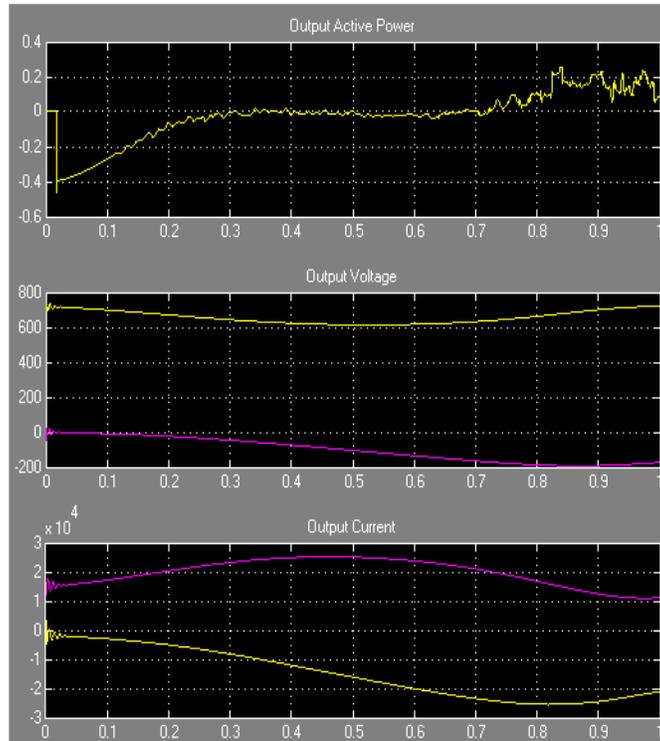
Also the ability of a STATCOM to overcome the distorting effects caused by the distributed generation i.e.; a wind turbine induction generator after its insertion has been observed stage by stage.

Graph 1 show the normal output voltage and current waveforms which are obtained after the simulation of a 5 bus system. Further, another graph has been plotted which shows the output active power, voltage and current waveforms which are traced just at the point of common coupling of the wind turbine induction generator.

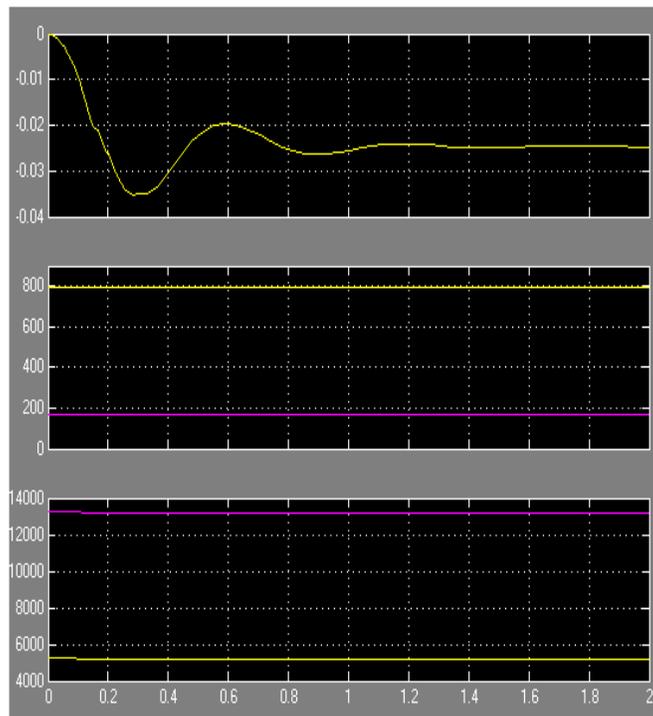
It is observed that, during the point of contact of the distributed generation to the smart grid, the voltage experiences a considerable amount of fluctuation.



Graph 1: Output Voltage & Current of 5 Bus system without D.G



**Graph 2: Output after introduction of D.G in to 5 Bus system**



**Graph 3: Output of 5 Bus System with D.G and STATCOM**

But when the STATCOM controls applied to the system and compensation is carried out, there is a near stable voltage profile as indicated in the third graph shown above. Here also, the same parameters namely active power, voltage and current have been plotted. The above work has actually been carried out using MATLAB Simulink starting with the load flow analysis and then the parameter measurement was done and was later on captured on the scope

## VII.CONCLUSION

With the presence of distributed generation the power flow is no longer radial but it can be reserved or meshed with the distributed generation sending power in any directions from where it is coupled.

This occurrence definitely has created a series of new problems, some of them closely related to system reliability, power quality and stability.

It is concluded that the introduction of distributed generation in a power system causes power stability issues in terms of the voltage, frequency and load angle of the grid to which the DG is connected.

It is obvious that integrating distributed generation in a network requires an advanced control device which is critical to ensuring high reliability and stability of the power system.

The simulation result clearly indicates that the utilization of STATCOM is able to maintain the voltage, frequency and voltage angle of the system in stability margins, following the connection of distributed generation and fault.

The result also shows the feasibility of integrating distributed generation on Smart Grid while its operation is in PV mode. Hence the bus voltage and frequency of distributed generation is regulated by its own controller. The implementation of STATCOM with proper control allows the grid to be smarter, especially in terms of stability. This is because of the capability of STATCOM to provide voltage enhancement by absorbing and/or supplying reactive power during integration of distributed generation and post fault conditions.

Hence, we could finally conclude that from the above made study and implementation of the impacts and compensation of a 5 bus system using smart grid technology, the distributed generation in spite of the vast range of applications and the kind of advantages it would offer in a power system, more often than not, it introduces certain amount of distortion in to the power system under operation. In order to overcome these distortions caused in the waveforms, especially that of the active power, voltage and current, it is advisable to use FACTS based devices like STATCOM.

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# Effects of Job Stress on Employee Retention: A Study on Banking Sector of Pakistan

Asim Masood

**Abstract-** In today's economic upheavals, downsizing, layoffs and mergers have cost hundreds of workers their jobs in banking sector of Pakistan. Many more have been shifted to unfamiliar tasks within their banks and wonder how much longer they will be employed. Adding to the pressures that workers face are new bosses, computer surveillance, fewer health and retirement benefits, and the feeling they have to work longer and harder just to maintain their current economic status. Workers at every level are experiencing increased tension and uncertainty. They are undergoing "Job Stress", to be precise. This study examines the relationship between Job Stress and Employee Retention and consequences of high stress on bank employees of banking sector of Pakistan.

**Index Terms-** Job Stress, Employee Retention, Performance, Working Conditions Organizational Culture

## I. INTRODUCTION

**S**tress is defined in terms of its physical and physiological effects on a person, and can be a mental, physical or emotional strain. It can also be a tension or a situation or factor that can cause stress. Occupational stress can occur when there is a discrepancy between the demands of the environment/workplace and an individual's ability to carry out and complete these demands. (Wikipedia)

The reason for choosing this topic being; Job Stress has become the greatest threat in the banking sector of modern era. The advent of technology, the bombardment of countless information of diverse nature and the competent business environment does not leave anyone to feel secure in banking sector of Pakistan. Everyone is literally under some sort of pressure and every night before sleeping, thousands of fears run across nearly every employee. This entire situation mostly directly and sometimes indirectly affects employee retention at work place.

All around the globe Stress is experienced by employees which is a universal element. Work overload, role ambiguities, time pressures, poor working condition and environment (ergonomics) and least desirable customer relationship in banking sector is caused by a number of factors such as increased mergers, acquisitions, restructuring, and technological developments.

Unfortunately, most of the times, employers fail to understand the basic cause of the Job Stress; being faced by an employee and they seem to only jump to conclusions resulting in consequences which the organization cannot bear. Mostly the symptoms of Job Stress are thought to be the causes, whereas it isn't the case. At times, when research is conducted, it reveals

that the employee was not to be blamed but probably the employer or organization was to.

Different sorts of similar studies and researches have already been conducted on this topic by foreign students and professionals both. This issue has plagued researchers for the past few decades the most as it is the most disastrous problem in banking sector, so this study is dynamic, diverse and gives one an opportunity to explore and find out the real grounds.

If kept at a certain level Job Stress serves as a driving force however it cannot be eliminated so in order to manage Job Stress factors affecting it such as Job Satisfaction should be optimized.

## 1.2) TYPES OF STRESS:

There are three types of stress as follows:

### a) PHYSICAL STRESS:

It is the stress that occurs due to the ergonomics in any organization. The physical conditions i.e. the space given to an employee to sit, the equipments provided to him and the space requirement for its handling, the comfort level of the furniture at his disposal, the placement of telephones, the system of cross ventilation in the room/ work station, the placements of lights etc come in this head and play a vital role in providing ease to the employee. If employees do not have comfort while working, they would be stress and these strains would result in extremely terrible results. Employees would either fall ill or would be so disturbed that they could go to the limit of quitting their job. Physical stress results in diseases like ulcer, blood pressure or even heart attack.

### b) EMOTIONAL/MENTAL STRESS:

Emotional/mental stress has become a very vast study as every individual has his own distinct personality, attitude, likings, dis-likings, perceptions, opinions and mind-set and therefore all this makes the study of emotional/mental stress a very diverse, dynamic, complicated and even confusing at times.

Every individual at the work place has to keep on playing with his own attitudes and styles of dealing with his subordinates, peers and boss. One attitude which might be the most appropriate to deal with a peer might create problems when used with a sub-ordinate or boss or even the same attitude used within a similar category, say peers, sub-ordinates or bosses might raise eye-brows of many. This situation gives rise to mental stress. Emotional stress rises its head as a result of insults, jealousy which results from attention given to one peer by the boss and neglecting the other.

Emotional/ mental stress also gives rise to consequences which have disastrous results for the organization. Emotional stressors result in apathy, boredom, inattentiveness, loss of ability to concentrate, irritability and negativism.

### c) BEHAVIORAL STRESS:

Behavioral stress is the stress that results due to the behavior of self or others. Any employee entering the

organization in an un-usual state of mind would definitely be unexpected to others and when they would greet that employee in the same old manner, the reaction would not be the same as it used to be. This situation might cause behavioral stress.

Behavioral stressors bring changes in behaviors like a sudden change in smoking habits, sudden noticeable weight loss or gain or even difficult breathing.

### **1.3) OUTCOMES OF JOB STRESS:**

The outcome of job stress is negative. Performance is affected which further results into the following circumstances:

- Absenteeism
- In-effectiveness
- Job Dissatisfaction
- Turnover

### **1.4) RESEARCH QUESTION:**

Is there any relationship between the Job Stress and Employee Retention in the banking sector of Pakistan?

### **1.5) OBJECTIVES:**

- To verify is it really any effect on job stress over employee retention and organization efficiency.
- To empirically study Job Stress that directly affects employee retention at different levels of age people.
- To empirically study Job Stress that directly affects employee retention at different levels of income groups..
- To measure how much Job Stress plays a function in increasing disappointment among employees.
- To illustrate that turn-over in organizations can taken due to Job Stress.
- To whether compensation has an effects on increased level of Job Stress among employees.

### **1.6) SIGNIFICANCE OF THE STUDY:**

This study is aimed at the following multiple purposes:

#### **a) FOR THE INDIVIDUALS:**

This shows that employees run under the various issues and logically make the choice on personal advantages. The next question in line up that the study about is that how does job stress arise, from working senerio, salary package and organizational culture.

#### **b) FOR FUTURE RESEARCHERS:**

In the future it job stress take value in effecting performance in the organsation.and directly effects on the employee performance.it also help employer that effect behavior of the employee in the organsation and set different goals for achieving it.

This research is purely based on the different factors and show direct relationship om job retention.and ensured to cover all the possible factors in the research.different factors how they have positively or negatively effects.

## II. LITRATURE REVIEW

A number of researchers have defined stress in different words such as, Kazmi, Amjad, and Khan, 2008 have defined stress as “a change in one’s physical or mental state, in other words disturbance or imbalance from normal state. Stress is caused disturbed events in work environment, social environment, and in routine life (work, family and social life) and also caused by emotional, psychological, mental and physical illness”. Moreover, “Stress comes from any situation or circumstance that require behavioral adjustment any change either good or bad is stressful or whether it’s positive or negative change, the physiological response is same” (W. Colligan and M. Higgins, 2010).

Job stress can arise from different environment of work like organizational or situational stress it is from the characteristics of the workers themselves i.e. dispositional stress (Riggio, 2003). Stress is a natural lesson in the life and every employee even executives and managers should be effected from this issue.according to survey about 100 million workdays are being affected due to stress problem among employees and nearly 50% - 75% due to disease cause stress (Bashir).

Absence and loss of employment are major cause of job stress In the organization.the ratio increase day after day because of organisation enviorment.they were the main hurdles of achieving goals and performance (Treven 2002).

Employers need to be aware of how the population (organization) is changing with respect to age. For Example, the new trends in the banking industry show an inclination towards more hiring of young and fresh business graduates. So in near future, most jobs, even top-level executives would be young people. This also poses another issue that young individuals are more aggressive and sensitive so they are more likely to fall prey to Job Stress. Qianqian Du et,al,(2009)

Joanna.L.Y .Ho.et,al,(2004) investigates the relationship between compensation benefit of employees on the basis of performance. Compensation relates with performance of employee in the organization accordingly show high performance as well as low performance of the employee.

Income has a major impact on the living standard of an individual. In reality, if this is said that it is the decider of the life-style of any individual, it would not be wrong. Income has also relationship with family life cycle which actually moulds the spending pattern of a family. Different researches have shown that the person with high income is having a different style of spending than low income groups’ persons. If a person has a family to support and the number of households is large, then his only criteria of selection of a job would be the money which he would receive. So, any such individual who is being paid less whereas, his expenditure is more, he would eventually experience Job Stress. KiridaranKanagaretnam et,al(2001).

Jhanzeb Shah,et,al,(2007) culture create society and exchange views.its changes from generation to generation. human nature changes fill the individual gap.culture changes individual behavior also.The symbols may be intangible (attitudes, beliefs, values, language) or tangible (tools, housing, products works of art). Cultures do change over time. Every organization has its own distinct culture. If an employee fails to comply with the organizational norms and culture, he would be

proving himself one odd against all so he would be more prone to have stress at his work place.

An individual making a shift from one organization to another has to be flexible enough so as to absorb and mould himself in the new organization's culture. Executives must also be alert to these changes so they can adjust their planning to be in step with, or even a little ahead of, the times to not let employees to be affected by cultural factors.

Alejandra et,al,(1996) Working conditions also poses a lot of pressure over employees. The space they are provided for work, the lights and air in the room, sitting arrangement, the relationship that the employee shares with his peers, sub-ordinates and boss are all the factors that affect the employee retention as these things become a cause of stress for an employee.

(Patiraj kumara et,al) The performance is measured on the basis of skill and motivation level of the individual employee. Due to this approach it easily evaluates the employee in the organization. It show Job Stress and personal life stress are different approaches. They are positively correlated with each other.

#### **GEOGRAPHICAL DISTRIBUTION:**

The bigger the market, the more is the chance of symptoms of Job Stress among employees. In the banking sector, the banks have brought their employees in direct competition with other bank's employees as the service provided by them is what matters. Also by the presence of so many commercial banks operating in Pakistan, employees are more prone to being stressful.

#### **AGE:**

Employers need to be aware of how the population (organization) is changing with respect to age. For Example, the new trends in the banking industry show an inclination towards more hiring of young and fresh business graduates. So in near future, most jobs, even top-level executives would be young people. This also poses another issue that young individuals are more aggressive and sensitive so they are more likely to fall prey to Job Stress.

#### **INCOME:**

Income has a major impact on the living standard of an individual. In reality, if this is said that it is the decider of the life-style of any individual, it would not be wrong. Income has also relationship with family life cycle which actually moulds the spending pattern of a family. Different research has shown that the person with high income is having a different style of spending than low income groups' persons. If a person has a family to support and the number of households is large, then his main criteria of selection of a job would be the money which he would receive. So, any such individual who is being paid less whereas, his expenditure is more, he would eventually experience Job Stress.

#### **ORGANIZATIONAL CULTURE:**

Cultures do change over time. Every organization has its own distinct culture. If an employee fails to comply with the organizational norms and culture, he would be proving himself one odd against all so he would be more prone to have stress at his work place. An individual making a shift from one organization to another, has to be flexible enough so as to absorb and mould himself in the new organization's culture. Executives must also be alert to these changes so they can adjust their planning to be in step with, or even a little ahead of, the times to not let employees to be affected by cultural factors.

#### **WORKING CONDITIONS:**

Working conditions also poses a lot of pressure over employees. The space they are provided for work, the lights and air in the room, sitting arrangement, the relationship that the employee shares with his peers, sub-ordinates and boss are all the factors that affect the employee retention as these things become a cause of stress for an employee.

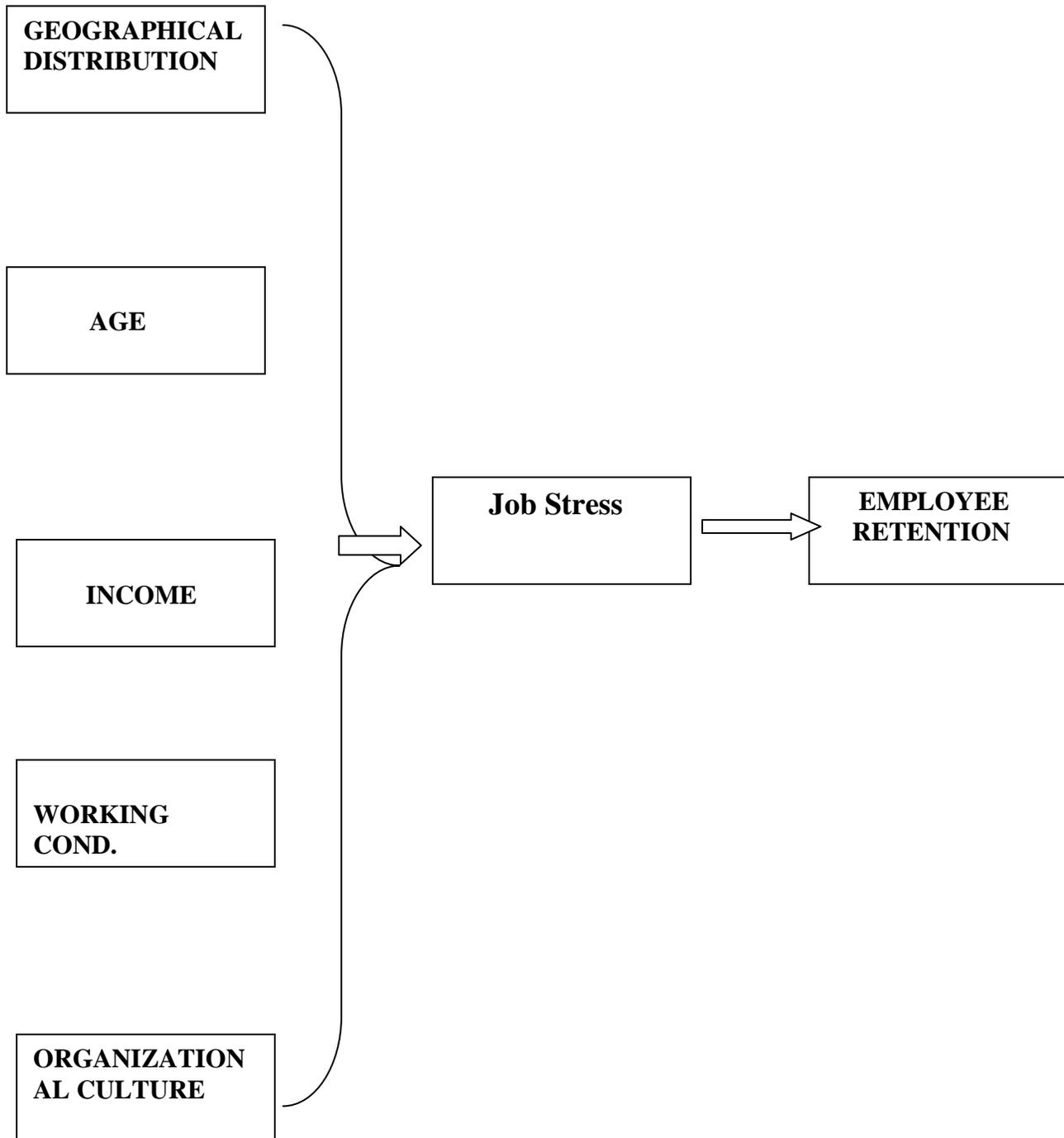
### III. RESEARCH METHODOLOGY

#### **3.1) HYPOTHESIS:**

Ho: There is positive relationship between Job Stress and Employee Retention

H1: There is no relationship between Job Stress and Employee Retention

**3.2) RESEARCH MODEL:**



**3.3) RESEARCH DESIGN AND SAMPLING PROCEDURE:**

The data were collected through questionnaires .this questionnaires were filled by hand as well as through soft form like through email. As the study is pointed towards effects of Job Stress on Employee Retention on banking sector of Pakistan, due to less time and minimum resources more appropriate sampling technique is used to explore the relationship between Job Stress and Employee Retention.

**a. POPULATION:**

The current study was arranged among employees of banking sector of Pakistan and as it is an employee based research, the choice has been meticulously made in terms of gender and age. For the generalization of research the survey has been scrupulously conducted to get most appropriate results.

**b. SAMPLE SIZE:**

Out of 150 questionnaire distributed we were only able to get hold of 100 respondents. Our sample size is hence 100. The

majority of respondents were mostly male i.e about 65 male out of 100 and 35 female out of 100.

**DATA ANALYSIS:**

**Descriptives**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
JS	100	1.20	5.00	3.8000	.98719
RET	100	1.33	5.00	3.7171	.90304
WL	100	1.50	5.00	3.8267	.97772
ER	100	1.00	5.00	3.7335	1.02159
Valid N (listwise)	100				

**INTERPRETATION:**

The descriptive statistics studies simple conclusion about the sample and the observations that have been calculated. These results may form the basis of the initial description of the data as

part of a more extensive statistical analysis, or they may be sufficient in and of themselves for a particular conclusion.in the table shows minimum as well as maximum results about IV and DV.also show standard Dev of the data.

**T-Test:**

**One-Sample Statistics**

	N	Mean	Std. Deviation	Std. Error Mean
JS	100	3.8000	.98719	.09872
RET	100	3.7171	.90304	.09030
WL	100	3.8267	.97772	.09777
ER	100	3.7335	1.02159	.10216

**INTERPRETATION:**

Above table shows the actual effects from the independent t-test.in the table std deviation is 0.90 related to retension.its

means 90% of overall population.also 97% of over all population data related to work load and vice versa.

**One-Sample Test**

	Test Value = 0					
	T	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
JS	38.493	99	.000	3.80000	3.6041	3.9959
RET	41.162	99	.000	3.71710	3.5379	3.8963
WL	39.139	99	.000	3.82670	3.6327	4.0207
ER	36.546	99	.000	3.73350	3.5308	3.9362

**INTERPRETATION:**

Above table shows the vale of t of dependent as well as independent variables.the mean difference of 3.800 having 95%

confidence interval.These are 2 tail test having lower value is 3.60 and upper value is 3.995.

**REGRESSION:**

**Variables Entered/Removed<sup>b</sup>**

Model	Variables Entered	Variables Removed	Method
1	ER, RET, WL <sup>a</sup>	.	Enter

a. All requested variables entered.

b. Dependent Variable: JS

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.792 <sup>a</sup>	.627	.615	.61244

a. Predictors: (Constant), ER, RET, WL

**ANOVA<sup>b</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	60.473	3	20.158	53.742	.000 <sup>a</sup>
	Residual	36.007	96	.375		
	Total	96.480	99			

a. Predictors: (Constant), ER, RET, WL

b. Dependent Variable: JS

**INTERPRETATION:**

Regression result has also been used to test the relationship between the independent variables of geographical distribution, income, working condition, org culture. The

correlation of coefficient is 0.792. The R-square adjusted is 0.692 and also  $F = 53.742$ ,  $p < 0.01$  shows the overall acceptance of our model and the result is statistically significant at the level of 0.01.

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.556	.281		1.978	.051
	RET	.032	.097	.030	.333	.740
	WL	.461	.095	.457	4.875	.000
	ER	.364	.092	.377	3.953	.000

a. Dependent Variable: JS

**INTERPRETATION:**

Above table explain that value of R is fair value and acceptable. Linear Regression calculate you to calculate linear

relationships between two or more variables. Regression results calculate by fit in which best shows the relationship

**Reliability**

**Case Processing Summary**

		N	%
Cases	Valid	100	100.0
	Excluded <sup>a</sup>	0	.0
	Total	100	100.0

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

Cronbach's Alpha	N of Items
.894	4

**Reliability Statistics**

Cronbach's Alpha	N of Items
.836	2

**Reliability Statistics**

Cronbach's Alpha	N of Items
.730	2

**Reliability Statistics**

Cronbach's Alpha	N of Items
.730	2

**INTERPRETATION:**

Above table shows the value of Alpha which is 0.894. its mean it is best fit in data and relationship between the IV and DV are good and acceptable. Cronbach's alpha is the mainly common calculate of internal consistency ("reliability"). It is mainly common help when we have multiple Likert scale in a questionnaire that form a scale and you are interested to explain if the scale is reliable and good.

**SOBEL TEST RESULTS:**

**PURPOSE:**

Check a mediator carries the influence of an IV to a DV.  
 $a$  = (unstandardized) regression coefficient for the association between IV and mediator.  
 $s_a$  = standard error of  $a$ .  
 $b$  = raw coefficient for the association between the mediator and the DV (when the IV is also a predictor of the DV).  
 $s_b$  = standard error of  $b$ .

VALUES	T.STAT	STANDARD ERR	P.VALUE
a 0.556	0.325	0.0546	0.744
b 0.032			
Sa 0.281			
Sb 0.097			

VALUES	T.STAT	STANDARD ERR	P.VALUE
a 0.556	1.832	0.1398	0.066
b 0.461			
Sa 0.281			
Sb 0.095			

VALUES	T.STAT	STANDARD ERR	P.VALUE
a 0.556	1.7696	0.1143	0.07677
b 0.032			
Sa 0.281			
Sb 0.092			

**INTERPRETATION**

In stats the **Sobel test** is a way of testing the significance of a mediation variable. The variable shows relationship between the independent variable and the dependent variable is hypothesized to be an indirect result that exists due to the control of a third variable (the mediator). Its included in a R.analysis variable, the effect of the independent variable is reduced and the effect of the mediator remains significant. It is also a specialized t-test that issues a method to way the less in the effect of the independent variable, after adding the mediator in the model, is a significant way and therefore whether the mediation effect is statistically significant

**IV. CONCLUSION AND RECOMMENDATION**

Employees have try to work with energy ,ability and determination even if they are not provided with the support, they need to perform their tasks with honesty. They are more focused to avoided stress and at their work place decrease directly affects their performance. If avoided then turn-over are unusually high and in this viable business world of today, if such be the ratio of employee turn-over then organizations could collapse. This finally leads to increase the working conditions and the working relationships among employees in the organizations. If the employees becoming overly stress during the job. They prefer to quit for few days and taking rest at home.

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# Development of a Total Quality Management Framework for Libyan tourism sector

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**Abstract-** The tourist industry have become in the search for all which may achieve its strategies, the various techniques and methods which help in achieving the highest levels of performance and excellence to reach the highest satisfaction of tourists, as it became a tourist in attention, concentration and focus of attention of many tourist enterprises, which are trying to attract various ways and means possible.

According to the available literature and based on the author's many visits and preliminary investigation regarding Libyan tourism sector in general and Tripoli the tourism sector in particular, it has been proven that the reality of private and the state-owned hotels in Libya is that: these hotels are facing many problems opposing their improvement, continuity and ability to compete.

Based on a series of comprehensive questionnaires, the weakness in the current system are identified and also found that Total Quality Management (TQM) would provide the solution for Libyan the tourism sector system. The literature illustrated that there are many models and frameworks in the field of TQM. However, the quality gurus have never agreed about a specific framework or implementation procedure. In addition, there is lack of a general model in the tourism sector, and there is no clear agreement as to the way in which TQM should be implemented in a tourism sector. Therefore, the focus of this paper is to identify an appropriate TQM framework for Libyan hotels and benchmarking them and distinguish their competitive advantage, in order to achieve performance excellence.

A questionnaire survey method is adopted to gather the data and information, which form the basis for the development of the proposed TQM framework. Statistical Package for the Social Sciences SPSS, the collected data and views from managers and employees in the organizations under investigation. In addition, in order to achieve the aim of this paper two models are developed and TQM framework that covers most aspects of TQM starting from top management awareness until even promoting continuous improvement is developed.

**Index Terms:** Development, services Quality, Tourism, sector, Libya.

## 1.INTRODUCTION

Seeking tourist industry in the current time to prove their presence, by providing the best as you can from the services, so that the superiority of these services expectations of tourists and their needs, Providing the best is the key basis for the intervention of which the tourist facilities to achieve progress and excellence of its competitors, because the business environment become the current environment of fast changing, as the method

or usual method of doing business are not suited to this environment. From here have become tourist industry binding in the search for all which may achieve its strategies, the various techniques and methods which help in achieving the highest levels of performance and excellence to reach the highest satisfaction of tourists, as it became a tourist in attention, concentration and focus of attention of many tourist enterprises, which are trying to attract various ways and means possible.

The study aims to diagnose the extent of awareness of workers in the tourism sector such as hotels of the importance of applying the principles of Total Quality Management, which was in customer satisfaction (tourists), and the commitment and support of senior management, and continuous improvement, in addition to the involvement of staff and enable them, And the emphasis on educating all employees in tourism facilities (hotels) different sections as the basis for excellence. The hotel sector in Libya from the service sectors active and dynamic, and a tributary of the national economy, it has grown this sector in the recent rapid growth due to expanded steadily in the tourism sector, no doubt that the application of the principles of Total Quality Management can enhance the quality of hotel services that must be that meets the needs and expectations of tourists, whether at the local level, or regional levels.

Still the importance of total quality management is a mature widely in many productive sectors, and service in general, and tourism facilities of different kinds, in particular, from here the main problem posed by this study is that the actual application of TQM requires necessarily understand workers in this sector in Libya to the importance of applying the principles of total quality management, Through investigative and close observation study which was conducted by the researcher for getting acquaintance with work progress in the tourism sector in Libya and Through interviews with some of their employees of various levels and specializations as well as with customers of these hotels the researcher concluded that there is a problem representing in decline of in the tourism services quality and insufficiency of attention paid to the customers satisfaction and achieving his desires by providing high quality services in the tourism sector in Libya . according to international specifications of in the tourism sector in Libya.

## 2. LITERATURE REVIEW

### 2.1. Definitions of Quality and TQM:

First of all, before deciding to implement changes in business, we need to define quality. If the customer wants quality, what does that mean? The answer is not simple. Quality can be defined as the customer's expectations and requirements; quality contains anything the customer expects and requires, and is ever changing [1].Quality is customer satisfaction [2].In addition, indicated that

quality is built into an organization by being competitive, removing consternation, managing costs and by caring. These four reasons illustrate why quality is very important and why now is the time for making quality happen. He indicated that consternation is caused by increasingly large numbers of employees spending more and more of their time doing work over again, because it was not done from the first time. Organizations must care not only about its customers, but also about the community, those living around it, their environment, and its competitive position[3].

Total quality management (TQM) has a long life. The Japanese moved in the direction of quality after the Second World War and the United States in the mid-1980s with the formation of the Baldrige Award in 1987. The movement then expanded into Europe with the establishment of the first European Foundation for Quality Management and the European Quality Award in 1988 and 1989 respectively. So TQM has been around a long time [4].

Trials of defining TQM led to several discussions and a large extent of misunderstanding as well as a huge extent of definitions. There are several attempts to define the TQM, and describe its main essentialities; however, there is no unified definition of TQM. It is a phenomenon that appears to have evolved over a period of time [5]. . So there have been several definitions and each deals with certain aspects. Quality management is a revolution because the philosophy and test methods and tools to discover better ways of doing things, it could be help public sector organisations to fulfil their responsibilities effectively and at a reduced cost to the government and taxpayers, also in the same a time improving services [6]. Regardless of the differences made by such attempts, there are some definitions that have appeared and found a place within the administrative mind. The following are among such definitions: -

Total means made up of the whole, q uality is a degree of excellence a product or service provides, and management means act, art of planning, organising, leading and controlling [7]. introduced some definition of TQM which is; TQM is essentially complete set of techniques, and principles of management, technologies and methodologies that put Together to work for the benefit of the end customer. TQM seeks to develop organizations through the creation of better planning and prioritise better design. It also aimed at strengthening operations and weak Strong protection areas that give organisations edge over their competitors (through continuous improvement the comparison). In addition, it is about total quality management continuous process of providing the best practices to ensure sustainability, and positive competitiveness. In a sense, it is about the management of change; it is then limitless and timeless in its approach. In addition explained that TQM aimed to meet the needs of customers to prevent poor quality, instead of correcting problems after they happen. Also put the continuous improvement understanding of the importance of performance measurement to identify opportunities for improvement and eliminate sources of inefficiency and costs[8].

## 2.2 THE IMPORTANCE OF TQM:THE BENEFITS OF QUALITY IMPROVEMENT THAT CAN BE SET FORTH: -

- Less consumer and customer complaints concerning goods and service quality provided to them.
- Less quality costs.
- More market share plus cost reduction.
- Less personnel complaints.
- Less quality defects and more customer satisfaction.
- More profits and productivity and less cost.
- Better cooperation and communication between the organisation units.
- Improve human relations and raise morale and continuous improvement.
- These benefits confirm the importance of TQM in improving the productivity and quality as well as the competitive support of the organisation [9].

## 2.3. ASPECTS OF TQM

indicated that Differing visions of researchers and writers in the principles underlying the Total Quality Management, However, they agreed on basic principles so the most commonly found in TQM literature these concepts are as the following:

- 1-Strategic planning.
- 2-Total employee involvement.
- 3-Continuous improvement.
- 4-Continuous training.
- 5-Making decisions based on facts.
- 6-Teamwork.
- 7-Empowerment.
- 8-Customer satisfaction.
- 9-Leadership[10]. .

## 2.4.THE STRUCTURE METHODOLOGY OF TOTAL QUALITY MANAGEMENT - BASED ON THE FOLLOWING COMMON ELEMENTS APPLICABLE TO ALL MODELS:

- 1- Cycle of Deming.
- 2- Working active.
- 3- The potential and possible outcomes of the Organization.

He adds that the develop methodologies (TQM) mutually different directions but both are very influential, namely:

- 1- Within the structure of the methodology (TQM) represented a model of excellence for the innovative

structure of a framework for comprehensive management system and the results of the organization. And applied this methodology in practice when a few of the organizations developed, which aims to achieve the excellent way in all respects, whether a Rehabilitation of the internal organization or the results of Business Administration.

2-Methodology as part of the structure (TQM) is the scale of a number of management systems can be integrated, whether it was a level of mutual or with existing systems in the organization. The application of this approach is in practice much in order to develop standards and develop a number of ways and formats (quality of the process, products and reduce the risk of impact on the environment, health and safety at work etc).

It contains standards for a number of management systems to the requirements of most of the standards for models of the quality system in total and return reasons Development of methodology for the application (TQM) in both directions parallel private to the impossibility of establishing standards for the requirements management system product in detail but simple in addition to the unwillingness of organizations to coordinate their systems in detail.

And verify the link between the two methodologies best practice in the developed world in organizations by applying the approach of excellence and expertise used to develop standards for a number of systems for broad application.

And used a large number of tools and techniques (TQM) in the application (TQM) so that the practical application of the draft quality may be impossible without it., tools and techniques that are used in an application (TQM) dedicated to the following below:

- Public Administration.
- Strategic management.
- Process management.
- Working in the crew[11].

### 3.1. OVERVIEW OF LIBYAN TOURISM SECTOR:

Libya (officially the State of Libya) is a country located in North Africa. Bordering the Mediterranean Sea to the north, Libya lies between Egypt to the east, Sudan to the southeast, Chad and Niger to the south and Algeria and Tunisia to the west.

Libya is a unique destination with long coastal beaches spectacular and well preserved Roman and Greek antiquities, amazing desert adventure opportunities, prehistoric civilizations, the Libyan people are generous and hospitable and Libya is very safe, before the war, in 2011 and after the war, the situation is not stable security ,However, the Libyan people are going forward to the development and stability, so this also good Competitive advantage , despite good comparative advantage there are major challenges to delivering appropriately-priced, high-quality products enabling Libya to compete with other destinations . accordingly Libya is a promising tourism destination in the Middle East and North Africa region. Early efforts to support tourism in the 1990s were re-energised after the moving of UN sanctions in 2003 following dramatic changes in Libya's foreign policy. Even with a healthy economy still high rates of unemployment (30%) combine with a dominant source of income - oil - which contributes 95% of GDP. Thus Libya is considering tourism for economic diversification [12].

Libya's economy has been dependent mainly on agriculture and pastoralism and trade in the period after World War II. After exploring and extracting oil in the early sixties great changes in the structure of the national economy for the benefit of the oil industry and service sectors associated with it so The Libyan economy depends primarily upon revenues from the oil sector, [13].

### 3.2. The policy of the tourism sector:

On 12/10/2010 the researcher held an interview with the tourism Director in Tripoli and highlighted the policy and difficulties in Tripoli tourism sector. The following sections provide a summary of the interview:

### 3.3. The policy of the tourism sector:

the policy of tourism in Libya, based on the principle of development and improvement of alternative sources of income and provide the conditions and economic and social climate appropriate to achieve the goal of economic diversification and to find sources of sustainable growth next to the oil sector, this is why the political will, which began to translate its actions on the ground through a plan Sustainable development and mega projects in infrastructure in general and the tourism sector in particular, so the Government has started to supports of the tourism sector and investment in order to become a second source of hard currency and the national income therefore Authority started of Tourism development Public policies for investment and development in this sector have included such strategies as follows: -

- Definition of Libya to the world, and the possession and natural tourism resources and industrial and achievements of economic and social development.

- Go-ahead of the Tourism Authority in Libya supervise on (30) project.
- Activation of the tourism sector even contributes to the growth of National Economy.
- Provide new employment opportunities for Libyans this program includes a number (38) project of the draft Development Plan (2008-2012).
- Studies and designs for special projects, internal tourism, roads and schemes her.
- Restoration and maintenance of ancient cities and historic buildings.
- Rehabilitation and training and international cooperation.
- Organization of fairs and festivals Tourist.
- Support the police to protect tourism and historical monuments.
- Support and processing the information center.
- Providing conditions and economic climate, social and institutional appropriate to achieve the goal of economic diversification and to create sources of sustainable growth next to the oil sector including the development of the services sector, trade, tourism and the promotion of export industries.
- Providing legal climate that helps attract foreign investment and the growth of the national economy.

<b>Total number of classified rooms</b>	6402
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- Libya sees thriving tourism industry ahead and At the present 130,000 people visit the country yearly; the government of Libya expects to raise this number to 10,000,000 tourists In the coming years .

Obviously, as a result, travel and tourism are a source of national income, and exacting Destination have prepared strategies and policies to raise tourism revenues. However, the whole revenue gained from tourism declined from 45 million Libyan Dinar, to 29 Million Libyan Dinar in 2006. The initial impression and study is that this is the result of declining international arrivals, other than the reality is different.

#### 4 . Difficulties of tourism sector:

However, some difficulties may occur which could lead to reduce standards in service, such as: -

- Low levels of service quality hotel in most hotels.
- Absence of training plans and qualification to match the fast development in the tourism sector.
- Retardation and poor public transport system.
- Revolution 2011 in Libya and security instability so far, which will greatly affect the development of the country and also economic changes which may result in high rate prices, resulting in a lack of investment in the tourism sector.
- Lack of appropriate accommodation facilities for tourists in the sites and attractions or near them.
- Lack of attention to the services of people with special needs .

**Table 2.1: Summary of Libyan tourism activity in 2010.**

Source: [14].

Activity	Statistics
<b>Total number of tourists</b>	105,997
<b>Tourists (overnight visitors)</b>	38,025
<b>Cruise passengers</b>	67,972
<b>Overnight stays in hotels</b>	266,157
<b>Average length of stay</b>	7
<b>Average spending of tourists per day</b>	80 US\$
<b>Total estimated income</b>	26,731,670 US\$
<b>Total number of cruises</b>	83
<b>The number of guests in hotels and similar</b>	432,347
<b>Establishments</b>	268
<b>Total number of hotels</b>	
<b>Total number of rooms</b>	13,638
<b>The total number of classified hotels</b>	62

#### 5. Developing of services quality framework of the Libyan tourism sector

The objective of this chapter is to establish clear standards and make Libyan tourism sector develops in practical steps through application of total quality management , after studying the current situation and problems facing the tourism sector, to apply these quality management methods must follow the following:

##### 5.1 Requirements of the development of tourism services quality

- 1 Creating a better understanding of the current situation.
- 2 Encouraging innovation.
- 3 Developing realistic aims
- 4 Establishing realistic action plans.
- 5 - the optimal exploitation of tourism resources.
- 6 - maximizing returns and the economic and social benefits, cultural and political tourism.
- 7 - Increase community awareness of the importance of tourism and its economic value.
- 8 - Developing the quality of the national tourist services.
- 9 - Develop the skills and capabilities of human resources for tourism.
- 10 - Upgrading the methods and means of promotion and marketing of tourism.
- 11 - creating a base for a national partnership between the public and private sector

Sector and civil institutions of the community.

- 12 - Raising the level of coordination and integration between tourism sector and sectors Other.
- 13- Providing all the clients' needs is very crucial in enhancing the hotel competitive place and reputation around the world.
- 14- Special care should be given to the selection of the hotel staff to ensure the best possible quality of services to the clients.
- 15- The institution should also adhere towards reducing the unnecessary costs because it is one of the obstacle preventing clients from using these hotels. Moreover, making all the prices and costs available to the clients will increase the trust of the clients who seem to have very little idea about the prices.
- 16- Continuous improvement is very crucial due to many factors amongst which is the highly competitive market we live in nowadays. This could be achieved by the following:

- a. Training and developing the staff
- b. Holding conferences and forums to generate and exchange new ideas on improving the hotel services quality.

- c. regular training and development programs on leadership and management should be done to improve the services quality.

17 - The quality assurance management team should be carefully selected due the importance of this management in improving the quality of services in the hotel.

18 - The successfulness of implementing the comprehensive quality assurance principles depends very much upon the managerial beliefs, their commitment and support for quality assurance management unit. Therefore, the private and state-owned classified hotels managers should give special care to the implementation of the comprehensive quality assurance. This could be achieved by establishing more quality assurance units in the hotels which should be connected to the high ranking officials in the hotel administration. this will enable the hotel administration to see whether or not the quality assurance criterion have been implemented.

19 - The study results have shown that the comprehensive quality assurance principles are poorly implemented in many the hotels under study. This shows that more work and effort needs to be done in order to raise the workers' awareness of the importance of these concepts which should be taken altogether and not to be selective in choosing one over the other because they are all connected to each other.

20 - Hotels visitors should be the paramount of any hotel management because they are the basis of any quality assurance management program. This could be done through continuously listening to the visitors needs and expectations and try to fulfill them.

21- Encouraging the team work culture among the hotel staff by opening communication channels in order to guarantee more constant contact with everyone since the quality assurance basically means all parties should be involved and have a say in managing the hotel .

## 6- Conclusion

Finally, although there are quality assurance management units in some of the hotels, the quality assurance principles cannot be achieved without a proper communications with the visitors and understanding their needs and requirements. The quality

assurance management can help in improving the quality of services by allocating sufficient money regardless of the institution revenue. This is because, as we know, that the quality assurance is what makes a difference between the hotels. Following the quality assurance criterion very strictly will help in identifying the weakness and the gaps of the services provided by the hotel. This will help in improving the services which in turn should have a positive impact on the clients by providing them with the best possible services.

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# Personality profile of novice and experimenters physical education Tunisian Teacher's

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**Abstract-**The aim of this study was to compare the psychological personality profiles of experienced and novice Tunisian physical education (PE) teachers. Recorded results allow to identify a psychological personality profile of PE teachers (experienced and novice). Analyses of variance demonstrate that a non-significant difference emerge on four parameters like the extraversion, consciousness, neuroticism and openness. This study shows that experienced teachers intervention practices fit precisely to the physical and human data from their environment. While PE teacher novices through a period of significant transition to the professional level, they are also facing similar realities personal level: they live in the so-called "reality shock". The psychological personality profile of Tunisian PE experienced teachers is different from that of PE novice's teachers. The Extraversion, consciousness or control, neuroticism and openness were the psychological variables that make the difference between the psychological profile of experienced teachers and novices.

**Index Terms:** Personality profiles, education, psychological factors, teaching.

## I-INTRODUCTION

During our PE teaching position at the Higher Institute for Sport and Physical Education where it is responsible for the educational support of students and Trainees following discussions and exchanges with associate teachers welcoming schools (experienced and novice), we have heard many times novices to share the challenges they faced in their infancy in education, unlike experienced that perform their tasks of teaching with ease and technical teachers. All country is seeking to improve the level of their schools to better meet the social and economic expectations of higher and higher (Degas, 2004). The faculty as the most significant and the most valuable resource in schools is at the center of efforts to improve teaching. Improving the efficiency and equity of education is to a great extent by the ability to ensure that qualified individuals interested in teaching, their teaching is of high quality and that all students have access to this type of education. Several studies have brought to light the difficulties related to the exercise of the profession (Boutin, 1999. Chevillard, 1985; Degas, 2004). Throughout his career, the teacher's goes through stages which abutted, mark and describe his career path. First starting out in the profession, he gradually acquires an "experienced" teacher status and even manages to be recognized as an "expert" by the educational institution (Volondat, 1979). Entry into the teaching profession is a complex integration of the novice teacher in a professional role new process. This is a transitional stage during which he must adapt to his new role, fit into one or more school and this while continuing their professional development begun in initial training.

This stage, which follows the initial training and the duration varies depending on the individual, is often marked by various difficulties, ensuring that the novice teachers saw what the researchers called "reality shock" (Meirieu, 1987). In all schools (primary and secondary schools) in Tunisia, compulsory courses in physical education and sports are taught to students in a very different intensity of a school board to another. In almost all cases, it is a physical education specialist who provides this education. The teachers are dedicated to learning. The effectiveness of their action requires that they have been trained in a particular area of intervention: school education. Teaching is a profession that requires special skills. The didactic and pedagogical intervention requires for (future) teachers mastery of knowledge, skills (including methods) to succeed in their mission. However, the recent literature considers the educational power of a PE teacher no longer holds today mainly to the amount of technical

knowledge which he can flaunt it, nor the diversity of teaching procedures that it can use, or its institutional status, but an ability to identify a number of background processes related to its own teaching attitude and reactions to them among students (Volondat, 1979; Degas, 2004; Dubar, 1998). In other words, knowledge and training cannot be combined and find their maximum efficiency if the teacher has some positive attitudes that constitute one aspect of his personality. Otherwise, there are very strong links between educational attitudes of the teacher on one side and the dimensions of personality (attitudes, character) of each other. This research aims to study the psychological personality profile of PE teachers and novice's experiments and identify the extent to which psychological personality profiles differ between experienced and novice groups. We assume that there is a difference between these psychological personality profiles for experienced teachers who have a level of esteem and self-control more developed than novice teacher's face their new PE teacher tasks.

## II- METHODS

### 1-Participants

Our study was conducted in collaboration with 40 PE teachers in post (20 novice teachers and 20 experienced teachers) who have agreed to participate in this study (Table n° 1) .They came from different elementary schools, teaching basic and secondary districts of "Kef and Béja" (In country of Tunisia).

Table.1-Identifications of the study population

	Participant	Age (mean ± SD)	seniority	Establishments
Experiments PE teachers	20	41.45 ± 11.31	+ 5 years	college
Novice PE teachers	18	30.1± 4.24	- 5 years	secondary

### 2-Materials and measurements

To conduct this research we used the Big Five Inventory (BFI) from the theory of the five factors of personality (Costa & McCrae, 1992), which currently meets broader consensus for the study of dimensional personality (The first show the appearance of a 5-factor model was published by (Fiske 2002). This model is the subject of a broad consensus among psychologists and helps describe the personality using 5 basic features highlighted by the theory of the "Big Five." The BFI was created to provide researchers and clinicians with efficient, reliable and valid measure individual differences in the Big Five dimensions. It consists of 44 items, each a short sentence describing an aspect of personality. The selection of items is based on previous empirical work developed from expert judgment and factor analyzes (Oyserman et al. 2002). The quality of this instrument is excellent (Oyserman et al. 2002). The Participants should meet on a 5-point scale:

- Extraversion (8items) search stimuli, sociable and impulsive behavior, insurance, need contacts, dynamic, active.
- Nice and friendliness (9items) quality of relationships with others, altruism, kindness, avoidance of conflicts.
- Conscientious (9items) compliance with social, conscientious standards responsible. Neuroticism or emotional stability (8items): resistance to stressors, little discomfort, no anxiety, no insecurity, low mood swings.
- Opening (10items) intellectual curiosity, varied interests, imagination and originality.

### 3-Course:

After contact organizations and obtaining the necessary approvals, tests were conducted in the month of October, November to May 2010 teachers experiments and June 2010 and October 2011 for new teachers; The tests were completed on site and placed on the field; Only 38 PE teachers have completed anonymously BFI in an individual award with 02 withdrawals; The session lasted about 20 minutes to 30 minutes for an individual award.

### 4- Statistical Analyses:

Using the software Stata <sup>TM</sup> \_\_ / 10.1 Copyright 1984-2009 (Statistics / Data Analysis Stata Corp USA) we conducted a descriptive analysis where the means and standard deviations were calculated for all variables studied. Then an ANOVA test with all required analyzes. The significance level was set at  $p < 0.05$ .

## III-RESULTS

Following consultation of answer sheets of the Big Five Inventory (BFI) (Costa & McCrae, 1992), we recorded the results presented in the following table 2 and table 3. However, these results show us a global overview, we conduct an analysis of variance (ANOVA) through test Mann-Whitney to determine the differences between psychological personality profiles of the two groups of teachers.

Tableau.2-score variables BFI experienced teachers

	Mean	± SD	Min	Max
Extroversion	3,71	0,48	2,77	4,44
Friendliness	3,24	0,52	2,5	4,25
Awareness	3,64	0,58	1,88	4,22
Neuroticism	2,44	0,74	1,25	3,75
Opening	3,71	0,49	2,5	4,4

Tableau.3-score variables BFI novice's teachers

	Mean	± SD	Min	Max
Extroversion	3,13	0,46	2 ,33	4
Friendliness	3,10	0,40	2,37	4 ,25
Thorough	3,10	0,51	2,11	4,22
Neuroticism	2,89	0,45	2,25	4,25
Opening	3,09	0,52	2,40	4,20

#### IV-DISCUSSION

##### The extroversion

ANOVAs revealed a highly significant difference between experienced and novice teachers with P value equal to ( $p < 0.0018$ ). The extrovert subject as pointed Costa & McCrae, 1992) is sociable, he seeks contact. The results of this study found that experienced teachers are more outgoing and sociables. They are looking for contact and stimuli, open to others and like to gather in groups where they live with their easiness. They possible to have moments of professional exchanges in which new elements are transmitted in addition to their expertise and their knowledge professionals' (Schimmack ET al, 2005). Experienced teachers are action-oriented and tend to be enthusiastic. Some authors like Porter, S R & Whitcomb, M E (2005), agree that enthusiasm plays a key role in the response of the physical education teacher. Marcel Poetic wrote about it as positive or negative valences in the relationship affecting teachers and students and cause attraction or rejection. Experienced teachers are not only a bridge between the student and the knowledge, but also guide, companions, with all that implies as human contact. (Larsen, 2005). The novice arrive at the school in which he was assigned and is faced with the need to learn all about the organization of the EPS in the institution, and at the same time to teach students that it discovers As to its implementation. Upon entry into the profession, the novice teacher is found subject to the same task as a teacher with many years of experience and that from the first day he took office (Schimmack ET al, 2005; Larsen, 2005 Bedell et al, 1999).

##### The friendliness

The statistical result sets no significant difference in the parameter friendliness between experienced teachers and new teachers ( $P = 0.41$ ). Studies of personality types according to the Big Five model of measuring the friendliness emphasize that the friendliness and related / correlated with the concept of "cooperation." Experienced or novices teachers need to establish a socio-professional relationship to flee "professional isolation". According to Lieberman and Miller (1984) "Teaching is an activity that takes place in isolation." For these researchers, there is an important paradox: PE teachers are engaged in an institution to carry out a common mission to all that of educating future adults, but aims to the act to promote this mission takes place in isolation mission takes

place in isolation. The teacher LOSA is often found the only adult among a group of students to whom he should teach. Their work environment, often land or municipal stadium often busy, quickly becoming its territory work place where he spent most of his working day. The PE teachers contribute to a common task, but the organization of work leaves little room for collaboration.

#### The awareness

Regarding the conscientious parameter defined as the ability that the individual has to control, regulate and direct its activities. The statistical recording a highly significant difference between experienced teachers and new teachers ( $p < 0.003$ ) treatment. A superficial reading of this result allows us to say that unlike the novices experienced teachers are better able to avoid trouble and succeed brilliantly in identifying and planning their educational goals. They are also perceived positively by others (colleagues, management of the institution and school pupils), as intelligent and reliable. The writings of Boutin (1999) provide an explanation part on the results recorded for the "experienced teacher" is a phase of stabilization and consolidation of a pedagogical repertoire remains characteristic. Experienced teachers are teachers whose practices intervention specifically to fit physical and human data is environment. Generally their willingness to appear as teaching models (Chevallard, 1985). While the PE teacher novice undergoing a period of significant transition to the professional level, it is also facing similar realities personal level. The novice teacher must deal with two types of often new responsibilities: professional and personal. As mentioned Cooke and Pang (1997), the heavy responsibilities of new teachers not only have an impact on the professional life, but also on personal life, finding the novices reduce social activities to invest (or survive) in their work.

#### The neuroticism

The results and analysis of recorded ANOVAs spotted a significant difference between the variable neuroticism experienced teachers and novice teachers. This is reflected in the capabilities that experienced teachers to resist stress and anxiety and low mood swings in their teaching tasks. We believe that the experience as a spontaneous learning process allows teachers to EPS experienced skills, on how to control teaching situations which occur and are sometimes critical and stressful. We can justify his statements by the fact that for several years the experienced teacher working on the property. He knows how. Although he has knowledge of APS students and he teaches it through a period of self-construction where the doubts and certainties alternate in education and fluency in the exercise of his profession and he teaches he masters the educational center implementations and to provide their colleagues a model of professional success. (Bedell et al. 1999).

#### The Opening

Our statistical analysis (ANOVAs) found a highly significant difference between the opening parameters experiments teachers and novice teachers ( $p < 0.001$ ) retained. To explain why this result we use a theoretical process widely studied in social psychology that the "conformism or majority influence" (Cooke, B., Pang, K, 1990 ; Denscombe, 1980) This theory is to submit to the opinions, rules, standards, models that represent the collective mentality or system values of the group is a party, and to make them his own. We have previously shown that teachers experiments trying to be regarded as models of success to follow for novices teachers that is not the ease and necessary technical requirements and faced the here and now of their preoccupations in their immediate teaching spots. This is thanks to a group of experienced teachers and novice teachers can be improved, acquirer new know-how "stuff" business, to challenge the most practical and theoretical "gaps" in the initial university education. This is the end to improve their powers of imagination and originality and build new initiatives and varied interests.

#### V-CONCLUSION

The Extraversion, consciousness or control, neuroticism and openness were the BFI psychological variables that make the difference between the psychological profile of experienced PF teachers and PE novices which confirms the main hypothesis of this study. The little scientific research with an interest in the study of the psychology of PE teachers (experienced and novices). This research is not intended to be exhaustive, but we wanted evaluated a large number of PE teachers but some major force met us (refusal of some teachers, Judgment of course ...), which could possibly enhance the results achieved in end to better understand the psychology of PE teachers (experienced and novice) in our opinion this seems a problem that we encountered in

this research and that limited our interpretations. Although it ignores the measurement of other psychological and emotional variables such as self-esteem and self-confidence.

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# Centralized Heart Rate Monitoring and Automated Message Alert System using WBAN

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**Abstract-** A vision commonly found in the research arena is to provide sensing and wireless communication for assisted living facilities, to improve lifestyle, to improve health care, and to support long term medical studies. Nowadays, Wireless Sensor Network research is being performed to address medical applications. WSN has put an enormous impact on medical healthcare in terms of reducing the patient's risks of severity in emergency situations. This paper presents a centralized heart rate monitoring and an automated message alert system that employs a wireless body area sensor network (WBAN), which is an enabling technology for medical applications in this type of environment.

**Index Terms-** Wireless Body Area Sensor Networks (WBAN), Wireless Sensor Network (WSN), Wi-Fi

## I. INTRODUCTION

A wireless sensor network (WSN) consists of spatially dispersed and dedicated sensors (motes) that can gather, monitor, process and record the physical or environmental conditions such as temperature, sound, humidity, pollution levels, pressure etc, and collaboratively pass their data through the network to a central location. Nowadays, WSN can be found in various healthcare applications like monitoring precarious diseases, Glucose level monitoring, Infant Monitoring etc as studied in [9].

One of the subsets of the medical WSN applications is Wireless Body Area Sensor Networks (WBAN). A WBAN is a special purpose sensor network that acts as an interface between various sensors in and around the human body and the computer system. They consist of several physiological sensors attached to the human body or implanted in the body, that will record and process the physiological changes and measurements, sending these measurements to an external processing unit, which could be then transmitted to other external servers [1][6]. Similar kind of examples include the prevention of ulcers[2], support of rehabilitation[3], or informing doctors at remote locations of the state of patients residing at home[4]. Various health care applications that use wearable sensors and implantable sensors in WBAN are studied in [7][10]. All the applications mentioned use wireless sensor nodes that measure physiological changes, perform some processing and send data to some Gateway (personal devices) like mobile phones, a personal computer or personal digital assistants (PDA) that acts as a sink [5].

The WBAN is capable of connecting to the communication network and transmit data. The sensors communicate with local control devices which are either on patient's body or at accessible distance. The local control devices then communicate with remote destination or a monitoring server to exchange data for diagnostic and therapeutic purposes. In emergency case, such as abnormal readings received by ECG, an alert is sent to the caring group of people. An appropriate action is then taken according to the severity of the alert. WBAN system must also meet a number of security requirements like confidentiality, data integrity etc as mentioned in [7][8].

In this project, the data obtained from multiple heartbeats, temperature and dust sensor is stored and processed using Atmel microcontroller, which is then transmitted to a centralized unit, where the information for multiple sensors will be displayed simultaneously. The efficiency of data transmission is monitored and verified. Wireless networking for the sensors had been successfully designed to show the active pulse sensor. Besides, the data transmitted and received by the receiving system is accurate and it has been proved through several observations.

Heartbeat sensors are used to get the heart rate data of the patients. The principle of this sensor is based on the red and infrared light absorption characteristics of oxygenated and deoxygenated hemoglobin. Oxygenated hemoglobin absorbs more infrared light and allows more red light to pass through it. Deoxygenated (or reduced) hemoglobin absorbs fewer red lights and allows less infrared light to pass through it. Red light is in the 600-750 nm wavelength light band and infrared light is in the 850-1000 nm wavelength light band. After the transmitted red (R) and infrared (IR) signals pass through the measuring site and are received at the photo detector, the R/IR ratio is calculated. The R/IR is compared to a "look-up" table. Dust sensor is used to measure the dust percentage inside the ward of the hospital and the temperature sensor is used to measure the temperature of the ward.

Once the data is received by these sensors and processed by the microcontroller, this data is sent to a main location with the help of Wi-fi. Wi-fi implements a high level communication protocol using low power digital radios. It is mostly used to send periodic data signals over long range with the help of mesh networks. It provides a secure way of networking. The low cost allows its wide usage and due to low power it can operate longer on batteries. Most importantly if the data sent by the sensors to the microcontroller is abnormal, then

an automatic message is sent to the doctor so that the patient can be attended. Each patient is authenticated with a unique ID (identification) number, so that there is no confusion in attending the suffering patient.

## II. METHODOLOGY

The working principle for this project is the easy measurement of a patient's vital parameter through a new sensor based device and the communication network provided by the gateway and Wi-fi technology. These two technologies combine to build a fast monitoring system for hospitals and healthcare centers and are very practical.

An optical sensor based device called heartbeat sensor is used to measure both pulse rate and hemoglobin level. It passes the light waves through a thin body part such as finger and a photo-detector at the other end measures the intensity of both. More oxygenated hemoglobin absorbs more infrared light and passes the red light. Deoxygenated (or reduced) hemoglobin absorbs few red lights and allows less infrared light to pass through it. This information or data is sent to the microcontroller which analyzes this information. Then this information is sent to the monitoring system (computer in the ward) which collects the data from the patients and then transmits it to the main location. Each such set consist of Microcontroller AT89S52, temperature sensor, dust sensor and heartbeat sensor. The dust sensor which is present in the ward itself detects the percentage of dust in the surroundings (ward) and helps in the precaution of the patients. The temperature sensor detects the temperature of the ward. This combination set of Microcontroller AT89S52, temperature sensor, dust sensor and heartbeat sensor acts as the transmitter part. The data obtained from these sensors are stored in the host computer. The data in the host computer can be Wi-fied anywhere in the network. Here it is wi-fied to a main location (monitoring server). This whole setup constitutes the receiver part. The data transmission is started as soon as all the connections are done. Each node (patient) has different ID number which has been assigned using AT89S51 controller. This ID number is important to differentiate the data, once it is received at the receiver end. Thus, overlapping of data can be avoided. Multiple data will be identified at the receiver end and will be shown on a single monitor. Thus, it could be easier for the medical practitioner to monitor a number of patients simultaneously. This monitoring will also view the active heartbeat and temperature sensor. Therefore, any idle or inactive sensor will be neglected.

The monitoring application is designed with the help of .Net and C#. These tools are system design software that provides engineers and scientists the required tools needed to create and deploy measurement and control systems through unprecedented hardware integration.

The data obtained from the sensors are real time data. If the data obtained from the heartbeat sensors shows any abnormality, automatic message alert is sent to the doctor's mobile also. The other sensors may also show abnormalities, in that case, the staffs or the nurses who are intimidated from the monitoring server, would take care of the scenario.

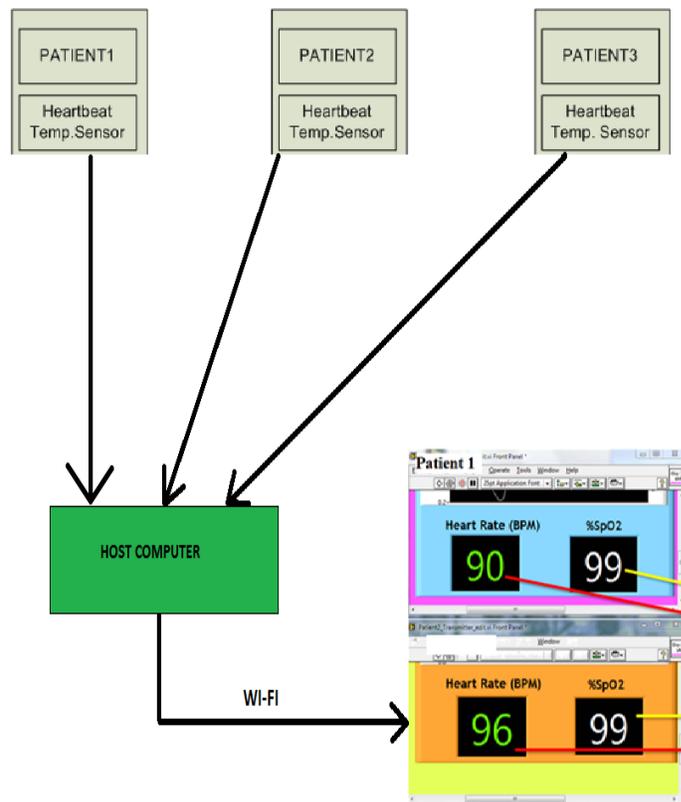


Figure 1: Block diagram for the Centralized Heart Rate Monitoring system

## III. RESULTS

The proposed system provides a web application for the observer to monitor the patients simultaneously using internet connections.

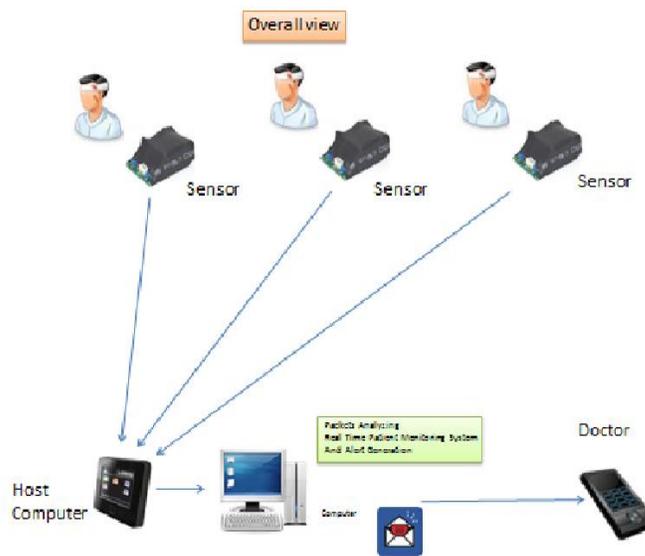


Figure 2: Proposed system diagram

As shown in the above proposed system diagram the observer opens the web application through the web browser. The operations are then selected by the observer. The observer collects the data of the patients from the host computer. The host computer sends the appropriate data through Wi-Fi. The observer then collects the information for the references. If the data received shows any abnormalities like abnormal heartbeat rate, abnormal temperature of the ward or the abnormal dust density of the ward, then an automatic message is sent to the doctor through the application to show the deteriorating condition of the patient or the ward.

Whenever the system collects the data from the patients, i.e. the host computer, the data can be stored in it and then be transmitted anywhere, where there is an appropriate Wi-Fi connection. It is transmitted to a main location where it is viewed continuously. The doctors and the nurses far away from the patients can simultaneously monitor the patients.

Various test cases were generated and the results were inferred from the test cases. The normal range for the heart rate of a patient was taken as 65bpm to 100bpm. The normal range for the dust percentage in the ward was taken as 005% to 020%.

The reading from patient 1 is taken from the host computer and then wi-fied to the main computer. Figure 3 demonstrates the condition of the patient to be normal.

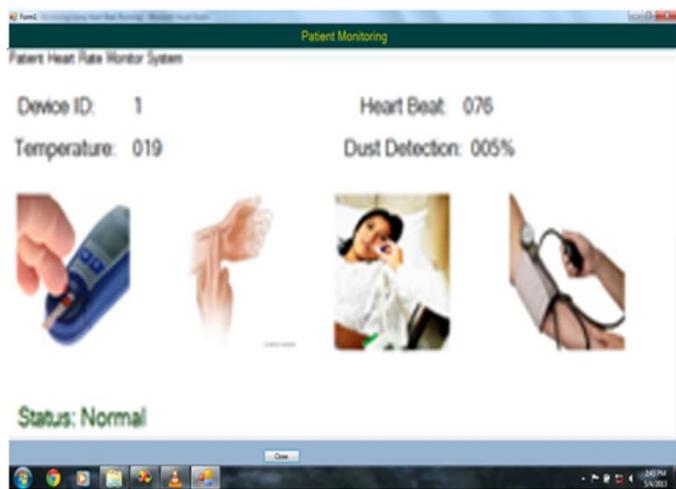


Figure 3: Normal Heart rate and temperature reading from patient 1

The reading from patient 1 is again taken from the host computer and then wi-fied to the main computer. Figure 4 below demonstrates the condition of the patient 1 to be abnormal. If there is any abnormal reading in the real time data from the sensors, an automatic message alert is sent to the mobile phone of the doctor or the health care professional.



Figure 4: Abnormal Heart rate and temperature reading from patient 1

Here, a single microcontroller is used for a single patient. Similarly more number of microcontrollers can be used to obtain the results from multiple patients. Figure 5 demonstrates the reading from multiple patients.

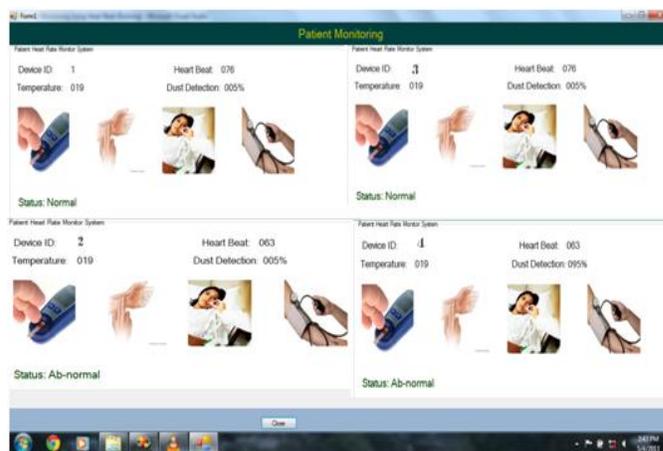


Figure 5: Reading from different patients

#### IV. CONCLUSION

The recent advances in the WBAN has the ability to integrate technology with existing applications or medical support platforms and deploy large scale systems that operate in unsupervised environments. The main objective of this project is to establish a wireless body area sensor network for handling real time data from different sensors and forwarding the data received by the host computer in the TTL format to the USB format on the receiving computer. The data that is transmitted and received is real time data and accurate. These features allow this system to be deployable in the hospitals or any institution that provides medical and nursing care. Further improvements on the paper includes expanding the system to mobile and remote patients, who are connected to a centralized monitoring system and doctors, using wireless body area network.

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# Determinants of Property Values, Jaipur City

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**Abstract-** The study was based on Hedonic pricing model which explains the price variability in terms of various functional characteristics of various attributes. It is based on recent transactions that have been paid for that particular property; the model is carried out with the help of regression analysis which is used to calculate the proportion of the total value accounted for by each of a property's individual attributes. The model is very demanding on both assumptions and data.

Since in an urban area, the property values are a function of various physical, environmental and psychological factors. In this study, we explored the relative contribution of each of these factors on residential property values. One of the quantifiable attributes of these factors is proximity. Proximity of these amenities to the particular properties has revealed a range of influences on its property values. We further enquired the influence at two spatial scales – city level and neighborhood level. The first, employs the distance to city centre, major transportation facilities, land use and environment factors as the variables, and the second one, distance to office, environmental factors, distance to nearest transport facility, road width and traffic congestion and third that is property level employs factors like built up area, number of bedrooms and toilets, construction technique, etc.

**Index Terms-** Property values, Hedonic Pricing Model, Stepwise Regression, Jaipur, Rajasthan.

## I. INTRODUCTION

Housing Market in India was initially a government enterprise when agencies like Housing board were actively supplying houses, but in due course of time in cities like Tamil Nadu, Gujarat etc the situation has changed due to high land prices, there is no more active agencies like Housing board or any agencies supplying houses from Government side thus inviting the private sector which in turn is shooting up the property prices.

The increasing rate of urbanization indicates to the fact that population in metropolitan areas are growing at a very fast pace and therefore demand of service land would be more in and around these urban centers. Due to the limited availability of such land within the urban areas, the land values are scaling new heights rapidly causing property values to increase beyond logical limits in both residential and commercial segments. Along with increasing high land values, cost of building materials and development charges having a “House” is a distant dream for majority of the population.

In urban areas, the property values are a function of various physical, environmental and psychological factors. Since, each

value of the property is unique; it is often difficult to identify the appropriate variables that will explain property value.

### 1.1 Aim of the Study

To study the factors influencing property values in a city and understand the mutual relationship between these factors.

### 1.2 Objective of the Study

1. To find what are the factors that influence the property values.
2. To find out what type of relation these factors have with respect to property value.
3. How the City of Jaipur's property values can be modeled using various statistical techniques?
- 4.

### 1.3 Research Questions

- 1 What are the various factors that influence the property value in an urban context?
- 2 How is the demand and supply influencing the property value?
- 3 Which way these factors influence – directly proportional or indirectly proportional?
- 4 How much (magnitude) is the influence of these factors on property value?
- 5 How the relationship derived from RQ1-4 is applied to Jaipur's case?
- 6

### 1.4 Scope and Limitations

Scope:

1. The study will only focus in JMC limit of Jaipur city.
2. The study will only focus on registered value and not on the market value.
3. Study various factors affecting the registered property values.

Limitation:

1. Will only consider values within 5 Yrs of transaction.
2. Various levels of factors will be studied within the time frame.
- 3.

## II. METHODS FOR CALCULATING LAND VALUE

### Accessibility and Proximity Levels –

It is operationalised through travel time thresholds with the use of a distance decay function, as the greatest impact is likely to be found closest to the public transport node. The distance thresholds are different for residential and commercial developments, with impact distances being larger for the residential than for commercial. Secondly, the impacts may be different on existing developments as compared with new developments, as it takes time for markets to react to change. In

addition, more than one location might have an accessibility improvement as a result of a transport investment.

**Market Activity and Business Competitiveness Surveys:**

Here the surveys are done to assess the property market, so it is important to take care while selecting the sample size and location, for the better accuracy, and then the sample selected can be used with other methods such as business interviews, focus groups discussion with stakeholders, attitudes to the investment, and in some cases local area surveys of speculative market.

**Qualitative analysis,**

This method includes information that will help balancing the more quantitative economic information and model outputs. The analysis include accessibility mapping, proximity analysis which includes distance to local facilities and catchment areas for a range of activities. But the actual value of qualitative studies is in the interpretation of results and the resolution of attribution.

**Descriptive Statistics-**

It gives a cross sectional view on market condition in terms of property and land value effects, and these factors can be further cross tabulated with measures of change in travel and modal split to check whether there is a statistical relationship (e.g. a correlation analysis).

**Regression analysis**

It is an analysis technique for establishing a relationship between different sets of data. It is performed on the available information on property transactions where property price act as dependant variable and the attributes of physical and neighborhood characteristics act as independent variables. The results of the regression will than give us how much change in the property price will be because of these particular attributes.

**Hedonic pricing,**

Hedonic price theory assumes that property price is actually a combination of different physical and neighborhood characteristics and that the overall transaction price can thus be decomposed into the component (or “hedonic”) prices of each attribute. The model is based on the recent prices that have been paid for the property, a regression analysis is used to calculate the contribution of each feature or attribute in the property value.

**Transactional analysis**

This monitors the changes in property and land values from actual transactions for past few years. It is the time-series analysis of property and land values.

**Projected ratable values**

This method is based on growth assessment, which determines the way the market is likely to move in terms of yields, occupancy rates, the demand for different types of space, and the rents to be paid. This assessment is based on the knowledge of property and land market.

**GIS mapping techniques,**

ACCMAP is a GIS based software package that links the Ordnance Survey OSCAR base mapping of the road network

with a database of public transport information to give accessibility surfaces reflecting isochrones, which can be presented as changes over time.

**Geographically Weighted regression (GWR)**

The approaches to mapping the results of GWR have primarily employed an equal step classification and sequential no-hue color scheme for choropleth mapping of parameter estimates.

**Linear Structural Relation (LISREL),**

It is a multivariate type of analysis for property values designed for addressing the measurement problems associated with current tests of the sources of property value. The model is for examining the relationship between property prices and hypothesized determinants of value. The model was developed by Joreskog and Goldbergen (1972) and is a multivariate factor analytic technique, consisting of two concurrent procedures. LISREL combines two procedures to derive estimate from the two models simultaneously. Firstly, the model is used to extract composite factors from sets of variable proxying for different hypothesized determinants of values and secondly, the model is used to estimate a linear relationship between property prices and extracted factors.

III. FACTORS AFFECTING VALUE OF A PROPERTY

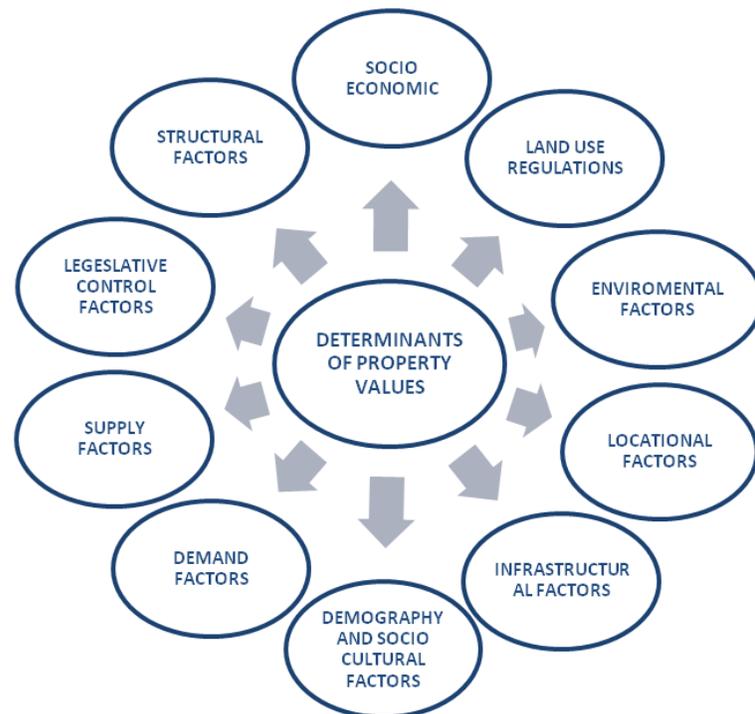


Figure 2: Determinants of Property Prices

The reaction of the man and the condition of environmental is not only a natural reaction, but also a regulatory action. Cities are a part of artificial environment where humans are formed.

The physical environmental of a structure is formed by natural and structured elements where, natural environment

elements are composed of elements like the city's sea, river, topographic structure, vegetation, air pollution and temperature. Nevertheless, built environment includes all the elements of the recreational areas, houses, working buildings, and the technical infrastructure connects all these different functions to each other. Housing lands is the most bulky elements of the built environment. In residential service areas and various networks which link them to each other forms the built environment and give a city a basic identity.

The evaluation of a housing land cannot be only done by its structural properties but also have to be evaluated by physiologically with other urban and spatial of environment. It is very important to produce a healthy environment for human community both socially and psychologically.

The value of a land is depended both on physical characteristics of a building but also on the built environment surrounds to that building. There are many variables associated with land that defined the value of that particular property such as the inner specificity of the housing, the unit of neighborliness the housing is included in, the distance of the housing land to the important centers and service areas in the city, the local characteristic of the neighborhood unit, the architectural and aesthetical structures and even the scenery factors, etc.

#### ***The Demand Factors***

Like in any other product, demand and supply forces play a very important role in the valuation of a property. The demand factors could be influenced by many reasons. A change in demographic characteristics by in-migration could cause a big spurt in demand for housing and other facilities. Similarly, augmentation of paying capacity leads higher demand for land. The social factors include population growth or decline, changes in family sizes, typical ages, and attitudes toward law and order, prestige and education levels.

Speculation is fallout of demand in the market. In anticipation of a particular advantage that a site might have after a particular amount of time due to infrastructural or location advantages, land values tend to be artificially raised. As a result supply of land is discouraged by increasing prices to unjustifiable limits.

#### ***The Supply Factors***

Development authorities have been following a trend of large scale land acquisition and thereby controlling the land supply. This procedure popularly known as land banking is good to in a way because the authority is able to release developed land for market use. Unfortunately, the development authorities have miserably failed in this regard due to various reasons. According to development authority this scarcity happens because of the following reasons that is high development cost, Scarcity of developable land, Standards that have to be met do not reflect ground realities of affordability, administrative delays and political considerations

This coupled with legal bottlenecks and inefficiency of government organizations are major reasons why supply of land is not being managed properly.

Public private partnerships signifies a step in the right direction and it is imperative for public authorities to involve the

private sector to share the burden of land provision otherwise the demand in the market creates abnormal price escalation.

The corollary situation is also unwanted one where supply exceeds demand to such an extent that the development cost is not met in the sale and the authority runs at tremendous losses. In such a situation too, the developer tries to keep his plots vacant for a long period so that an artificial scarcity can be created.

#### ***Physical Infrastructure Advantages***

Traditionally, areas having high infrastructural provision have higher land values. This goes for both the physical and social infrastructure provisions. Physical infrastructure would include power supply and its backup, Water supply, sewerage network, drainage network, Solid waste disposal, traffic and transport elements.

#### ***Social Infrastructure Advantages***

The facility supplied to a property plays an important role and has maximum effect on the real estate's price. Usually the closer the land is to commercial centers or recognized vacation spots, the more expensive the land becomes. Therefore the Social infrastructure includes educational facilities, medical facilities, commercial facilities and institutional elements.

#### ***Location Advantages***

The location of land is still considered one of the most important factors in deciding its value. Urban areas have primarily three land uses-activity areas, non-activity areas and transportation areas. Activity areas are employment centers where people use the transportation areas to come from non-activity zones. The activity areas are most sought after because they provide opportunity for business. That is why property values are higher as we go towards the CBD area. Conversely, the areas which are in the vicinity of non preferable uses like drains, airports, railway lines, slums etc. are not preferred. Higher accessibility to work centers is a big factor affecting land values.

#### ***Transport Linkages***

If location is a function of market linkages, then any adjustment in the cost or length of the linkages for a given parcel will alter its value. Improved transportation routes in cities have definitely changed the value of properties located near these routes.

- a) Accessibility to main road
- b) Nearness to bus transit system
- c) Distance to rail transit system
- d) Distance to Airport

#### ***Socio Economic Factors***

People residing in the city fall prey to the social and economic transformations taking place in it. Due to variations in the political set up or due to legal or governmental forces particular areas face economic and social problems. All this might lead to distress sale thus making property values fall. Such factors are:

- a) Type and amount of taxation.
- b) Zoning and building laws, planning and restrictions.

### Demography and socio cultural factors

Depending upon the distribution of population income and social class wise, land prices increase proportionately with income group (and higher social class). Thus these factors include:

- a) Population density and projected growth
- b) Demographic mix and resultant influence on property demand
- c) Socio cultural dynamics and influence on property class
- d) Nature of the residents: employment and social status, etc
- e) Presence of destitute in the neighborhood and the perceived menace
- f) Multi ethnic co-habitation and perceived social tension

### Structural factors

Factors which are directly related to property are affecting the price of a property directly.

- a) Plot size.
- b) House size
- c) Built up area
- d) house size;
- e) Number of living room,
- f) Number of bedroom,
- g) Number of bathroom,
- h) Fireplaces,
- i) Garages;
- j) Age of structure;
- k) Other facilities available like garden, pool etc within.

### Environmental factors

Environmental amenities such as air quality, level of noise in the neighborhood can be considered as resources with monetary value.

- a) Atmospheric pollution,
- b) Noise impact.
- c) Proximity to Residential area.
- d) Proximity to recreational ground and other landscape features.
- e) Surface water.

### Land use regulations

The effect of a land-use regulation on property values can be positive or negative, whereas removing a land-use regulation from one property can be expected to have a positive effect.

1. Distance to industrial area
2. Distance to institutional area
3. Distance to commercial area
4. Nearness to other residential area

### Legislative / Statutory Control Factors

The most influential sub-factors under this category are the various taxes relating to the sale, ownership and use of property, notably, Property Gains Tax Laws, municipality taxes and divergent tax rates (i.e. tax rates on service rates, electricity, water, telecommunications, etc). Planning controls were perceived to be the second most influential sub-factors influencing property values. (W. Britton 1989).

Property Gains Tax Laws, municipality taxes, divergent tax rates ( tax rates on service rates, electricity, water, telecommunications etc

- a) Planning controls: Town planning / zoning and country planning act
- b) Legal requirements by the council, based on height restrictions, quality and class of residential property, etc
- c) Deregulation / Liberalization of property market, e.g. allowing foreign investors involvement in property business
- d) By - laws pertaining to safety, healthy working conditions, fire equipment, etc
- e) Tenure of the property (Price of property is valued in terms of the time of lease).
- f) Price paid on property on compulsory purchase (local authorities, statutory undertakings).
- g) Periodic valuation of residential property for taxation purposes.

These Factors affect the market at different levels, say At City level, and neighborhood level and at property level respectively, and are further sub divided into aspects, which affects the values of a property at different levels under following heads because all aspects are not applicable at every level.

### 3.1 City Level

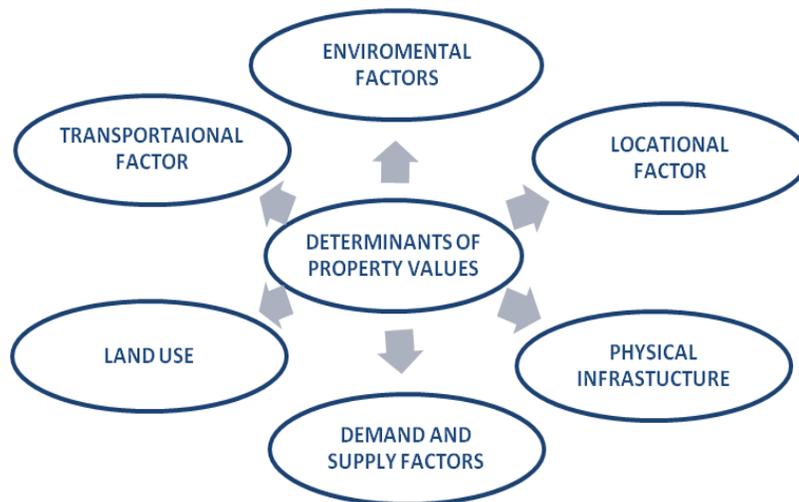


Figure 3: Determinants of Property values at city level

### The Demand Factors

Like in any other product, demand and supply forces play a very important role in the valuation of a property. The demand factors could be influenced by many reasons. A change in demographic characteristics by in-migration could cause a big spurt in demand for housing and other facilities. Similarly, augmentation of paying capacity leads higher demand for land. The social factors include population growth or decline, changes

in family sizes, typical ages, and attitudes toward law and order, prestige and education levels.

Speculation is fallout of demand in the market. In anticipation of a particular advantage that a site might have after a particular amount of time due to infrastructural or location advantages, land values tend to be artificially raised. As a result supply of land is discouraged by increasing prices to unjustifiable limits.

### **Environmental factors**

Property values are influenced by the environmental factors in a big way. Human being behaviors are not neutral to the environment surroundings for the simple reason that they adjust their quality of life and living according to the location and the environmental conditions of a particular area. These living conditions and quality of life determine and affect the real estate market. This also envisages the quality of social circle that crops out in a particular area. Greenery and landscape, water level condition, noise pollution are few factors which govern a property price in a given area.

### **Land use regulations**

The effect of a land-use regulation on property values can be positive or negative, whereas removing a land-use regulation from one property can be expected to have a positive effect. Indeed, many land use regulations actually increase property values by creating positive “amenity effects” and “scarcity effects.”

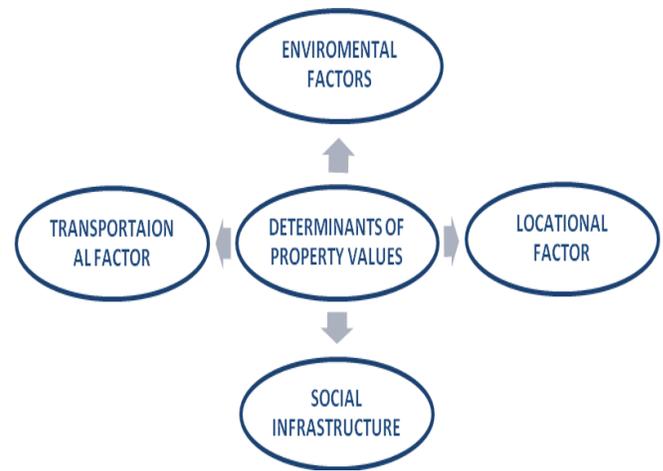
### **Location Advantages**

The location of land is still considered one of the most important factors in deciding its value. Urban areas have primarily three land uses-activity areas, non-activity areas and transportation areas. Activity areas are employment centers where people use the transportation areas to come from non-activity zones. The activity areas are most sought after because they provide opportunity for business. That is why property values are higher as we go towards the CBD area. Conversely, the areas which are in the vicinity of non preferable uses like drains, airports, railway lines, slums etc. are not preferred. Higher accessibility to work centers is a big factor affecting land values.

### **Transport Linkages**

If location is a function of market linkages, then any adjustment in the cost or length of the linkages for a given parcel will alter its value. Improved transportation routes in cities have definitely changed the value of properties located near these routes.

## **3.2 Neighborhood Level**



**Figure 2: Determinants of Property values at neighborhood level**

### **Environmental Factors:**

Property values are influenced by the environmental factors in a big way. Human being behaviors are not neutral to the environment surroundings for the simple reason that they adjust their quality of life and living according to the location and the environmental conditions of a particular area. These living conditions and quality of life determine and affect the real estate market. This also envisages the quality of social circle that crops out in a particular area. Greenery and landscape, water level condition, noise pollution are few factors which govern a property price in a given area.

### **Social Infrastructure:**

Traditionally, areas having high infrastructural provision have higher land values. This goes for both the physical and social infrastructure provisions. Social infrastructure includes educational, medical, commercial and institutional elements which are essential for a better quality life.

### **Location Factors:**

Plots situated in the city and nearer to the work place will be more valuable as compared to plots in the suburbs and further from the work place. Distance to workplace also affects the price of a property, as the distance travelled to work is less the properties within an easy approachable distance will fetch more value that property which is far from the work place. As it reduced the time travelled by the commuters and traffic can be reduced as people would prefer to walk to their work places considering the health and environmental aspects.

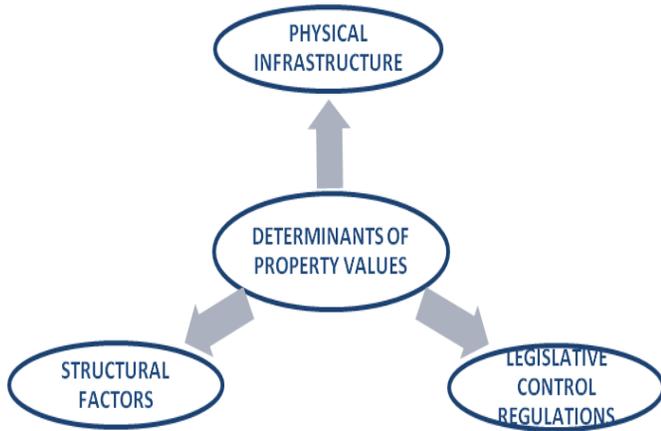
### **Transportation Factors:**

Location is within easy reach of, bus station or other means of transport is preferred by the tenants and they are usually prepared to pay higher rents as compared to similar premises situated away from the bus station in spite of the fact that there is disturbance at regular intervals and the premises are devoid of peaceful atmosphere at night.

If location is a function of market linkages, then any adjustment in the cost or length of the linkages for a given parcel

will alter its value. Improved transportation routes in cities have definitely changed the value of properties located near these routes. The changes in transportation routes have changed the effective cost of getting particular market, so land which was far from the CBD now commands a higher rent because of improved access to the market.

**3.3 Property Level**



**Figure 3: Determinants of Property Values at property level**

**Physical Infrastructure**

Traditionally, areas having high infrastructural provision have higher land values. Here Physical infrastructure would include availability of amenities and facilities such as power supply and its backup, water supply, sewerage network, drainage network, solid waste disposal and traffic and transport elements.

**Structural Factors**

Factors such as Plot size ; house size and built up area affects the property price the most followed by; house size; number of living room, bedroom, bathroom, fireplaces, garages; age of structure; other facilities available like garden, pool etc within .

**Legislative Control Regulations**

The most influential sub-factors under this category are the various taxes relating to the sale, ownership and use of property, notably, Property Gains Tax Laws, municipality taxes and divergent tax rates (i.e. tax rates on service rates, electricity, water, telecommunications, etc). Planning controls were perceived to be the second most influential sub-factors influencing property values. (W. Britton 1989).

**IV. METHODOLOGY**

The methodology of the study can be divided into 2 parts: Primary data collection, Secondary research and Empirical research. Secondary research comprised of articles by various publications, books along with web search and data from various agencies, valuers and real estate agents.

To study the trend of housing and transaction taking place in Jaipur Housing market there was various data collected from Registration and stamping department and from valuers, brokers and Real estate agents.

Firstly, Past 5 yrs transaction was seen to get an idea about the trend of the city. The transactions studied are the transaction registered with Revenue department from 01-01-2007 to 31-12-2012. Since the study covers the changes in the land market for last 5 years.

Secondly collected were the DLC rates for all the DLC zone of the Respective Sub Registrar zone of the Jaipur city.

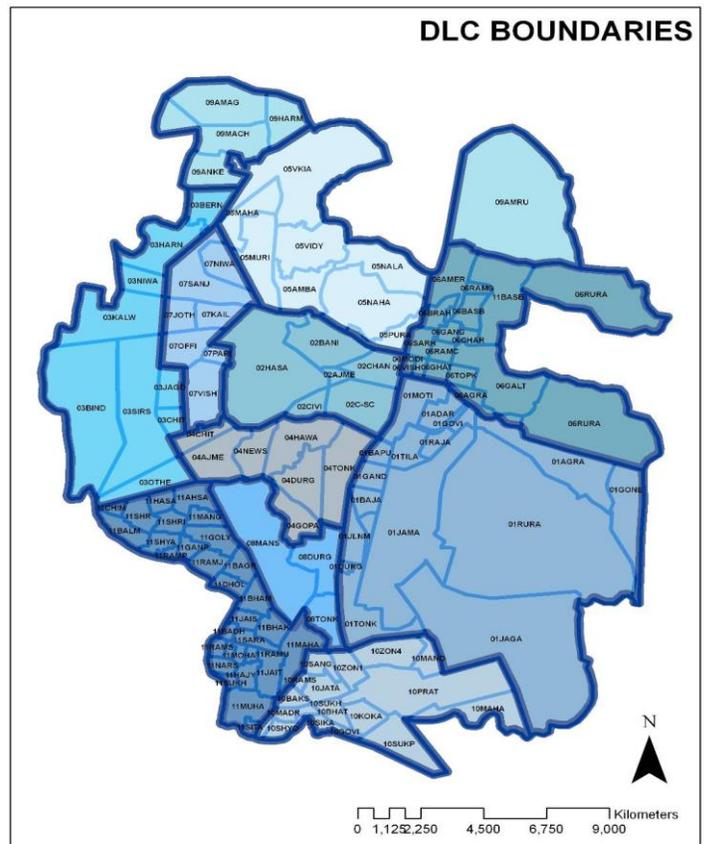
Thirdly collected was the Market value of the property, the actual price on which the transaction happens of a particular property. Usually this market value is very high as compared to the DLC rates available. This was collected from the various real estate brokers and a valuer available is that particular zone.

Once the secondary data was collected observations were made with reference to the prevailing values of the properties and market conditions. Factors were identified within the undertaken case studies through physical survey, where as recent property trends within Jaipur city and significance of identified factors are concluded from the replies of valuers and builders. This study is carried out at three levels.

1. Property Level
2. Neighborhood Level
3. City Level

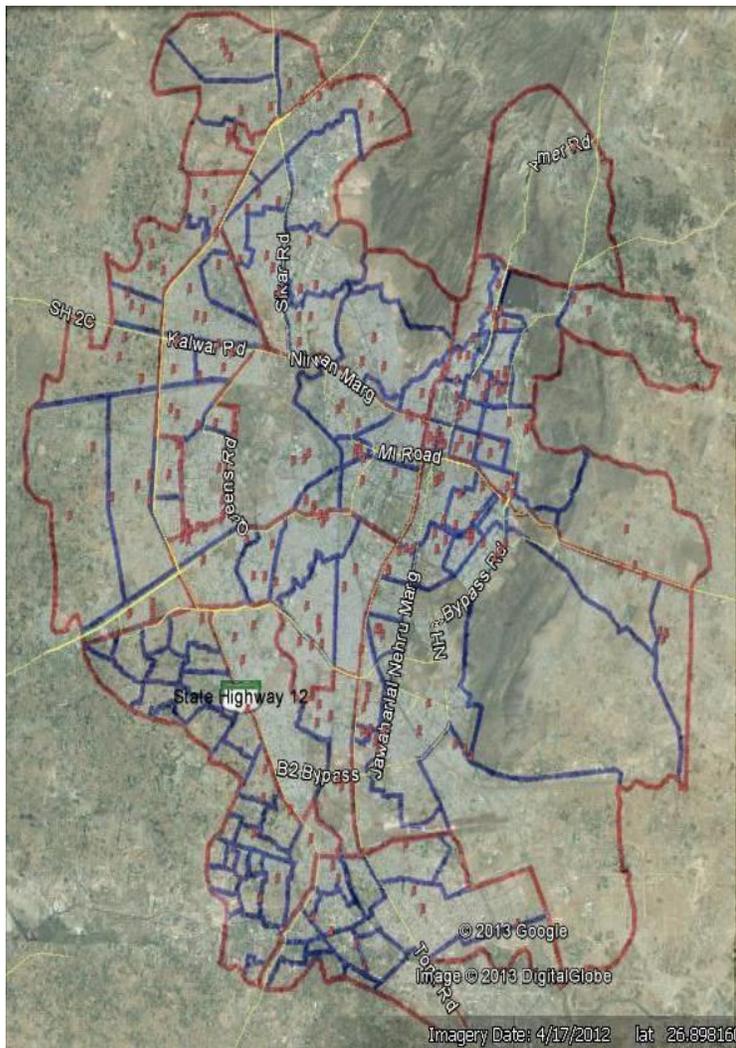
The plan of action for the primary data collection happened in following manner:

1. Preparation of questionnaire.
2. Sampling.



**Figure 4: Map showing SR Boundaries and DLC Boundaries of Jaipur city.**

The sampling started with identifying and selecting of samples where 3 samples each from every



**Figure 4: Map Showing Samples within the JMC Limit**

*Table 2: Total DLC in each SR Zone*

SR Zone	Area SQ.Km	No. of DLC
Jaipur 1	98.93	16
Jaipur 2	28.49	6
Jaipur 3	42.31	9
Jaipur 4	22.41	7
Jaipur 5	38.37	8
Jaipur 6	40.83	16
Jaipur 7	16.22	7
Jaipur 8	18.24	3
Amer	33.03	5
Sanganear 1	28.19	17
Sanganear 2	27.06	31
Total	394.08	125

DLC zone were selected based upon the following considerations.

- a) The surveyed property should lie within the JMC limit.
  - b) The transaction of the surveyed property should have taken place in past 5 yrs.
  - c) The property should be a built property rather than a barren land.
3. Execution of data collected.
  4. Preliminary Data analysis.

For the computation of data following steps were followed:

- To start with the process firstly we have descriptive statistics analysis for all the factors and the one which doesn't show appropriate result are not considered
- Once the data is cleaned, the averages of each DLC were taken for all the factors and a new data was formed for the aggregated data.

This Data was further used for analysis at all the levels,

#### 4.1 Tools for Analysis

There were two type of method used for analysis

#### Correlation analysis

It is performed and based on the co-efficient value the factors are grouped. The factors having co-efficient less than 0.05 are discarded. Through a correlation analysis an attempt is made to understand the relationship between the various factors and their influence on the property values. The basic objective of this exercise is to find out what are the other parameters which affect the residential property values across the city. The exercise is done to see which variables are significant and which are not, and the one which are significant are positively significant or negatively.

#### Step wise Regression

Once the significant variables are identified, a stepwise regression will be carried out on entire data set. Considering Property values as dependent variable (Y) and all the factors as independent variables (X). Stepwise regression when carried out in SPSS program, it removes the non significant variables automatically at the first stage and further subdivide the variables in to models that give the best fit result and hence a model with maximum number of significant variable with high  $R^2$  value is achieved. This process is carried out for the dataset of both neighborhood and city level, to achieve significant results.

## V. DATA COLLECTION

Housing in India has traditionally been the activity of private enterprise. The increasing rate of urbanization indicates to the fact that population in metropolitan areas are growing at a very fast pace and therefore demand of service land would be more in and around these urban centers. Due to the limited availability of such land within the urban areas, the land prices are scaling new heights rapidly causing property values to increase beyond logical limits in both residential and commercial segments. Along with sky rocketing land values, cost of building

materials and development charges of planning agencies have also raised alarmingly making “House” a dream for majority of population.

The methodology of the study can be divided into 2 parts: Primary data collection, Secondary research and Empirical research. Secondary research comprised of articles by various publications, books along with web search and data from various agencies, valuers and real estate agents.

The objective of this thesis is to find factors that affect residential property at property level and any distance-related externality effects of residential property values of neighborhoods and city level with in the Jaipur Municipal Limit in Jaipur city.

This chapter deals with the major findings derived from the undertaken case studies. The total chapter explains the process of

data collection and selection of major indicators affecting property values.

### 5.1. Property Transactions

To study the trend of housing and transaction taking place in Jaipur Housing market there was various data collected from Registration and stamping department and from valuers, brokers and Real estate agents.

### 5.2. SR Transactions

Firstly, Past 5 yrs transaction was seen to get an idea about the trend of the city.

In Jaipur any one can register his/her document anywhere in the city i.e. a person having property in the zone , say Jaipur –VII can register his/her property with Jaipur-I.

Table 2: Total transaction of each SR zone in 2012

	SR1	SR2	SR3	SR4	SR5	SR6	SR7	SR8	SR9	SR10	SR11
SR1	6.84	1.14	0.04	1.16	2.03	0.75	0.08	0.77	0.02	0.31	0.16
SR2	0.13	9.80	0.07	0.08	1.11	0.32	0.06	0.03	0.00	0.01	0.01
SR3	0.64	1.76	7.67	0.42	3.84	0.15	2.59	0.34	0.03	0.08	0.07
SR4	0.63	1.06	0.08	3.04	1.63	0.22	0.65	0.47	0.01	0.06	0.03
SR5	0.17	0.89	0.35	0.04	27.11	0.30	0.08	0.04	0.02	0.00	0.01
SR6	0.49	0.72	0.05	0.13	1.62	3.51	0.01	0.04	0.22	0.01	0.01
SR7	0.23	0.81	1.23	0.14	1.47	0.13	2.52	0.08	0.01	0.02	0.01
SR8	0.17	0.18	0.01	0.10	0.31	0.09	0.02	3.19	0.01	0.08	0.03
SR 9	0.45	0.52	2.02	0.08	1.74	0.14	0.12	0.08	6.98	0.02	0.01
SR10	4.23	0.91	0.07	1.33	1.84	0.44	0.19	1.71	0.04	11.90	3.23
SR11	1.14	0.88	0.22	0.55	1.56	0.16	1.80	2.40	0.01	1.63	4.45
Total	15.12	18.67	11.81	7.07	44.27	6.20	8.11	9.15	7.37	14.12	8.00

That is the reason of many places having very high land registration of other places outside the jurisdiction of that revenue office, eg. Jaipur- V has maximum registrations and majority of them are outside area, only because it is centrally

located and many unseen reasons. Similarly with Jaipur – II and Jaipur – I.

The transactions studied are registrations with Revenue department from 01-01-2007 to 31-12-2012. Since the study covers the changes in the land market for last 5 years.

Table 3: Last Five year transactions in each SR's( In Thousands)

	2007	2008	2009	2010	2011	2012
SR1	9.39	9.08	7.91	9.20	10.68	13.31
SR2	3.53	3.88	2.52	2.61	2.55	11.61
SR3	10.17	7.97	6.99	9.01	11.46	17.59
SR4	5.12	5.52	3.88	5.03	5.94	7.88
SR5	8.46	10.55	4.86	6.11	6.17	29.00
SR6	4.05	4.24	3.82	4.41	5.07	6.81
SR7	5.59	4.13	3.48	4.57	4.76	6.63
SR8	4.87	3.55	3.14	4.39	3.46	4.18
Amer	8.51	6.94	6.07	6.87	4.97	12.15
Sanganer 1	11.50	11.87	12.56	15.92	18.90	25.91
Sanganer 2	7.08	6.84	7.00	10.08	11.21	14.79

The land registration are more in the peripheral areas of Jaipur i.e. Sanganer-I which itself has more than double of the second highest land registration area. Also the area under the jurisdiction is more.

Jaipur – V and Sanganer – I am areas having more transactions during the last 5 years. These areas include the major roads i.e. Area around Ajmer Road, Kalawar Road and Sikar Road in the west of the city (Jaipur – III) and Jagatpura and Sanganer on Tonk Road (Sanganer –I and II) on the South periphery of the city. This is also because they are the recently released land by the department, so a little cheap with more availability.

There are comparatively less land transactions on the north and east of the city due to physical barriers restricting the growth than the west and south periphery.

### 5.3. DLC Rates and Market Price

‘DLC (District level committee) Rates’, is the land valuation rate which is based on the average rates laid down by the District level committee (DLC) for registration of sale deeds under stamps and registration act.

The maps below shows the variation of the DLC rates in the DLC zone. The maximum value among the maximum value of each DLC zone is in JLN Marg and Tonk road zone of Jaipur-I where as minimum value in the minimum range is in Jaisinghpura of sanganeer II.

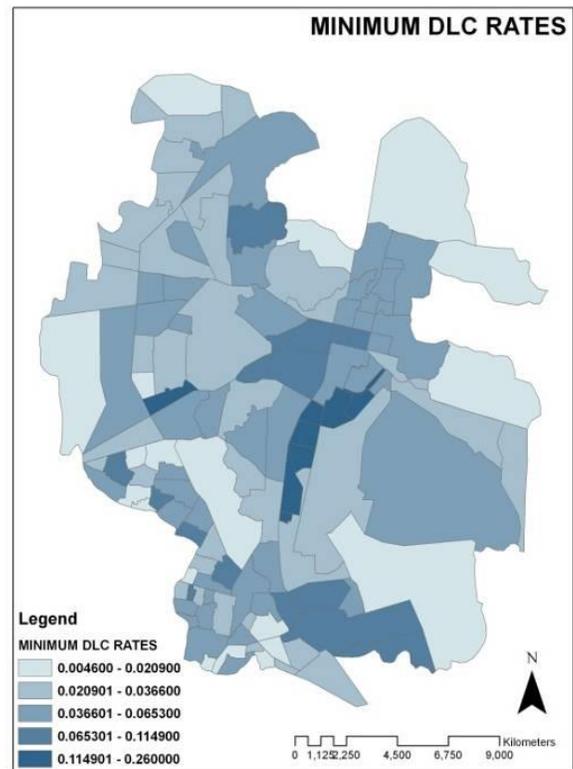


Figure 6: Minimum DLC Rates

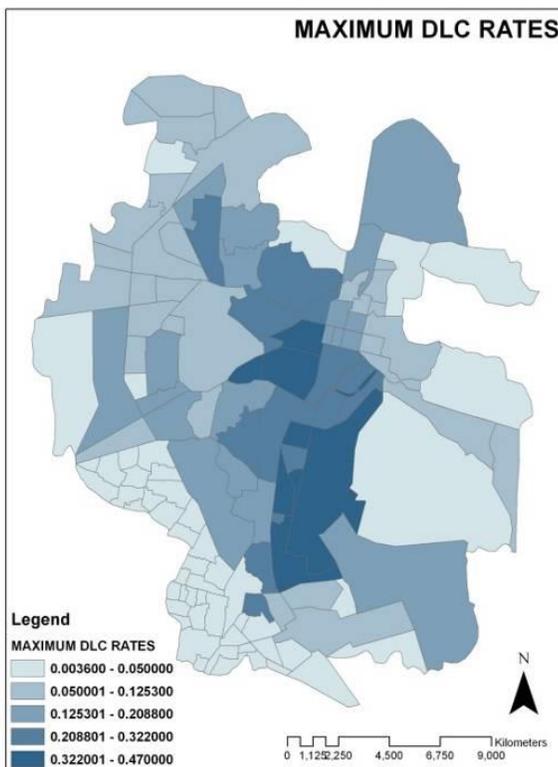
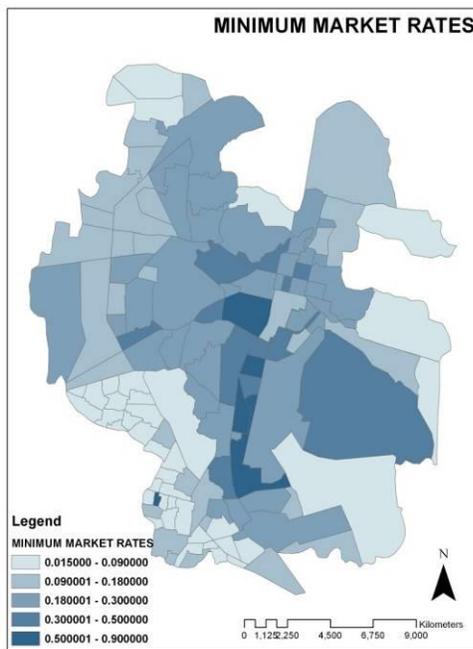


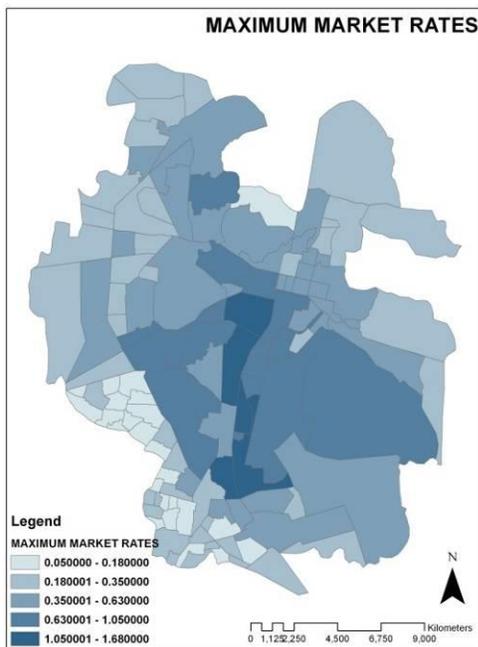
Figure 5: Maximum DLC Rates

Thirdly collected was the **Market value** of the property, the actual price on which the transaction happens of a particular property. Usually this market value is very high as compared to the DLC rates available. This was collected from the various real estate brokers and a valuer available is that particular zone.

The map below shows the maximum and minimum market value range with a given DLC zone. The DLC having the minimum value in the minimum value range is in Nala area DLC of Jaipur V region whereas the maximum value in the maximum range is of JLN Marg of Jaipur I zone.



**Figure 7: Minimum Market Rates**



**Figure 8: Maximum Market Rates**

**5.4 DLC Rates Vs Market Value**

The DLC rates are an essential guideline for the assessment of the calculation of stamp duty. The Stamp Duty and Registration Fees are to be valued on the prescribed market rates as per the provisions of the relevant Act/Rules and Departmental instructions. The non-compliance of the relevant Act/Rules and Departmental instructions by the SRs resulted in short levy of Stamp Duty and Registration Fees.

Stamp Duty is payable at the time of transfer agreement according to the DLC Rates. In this document price of each land

is decided by revenue department of state government depending on its Location. Stamp Duty is the fixed percentage of tax payable to the government on registration of each property ownership transaction.

**Table 4: Market price Vs DLC Rates**

SR Zones	Market Price Vs DLC Price
SR-1	4.64
SR-2	4.92
SR-3	5.51
SR-4	5.31
SR-5	4.38
SR-6	4.78
SR-7	3.55
SR-8	5.64
SR-9	3.58
SR-10	8.92
SR-11	8.82

**5.5 Inference**

As the comparison table (Annexure1) above shows that prevailing market rates as well as market rates of 2012 are 6 times higher than the DLC Rates with maximum variation seen in Peripheral areas such as SR-10 and SR-11 because the growth is in that particular direction of the city rather than Amer which is also in periphery but is restricted by mountains. The DLC 2012, made effective from 01-04-2012 which was prepared as on market situation of 2011. Hence, DLC still needs to be updated to get exact current market prices of the property. With the latest computer technology it is possible to come to very close to realistic price of each and every plot of land within identified value zone, which will help to make the new and updated DLC Rates very scientific and simple in use and will not burden the end user.

**VI. ANALYSIS**

A qualitative and quantitative analysis is done from the data collected in the following areas:

- Identifying the factors that have major positive and negative impact on the value of the property.
- Computing price variation for under taken case studies
- To find out significant effect of each factor on the value of the property at:

Neighborhood Level

City Level

*Statistical Analysis of Property Values*

**6.1. Neighborhood Level**

Statistical methodology: Stepwise Linear Regression Analysis.

Dependent variable: Property Price in Rs./Sq.mt

Independent Variables Land use, Distance to main road, Quality of Air pollution, Traffic congestion, Distance to Kindergarten, Distance to School, Distance to office, Distance to temple, Distance to hospital, Distance to Police chowki, Distance to Park, Distance to convenient shopping, Distance to party plot, Distance to Bus stand, Distance to metro and auto stand.

We have considered that the following factors may or may not affect the, value of the property. As we move close to the following factors the property values will: +ve: increase or -ve: decrease.

So first correlation analysis is performed and then regression analysis is performed to understand the effect empirically.

**Correlation Analysis**

Through a correlation analysis is an attempt made to understand the relationship between the various factors and their influence on the property values. The basic objective of this exercise is to find out the parameters which affect the property values of residential properties within the JMC limit of Jaipur city. The exercise is done to see what variables are responsible for the impact on property values within the study area and to what level.

*Table 5 : Variable significance at Neighborhood level*

Independent Variables	(+ve or -ve value)	Significance
LANDUSE	Negative	Significant
DIST_MAINRD	Positive	Significant
TRAFFCONGEST	Negative	Non Significant
DIST_KG	Negative	Non Significant
DIST_SCH	Positive	Non Significant
DIST_OFFC	Positive	Non Significant
DIST_TEMPLE	Positive	Non Significant
DIST_HOSP	Positive	Significant
DIST_RECREAT	Positive	Significant
DIST_PC	Positive	Significant
DIST_PARK	Negative	Significant
DIST_SHPG	Positive	Significant
DIST_PARTY PLOT	Negative	Non Significant
DIST_BS	Positive	Non Significant
DIST_METRO	Positive	Significant
DIST_AUTO	Positive	Non Significant

A correlation matrix is compiled to find out the correlated variables and their degree of statistical significance. Only

significantly correlated variables are considered for further analysis i.e. for regression analysis.

*Inference: From the correlation matrix (Annexure3) except distances from convenient shopping, recreational zone and metro station no other factor is showing significant correlation with current property price.*

*Hence the results are showing non-significance after performing correlation so we further expand our study and will do regression analysis for the above dataset. .*

**Step wise Linear Regression Analysis**

A stepwise regression has been carried out on entire data set considering Property values as dependent variable (Y) and all the factors as independent variables (X). Stepwise regression when carried out in SPSS program, it removes the non significant variables automatically at the first stage and further subdivide the variables in to models that give the best fit result and hence a model with maximum number of significant variable with high R2 value is achieved. This process is carried out for the dataset of Neighborhood level, to achieve significant results. The table shows results of four models.

*Table 6: Results of Regression at Neighborhood level*

Model Summary					
Model		R	R Square	Adjusted R Square	Std. Error of the Estimate
dimension0	1	.734 <sup>a</sup>	.539	.534	154.239
	2	.824 <sup>b</sup>	.679	.671	129.560
	3	.877 <sup>c</sup>	.769	.761	110.370
	4	.886 <sup>d</sup>	.785	.775	107.267
a. Predictors: (Constant), DIST_METRO					
b. Predictors: (Constant), DIST_METRO, DIST_MAINRD					
c. Predictors: (Constant), DIST_METRO, DIST_MAINRD, DIST_RECREAT					
d. Predictors: (Constant), DIST_METRO, DIST_MAINRD, DIST_RECREAT, DIST_TEMPLE.					

Out the above mentioned models, Model 4 is considered to be the most significant model as its R<sup>2</sup> = 0.785 which means the model shows 78% of variation in property values is because of these four variables; Distance to Metro Station, Distance to Main Road , Distance to Temple and Distance to Recreational area.

The equation we get here is:

$$\text{Property Price (Y)} = 234.98 + 0.180*(D\_Metro Station) + 1.25*(D\_Main Road) + 0.284*(D\_Recreational) + .197*(D\_Temple)$$

*Equation 1: Regression equation for factors affecting property value at Neighborhood level*

To see the significance of the individual independent variable t test is done. Results show significant results for all 4 selected factors. (Refer Annexure 4)

After achieving the results from the correlation and regression analysis, we can say that they are not completely matching the assumptions which were supposed and the result was inconclusive. Hence a clear result is not achieved which can help us to analyze the effect of the considered factors on the property values.

Now to get a clearer result of these factors and to understand the effect and check their significance spatially, Geographically Weighted Regression (GWR) method in GIS is applied for detailed analysis.

### 6.2. City Level

Statistical methodology: Correlation and Regression Analysis.

Dependent variable: Property Price in Rs./Sq.mt

Independent Variables: Distance from ISBT, Distance from open spaces, Distance form Railway station, Distance to Airport, Distance from Mall, Distance from National Highway, Distance from 4 main CBD of Jaipur that is Govind marg, JLN Road, MI Road and Sawai Man Singh road, Distance from Heritage structure and Distance from Hotel. We have considered that the following factors may or may not affect the value of the property. As we move close to the following factors the property values will: +ve: increase or -ve: decrease. So the correlation and regression analysis is performed to understand the effect empirically.

### Correlation Analysis

Through a correlation analysis an attempt is made to understand the relationship between the various factors and their influence on the property values. The basic objective of this exercise is to find out what are the other parameters which affect the property values of residential properties at city level within the JMC limit of Jaipur city. The exercise is done to see what variables are responsible for the impact on property values within the study area.

**Table 7: Significance of variables at city level**

Independent Variables	(+ve or -ve value)	Significant / Non Significant
DISTOPENSACE	Positive	Non Significant
DIST_HOTEL	Positive	Significant
DIST_MALL	Positive	Significant
DIST_TOURIST	Positive	Non Significant
DIST_RS	Positive	Significant
DIST_ISBT	Positive	Significant
DIST_AIRPORT	Positive	Significant
DIST_NH	Negative	Non Significant
DIST_JLNRD	Positive	Significant
DISTMIRD	Positive	Significant

<b>DIST_SRSRD</b>	Positive	Significant
<b>DIST_GOV MARG</b>	Positive	Significant

A correlation matrix is compiled to find out the correlated variables and their degree of statistical significance. Only significantly correlated variables are considered for further analysis i.e. for regression analysis

Inference: From the correlation matrix (Annexure 5) except distances from open space, heritage structure and National Highway all other factors are showing significant correlation with current property price.

But to confirm the result we further expand our study and will do regression analysis for the above dataset

### Linear Regression Analysis

A stepwise regression has been carried out on entire data set of city level parameters. Considering Property values as dependent variable (Y) and all other the factors as independent variables (X).

Stepwise regression when carried out in SPSS program, it removes the non significant variables automatically at the first stage and further subdivide the variables in to models that give the best fit result and hence a model with maximum number of significant variable with high  $R^2$  value is achieved.

This process is carried out for the dataset at city level, to achieve significant results. The table shows results of four models.

**Table 8: Regression result for variables at city level**

Model Summary					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	
dimension0	1	.743 <sup>a</sup>	.552	.547	160.409
	2	.859 <sup>b</sup>	.738	.732	123.363
	3	.905 <sup>c</sup>	.820	.813	102.930
	4	.910 <sup>d</sup>	.828	.820	101.018
a. Predictors: (Constant), DIST_SRSRD					
b. Predictors: (Constant), DIST_SRSRD, DIST_RS					
c. Predictors: (Constant), DIST_SRSRD, DIST_RS, DIST_AIRPORT					
d. Predictors: (Constant), DIST_SRSRD, DIST_RS, DIST_AIRPORT, DIST_HOTEL					

Out the above mentioned models, Model 4 is considered to be the most significant model as its  $R^2 = 0.828$  which means the model shows 83% of variation in property values because of these four variables; Distance to Airport, Distance to CBD Sawai Ram Singh Road, Distance to Railway Station and Distance to Hotel.

The equation we get here is:  
**Property Price (Y) = 89.340 + 0.141\*(D\_Airport) + 0.179\*(D\_SRSRD) + 0.143\*(D\_Railway Station) + .095\*(D\_Hotel)**

Equation 2: Equation showing relation between factors affecting and property value

To see the significance of the individual independent variable *t* test is done. Results show significant results for all 4 selected factors. (Refer Annexure 6)

After achieving the results from the correlation and regression analysis, we can say that they are not completely matching the assumptions which were supposed and the result was inconclusive. Hence a clear result is not achieved which can help as to analysis the effect of the considered factors on the property values.

*This may be due to variation in property values from market values or some other factors may be included or excluded from the list of selected factors.*

*Now to get a clearer result of these factors and to understand the effect and check their significance spatially, Geographically Weighted Regression (GWR) method in GIS is applied for detailed analysis.*

### 6.3. Comparative analysis

Conclusion for comparative analysis:

Table 9: Comparison Table

SR Zone	Predicted value/DLC	Predicted Value/Market Value
SR-1	7.48	0.83
SR-2	5.41	0.90
SR-3	48.48	0.91
SR-4	12.58	1.01
SR-5	14.65	0.83
SR-6	35.70	0.87
SR-7	47.18	0.92
SR-8	11.16	0.92
SR-9 (Amer)	58.61	0.91
SR-10 (Sanganear 1)	258.46	0.96
SR-11 (Sanganear 2)	294.57	0.94
<b>Total</b>	72.21	0.91

After getting the equation for determining the property value, the predicted values were calculated for the properties surveyed (Annexure), after calculating the values all the three values that is market value (value on which the property was bought), DLC value (value of the property based on the ASR rates), and Predicted values (calculated from the equation 2)

When evaluated it was seen that PV were on an average 72 times more than the DLC value. This may be due to variation in property values from market values or some other factors may be included or excluded from the list of selected factors. The maximum difference could be seen in the peripheral areas such as SR 10 and SR 11, this is mainly because the new development coming up and these are the areas where the recent release of land by JDA has taken place, which further in long run can give high returns in contrast to areas like SR-1 and SR-2 where there is hardly any land available and prices are very high.

The difference can also be seen in SR 3 and SR-7 which also lies in the peripheral areas, but the difference is less as compared to SR-10 and SR-11 because the development in these areas started long back thus leading to little high prices which might be out of affordability limits of many people.

The difference between the Market value and Predicted value (Annexure) doesn't vary much and more or less same in all the Sub registrar zones.

*Thus it can be seen that the DLC revision is more required in the peripheral areas rather than in the core part of the city where the average difference is 250 times in comparison with the core city where the difference is 10 times on an average.*

## VII. CONCLUSIONS

The research is a pragmatic approach to the study of factors influencing values of residential properties. It also includes the study of recent trends in property values within city. The study is based on the physical survey, replies received from the valuers, builders and other observations made with reference to the prevailing property values and market conditions. Identified factors within the undertaken study areas are done through physical survey, where as recent property trends within Jaipur city and significance of identified factors are concluded.

The development of garden, provision of basic amenities, social infrastructure, housing quality, transportation connectivity, environmental quality, recreational facilities and future price appreciation are the governing factors for the skyrocketed prices within the study areas.

The study is indicative that prevailing market rates are very much higher than property rates given in the Annual Statement of Rates (DLC Rates). As per the DLC, property rates given are still need to be revised as per market values prevailing within the area. Findings indicate the rates provided in DLC needs have to be increased by 70-80 times more to achieve present market value.

At city level the factors that affect the residential property value revealed from the results of correlation and regression are distance from CBD SRS Road, distance from Hotel, distance from Railway Station and distance from Airport together showed a positive significance up to 83%, which suggests as the

distance between properties and these factors increases the prices also increases

These factors influence the market value of the properties taken in to consideration in a positive way. From the study it is evident that distance from these factors has a positive impact on the value.

At property level the factors that affect the residential property value revealed from the results of correlation and regression analysis are distance from temple, distance from metro stations, distance from recreational zone and distance of the property from main road together showed a positive significance up to 76%, which suggests as the distance between properties and these factors increases the prices also increases

In many case it is also observed that factors which can be seen as pull factors for high value of properties in prevailing market came out to be non significant after applying statistical methods of correlation and regression to calculate their impact.

### VIII. SUGGESTIONS AND RECOMMENDATIONS

The valuation method discussed above is theoretical approaches to the question of value and help you estimate the worth of a property in accordance with your preferences and needs. In practice, however, it is the free market, i.e. the forces of supply and demand, which decide what amount of money a house changes hands for.

There may be a substantial gap between subjective valuations and the fluctuations of the free market. Thus, the subjective value of a property does not always correspond to its actual price. The forces of supply and demand cannot be scientifically predicted. Every property valuation can only ever be a guideline to what the house will eventually change hands for.

Thinking about to use for government, a standard valuation methodology should be derived from the in depth research of such topics, so that

- Difference in property price can be calculated, that is where the property price in a particular city is more and where it is less and what are the attributes contributions in this variation.
- Significance of each attribute on the value and finding out of magnitude of each factor affecting the property value can make the valuation of real property more precise and clear.
- Standard indicators should be setup, which can indicate by what amount the factor influence the value will control the property market. The objective behind it is to assist citizen to arrive at an appropriate methodology for their property valuation. It will enable to reveal the property values for every location or specified area within an administrative boundary.
- Significance of each factor should be minutely studies, since in case of every different property, the set of indicators affecting would be different, so that while performing such analysis will result in very appropriate factors that, affect the value of the property and minimize the inaccuracy in calculation or estimating the property values.

- To have a fair amount in the registration process, this study is also important, as it can further help in updating the DLC rates at regular interval, so that it can reach the real and actual market scenario.

### ACKNOWLEDGEMENTS

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### ABOUT THE AUTHOR

The author is a student of CEPT University, Ahmedabad, perusing masters in planning with specialization in Housing with her real roots in architecture from Aayojana School of Architecture, Jaipur. The interest of author lies in Real estate as this sector of industry is currently driving the economy.

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# Determination of Copper (II) and Palladium (II) by Polarographic Methods

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**Abstract-** Schiff base 2-Hydroxy-5-methoxy Benzaldehyde – Tris [HMBT] Ligand is a new chromogenic reagent have not been used so far for the determination of copper and palladium in trace quantities. Effect of  $p^H$  on wave height for COPPER-[HMBT] PALLADIUM –[HMBT] systems have been studied at  $p^H$  7-8.5 and 8.5-11.5 for Copper and Palladium respectively in 0.1 m molar  $NaNO_3$  and 0.002 % Triton  $-x-100$  which increases the stability of the complex . Effect of Ligand concentration on Copper and Palladium have been studied at  $P^H$  8.5 for Copper and Palladium, Effect of height of mercury column on copper-[HMBT] palladium –[HMBT] at  $P^H$  8.5 , Effect of copper ion concentration and palladium ion concentration on the wave height at  $P^H$  8.5 have been studied.

**Index Terms-** polarographic ,copper ,palladium ,HMBT ligand.

## I. INTRODUCTION

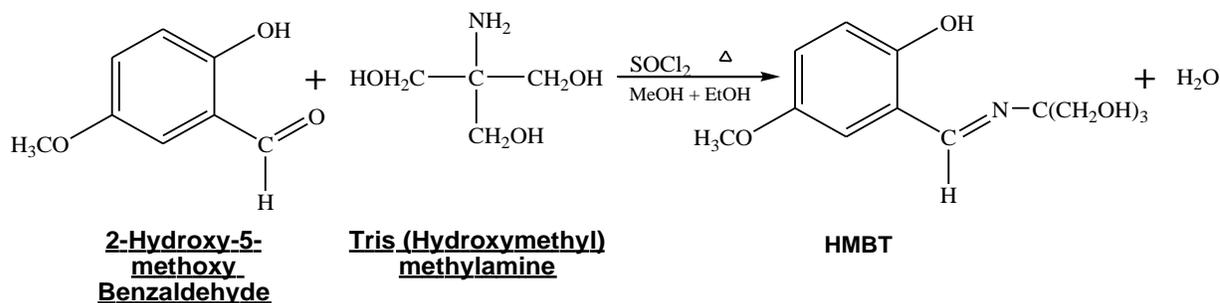
Many number of Schiff bases were synthesized from Tris (Hydroxymethyl) methylamine with different aldehydes and were tested as pharmaceutical intermediates [1,2], bactericides, fungicides [3] and pesticides [4]. Schiff bases prepared by Inoyatov [5] act as effective polymers. Spectrophotometric work [6] on the azomethine of pyridoxal-5'-phosphate-Tris was carried out and determined the formation constant (pKa) values. Vyas *et al.*, [7] published work on polarographic determination of ligand-proton stability constants for Salicylaldehyde-Tris (ST) Schiff base in 50% DMF. Effect of pH, amine concentration and solution composition of pyridoxal-5'-phosphate-Tris was reported by Blazquex *et al.*, [8] employing polarographic technique. ., [9] reported the effect of pH, supporting electrolytes, solvents and acid concentration on the polarographic reduction of ST. Characterization of seven

new Schiff bases derived from Tris and various aldehydes was reported [10]. [11,12] reported determination of metal-to-ligand ratio and stability constants of complexes of palladium(II) and copper(II) in presence of Schiff bases derived from Tris and various ketones in  $KNO_3$  as supporting electrolyte at pH 10.5 in 50% DMF-water medium.

The various metal ions such as Cu(II), Pb(II), Cd(II), Pd(II) and In(III) using HMBT as complexing agent polarographically in  $NaNO_3$  as the supporting electrolyte at pH 8.5 in 40 : 60 methanol-water medium. The studies include effect of pH, effect of ligand concentration, effect of height of mercury column and effect of metal ion concentration. The studies were aimed at establishing the complexing ability of 2-Hydroxy-5-methoxy benzaldehyde-Tris and developing a procedure for the determination of various metal ions present individually and in binary mixtures constituting important alloys and ores of industrial importance.

## Preparation and Characterization of 2-Hydroxy-5-methoxy Benzaldehyde – Tris [HMBT] Ligand Preparation of the ligand: 2-Hydroxy-5-methoxy Benzaldehyde – Tris [HMBT]

Equimolar concentrations of Tris (Hydroxymethyl) methylamine (TRIS) and 2-Hydroxy-5-methoxy Benzaldehyde were dissolved separately in methanol and refluxed for one hour in methanol & ethanol solvent mixture in presence of few drops of acid catalyst namely  $SOCl_2$ . The refluxed solution was allowed to cool and kept aside for overnight. White crystalline needles were obtained and the compound was recrystallized. The melting point and yield of the compound were found to be 70-72°C and 82% respectively.



## II. CHARACTERIZATION OF THE LIGAND

The characterization of the Schiff base was made by Elemental analysis, Chemical reactions and IR studies. Elemental analysis for Carbon, Hydrogen, Oxygen and Nitrogen present in the Schiff base was obtained from CDRI, Lucknow, India. Chemical analysis for the functional groups i.e., carbonyl (>C=O) and amine (-NH<sub>2</sub>) groups was carried out by standard procedure and found to be absent indicating the formation of azomethine.

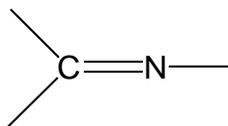
An infrared spectrum for the derived Schiff base was recorded by KBr Pallet method employing Perkin Elmer IR spectroscopy. Infrared spectrum (Fig. 6) of the azomethine obtained from the reaction of 2-Hydroxy-5-methoxy Benzaldehyde and Tris [HMBT] showed peak at 1650 cm<sup>-1</sup> indicating the existence of >C=N- group in all compounds. Peaks were also observed in the region of 3370 – 3340 cm<sup>-1</sup> (broad, OH-stretching), 3200 – 3180 cm<sup>-1</sup> (broad, phenolic OH), 1600, 1530, 1500, 1450 cm<sup>-1</sup> (aromatic >C=C< vibrations) and 1230 – 1220 cm<sup>-1</sup> (C-O stretching coupled phenolic OH

deformation). The above IR data clearly suggested that the chemical reaction between the amino and various aldehydic group was taken place resulting in the formation of respective Schiff base compound. The other groups in the compound remain unaffected during conversion into azomethine. The elemental analysis and IR data were tabulated in the Table 1.

## III. NMR SPECTRA

In the present investigation <sup>1</sup>H NMR spectrum was obtained for the ligand HMBT using Gemini – 200MHz <sup>1</sup>H NMR Spectrometer from IICT, Hyderabad, in DMSO-D<sup>6</sup> solvent at room temperature. Important chemical shift values for various protons such as proton of azomethine group, methyl protons of methoxy group, methyl protons of hydroxy methyl group, hydroxyl protons of hydroxy methyl group, proton of aromatic hydroxyl group and aromatic protons present in the compound were summarized in the Table-2.

**TABLE-1 Analytical and IR spectral data of [HMBT] Ligand**

<b>Molecular Formula</b>	C <sub>12</sub> H <sub>17</sub> NO <sub>5</sub>	
<b>Colour</b>	Yellow	
<b>Melting point</b>	70 – 72 °C	
<b>Elemental analysis</b>	<b>Found (%)</b>	<b>Calc. (%)</b>
Carbon	56.43	56.46
Hydrogen	6.70	6.71
Oxygen	31.32	31.34
Nitrogen	5.47	5.49
<b>Yield</b>	82%	
<b>IR absorption band</b>	1650 cms <sup>-1</sup>	
		

**TABLE -  $^2\text{H}$  NMR spectral data for [HMBT] Ligand in  $\text{DMSO}-d_6$**

Sl. No.	Different protons in the Ligand	$\delta$ Chemical shift in ppm
1	$-\text{HC}=\text{N}$ (Proton of azomethine group)	7.96
2	$-\text{OCH}_3$ (Methyl protons of methoxy group)	3.66
3	$-\text{CH}_2\text{OH}$ (Methyl protons of hydroxymethyl group)	3.78
4	$-\text{CH}_2\text{OH}$ (Hydroxyl protons of hydroxymethyl group)	4.62
5	$\text{Ar}-\text{OH}$ (Hydroxyl Proton of Aromatic hydroxy group)	5.73
6	Aromatic protons	6.64–7.25

IV. RESULTS AND DISCUSSION

**i) Polarographic Behaviour of Individual Metal Ions ( $\text{Cu}^{2+}$ ,  $\text{Pd}^{2+}$ ) in Presence of [HMBT]**

**a) Effect of pH on the Wave height** :The main purpose of studying effect of hydrogen ion concentration on polarographic wave is to ascertain the hydrogen ion participation in electrochemical reduction at d.m.e. Further, it is also useful to fix an appropriate pH value at which separation of two or more

metal ions is possible present in mixture solutions. In the present study, effect of pH on various metal ions in presence of 0.1M  $\text{NaNO}_3$  as the supporting electrolyte 0.06M ligand concentration at mercury height of 70.0 cms in 40 : 60 methanol-water medium. The pH range studied for Copper and Palladium, was between 5.0–11.5. From  $E_{3/4} - E_{1/4}$  value computed from the polarograms of pH studies indicated that, Copper and Palladium reduced reversibly .

**TABLE – 3**

**Effect of pH on Copper – [HMBT] System**

$[\text{Cu}^{+2}]$	=	1.0 mM
[HMBT]	=	0.06M
$[\text{NaNO}_3]$	=	0.1 M
Triton -x-100	=	0.002 %

pH	$E_{1/2}$ (-V. vs S.C.E)	$E_{3/4}$ (mV)	-	$E_{1/4}$
7.0	0.219	56.82		
7.5	0.261	56.80		
8.0	0.301	57.78		
8.5	0.311	56.84		

**TABLE – 4**

**Effect of pH on Palladium – [HMBT] System**

$[\text{Pd}^{2+}]$	=	1.0 mM
[HMBT]	=	0.06M
$[\text{NaNO}_3]$	=	0.1 M
Triton -x-100	=	0.002 %

pH	$E_{1/2}$ (-V. vs S.C.E)	$E_{3/4}$ (mV)	-	$E_{1/4}$
8.5	0.919	78.98		
9.5	0.987	79.92		
10.5	1.007	78.90		
11.5	1.019	78.98		

**b) Effect of Ligand concentration**

Effect of ligand concentration on polarographic wave is of considerable importance since; it gives whether the polarographic wave is controlled by diffusion alone or depends on some other factors such as kinetic, adsorption or catalytic currents. Further, it also helps to establish the validity of Ilkovic equation. Well defined polarograms obtained with different concentrations of the ligand enables to carryout qualitative determination of metal ions in binary, ternary etc. mixtures constituting important ores and alloys. In addition to the above application, the studies also help to establish the complexation

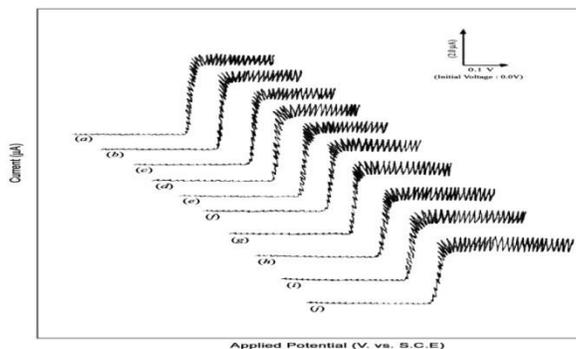
of ligand with various metal ions.,effect of varying concentrations of the HMBT ligand on Copper(II), palladium (II) and in presence of 0.1M NaNO<sub>3</sub> as supporting electrolyte and 0.002% of Triton-X-100 as maximum suppressor at pH 8.5. The results indicated that HMBT was able to complex with copper and palladium the metal ions under consideration by the fact that diffusion current ( $i_d$ ) decreased where as half-wave potential ( $E_{1/2}$ ) shifted towards more negative values with increasing concentration of the ligand Further, the studies also suggested that Lead and Cadmium reduced reversibly at d.m.e

**TABLE – 5**

**Effect of Ligand [HMBT] Concentration on copper**

[Cu<sup>+2</sup>] = 1.0 mM  
[NaNO<sub>3</sub>] = 0.1 M  
pH = 8.5  
Triton -x-100 = 0.002 %

[HMBT] (M)	$E_{1/2}$ (-V. vs S.C.E)	$i_d$ ( $\mu$ A)	Slope (mV)
0.005	0.258	6.1042	60.50
0.008	0.264	6.0585	60.50
0.010	0.268	6.0130	61.44
0.020	0.278	5.9674	58.98
0.030	0.287	5.9219	58.98
0.040	0.302	5.7852	57.34
0.050	0.307	5.6941	57.82
0.060	0.311	5.5574	60.50
0.080	0.318	5.4208	58.98
0.100	0.323	5.2841	57.34



**Fig. 1 : Polarograms of 1.0 mM copper ion in a) 0.005 b) 0.008 c) 0.010 d) 0.020 e) 0.030 f) 0.040g) 0.050h) 0.060 i) 0.080 and j) 0.10 M [HMBT] and 0.1M NaNO<sub>3</sub> at pH 8.5**

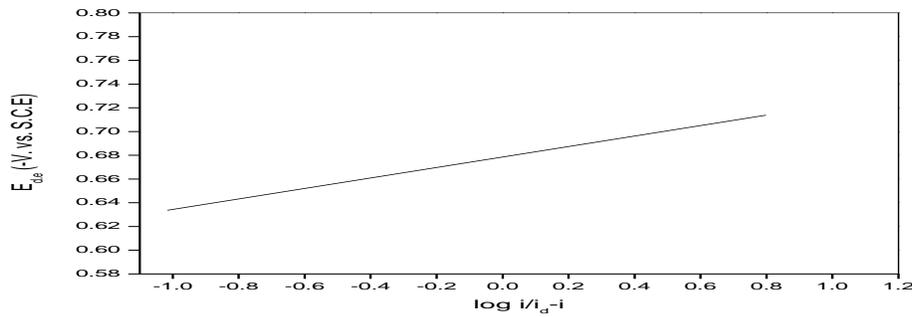


Fig. 2 : A typical log plot of 1.0 mM copper in 0.1 M [HMBT] and 0.1M NaNO<sub>3</sub> at pH 8.

TABLE – 6  
 Effect of Ligand [HMBT] Concentration on Palladium

[Pd <sup>2+</sup> ]	=	1.0 mM
[NH <sub>3</sub> +NH <sub>4</sub> Cl]	=	1.0M
pH	=	8.5
Triton -x-100	=	0.002 %

[HMBT] (M)	E <sub>1/2</sub> (-V. vs S.C.E)	i <sub>d</sub> (μA)	Slope (mV)
0.005	0.856	5.9174	64.88
0.008	0.868	5.7910	64.49
0.010	0.879	5.6651	64.04
0.020	0.882	5.5392	64.02
0.030	0.885	5.4133	63.90
0.040	0.899	5.3504	64.14
0.050	0.907	5.2874	63.78
0.060	0.919	5.2245	63.22
0.080	0.923	5.0986	63.38
0.100	0.935	4.9727	63.00

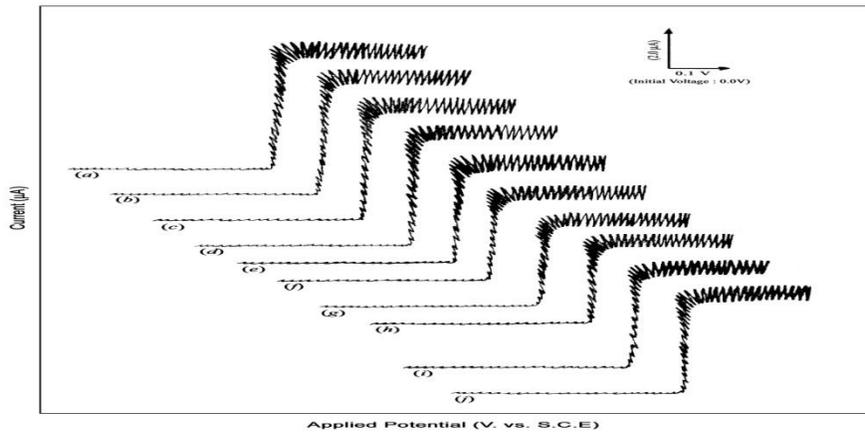
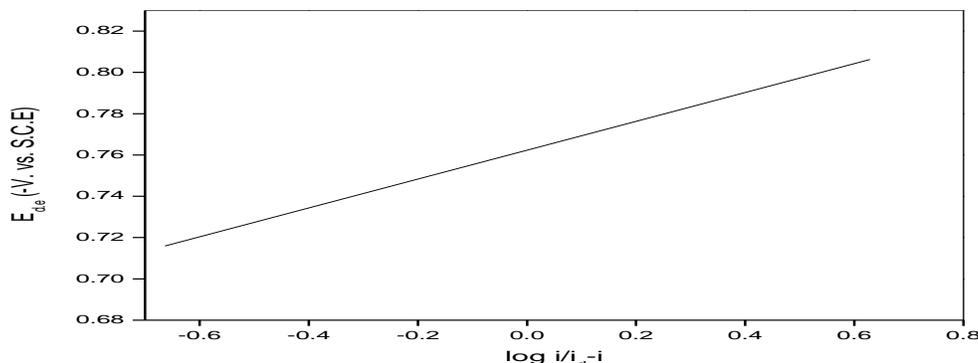


Fig. 3: Polarograms of 1.0 mM Palladium ion in a) 0.005 b) 0.008 c) 0.010 d) 0.020 e) 0.030 f) 0.040g) 0.050h) 0.060 i) 0.080 and j) 0.10 M [HMBT] and 0.1M NaNO<sub>3</sub> at pH 8.5



**Fig .4 A TYPICAL LOG PLOT OF 1.0 mM Palladium 0.1M [ HMBT] AND 0.1M NaNO<sub>3</sub> AT P<sup>H</sup> 8.5.**

**c) Effect of height of mercury column :**

Effect of height of mercury column on polarographic wave helps to establish the diffusion controlled nature of the electrode

reaction at d.m.e by calculating  $i_d/\sqrt{h}$  values. In the present studies, in detail the influence of mercury height on diffusion current of metal ions such as copper(II), palladium(II), ions at 1.0 mM concentration (in presence of fixed concentration of HMBT ligand (0.05M), ionic concentration 0.1M NaNO<sub>3</sub> except 1.0M as

supporting electrolyte and 0.002% of Triton-X-100 as maximum

suppressor at pH 8.5. Results indicated that  $i_d/\sqrt{h}$  values were constant with in the experimental error (Tables.9,10) suggesting the diffusion controlled nature of all the metal ions under consideration at d.m.e. Mercury height of 70.0 cms was fixed to carry out other studies like effect of pH, effect of ligand concentration and effect of metal ion concentration.

**TABLE – 7**

**Effect of height of Mercury column on copper – [HMBT] System**

[Cu <sup>+2</sup> ]	=	1.0 mM
[HMBT]	=	0.05 M
[NaNO <sub>3</sub> ]	=	0.1 M
[pH]	=	8.5
Triton -x-100	=	0.002 %

Height of Mercury Column h(cm)	$i_d$ (μA)	$i_d/\sqrt{h}$
80	6.1250	0.6848
75	5.9296	0.6847
70	5.6941	0.6805
60	5.3105	0.6856

**TABLE – 8**

**Effect of height of Mercury column on palladium-[HMBT] System**

[Pd <sup>+2</sup> ]	=	1.0 mM
[HMBT]	=	0.05 M
[NH <sub>3</sub> +NH <sub>4</sub> Cl]	=	1.0 M
[pH]	=	8.5
Triton -x-100	=	0.002 %

Height of Mercury Column h(cm)	$i_d$ (μA)	$i_d/\sqrt{h}$
80	5.6852	0.6350
75	5.5060	0.6362
70	5.2874	0.6320
60	4.9359	0.6377

**d) Effect of metal ion concentration**

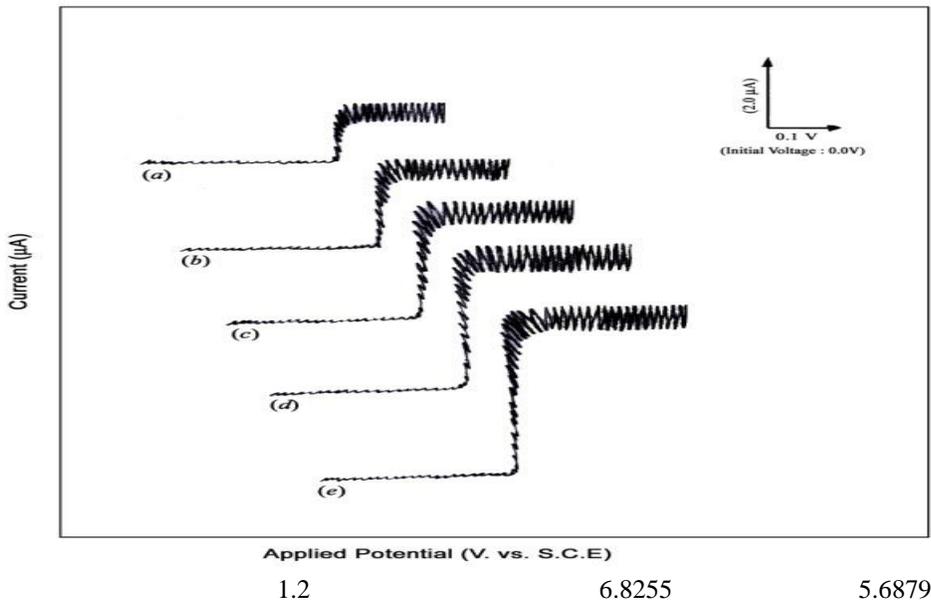
The studies of effect of metal ion concentration on polarographic wave height are of immense importance due to the fact that it establishes diffusion controlled nature of the electrode reaction and the validity of Ilkovic equation. Further, the studies also help us to carryout quantitative determination of metal ions by constructing calibration plots at different concentrations of the depolarizer. Polarographic studies of various metal ions of biological and industrial importance like Copper(II), Lead(II), Cadmium(II), Palladium(II), and Indium(III). Metal ion concentration was varied from 0.4 mM to 1.2 mM (except for Indium 0.1 mM to 0.5 mM) in presence of complexing agent HMBT (0.05M), 0.1M NaNO<sub>3</sub> as supporting

electrolyte (except for Palladium 1.0M [NH<sub>3</sub>+NH<sub>4</sub>Cl]) and 0.002% of Triton-X-100 at pH 8.5. Calibration graphs were drawn at different concentrations of metal ion under identical conditions. In all the instances, straight line plots were obtained passing through the origin indicating the validity of Ilkovic

equation. Values computed for  $\frac{i_d}{c}$  were constant with in the experimental error the metal ions whose half-wave potential difference was more than 0.2 V were selected to carry out quantitative analysis present in binary mixtures constituting different important ores and alloys.

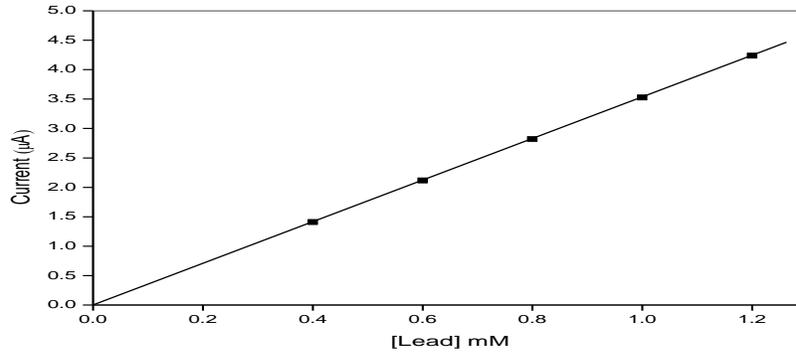
**TABLE – 9**  
**Effect of copper ion concentration on the wave height**  
 [HMBT] = 0.05 M  
 [NaNO<sub>3</sub>] = 0.1 M  
 [pH] = 8.5  
 Triton -x-100 = 0.002 %

[Cu <sup>+2</sup> ] (mM)	i <sub>d</sub> (μA)	i <sub>d</sub> /c
0.4	2.2773	5.6932
0.6	3.4160	5.6932
0.8	4.5449	5.6811
1.0	5.6941	5.6941



**Fig.5: Polarograms a) 0.4 b) 0.6 c) 0.8 d) 1.0 and e) 1.2 mM**

**Copper ion in 0.050 M HMBT and 0.1M NaNO<sub>3</sub> at pH 8.5**



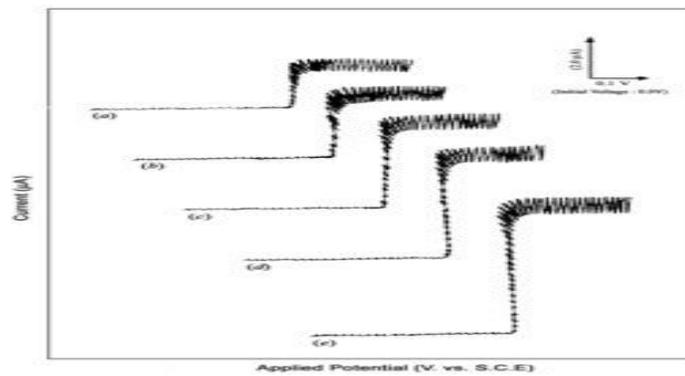
**Fig. 6 : Calibration plot of copper ion in 0.05M ligand [HMBT] and 0.1M NaNO<sub>3</sub> at pH 8.5**

**TABLE – 10**

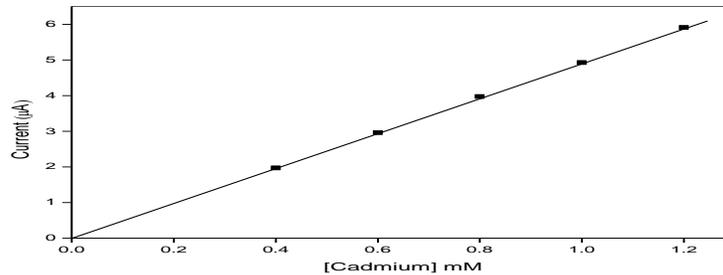
**Effect of palladium ion concentration on the wave height**

[HMBT]	=	0.05 M
[NH <sub>3</sub> +NH <sub>4</sub> Cl]	=	1.0 M
[pH]	=	8.5
Triton -x-100	=	0.002 %

[Pd <sup>+2</sup> ] (mM)	i <sub>d</sub> (µA)	i <sub>d</sub> / c
0.4	2.1144	5.2860
0.6	3.1717	5.2862
0.8	4.2354	5.2943
1.0	5.2874	5.2874
1.2	6.3449	5.2874



**Fig. 7 : Polarograms of a) 0.4 b) 0.6 c) 0.8 d) 1.0 and e) 1.2 mM palladium ion in 0.05MHMBT and 0.1M NaNO<sub>3</sub> at pH 8.5**



**Fig. 8 : Calibration plot of palladium ion in 0.05M ligand [HMBT] and 0.1M NaNO<sub>3</sub> at pH 8.5**

ii) **Investigation of metal-to-ligand ratio and stability constants of palladium – HMBT reversible system**

Earlier polarographic investigation on palladium in presence of complexing agent HMBT, 0.1M NaNO<sub>3</sub> as supporting electrolyte and 0.002% of Triton-X-100 as maximum suppressor at pH 8.5 revealed that palladium undergone reversible electrode reaction at d.m.e. The graph plotted against E<sub>1/2</sub> and -log [HMBT] gave a smooth curve showing the existence of various step-wise complex equilibria in solution. The author, therefore, employed Deford and Hume method for the determination of ligand number and formation constants of the palladium-HMBT system.

To start with various F<sub>0</sub>[X] functions were determined using the equation

$$F_0[X] = \text{Anti log} \left[ \frac{0.4343nF}{RT} \Delta E_{1/2} + \log \frac{I_M}{I_C} \right]$$

Where I<sub>C</sub> representing experimental mean value of the diffusion current constant for different complex equilibria. A graph was drawn between F<sub>0</sub>[X] and [X] values From the limiting slope of the curve, β<sub>1</sub> value was computed. Secondly,

F<sub>1</sub>[X] values at different concentrations of the ligand were calculated making use of the following equation

$$F_1[X] = \left[ \frac{F_0[X] - 1}{[X]} \right]$$

A plot was constructed between F<sub>1</sub>[X] and [X] values The intercept of the curve gave β<sub>1</sub> value and the limiting slope of it represented β<sub>2</sub>. F<sub>2</sub>[X] functions were then evaluated employing the equation

$$F_2[X] = \left[ \frac{F_1[X] - \beta_1}{[X]} \right]$$

A graph was plotted for the obtained values of F<sub>2</sub>[X] and [X] values A straight line parallel to X-axis was obtained. The intercept of the graph gave β<sub>2</sub> value. From the results, it was observed that palladium formed 1 : 2 complex with HMBT and the step-wise formation constants were found to be β<sub>1</sub> = 0.6 × 10<sup>2</sup> and β<sub>2</sub> = 1.675 × 10<sup>2</sup>. Experimental results were tabulated in the table

**TABLE – 11**  
**Effect of Ligand Concentration on copper – [HMBT] System**

[Cu <sup>+2</sup> ]	=	1.0 mM
[NaNO <sub>3</sub> ]	=	0.1M
pH	=	8.5
Triton -x-100	=	0.002 %

[HMBT] (M)	E <sub>1/2</sub> (-V. vs S.C.E)	i <sub>d</sub> (μA)	Slope (mV)	log [HMBT]
0.000	0.390	6.0680	-	-
0.005	0.443	3.9030	31.28	-2.3010
0.008	0.450	3.8400	30.72	-2.0969
0.010	0.454	3.7771	29.92	-2.0000
0.020	0.462	3.7142	30.24	-1.6989
0.030	0.468	3.6512	29.32	-1.5228
0.040	0.471	3.5883	29.49	-1.3979
0.050	0.475	3.5253	30.72	-1.3010
0.060	0.479	3.3994	28.90	-1.2218
0.080	0.483	3.3364	29.48	-1.0969
0.100	0.486	3.2105	30.72	-1.0000

$$\beta_{Mxj} = 2.0801 \times 10^4$$

iii) **Calculation of stability constant and ligand number of copper– HMBT system (Lingane method)**

Perusal of literature suggested that very little polarographic work on Pb(II) with Schiff bases derived from Tris was reported. Patel *et al.*, [56] reported copper in presence of Salicylaldehyde-Tris (ST) along with various metal ions and determined stability constants for the complex species in aqueous solution using potentiometric technique. Sreenivasulu and his co-workers [153] determined the stability constants of copper with four different Schiff bases derived from Tris and discussed the stability order on the basis of Resonance and Hyperconjugation.

Electrochemical studies on copper complexes of Benzoyl acetone-Tris (BAT) was investigated by Babu prasad *et al.*, [248]. Polarographic behaviour of palladium and copper in presence of Ortho Vanillin-Tris (OVT) was studied by Hari *et al.*, [318].

In view of limited number of references available on Cu(II) in presence of Schiff bases derived from Tris, the author in the present investigation, therefore, studied polarographic work on Cu(II) in presence of 2-hydroxy-5-methoxy benzaldehyde-Tris (HMBT) in order to understand the complexing ability of the ligand and determined metal-to-ligand ratio as well as stability

constant of the system in 0.1M NaNO<sub>3</sub> as supporting electrolyte at pH 8.5. The author prepared the solutions in 40 : 60 Methanol–water medium.

Results obtained (Chapter-III; Section-ii) regarding Lead studies in presence of chelating agent HMBT indicated that Lead undergone reversible two electron reduction at d.m.e. Graph drawn between half–wave potential (E<sub>1/2</sub>) and –log [HMBT] gave a straight line (Fig. 36) suggesting the formation of single and stable complex species in solution. Lingane method was, therefore, adopted for the determination of metal–to–ligand ratio and stability constant of copper–HMBT complex using the following equation

$$\Delta E_{\frac{1}{2}} = \frac{0.0591}{n} \log \beta_{m_{xj}} + j \frac{0.0591}{n} \log [X]$$

Where, The symbols represent their usual significance. The coordination number (j) was determined by equating the slope of the plot to

$\frac{0.0591}{j n}$  where ‘n’ representing number of electrons participating in the electrode reaction. The ligand number obtained from the slope of the graph was found to be two. Further, the stability constant of copper–HMBT system was calculated at 0.1 M concentration of the ligand HMBT and was equal to  $\beta_{M_{xj}} = 2.0801 \times 10^4$ . Experimental results were tabulated (Table 26).

## V. CONCLUSIONS

Determination of traces quantities of elements copper(II) and palladium(II) using HMBT Schiff base is not tedious and do not involve any heating, separation or extraction of the components. Determination of metal ions copper and palladium using HMBT ligand is simple and selective and rapid, can be applicable in determinations in metallurgy, environmental analysis (air, water, and sea water contaminants), Food analysis, toxicology and clinical analysis, analysis of drugs and

pharmaceutical preparations, determination of pesticide or herbicide residues in the foods and other samples. HMBT is a versatile and new chromagenic reagent for the determination of trace quantities of copper and palladium by polarographic methods.

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# “Laboratory Evaluation of Usage of Waste Tyre Rubber in Bituminous Concrete”

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**Abstract-** Due to overall development, new roads is being constructed, and the ever increasing population has raised the vehicular density from last few decades. The wear and tear of tires from these vehicles is undoubted. So a large number of scrap tires are being generated. A large number of waste and worn out tires are already in existence and with an annual generation rate of 15-20% each year. These tires are discarded indiscriminately or stockpiled. The used tires pose a great threat to human health and environment, since they are non-biodegradable;the waste tire rubber has become a problem of disposal.This paper is intended to study the feasibility of the waste tire rubber as a blending material in bitumen, which is used for road construction. The Waste tire rubber appears to possess the potential to be partially added in bitumen, providing a recycling opportunity. If Waste or used tire rubber can be added in bitumen for improving the properties, and disposing off the tires, thus the environmental gains can be achieved.

*Index Terms-* Waste tire rubber, Blended bitumen, Marshall Stability Test.

## I. INTRODUCTION

For a country like India an efficient road network is necessary for national integration, industrial development and as well as for socio-economic development. Due to improvement in living standards of the people, the use of vehicles has increased over a last few years, giving rise in the vehicular density on roads. As vehicles are used frequently the wear and tear of their tires is obvious. Due to wear and tear of tires the life of tire reduces and at last it becomes useless. The disposal of these tires has become a serious problem. These tires are disposed easily by either burning or by dumping. Disposal by burning causes air pollution and dumping causes valuable land to be wasted for stacking up the tires. So it is required to dispose these tires safely and economically.

So an attempt to use this waste tire rubber for improving the properties of bitumen by blending it with crumb rubber and ultimately a new method to be introduced to reduce pollution problems and protect our environment.

However, with the use of waste tire rubber in bitumen, it will definitely be environmentally beneficial, it can improve the bitumen binder properties and durability, and it will also have a potential to be cost effective.

Conventional bituminous materials have been used satisfactorily in most highway pavement Environmental factors such as temperature, air, and water can have a profound effect on durability of these pavements. The ideal bitumen should be strong enough, at optimum temperatures, to withstand rutting or permanent deformation, and soft enough to avoid excessive thermal stresses, at low pavement temperatures, and

fatigue, at moderate temperatures. After adding the waste tire rubber in bitumen the properties of the bitumen will be checked.

As disposal of waste tires has become a worldwide problem and has caused worry to administrators, researchers and environmentalists. This paper is intended to study the feasibility of the waste tire rubber as a blending material in bitumen, which is used for road construction. The Waste tire rubber appears to possess the potential to be partially added in bitumen, providing a recycling opportunity. If Waste or used tire rubber can be added in bitumen for improving the properties, and disposing off the tires, thus the environmental gains can be achieved.

## II. METHODOLOGY

For this research work aggregate, bitumen and crumb of scrap tyre was used. Different properties of bitumen and aggregate have been tested. Then prepare different mixes of bitumen and crumb of waste tire rubber with varying proportions by using wet process. The percentage weight of crumb tyre rubber replace for percentage weight of bitumen taken for test. The feasibility of different mixes of bitumen and crumb tire rubber with varying proportions with aggregate has been tested.

## III. RESULTS

Marshall Stability test has been preparing for bituminous mix design, for this research project the size of aggregate used as follows:

**Table No. 1: Mix Proportion**

Material	Sieve size mm	Wt. in kg.
Aggregate	40 – 19	74.10 gm.
	19 – 13	347.1 gm.
	13 – 6	260.00 gm.
	6 – 0	559.00 gm.
Bitumen		59.8 gm.
	Total	1300 gm.

**Table No. 2: Physical properties of aggregate & filler used**

Sr. No	Aggregate tests	Test results obtained
1	Crushing value (%)	24.8

2	Impact value (%)	20.8			
3	Los Angeles abrasion value (%)	32			
	<b>Sieved size mm</b>	<b>40-19</b>	<b>19-13</b>	<b>13-6</b>	<b>6-0</b>
4	Specific gravity	2.68	2.65	2.63	2.62
5	Water absorption	0.93	0.75	0.68	-----

**Table No.3: Physical properties of ground waste tire rubber**

Properties	Measured value
Specific gravity	0.94
Unit weight g/cm <sup>3</sup>	0.69
Absorption %	1.8
Fineness modulus	3.78

**Table No. 4: The properties of the bitumen without rubber content**

Sr. No.	Penetration test @27 <sup>0</sup> C, 5S,100gm	Softening point @ ring ball test	Ductility(cms) @27 <sup>0</sup> C, 5cm/ min	Viscosity (sec) @ Viscometer by ball stopper	Specific gravity Reading (G)
1.	60-70 grade	60 <sup>0</sup> C	73	26	1.036

**Table No. 5: Details of sample constitution and percent constituents**

%of	Sample constitution		Sample preparation		% constituent by wt. of bitumen		
	60/70 grade bitumen	crumb rubber	Bulk	% air VMA	VFB	Marshall	Flow
	mm particle size of crumb rubber		Wet process		5%	10%	15%
					20%		
					25%		
					30%		

**Table No. 6: Marshall Stability Readings**

rubber	(gm)		specific gravity (g/cc)	voids (Vv)			stability (kg)	value (mm)
	Air	water						
0	1257	773	2.56	4.12	15.49	73.40	1190.56	3.3
5	1274	787	2.58	4.08	14.13	71.12	1051	3.0
10	1278	798	2.60	4.41	14.05	68.64	912.8	2.9
15	1269	790	2.63	4.36	12.64	65.30	843.8	3.6
20	1284	791	2.60	5.10	12.73	58.00	715.9	2.7
25	1270	789	2.63	5.05	10.81	53.28	652.9	2.9
30	1268	793	2.64	6.06	11.43	46.98	550.6	2.6

**Table No. 7: Properties of bitumen by varying % of rubber**

Properties	60/70 grade bitumen	Bitumen with rubber content %					
		5	10	15	20	25	30
Penetration value @ 25 <sup>0</sup> C, 5 S, 100 gm	65.6	59.3	56.3	45.6	35.3	27.2	21.6
Softening Point( <sup>0</sup> C) @ ring ball test	57	62	62	65	72.5	77.5	83
Ductility test (cms)@ 27 <sup>0</sup> C, 5 cm/min	73	61	55	41.6	21.8	14.3	12.7
Viscosity test@ 27 <sup>0</sup> C(sec)	26	22.5	20	17	15.5	11.5	9
Specific Gravity	1.036	1.180	1.24	1.46	1.70	2.0	2.26

- **Marshall stability test**

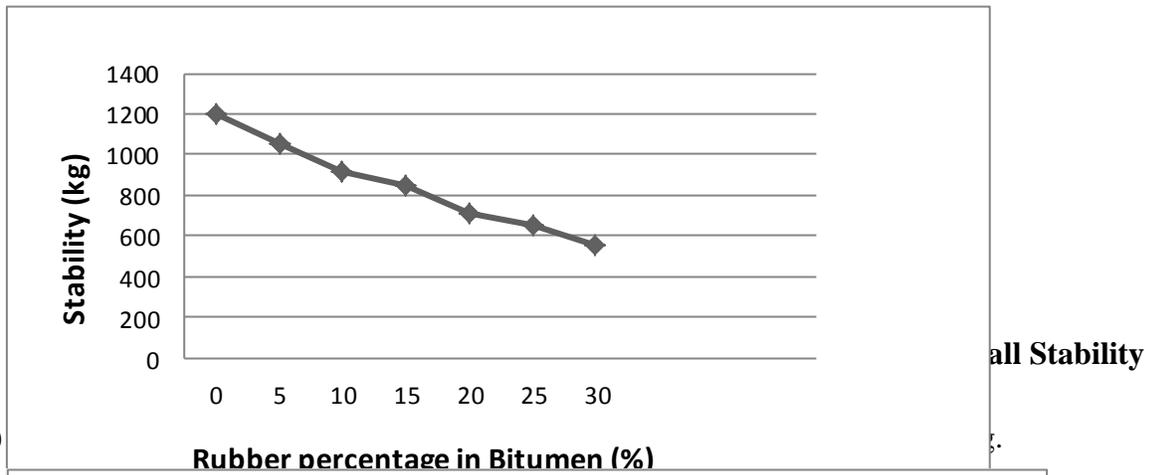
IRC Recommendation for modified blended bitumen

Bitumen Grade – 60/70

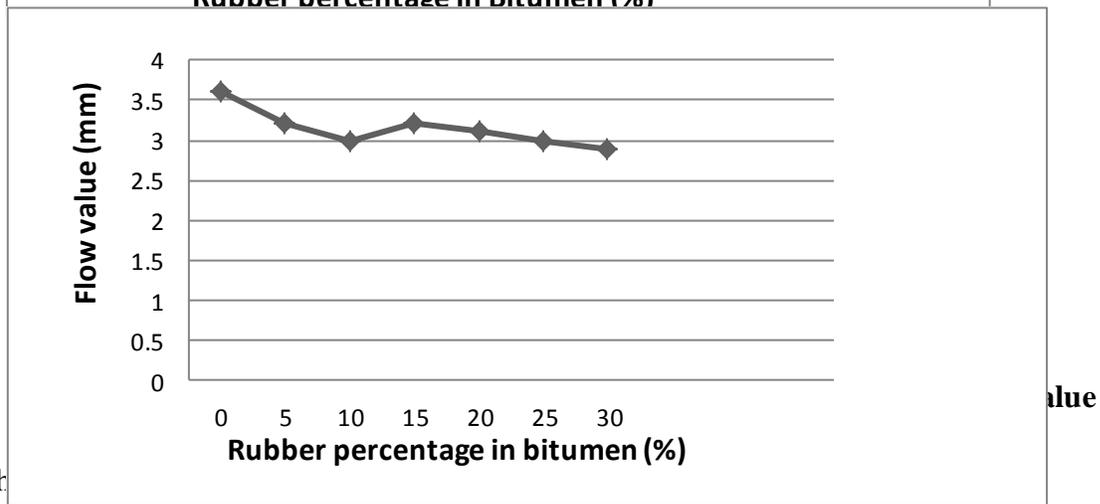
Test property	Specified value
Marshall Stability kg.	340 (minimum)
Flow value (mm)	2.5 – 4
Air voids in total mix Vv %	3 to 5
Voids filled with bitumen VFB %	65 to 85

#### IV. CONCLUSION

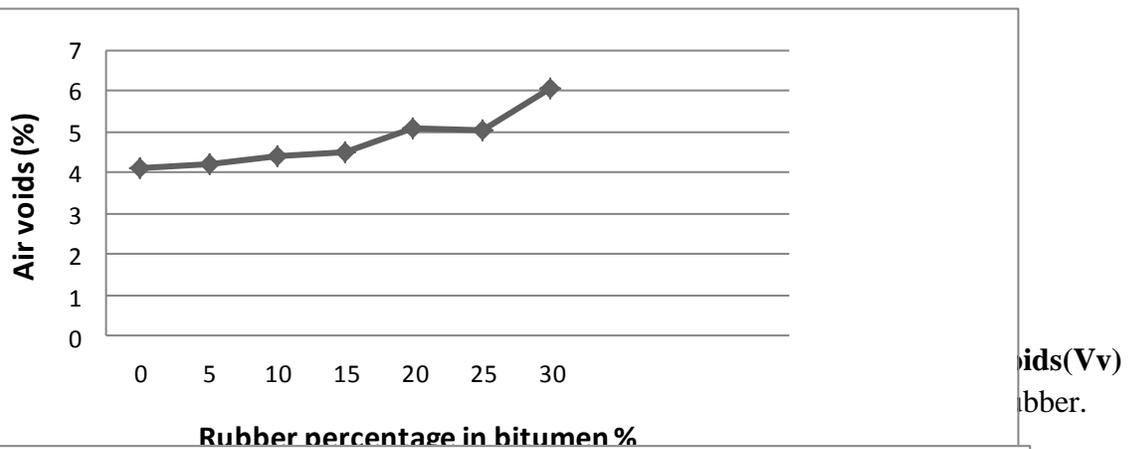
- 1) The values of Marshall Stability are consistent for all rubber percentage reading.



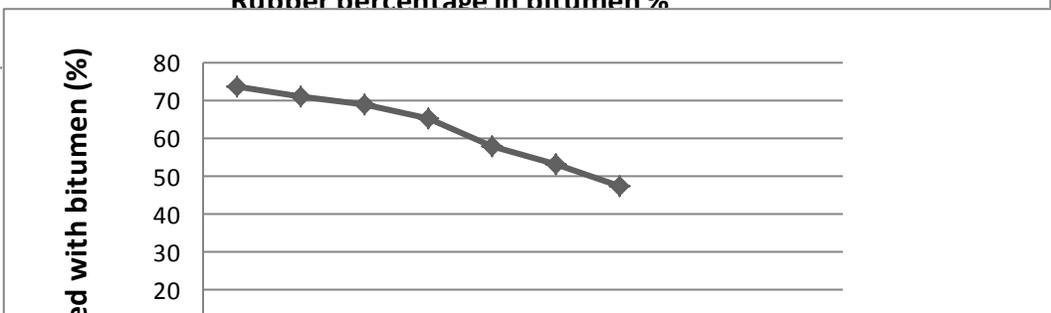
2)



3) The



4)



## Graph No.4 Percentage of Rubber in Bituminous Concrete Vs voids filled with bitumen (VFB)

### V. FINAL CONCLUSIONS

After careful evaluation of the properties and taking various tests as per standards the results shown by 10% addition of rubber crumbs has best suitability for blending it with bitumen. This will help to dispose the waste tire rubber in a proper way and solve the problem of environmental concerns up to a certain extent.

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# RATIONAL INTERPOLATION METHOD FOR SOLVING INITIAL VALUE PROBLEMS (IVPS) IN ORDINARY DIFFERENTIAL EQUATIONS

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**Abstract-** In this paper we designed Rational Interpolation Method for solving Ordinary Differential Equations (ODES) and Stiff initial value problems (IVPs). This was achieved by considering the Rational Interpolation Formula.

$$y_{(x)} = U_{(x)} = \frac{P_0 + P_1x + P_2x^2 + P_3x^3 + p_4x^4 + P_5x^5}{1 + q_1x + q_2x^2 + q_3x^3 + q_4x^4 + q_5x^5 + q_6x^6}$$

Satisfying  $U(X_{n+i}) = y_{n+i}$ ,  $i = 0, 1, 2, 3, 4, 5, 6$ .

We also implemented  $k=6$  in Aashikpelokhai (1991) class of rational integration formula given by

$$y_{n+1} = \frac{\sum_{i=0}^5 p_i X_{n+1}^i}{1 + \sum_{i=1}^6 q_i X_{n+1}^i}$$

where,

$$p_i = \frac{(2k-1-i)! \binom{k-1-i}{i} h^{k-1-i}}{(2k-1)! x_{n+1}^i} y_n, \quad i = 0(1)(k-1), \quad q_i = \frac{(-1)^i (2k-1-i)! \binom{k}{i} h^{-i}}{(2k-1)! x_{n+1}^i}, \quad i = 0(1)k$$

$$P_j = \frac{\sum_{i=1}^j h^{(j+1-i)} y_n^{(j+1-i)}}{\sum_{i=1}^j (j+1-i)! X_{n+1}^{(j+1-i)}} q_{i-1} + y_n q_j, \quad j=1(1)5$$

The results as analyzed with the computer show that the rational interpolation method copes favorably well with ordinary differential equations and stiff initial value problems.

**Index Terms** - Rational Interpolation Method, Stability, Consistency and Convergence.

## 1.0 INTRODUCTION

Numerical methods for systems of Ordinary Differential Equations (ODEs) have been attracting much attention due to their need in the solution of problems arising from the mathematical formulation of physical situations in chemical kinetics, population models, mechanical oscillations, planetary motions, electrical networks, nuclear reactor control, tunnel switching problems, reversible enzyme kinetic often lead to Initial Value Problems (IVPs) in Ordinary Differential Equations that are stiff or singular or oscillatory. There are quite a number that are stiff, they are mainly from Reaction, Chemical kinetic and Life Sciences. [Ref. Aashikpelokhai (1991,1997,2000), Momodu (2006), Nunn and Huang (2005), Lambert (1973,2000), Corless (2001), Norelli (1985), Fatunla (1980, 1982,1988), Hall and Watt (1976), Cryer (1973), Abhulimen and Otunta, (2007), Niekerk(1985), Vigo and Martin ( 2006) ]

The problem for this research paper is to find a numerical solution to the IVP which is represented by,

$$y^1 = f(x, y); y(x_0) = y_0, a \leq x \leq b \tag{1.1}$$

where  $f(x, y)$  is defined and continuous in a region  $D \subset [a, b]$ , that is stiff.

However, this research paper is therefore to design and implement a new method that can cope effectively well with such problems. Our aims in this research paper is to solve problem represented by (1.1) where  $f(x,y)$  must satisfy a Lipchitz condition with respect to  $y$ . In order to achieve the above aim, we therefore set the following objectives.

- (i) To construct a rational interpolation method having one of its members L-stable and to cope with ordinary differential equations and stiff IVPs.
- (ii) To determine the performance, stability, consistency and nature of convergence of the rational integrator constructed in (1) above.
- (iii) To compare the performance of the proposed rational integrators (k = 6) with some established results.
- (iv) To develop a program in Java for the implementation of the rational integrators.

**Definition 1.1.** A one-step method is said to be **A-STABLE** if when applied to the test equation  $y' = \lambda y$  with  $\text{Re}(\lambda) < 0$ , it gives,  $y_{n+1} = S(\bar{h}) y_n$ , with the stability function  $S(\bar{h})$  satisfying,

$$|S(\bar{h})| < 1 \text{ for all } \text{Re}(\bar{h}) < 0, \bar{h} = \lambda h$$

**Definition 1.2.** A given One-Step Method is said to be **L-Stable** if it is A-Stable and in addition,

$$\text{Re}(\bar{h}) \xrightarrow{\text{Limit}} -\infty |S(\bar{h})| = 0$$

**Definition 1.3.** The Initial Value Problem (IVP) (1.1.1) is said to be **stiff** over the finite interval  $[a, b]$  if for every  $x \in [a, b]$ , the Eigenvalues  $\lambda_i(x)$ ,  $i = 1, 2, \dots, n$  of the Jacobian matrix arising from (1.1) satisfies the following equations.

- 1.  $\text{Re} \lambda_i(x) < 0, \quad i = 1, 2, \dots, n$  and
- 2. The stiffness ratio =  $\frac{\max |\text{Re} \lambda_{i(x)}|}{\min |\text{Re} \lambda_{i(x)}|} \gg 1, i = 1, 2, \dots, n$

For the linear initial value problem

$$y' = Ay + g, \quad y(x_0) = y_0 \tag{1.2}$$

$\frac{\partial y^1}{\partial y} = A$ , is  $m \times m$  Matrix and  $g \in R^m$ , it is to be noted that A or g may be constraints or functions of x.

### 1.2 THE DERIVATION OF THE RATIONAL INTERPOLATION METHOD

Our derivation of the rational interpolation method consists of matching the Taylor series expansion of  $y(x_{n+1})$  with the Taylor series of the approximation value of  $y_{n+1}$ . At the point  $x = x_n$  in the interval  $[x_n, x_{n+1}]$ , we set  $y_n = y(x_n)$ , since Our Taylor series about  $x_n$  for both  $y(x_{n+1})$  and  $y_{n+1}$  require the use of  $h = x_{n+1} - x_n$ , we choose in sufficiently small enough so that  $x_{n+1}$  and  $x_n$  are very close. The following equations are results of matching of the Taylor series of  $y(x_{n+1})$  and  $y_{n+1}$  for the case  $k = 6$  where

$$y_{n+1} = \frac{\sum_{i=0}^{k-1} P_i X_{n+1}^i}{1 + \sum_{i=1}^k q_i X_{n+1}^i} = \frac{\sum_{i=0}^5 P_i X_{n+1}^i}{1 + \sum_{i=1}^6 q_i X_{n+1}^i} \tag{1.3}$$

$$y_{n+1} = \frac{P_0 + P_1 x_{n+1} + P_2 x_{n+1}^2 + P_3 x_{n+1}^3 + P_4 x_{n+1}^4 + P_5 x_{n+1}^5}{1 + q_1 x_{n+1} + q_2 x_{n+1}^2 + q_3 x_{n+1}^3 + q_4 x_{n+1}^4 + q_5 x_{n+1}^5 + q_6 x_{n+1}^6} \tag{1.4}$$

where,

$$P_j = \sum_{i=1}^j \frac{h^{(j+1-i)} y_n^{(j+1-i)} q_{i-1}}{(j+1-i)! (x_{n+1})^{(j+1-i)}} + y_n q_j, \quad j = 1(1)k - 1 \tag{1.5}$$

when  $j = 0, i = 1$ , from 2.3.3 we have,

$$P_0 = y_n q_0 \quad \text{i.e.} \quad q_0 = 1 \quad P_0 = y_n \tag{1.6}$$

when  $j = 1, i = 1$ , 1.5 becomes.

$$P_1 = \frac{h y_n^{(1)} q_0}{1! x_{n+1}} + y_n q_1 \Rightarrow \frac{h y_n^{(1)}}{1! x_{n+1}} + y_n q_1$$

$$\frac{h y_n^{(1)}}{1!} = x_{n+1} [-p_0 q_1 + p_1] \tag{1.7}$$

when  $j = 2, i = 1, 1.5$  becomes

$$P_2 = \frac{h^2 y_n^{(2)}}{2! x_{n+1}^2} + \frac{h y_n^{(1)}}{1! x_{n+1}} q_1 + y_n q_2$$

$$\frac{h^2 y_n^{(2)}}{2!} = x_{n+1}^2 \left[ -p_0 q_2 - \frac{h y_n^{(1)}}{1! x_{n+1}} q_1 + p_2 \right] \tag{1.8}$$

when  $j = 3, 4, 5, 6, 7, 8, 9, 10, 11, i = 1$  we have in 1.9

$$\frac{h^3 y_n^{(3)}}{3!} = x_{n+1}^3 \left[ -p_0 q_3 - \frac{h^2 y_n^{(2)}}{2! x_{n+1}^2} q_1 - \frac{h y_n^{(1)}}{1! x_{n+1}} q_2 + p_3 \right] \tag{1.9}$$

$$\frac{h^4 y_n^{(4)}}{4!} = x_{n+1}^4 \left[ -p_0 q_4 - \frac{h^3 y_n^{(3)}}{3! x_{n+1}^3} q_1 - \frac{h^2 y_n^{(2)}}{2! x_{n+1}^2} q_2 - \frac{h y_n^{(1)}}{1! x_{n+1}} q_3 + p_4 \right] \tag{1.10}$$

$$\frac{h^5 y_n^{(5)}}{5!} = x_{n+1}^5 \left[ -p_0 q_5 - \frac{h^4 y_n^{(4)}}{4! x_{n+1}^4} q_1 - \frac{h^3 y_n^{(3)}}{3! x_{n+1}^3} q_2 - \frac{h^2 y_n^{(2)}}{2! x_{n+1}^2} q_3 - \frac{h y_n^{(1)}}{1! x_{n+1}} q_4 + p_5 \right] \tag{1.11}$$

$$\frac{h^6 y_n^{(6)}}{6!} = x_{n+1}^6 \left[ -p_0 q_6 - \frac{h^5 y_n^{(5)}}{5! x_{n+1}^5} q_1 - \frac{h^4 y_n^{(4)}}{4! x_{n+1}^4} q_2 - \frac{h^3 y_n^{(3)}}{3! x_{n+1}^3} q_3 - \frac{h^2 y_n^{(2)}}{2! x_{n+1}^2} q_4 - \frac{h y_n^{(1)}}{1! x_{n+1}} q_5 + p_6 \right] \tag{1.12}$$

$$\frac{h^7 y_n^{(7)}}{7!} = x_{n+1}^7 \left[ -p_0 q_7 - \frac{h^6 y_n^{(6)}}{6! x_{n+1}^6} q_1 - \frac{h^5 y_n^{(5)}}{5! x_{n+1}^5} q_2 - \frac{h^4 y_n^{(4)}}{4! x_{n+1}^4} q_3 - \frac{h^3 y_n^{(3)}}{3! x_{n+1}^3} q_4 - \frac{h^2 y_n^{(2)}}{2! x_{n+1}^2} q_5 - \frac{h y_n^{(1)}}{1! x_{n+1}} q_6 + p_7 \right] \tag{1.13}$$

$$\frac{h^8 y_n^{(8)}}{8!} = x_{n+1}^8 \left[ -p_0 q_8 - \frac{h^7 y_n^{(7)}}{7! x_{n+1}^7} q_1 - \frac{h^6 y_n^{(6)}}{6! x_{n+1}^6} q_2 - \frac{h^5 y_n^{(5)}}{5! x_{n+1}^5} q_3 - \frac{h^4 y_n^{(4)}}{4! x_{n+1}^4} q_4 - \frac{h^3 y_n^{(3)}}{3! x_{n+1}^3} q_5 - \frac{h^2 y_n^{(2)}}{2! x_{n+1}^2} q_6 - \frac{h y_n^{(1)}}{1! x_{n+1}} q_7 + p_8 \right] \tag{1.14}$$

$$\frac{h^9 y_n^{(9)}}{9!} = x_{n+1}^9 \left[ -p_0 q_9 - \frac{h^8 y_n^{(8)}}{8! x_{n+1}^8} q_1 - \frac{h^7 y_n^{(7)}}{7! x_{n+1}^7} q_2 - \frac{h^6 y_n^{(6)}}{6! x_{n+1}^6} q_3 - \frac{h^5 y_n^{(5)}}{5! x_{n+1}^5} q_4 - \frac{h^4 y_n^{(4)}}{4! x_{n+1}^4} q_5 - \frac{h^3 y_n^{(3)}}{3! x_{n+1}^3} q_6 - \frac{h^2 y_n^{(2)}}{2! x_{n+1}^2} q_7 - \frac{h y_n^{(1)}}{1! x_{n+1}} q_8 + p_9 \right] \tag{1.15}$$

$$\frac{h^{10} y_n^{(10)}}{10!} = x_{n+1}^{10} \left[ -p_0 q_{10} - \frac{h^9 y_n^{(9)}}{9! x_{n+1}^9} q_1 - \frac{h^8 y_n^{(8)}}{8! x_{n+1}^8} q_2 - \frac{h^7 y_n^{(7)}}{7! x_{n+1}^7} q_3 - \frac{h^6 y_n^{(6)}}{6! x_{n+1}^6} q_4 - \frac{h^5 y_n^{(5)}}{5! x_{n+1}^5} q_5 - \frac{h^4 y_n^{(4)}}{4! x_{n+1}^4} q_6 - \frac{h^3 y_n^{(3)}}{3! x_{n+1}^3} q_7 - \frac{h^2 y_n^{(2)}}{2! x_{n+1}^2} q_8 - \frac{h y_n^{(1)}}{1! x_{n+1}} q_9 + p_{10} \right] \tag{1.16}$$

$$\frac{h^{11}y_n^{(11)}}{11!} = x_{n+1}^{11} \left[ -P_0q_{11} - \frac{h^{10}y_n^{(10)}}{10!x_{n+1}^{10}}q_1 - \frac{h^9y_n^{(9)}}{9!x_{n+1}^9}q_2 - \frac{h^8y_n^{(8)}}{8!x_{n+1}^8}q_3 - \frac{h^7y_n^{(7)}}{7!x_{n+1}^7}q_4 - \frac{h^6y_n^{(6)}}{6!x_{n+1}^6}q_5 - \frac{h^5y_n^{(5)}}{5!x_{n+1}^5}q_6 - \frac{h^4y_n^{(4)}}{4!x_{n+1}^4}q_7 - \frac{h^3y_n^{(3)}}{3!x_{n+1}^3}q_8 - \frac{h^2y_n^{(2)}}{2!x_{n+1}^2}q_9 - \frac{hy_n^{(1)}}{1!x_{n+1}}q_{10} + p_{11} \right] \tag{1.17}$$

This lead to a generalized equation

$$\frac{h^m y_n^{(m)}}{m!} = x_{n+1}^m \left[ -y_n q_i - \frac{h^{m-v} y_n^{(m-v)}}{(m-v)! x_{n+1}^{m-v}} q_{i-(m-1)} - \frac{h^{m-v+1} y_n^{(m-v+1)}}{(m-v+1)! x_{n+1}^{m-v+1}} q_{i-(m-2)} - \frac{h^{m-v+2} y_n^{(m-v+2)}}{(m-v+2)! x_{n+1}^{m-v+2}} q_{i-(m-3)} - \frac{h^{m-v+3} y_n^{(m-v+3)}}{(m-v+3)! x_{n+1}^{m-v+3}} q_{i-(m-4)} - \frac{h^{m-v+4} y_n^{(m-v+4)}}{(m-v+4)! x_{n+1}^{m-v+4}} q_{i-(m-5)} - \frac{h^{m-v+5} y_n^{(m-v+5)}}{(m-v+5)! x_{n+1}^{m-v+5}} q_{i-(m-6)} - \frac{h^{m-v+6} y_n^{(m-v+6)}}{(m-v+6)! x_{n+1}^{m-v+6}} q_{i-(m-7)} - \dots - \frac{h^{m-v+r} y_n^{(m-v+r)}}{(m-v+r)! x_{n+1}^{m-v+r}} q_{i-(m-t)} + p_i \right] \tag{1.18}$$

Hence equation 1.18 gives our general derivation method. And where  $P_0=y_n$ ,  $v=1$ ,  $m=i=1, 2, 3, \dots$ ,  $t=1,2,3, \dots$  and  $r=1,2,3, \dots$ . As the parameters of  $p_1, p_2, p_3, p_4, p_5, q_1, q_2, q_3, q_4, q_5$  and  $q_6$  cannot be easily obtained using equations 1.8 – 1.17. We therefore adopt the method of writing one result as a combination of others as was used by Fatunla (1978). By writing 1.17 as a combination of equation 1.8 – 1.16 we get,

$$\frac{h^{10}y_n^{(10)}}{10!x_{n+1}^{10}}q_1 + \frac{h^9y_n^{(9)}}{9!x_{n+1}^9}q_2 + \frac{h^8y_n^{(8)}}{8!x_{n+1}^8}q_3 + \frac{h^7y_n^{(7)}}{7!x_{n+1}^7}q_4 + \frac{h^6y_n^{(6)}}{6!x_{n+1}^6}q_5 + \frac{h^5y_n^{(5)}}{5!x_{n+1}^5}q_6 = -\frac{h^{11}y_n^{(11)}}{11!x_{n+1}^{11}} \tag{1.19}$$

$$\frac{h^9y_n^{(9)}}{9!x_{n+1}^9}q_1 + \frac{h^8y_n^{(8)}}{8!x_{n+1}^8}q_2 + \frac{h^7y_n^{(7)}}{7!x_{n+1}^7}q_3 + \frac{h^6y_n^{(6)}}{6!x_{n+1}^6}q_4 + \frac{h^5y_n^{(5)}}{5!x_{n+1}^5}q_5 + \frac{h^4y_n^{(4)}}{4!x_{n+1}^4}q_6 = -\frac{h^{10}y_n^{(10)}}{10!x_{n+1}^{10}} \tag{1.20}$$

$$\frac{h^8y_n^{(8)}}{8!x_{n+1}^8}q_1 + \frac{h^7y_n^{(7)}}{7!x_{n+1}^7}q_2 + \frac{h^6y_n^{(6)}}{6!x_{n+1}^6}q_3 + \frac{h^5y_n^{(5)}}{5!x_{n+1}^5}q_4 + \frac{h^4y_n^{(4)}}{4!x_{n+1}^4}q_5 + \frac{h^3y_n^{(3)}}{3!x_{n+1}^3}q_6 = -\frac{h^9y_n^{(9)}}{9!x_{n+1}^9} \tag{1.21}$$

$$\frac{h^7y_n^{(7)}}{7!x_{n+1}^7}q_1 + \frac{h^6y_n^{(6)}}{6!x_{n+1}^6}q_2 + \frac{h^5y_n^{(5)}}{5!x_{n+1}^5}q_3 + \frac{h^4y_n^{(4)}}{4!x_{n+1}^4}q_4 + \frac{h^3y_n^{(3)}}{3!x_{n+1}^3}q_5 + \frac{h^2y_n^{(2)}}{2!x_{n+1}^2}q_6 = -\frac{h^8y_n^{(8)}}{8!x_{n+1}^8} \tag{1.22}$$

$$\frac{h^6y_n^{(6)}}{6!x_{n+1}^6}q_1 + \frac{h^5y_n^{(5)}}{5!x_{n+1}^5}q_2 + \frac{h^4y_n^{(4)}}{4!x_{n+1}^4}q_3 + \frac{h^3y_n^{(3)}}{3!x_{n+1}^3}q_4 + \frac{h^2y_n^{(2)}}{2!x_{n+1}^2}q_5 + \frac{hy_n^{(1)}}{1!x_{n+1}}q_6 = -\frac{h^7y_n^{(7)}}{7!x_{n+1}^7} \tag{1.23}$$

$$\frac{h^5y_n^{(5)}}{5!x_{n+1}^5}q_1 + \frac{h^4y_n^{(4)}}{4!x_{n+1}^4}q_2 + \frac{h^3y_n^{(3)}}{3!x_{n+1}^3}q_3 + \frac{h^2y_n^{(2)}}{2!x_{n+1}^2}q_4 + \frac{hy_n^{(1)}}{1!x_{n+1}}q_5 + y_n q_6 = -\frac{h^6y_n^{(6)}}{6!x_{n+1}^6} \tag{1.24}$$

For each positive integer m, the expression:

$$\frac{h^m y_n^m}{m! x_{n+1}^m}$$

is a real number, for this reason equations (1.19 – 1.24) represent simultaneous Linear Equation (SLE) in  $q_1, q_2, q_3, q_4, q_5$  and  $q_6$ . In the course of using the integrator 1.3 of higher values of k, the use of matrix equation gives rise to clearer solutions and make clearer the investigation of stability properties of the integrator, hence we put the simultaneous linear equation in matrix form as shown below:

$$\begin{bmatrix} \frac{h^{10} y_n^{(10)}}{10! x_{n+1}^{10}} & \frac{h^9 y_n^{(9)}}{9! x_{n+1}^9} & \frac{h^8 y_n^{(8)}}{8! x_{n+1}^8} & \frac{h^7 y_n^{(7)}}{7! x_{n+1}^7} & \frac{h^6 y_n^{(6)}}{6! x_{n+1}^6} & \frac{h^5 y_n^{(5)}}{5! x_{n+1}^5} \\ \frac{h^9 y_n^{(9)}}{9! x_{n+1}^9} & \frac{h^8 y_n^{(8)}}{8! x_{n+1}^8} & \frac{h^7 y_n^{(7)}}{7! x_{n+1}^7} & \frac{h^6 y_n^{(6)}}{6! x_{n+1}^6} & \frac{h^5 y_n^{(5)}}{5! x_{n+1}^5} & \frac{h^4 y_n^{(4)}}{4! x_{n+1}^4} \\ \frac{h^8 y_n^{(8)}}{8! x_{n+1}^8} & \frac{h^7 y_n^{(7)}}{7! x_{n+1}^7} & \frac{h^6 y_n^{(6)}}{6! x_{n+1}^6} & \frac{h^5 y_n^{(5)}}{5! x_{n+1}^5} & \frac{h^4 y_n^{(4)}}{4! x_{n+1}^4} & \frac{h^3 y_n^{(3)}}{3! x_{n+1}^3} \\ \frac{h^7 y_n^{(7)}}{7! x_{n+1}^7} & \frac{h^6 y_n^{(6)}}{6! x_{n+1}^6} & \frac{h^5 y_n^{(5)}}{5! x_{n+1}^5} & \frac{h^4 y_n^{(4)}}{4! x_{n+1}^4} & \frac{h^3 y_n^{(3)}}{3! x_{n+1}^3} & \frac{h^2 y_n^{(2)}}{2! x_{n+1}^2} \\ \frac{h^6 y_n^{(6)}}{6! x_{n+1}^6} & \frac{h^5 y_n^{(5)}}{5! x_{n+1}^5} & \frac{h^4 y_n^{(4)}}{4! x_{n+1}^4} & \frac{h^3 y_n^{(3)}}{3! x_{n+1}^3} & \frac{h^2 y_n^{(2)}}{2! x_{n+1}^2} & h y_n^{(1)} \\ \frac{h^5 y_n^{(5)}}{5! x_{n+1}^5} & \frac{h^4 y_n^{(4)}}{4! x_{n+1}^4} & \frac{h^3 y_n^{(3)}}{3! x_{n+1}^3} & \frac{h^2 y_n^{(2)}}{2! x_{n+1}^2} & h y_n^{(1)} & y_n \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \\ q_4 \\ q_5 \\ q_6 \end{bmatrix} = \begin{bmatrix} \frac{h^{11} y_n^{(11)}}{11! x_{n+1}^{11}} \\ \frac{h^{10} y_n^{(10)}}{10! x_{n+1}^{10}} \\ \frac{h^9 y_n^{(9)}}{9! x_{n+1}^9} \\ \frac{h^8 y_n^{(8)}}{8! x_{n+1}^8} \\ \frac{h^7 y_n^{(7)}}{7! x_{n+1}^7} \\ \frac{h^6 y_n^{(6)}}{6! x_{n+1}^6} \end{bmatrix} = \mathbf{b} \quad 1.25$$

To solve for  $q_1, q_2, q_3, q_4, q_5$  and  $q_6$  we use the matrix equation (1.25)  $p_1, p_2, p_3, p_4,$  and  $p_5$  can be obtained from the equations (1.6 – 1.11). That is,

$$P_1 = \frac{h y_n^{(1)} q_0}{1! x_{n+1}} + y_n q_1 \quad 1.26$$

$$P_2 = \frac{h^2 y_n^{(2)}}{2! x_{n+1}^2} + \frac{h y_n^{(1)}}{1! x_{n+1}} q_1 + y_n q_2 \quad 1.27$$

$$P_3 = \frac{h^3 y_n^{(3)}}{3! x_{n+1}^3} + \frac{h^2 y_n^{(2)}}{2! x_{n+1}^2} q_1 + \frac{h y_n^{(1)}}{1! x_{n+1}} q_2 + y_n q_3 \quad 1.28$$

$$P_4 = \frac{h^4 y_n^{(4)}}{4! x_{n+1}^4} + \frac{h^3 y_n^{(3)}}{3! x_{n+1}^3} q_1 + \frac{h^2 y_n^{(2)}}{2! x_{n+1}^2} q_2 + \frac{h y_n^{(1)}}{1! x_{n+1}} q_3 + y_n q_4 \quad 1.29$$

$$P_5 = \frac{h^5 y_n^{(5)}}{5! x_{n+1}^5} + \frac{h^4 y_n^{(4)}}{4! x_{n+1}^4} q_1 + \frac{h^3 y_n^{(3)}}{3! x_{n+1}^3} q_2 + \frac{h^2 y_n^{(2)}}{2! x_{n+1}^2} q_3 + \frac{h y_n^{(1)}}{1! x_{n+1}} q_4 + y_n q_5 \quad 1.30$$

By adopting equations 1.26 – 1.30 produces the values of  $p_1, p_2, p_3, p_4$  and  $p_5$  when the values of  $q_1, q_2, q_3, q_4$  and  $q_5$  are substituted into it.

### 1.3 STABILITY OF THE RATIONAL INTERPOLATION METHOD

In this section, we shall investigate the stability properties of the integrator formula for  $k = 6$ .

$$y_{n+1} = \frac{\sum_{i=0}^5 P_i X_{n+1}^i}{1 + \sum_{i=1}^6 q_i X_{n+1}^i} \tag{1.31}$$

However, the use of matrix equation 1.25 will give us investigative advantage to obtain results easily. When the integrator 1.31 is applied to  $y^1 = \lambda y$  the equation 1.25 becomes:

$$\begin{bmatrix} \frac{\bar{h}^{-10}}{10! x_{n+1}^{10}} & \frac{\bar{h}^{-9}}{9! x_{n+1}^9} & \frac{\bar{h}^{-8}}{8! x_{n+1}^8} & \frac{\bar{h}^{-7}}{7! x_{n+1}^7} & \frac{\bar{h}^{-6}}{6! x_{n+1}^6} & \frac{\bar{h}^{-5}}{5! x_{n+1}^5} \\ \frac{\bar{h}^{-9}}{9! x_{n+1}^9} & \frac{\bar{h}^{-8}}{8! x_{n+1}^8} & \frac{\bar{h}^{-7}}{7! x_{n+1}^7} & \frac{\bar{h}^{-6}}{6! x_{n+1}^6} & \frac{\bar{h}^{-5}}{5! x_{n+1}^5} & \frac{\bar{h}^{-4}}{4! x_{n+1}^4} \\ \frac{\bar{h}^{-8}}{8! x_{n+1}^8} & \frac{\bar{h}^{-7}}{7! x_{n+1}^7} & \frac{\bar{h}^{-6}}{6! x_{n+1}^6} & \frac{\bar{h}^{-5}}{5! x_{n+1}^5} & \frac{\bar{h}^{-4}}{4! x_{n+1}^4} & \frac{\bar{h}^{-3}}{3! x_{n+1}^3} \\ \frac{\bar{h}^{-7}}{7! x_{n+1}^7} & \frac{\bar{h}^{-6}}{6! x_{n+1}^6} & \frac{\bar{h}^{-5}}{5! x_{n+1}^5} & \frac{\bar{h}^{-4}}{4! x_{n+1}^4} & \frac{\bar{h}^{-3}}{3! x_{n+1}^3} & \frac{\bar{h}^{-2}}{2! x_{n+1}^2} \\ \frac{\bar{h}^{-6}}{6! x_{n+1}^6} & \frac{\bar{h}^{-5}}{5! x_{n+1}^5} & \frac{\bar{h}^{-4}}{4! x_{n+1}^4} & \frac{\bar{h}^{-3}}{3! x_{n+1}^3} & \frac{\bar{h}^{-2}}{2! x_{n+1}^2} & \frac{\bar{h}}{1! x_{n+1}} \\ \frac{\bar{h}^{-5}}{5! x_{n+1}^5} & \frac{\bar{h}^{-4}}{4! x_{n+1}^4} & \frac{\bar{h}^{-3}}{3! x_{n+1}^3} & \frac{\bar{h}^{-2}}{2! x_{n+1}^2} & \frac{\bar{h}}{1! x_{n+1}} & 1 \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \\ q_4 \\ q_5 \\ q_6 \end{bmatrix} = \begin{bmatrix} \frac{\bar{h}^{-11}}{1! x_{n+1}^{11}} \\ \frac{\bar{h}^{-10}}{10! x_{n+1}^{10}} \\ \frac{\bar{h}^{-9}}{9! x_{n+1}^9} \\ \frac{\bar{h}^{-8}}{8! x_{n+1}^8} \\ \frac{\bar{h}^{-7}}{7! x_{n+1}^7} \\ \frac{\bar{h}^{-6}}{6! x_{n+1}^6} \end{bmatrix} = \mathbf{b} \tag{1.32}$$

where  $\bar{h} = \lambda h$

The application of Gaussian elimination to (1.32) yields

$$\begin{bmatrix} 1 & \frac{10X_{n+1}}{\bar{h}} & \frac{90X_{n+1}^2}{\bar{h}^2} & \frac{720X_{n+1}^3}{\bar{h}^3} & \frac{5040X_{n+1}^4}{\bar{h}^4} & \frac{302405X_{n+1}^5}{\bar{h}^5} \\ 0 & 1 & \frac{18X_{n+1}}{\bar{h}} & \frac{216X_{n+1}^2}{\bar{h}^2} & \frac{5016X_{n+1}^3}{\bar{h}^3} & \frac{15120X_{n+1}^4}{\bar{h}^4} \\ 0 & 0 & 1 & \frac{24X_{n+1}}{\bar{h}} & \frac{336X_{n+1}^2}{\bar{h}^2} & \frac{3360X_{n+1}^3}{\bar{h}^3} \\ 0 & 0 & 0 & 1 & \frac{28X_{n+1}}{\bar{h}} & \frac{420X_{n+1}^2}{\bar{h}^2} \\ 0 & 0 & 0 & 0 & 1 & \frac{30X_{n+1}}{\bar{h}} \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \\ q_4 \\ q_5 \\ q_6 \end{bmatrix} = \begin{bmatrix} -\frac{10! \bar{h}}{1! X_{n+1}} \\ -\frac{9! \bar{h}^{-2}}{1! X_{n+1}^2} \\ -\frac{8! \bar{h}^{-3}}{1! X_{n+1}^3} \\ -\frac{7! \bar{h}^{-4}}{1! X_{n+1}^4} \\ -\frac{6! \bar{h}^{-5}}{1! X_{n+1}^5} \\ -\frac{5! \bar{h}^{-6}}{1! X_{n+1}^6} \end{bmatrix} \tag{1.33}$$

where

$$\begin{bmatrix} q_1(\bar{h}) \\ q_2(\bar{h}) \\ q_3(\bar{h}) \\ q_4(\bar{h}) \\ q_5(\bar{h}) \\ q_6(\bar{h}) \end{bmatrix} = \begin{bmatrix} -\frac{3628200\bar{h}}{1! X_{n+1}} \\ -\frac{13426560\bar{h}^{-2}}{1! X_{n+1}^2} \\ -\frac{2177280\bar{h}^{-3}}{1! X_{n+1}^3} \\ -\frac{166320\bar{h}^{-4}}{1! X_{n+1}^4} \\ -\frac{4320\bar{h}^{-5}}{1! X_{n+1}^5} \\ -\frac{120\bar{h}^{-6}}{1! X_{n+1}^6} \end{bmatrix} \quad 1.34$$

Applying 1.34 in 1.26 – 1.30 also imply

$$\begin{bmatrix} p_1(\bar{h}) \\ p_2(\bar{h}) \\ p_3(\bar{h}) \\ p_4(\bar{h}) \\ p_5(\bar{h}) \end{bmatrix} = \begin{bmatrix} \frac{36288600\bar{h}}{1! X_{n+1}} \\ \frac{29756760\bar{h}^{-2}}{1! X_{n+1}^2} \\ \frac{16088060\bar{h}^{-3}}{1! X_{n+1}^3} \\ \frac{5670820\bar{h}^{-4}}{1! X_{n+1}^4} \\ \frac{1492585\bar{h}^{-5}}{1! X_{n+1}^5} \end{bmatrix} \quad 1.35$$

Finally, if we apply the results in 1.34 and 1.35 to the integrator 1.31. We obtain the stability root given by

$$S(\bar{h}) = \frac{P_0 + P_1 x_{n+1} + P_2 x_{n+1}^2 + P_3 x_{n+1}^3 + P_4 x_{n+1}^4 + P_5 x_{n+1}^5}{1 + q_1 x_{n+1} + q_2 x_{n+1}^2 + q_3 x_{n+1}^3 + q_4 x_{n+1}^4 + q_5 x_{n+1}^5 + q_6 x_{n+1}^6}$$

$$S(\bar{h}) = \frac{3991680 + 36288600\bar{h} + 29756760\bar{h}^{-2} + 16088060\bar{h}^{-3} + 5670820\bar{h}^{-4} + 1492585\bar{h}^{-5}}{3991680 - 3628200\bar{h} + 13426560\bar{h}^{-2} - 2177280\bar{h}^{-3} + 166320\bar{h}^{-4} - 4320\bar{h}^{-5} + 120\bar{h}^{-6}} \quad 1.36$$

However, by direct proof and definitions, equation 1.36 is A- stable and L – stable. For L- stable the RAS together with the point of encroachment into the right – half of the complex plane.

#### 1.4 CONSISTENCY AND CONVERGENCE

The integration formula given by  $y_{n+1} = y_n + h\phi(x_n, y_n, h)$  is said to be consistent with the initial value problem (ivp), if

$$\phi(x, y, 0) = f(x, y) \quad 1.37$$

With this definition, we can prove the theorem on the consistency of our method.

Lambert (1976) further stated that a multi step is said to be convergent if and only if the method is zero stable and consistent.

#### 1.5 THEOREM (CONSISTENCY AND CONVERGENCE)

The numerical integration formula given by,

$$y_{n+1} = \frac{\sum_{i=0}^{k-1} P_i X_{n+1}^i}{1 + \sum_{i=1}^k q_i X_{n+1}^i} \tag{1.38}$$

is convergent.

**Proof**

To establish the convergence of the new integrators formula, we have to show that the integrators are consistent as noted in Lambert (1978).

Given that  $P_0 = y_n$  (By 1.6)

$$y_{n+1} = \frac{\sum_{i=0}^5 P_i X_{n+1}^i}{1 + \sum_{i=1}^6 q_i X_{n+1}^i} \tag{By 1.3}$$

By re-arranging 1.3 we obtain

$$y_{n+1} - y_n = \frac{\sum_{i=0}^5 (P_i - q_i y_n) X_{n+1}^i}{1 + \sum_{i=1}^6 q_i X_{n+1}^i} \tag{1.39}$$

$$\frac{y_{n+1} - y_n}{h} = \frac{(p_1 - q_1 y_n)_{n+1} + (p_2 - q_2 y_n)(n+1)^2 h + (p_3 - q_3 y_n)(n+1)^3 h^2 + (p_4 - q_4 y_n)(n+1)^4 h^3 - q_5(n+1)^5 h^4}{1 + \sum_{i=1}^6 q_i (n+1)^i h^i} \tag{1.40}$$

$$\frac{y_{n+1} - y_n}{h} = \phi(x_n, y_n, h) \tag{1.41}$$

where  $\phi$  is the increment function.

This leads us to,

$$\phi(x_n, y_n, 0) = (p_1 - q_1 y_n)(n+1) \quad \text{i.e.} \quad n+1 = \frac{x_{n+1}}{h}$$

$$\phi(x_n, y_n, 0) = (p_1 - q_1 y_n) \frac{x_{n+1}}{h} \tag{1.42}$$

But,

$$p_i = \sum_{j=1}^i \frac{h^{i+1-j} (y_n)^{i+1-j} q_{j-1}}{(i+1-j)! (x_{n+1})^{i+1-j}} + y_n q_i \tag{1.43}$$

$$p_1 = \frac{h y_n^{(1)}}{1! x_{n+1}} + y_n q_1$$

$$p_1 - y_n q_1 = \frac{h y_n^{(1)}}{1! x_{n+1}} \tag{1.44}$$

putting equation 1.44 into 1.42

$$\phi(x_n, y_n, 0) = \frac{h y_n^{(1)}}{x_{n+1}} \cdot \frac{x_{n+1}}{h}$$

$$\phi(x_n, y_n, 0) = y_n^{(1)} = f(x_n, y_n) = f(x, y)$$

Hence, we conclude that the new rational interpolation method is consistent with the initial value problem (ivp).

**1.6 NUMERICAL COMPUTATIONS AND RESULTS**

**Problem 1:** Aashikpelokhai (1991) and Fatunla (1983)

$y' = y, y(0) = 1$ , Exact Solution  $y = e^x, 0 \leq x \leq 1$ .

**Table 1.** Efficiency of our method of order eleven (11) on problem 1 for  $h = 0.5$ , and  $0 \leq x \leq 5$ .

$x_n$	H	Theoretical Solution (Tsol)	Numerical Solution(Nsol)	Interpolation Method Error (En)	$N_f$
0.5	0.5	1.648721271	1.648721271	-1.386823989E-10	1
1.0	0.5	2.718281828	2.718281826	1.801506944E-9	2
1.5	0.5	4.481689069	4.481688764	3.047049768E-7	3
2.0	0.5	7.389056096	7.389046016	1.008072234E-5	4
2.5	0.5	12.182493956	12.182340480	1.534755087E-4	5
3.0	0.5	20.085536913	20.084103084	1.433828596E-3	6
3.5	0.5	33.115451939	33.105881851	9.570088402E-3	7
4.0	0.5	54.598149996	54.548180215	4.996978142E-2	8
4.5	0.5	90.017131232	89.800704590	2.164266417E-1	9
5.0	0.5	148.413158977	148.603848505	8.093104724E-1	10

**Table 2.** Error in Numerical Integrators with uniform meshsize  $h = 0.1$  on problem 1

X	Theoretical Solution	Aashikpelokhai (1991)				Fatunla (1983)	$N_f$
		Error x $10^{12}$ Order = 11	Error x $10^{12}$ Order = 9	Error x $10^{12}$ Order = 7	Error x $10^8$ Order = 5	Error x $10^6$ Order = 4	
0.1	1.10517092	0.00000	0.00000	0.00799	-0.15622	0.60450	1
0.2	1.22140027	0.00022	-0.00022	0.00866	-0.17265	0.48269	2
0.3	1.34985881	0.00000	0.00000	0.00955	-0.19081	0.38781	3
0.4	1.49182470	-0.00022	0.00000	0.01066	-0.21088	0.36697	4
0.5	1.64872127	0.00022	0.00000	0.01177	-0.23305	0.32105	5
0.6	1.82211880	-0.00022	-0.00022	0.01288	-0.25756	0.02256	6
0.7	2.01375271	0.00000	0.00000	0.01465	-0.28465	0.35937	7
0.8	2.22554093	-0.00044	0.00000	0.01554	-0.31459	0.34473	8
0.9	2.45960311	0.00000	0.00000	0.01731	-0.34768	0.30697	9
1.0	2.71828183	0.00044	0.00000	0.01954	-0.38424	0.03030	10

From table 1, we observed that our new rational interpolation method of order eleven when compared with table 2 above shows that the rational interpolation method are efficient at resolving differential equations with exponential solutions. They compare favorably with Aashikpelokhai (1991) and Fatunla (1983).

**Problem 2:** Corles (2001)

$y' = x-y, y(1) = 2$ , Exact Solution  $y = x-1 + 2e^{1-x}, 1.0 \leq x \leq 2.0$  and  $h = 0.1$

**Table 3**

X	H	Theoretical Solution(Tsol)	Corles Error Order = 5	Interpolation Method Error Order = 11	$N_f$
1.1	0.1	1.90967483610	2.951622E-04	3.056044E-11	11
1.2	0.1	1.83746150621	5.341768E-04	5.530487E-11	12
1.3	0.1	1.78163644144	7.249117E-04	7.506484E-11	13
1.4	0.1	1.74064009216	8.745193E-04	9.062775E-11	14

1.5	0.1	1.71306131953	9.890795E-04	1.034086E-10	15
1.6	0.1	1.69762327230	1.073837E-03	1.199023E-10	16
1.7	0.1	1.69317060770	1.133561E-03	1.722329E-10	17
1.8	0.1	1.69865792836	1.172066E-03	3.916361E-10	18
1.9	0.1	1.71313931960	1.193047E-03	1.226139E-9	19
2.0	0.1	1.73575888247	1.199245E-03	3.999923E-9	20

From the numerical results in table 3, we observed that the error tolerance of order eleven could raise to  $10^{-11}$  as against of order five  $10^{-04}$  prescribed in corles (2001). Hence order eleven of our new interpolation method has a higher degree of accuracy.

**Problem 3:**

$$y' = \begin{pmatrix} -0.1 & -49 & 0 \\ 0 & -50 & 0 \\ 0 & 70 & -120 \end{pmatrix} y, \quad y(0) = \begin{pmatrix} 2 \\ 1 \\ 2 \end{pmatrix}, \quad 0 \leq x \leq 15, \quad y = \begin{pmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 1 & 1 \end{pmatrix} \begin{matrix} \text{Exact solution} \\ e^{-0.1x} \\ e^{-50x} \\ e^{-120x} \end{matrix}$$

The eigenvalues of the system of the differential equation are  $\lambda_1 = -0.1$ ,  $\lambda_2 = -50$  and  $\lambda_3 = -120$ . Therefore the stiffness factor is 1200.

**Table 4**

First Component						
X <sub>n</sub>	H	Theoretical solution	Aashikpelokhai (1991)		Interpolation Method	N <sub>f</sub>
			Error K = 2	Error K = 1	Error k = 6	
5.0	0.2	0.606530660	-1.3(-9)	-1.2(-4)	-2.4E-11	25
10.0	0.2	0.367879441	-8.1(-10)	-7.3(-5)	-3.8E-11	50
15.0	0.2	0.223313016	-4.9(-10)	-4.4(-5)	-4.3E-11	75
Second Component						
5.0	0.2	0.000000000	0.0	0.0	0.0	25
10.0	0.2	0.000000000	0.0	0.0	0.0	50
15.0	0.2	0.000000000	0.0	0.0	0.0	75
Third Component						
5.0	0.2	0.000000000	0.0	0.0	0.0	25
10.0	0.2	0.000000000	0.0	0.0	0.0	50
15.0	0.2	0.000000000	0.0	0.0	0.0	75

From table 4 above we can observe that our new rational interpolation method also shows the accuracies of the integrators with increasing in k.

## 1.7 CONCLUSION

The implementations of the class of rational interpolation method were coded in Java and run on digital computer. In conclusion, from the above results in tables 1,2,3 and 4 it can be seen that our Rational Interpolation method of order eleven is efficient and accurate when compared with the existing methods of Aashikpelokhai (1991) and Fatunla (1983) and Corles (2001) which can solve the same set of numerical initial value problems. The Region of Absolute Stability (RAS) of the rational Interpolation method lies entirely on the Left-half of the complex plane. We therefore conclude that the rational interpolation method is both A-stable and L-stable for  $K=6$ . Hence, it is recommended for users, who are currently working in the area of research.

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# THE DETERMINANT AND THE INVERSE OF NON – SINGULAR 2 X 2 AND 3 X 3 MATRICES USING ADJOINT METHOD

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**Abstract-** In this paper work we study the derivation of the determinant, the adjoint, and inverse of non – singular 2 x 2 and 3 x 3 matrices. And some computational problems and results were carry out.

**Index Terms-** Matrix, Determinant, Non - Singular, Adjoint and Inverse.

## 1.0 INTRODUCTION

The inverse of a 2 x 2 and 3 x 3 non – singular matrix is got by either the adjoint method or using elementary operation, noting that the determinant of the given matrix must be non zero. The determinant is then obtained by subtracting the product of the elements in the ordinary diagonal from the product of the elements in the leading diagonal. The inverse matrix is then found to be equal to the reciprocal of the determinant of the original matrix multiplied by the adjoint matrix. (Ref. Celia, C.W; Nice A.T.F; Elliot.K.F. (1987), Ilori S.A.and Akinyele O. (1986), Lipchitz Seymour. (1988), Meyer, Carl D. (2001), Poole, David (2006), Saturday.E.G. (2012), Stroud.K.A. (2007), Voyevodi N.V.V. (1980 and Stephenson. (1999).

## 1.1 Some Definitions

**1.1.1 Matrix:** A matrix can be defined as a set of quantities arranged in a rectangular array of m rows and n columns.

$$\begin{bmatrix} a_{11} & a_{12} & a_{13} & a_{1n} \\ a_{21} & a_{22} & a_{23} & a_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ a_{m1} & a_{m2} & a_{m3} & a_{mn} \end{bmatrix}$$

The individual quantities are called the elements of the matrix of rows and columns is said to be of order m x n.

**1.1.2 Determinant Matrix:** The determinant of a matrix is a scalar (constant) obtained from the matrix by an appropriate evaluation depending on the order of the matrix. The determinant of matrix A is denoted by  $|A|$ .

**1.1.3 Non - Singular Matrix:** This is a square matrix whose determinant is not zero.

**1.1.4 Adjoint Matrix:** This is the transpose of the cofactors matrix. The adjoint of a matrix A is denoted by  $(AdjA)$ .

**1.1.5 The Inverse Matrix:** The inverse of a matrix is another matrix which multiplies the original matrix to give an identity matrix. The inverse of a matrix A is denoted by  $A^{-1}$ .

## 1.2 THE DERIVATION OF THE DETERMINANT AND THE INVERSE OF NON – SINGULAR 2 X 2 AND 3 X 3 MATRICES USING ADJOINT METHOD.

### 1.2.1 For 2 X 2 Matrix

Let us consider the matrix

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

**1.2.1.1 The Determinant**

$$|A| = \det A = ad - bc \neq 0 \tag{1.3.1.1a}$$

Hence A is non – singular matrix and its has an inverse

**1.2.1.2 The Adjoint**

$$\text{Adj}A = \begin{bmatrix} d & -b \\ -c & a \end{bmatrix} \tag{1.3.1.2b}$$

**1.2.1.3 The Inverse**

$$A^{-1} = \frac{1}{|A|} \text{Adj}A \tag{1.3.1.3c}$$

Putting equations 1.3.1.1a and 1.3.1.2b into equation 1.3.1.3c we have,

$$\begin{aligned} A^{-1} &= \frac{1}{ad-bc} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix} \\ &= \begin{bmatrix} \frac{d}{ad-bc} & \frac{-b}{ad-bc} \\ \frac{-c}{ad-bc} & \frac{a}{ad-bc} \end{bmatrix} \end{aligned} \tag{1.3.1.3d}$$

Hence equation 1.3.1.3d gives the inverse of 2 x 2 non- singular matrix.

**1.2.2 For 3 X 3 Matrix**

Let consider the matrix

$$B = \begin{bmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{bmatrix}$$

**1.2.2.1 The Determinant**

$$\begin{aligned} |B| = \det B &= a_1 \begin{bmatrix} b_2 & c_2 \\ b_3 & c_3 \end{bmatrix} - b_1 \begin{bmatrix} a_2 & c_2 \\ a_3 & c_3 \end{bmatrix} + c_1 \begin{bmatrix} a_2 & b_2 \\ a_3 & b_3 \end{bmatrix} \\ &= a_1(b_2c_3 - b_3c_2) - b_1(a_2c_3 - a_3c_2) + c_1(a_2b_3 - a_3b_2) \\ |B| &= a_1b_2c_3 - a_1b_3c_2 - a_2b_1c_3 + a_3b_1c_2 + a_2b_3c_1 - a_3b_2c_1 \neq 0 \end{aligned} \tag{1.3.2.1a}$$

$$\text{Let } M = |B| = a_1b_2c_3 - a_1b_3c_2 - a_2b_1c_3 + a_3b_1c_2 + a_2b_3c_1 - a_3b_2c_1 \tag{1.3.2.1b}$$

Hence B is a non-singular matrix and it has inverse.

**1.2.2.2 The Adjoint**

$$\text{Adj}B = \begin{bmatrix} b_2 & c_2 \\ b_3 & c_3 \end{bmatrix} - \begin{bmatrix} b_1 & c_1 \\ b_3 & c_3 \end{bmatrix} + \begin{bmatrix} b_1 & c_1 \\ b_2 & c_2 \end{bmatrix}$$

$$\begin{aligned}
 & - \begin{bmatrix} a_2 & c_2 \\ a_3 & c_3 \end{bmatrix} + \begin{bmatrix} a_1 & c_1 \\ a_3 & c_3 \end{bmatrix} - \begin{bmatrix} a_1 & c_1 \\ a_2 & c_2 \end{bmatrix} \\
 & + \begin{bmatrix} a_2 & b_2 \\ a_3 & b_3 \end{bmatrix} - \begin{bmatrix} a_1 & b_1 \\ a_3 & b_3 \end{bmatrix} + \begin{bmatrix} a_1 & b_1 \\ a_2 & b_2 \end{bmatrix} \\
 & = \begin{bmatrix} b_2c_3 - b_3c_2 & -b_1c_3 + b_3c_1 & b_1c_2 - b_2c_1 \\ -a_2c_3 + a_3c_2 & a_1c_3 - a_3c_1 & -a_1c_2 + a_2c_1 \\ a_2b_3 - a_3b_2 & -a_1b_3 + a_3b_1 & a_1b_2 - a_2b_1 \end{bmatrix}
 \end{aligned}
 \tag{1.3.2.2c}$$

**1.2.2.3 The Inverse**

$$B^{-1} = \frac{1}{|B|} \text{Adj}B
 \tag{1.3.2.3d}$$

Putting equations 1.3.2.1b and 1.3.2.2c into equation 1.3.2.3d we have,

$$\begin{aligned}
 & = \frac{1}{M} \begin{bmatrix} b_2c_3 - b_3c_2 & -b_1c_3 + b_3c_1 & b_1c_2 - b_2c_1 \\ -a_2c_3 + a_3c_2 & a_1c_3 - a_3c_1 & -a_1c_2 + a_2c_1 \\ a_2b_3 - a_3b_2 & -a_1b_3 + a_3b_1 & a_1b_2 - a_2b_1 \end{bmatrix} \\
 & = \begin{bmatrix} \frac{b_2c_3 - b_3c_2}{M} & \frac{-b_1c_3 + b_3c_1}{M} & \frac{b_1c_2 - b_2c_1}{M} \\ \frac{-a_2c_3 + a_3c_2}{M} & \frac{a_1c_3 - a_3c_1}{M} & \frac{-a_1c_2 + a_2c_1}{M} \\ \frac{a_2b_3 - a_3b_2}{M} & \frac{-a_1b_3 + a_3b_1}{M} & \frac{a_1b_2 - a_2b_1}{M} \end{bmatrix}
 \end{aligned}
 \tag{1.3.2.3e}$$

Hence equation 1.3.2.3e gives the inverse of 3 x 3 non- singular matrix.

**1.3 THE COMPUTATION OF DETERMINANT, ADJOINT AND INVERSE OF 2 X 2 AND 3 X 3 MATRICES**

**1.3.1 Problems of 2 X 2 Matrices.**

Some of the problems and results of 2 x 2 matrices are shown in table 1 below.

**Table 1**

Problem	Matrix	Determinant	Adjoint	Inverse
1	$A = \begin{bmatrix} -3 & 2 \\ -1 & 7 \end{bmatrix}$	19	$\begin{bmatrix} 7 & -2 \\ 1 & -3 \end{bmatrix}$	$\frac{1}{-19} \begin{bmatrix} 7 & -2 \\ 1 & -3 \end{bmatrix}$
2	$B = \begin{bmatrix} -2 & -6 \\ 3 & 5 \end{bmatrix}$	8	$\begin{bmatrix} 5 & 6 \\ -3 & -2 \end{bmatrix}$	$\frac{1}{8} \begin{bmatrix} 5 & 6 \\ -3 & -2 \end{bmatrix}$
3	$C = \begin{bmatrix} -2 & 3 \\ 1 & -4 \end{bmatrix}$	5	$\begin{bmatrix} -4 & -3 \\ -1 & -2 \end{bmatrix}$	$\frac{1}{-5} \begin{bmatrix} -4 & -3 \\ -1 & -2 \end{bmatrix}$

$$\begin{array}{l}
 4 \quad D = \begin{bmatrix} -3 & -5 \\ -2 & 4 \end{bmatrix} \quad 2 \quad \begin{bmatrix} 4 & 5 \\ 2 & -3 \end{bmatrix} \quad \frac{1}{-22} \begin{bmatrix} 4 & 5 \\ 2 & -3 \end{bmatrix} \\
 5 \quad E = \begin{bmatrix} 11 & 3 \\ 17 & 5 \end{bmatrix} \quad 4 \quad \begin{bmatrix} 5 & -17 \\ -3 & 11 \end{bmatrix} \quad \frac{1}{4} \begin{bmatrix} 5 & -17 \\ -3 & 11 \end{bmatrix}
 \end{array}$$

**1.3.2 Problems of 3 X 3 Matrices.**

Some of the problems and results of 3 x 3 matrices are shown in table 2 below.

**Table 2**

Problem	Matrix	Determinant	Adjoint	Inverse
1	$A = \begin{bmatrix} 3 & 2 & 5 \\ 6 & 8 & 4 \\ 7 & 3 & 2 \end{bmatrix}$	-146	$\begin{bmatrix} 4 & 11 & -32 \\ 16 & -29 & 18 \\ -38 & 5 & 12 \end{bmatrix}$	$\frac{1}{-146} \begin{bmatrix} 4 & 11 & -32 \\ 16 & -29 & 18 \\ -38 & 5 & 12 \end{bmatrix}$
2	$B = \begin{bmatrix} 3 & 4 & 5 \\ 7 & 5 & 8 \\ 9 & 2 & 1 \end{bmatrix}$	41	$\begin{bmatrix} -11 & 8 & 2 \\ 65 & -51 & 18 \\ -31 & -30 & 13 \end{bmatrix}$	$\frac{1}{41} \begin{bmatrix} -11 & 8 & 2 \\ 65 & -51 & 18 \\ -31 & -30 & 13 \end{bmatrix}$
3	$C = \begin{bmatrix} 2 & 1 & -1 \\ 1 & -4 & 2 \\ 3 & 2 & -3 \end{bmatrix}$	11	$\begin{bmatrix} 8 & 1 & -2 \\ 9 & -3 & -5 \\ 14 & -1 & -9 \end{bmatrix}$	$\frac{1}{11} \begin{bmatrix} 8 & 1 & -2 \\ 9 & -3 & -5 \\ 14 & -1 & -9 \end{bmatrix}$
4	$D = \begin{bmatrix} 2 & 3 & 2 \\ 1 & 4 & 3 \\ 4 & 1 & 6 \end{bmatrix}$	30	$\begin{bmatrix} 21 & -16 & 1 \\ 6 & 4 & -4 \\ 15 & 10 & 5 \end{bmatrix}$	$\frac{1}{30} \begin{bmatrix} 21 & -16 & 1 \\ 6 & 4 & -4 \\ 15 & 10 & 5 \end{bmatrix}$
5	$E = \begin{bmatrix} 3 & 2 & -8 \\ 4 & 6 & -5 \\ 2 & 7 & 3 \end{bmatrix}$	-13	$\begin{bmatrix} 53 & -62 & 38 \\ -22 & 25 & -17 \\ 16 & -17 & 10 \end{bmatrix}$	$\frac{1}{-13} \begin{bmatrix} 53 & -62 & 38 \\ -22 & 25 & -17 \\ 16 & -17 & 10 \end{bmatrix}$

#### 1.4 CONCLUSION

In conclusion, from the analysis of the computational results in tables 1 and 2 above, we discover that the derivation of the determinant and inverse of non-singular  $2 \times 2$  and  $3 \times 3$  using adjoint method is efficient and accurate when solving matrices problems. And it can also handle matrices of higher orders.

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# Investigation of Heavy metal status in soil and vegetables grown in urban area of Allahabad, Uttar Pradesh, India

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**Abstract-** The present study was carried out to assess levels of different heavy metals like Iron, Cadmium, Nickel, Lead, Copper and Zinc in vegetables irrigated with water from different sources industrial area of Naini Allahabad. The order of heavy metal concentration was found in  $Fe > Zn > Cd > Pb > Ni > Cu$  in irrigated water and  $Fe > Ni > Zn > Cu > Cd > Pb$  was observed in industrial contaminated sites of soils. Metal levels observed in these sources were compared with WHO. The concentrations (mg/L) of heavy metals in irrigated water ranged from 0.249 to 0.257 for Fe, 0.049 to 0.056 for Zn, 0.028 to 0.036 for Cd, 0.015 to 0.019 for Cu, 0.035 to 0.042 for Pb and 0.031 to 0.038 for Ni which is lower than recommended maximum tolerable levels proposed by joint FAO/WHO Expert committee on food additives (2007), with the exception of Cd and Fe which exhibited elevated content. Uptake and translocation factor of heavy metal from soil to Edible parts of vegetables were quite distinguished for almost all elements examined. Although the practice of growing leafy vegetables using wastewater for irrigation is aimed at producing socio-economic benefits but study reveals that heavy metal-contaminated vegetables grown in wastewater-irrigated areas may pose Public health hazards which is not safe and may not be sustainable in the long-term.

**Index Terms-** Heavy metal, Wastewater irrigation, Contamination, Bioconcentration Factor.

## I. INTRODUCTION

Use of wastewater to irrigate agricultural lands is one of common practice in suburban and industrial areas in many parts of the world (Sharma et al. 2007, Gupta et al. 2008). Waste water irrigation leads to accumulation of heavy metals in the soil (Singh et al. 2004, Mapanda et al. 2005, Sharma, Agarwal and Marshall 2007). Sewage waste has been implicated as a potential source of heavy metals such as Copper (Cu), Cadmium (Cd), Zinc (Zn), Lead (Pb), Nickel (Ni) and Iron (Fe) in the edible and non-edible parts of vegetables (Sharma, Agarwal and Marshall 2006). Food safety issues and potential health risks make this as one of the most serious environmental concerns. There is evidence to indicate that agricultural soil also have increased levels of heavy metals as a results of increased in anthropogenic activities (Mc Laughlin and Singh 1999, Sharma Agrawal, and Marshall 2007). Wastewater carries appreciable amounts of trace toxic metals (Pescod 1992, Yadav et al. 2002) which often leads to degradation of soil health and contamination of food chain mainly through the vegetable grown on such soils (Rattan, et al. 2002). The toxic elements accumulated in organic matter in soils are taken up by growing plants and lastly exposing humans to this contamination (Khan et al. 2008).

Municipal solid waste application in agricultural land, wastewater discharge from industries and houses along with abundant pesticide use are the other major sources of the toxic heavy metals. Heavy metals contaminants can be found on the surface and in the tissues of fresh vegetables (Arif et al. 2011). Certain trace elements are essential in plant nutrition, but plants growing in a polluted environment can accumulate trace elements at high contaminations causing a serious risk to human health when they are consumed (Voutsas et al. 1996). Tricopoulos in 1997 revealed carcinogenic effects of several heavy metals such as Cadmium (Cd), Iron (Fe), Lead (Pb), Mercury (Hg), Zinc (Zn) and Nickel (Ni). There have been a number of studies which reported the deposition of heavy metals in soil, Crops and vegetables grown in the vicinity of industrial areas (Yang et al. 2004, Grytsyuk et al. 2006, Mingorance et al. 2007 and Khan et al. 2008).

## II. RESEARCH METHODOLOGY

### The Study

The current study was carried out from December 2012 to June 2013 in the around Allahabad industrial processing zone (AIPZ), Naini (25°23'46"N 81°52'17"E) is a suburban industrial town located in Allahabad district, Uttar Pradesh, India. Industrial area comprised of number of industries such as Alstom, ITI Limited, Bharat Pumps & Compressors (headquarters), Areva, Steel Authority of India Limited (SAIL), Dey's medical, Food Corporation of India (FCI), Triveni Structural's Limited (TSL), Cotton Mills subsidiary of Central Government, Raymond polyester plant Most of the people located in this area are industrial workers and belong to the weaker section of the society.

Our study area is situated in the south side of the river Ganga 9 km south of Allahabad city. Naini Allahabad municipality has a conventional sewage treatment plant and final treated effluent from the treatment plant is directly taken to the adjoining agricultural

land. The common vegetable grown in the study area is tomato, spinach, coriander, radish, cabbage etc. which are supplied to the all vegetables market in Allahabad and the rest entire the common market. In this study we investigated the concentration of Pb, Zn, Cd, Fe, Cu and Ni irrigation wastewater, soil, and vegetable grown in the mawaiya drain agricultural land area having long term uses of the treated and untreated wastewater for irrigation. The levels of contamination were compared with the Indian Standard guidelines to assess the potential hazards of heavy metals to public health. Most of the industries discharge their effluents without any prior treatment, through open drain which contaminates water, soil and vegetables of the adjoining areas. Different kinds of vegetables such as Tomato (*Lycopersicon esculentum*), Spinach (*Spinacia oleracea*), Coriandrum (*Coriandrum sativum*), Cabbage (*Brassica oleracea*), and Radish (*Raphanus sativum*) are grown in the area throughout the year and are used for home consumption and mainly for selling to residential areas of Allahabad. Samples of soils and these vegetables were collected randomly in triplicate from effluent-contaminated agricultural land located beside Mawaiya drain (a drain in which all the complex industrial effluents from the Allahabad export processing zone are disposed (AEPZ).

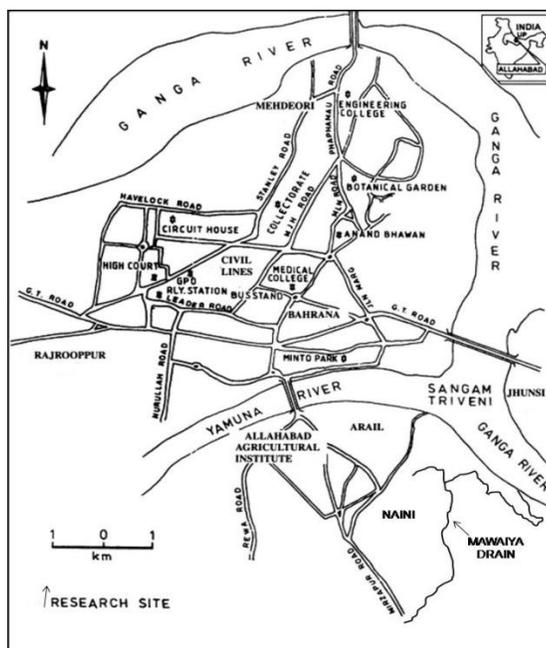


Figure.1 Mawaiya Drain of Naini, Allahabad.

### Method of Study

Industrial wastewater samples of untreated and treated, top soil (0-13 cm. depths) and 10-15 plants of the same species of Tomato, Spinach, Coriandrum, Cabbage and Radish were collected randomly in triplicate by hand using vinyl gloves carefully packed into polyethylene bags and the whole plant body was brought to the laboratory from the suburban area of Naini Allahabad mawaiya drain during the month from December 2012 to June 2013 in order to estimate the total heavy metal content ( Fe, Zn, Cd, Cu, Pb and Ni) in these samples. The cleaning (soil removal) of vegetable plant samples was performed by shaking and also by means of a dry pre-cleaned vinyl brush. Then the whole vegetable plant bodies were divided into different plants and non-edible portions were removed as per normal household practices. The edible parts of the vegetable samples were washed with tap water several times.

Wastewater samples were pretreated with concentrated  $\text{HNO}_3$  to prevent Microbial degradation of heavy metals. 50 ml of wastewater samples were digested with 10 ml concentrated  $\text{HNO}_3$  at  $80^\circ\text{C}$  (APHA 1985). Soil samples were air-dried crushed and passed through 2 mm mesh sieve and stored at ambient temperature prior to analysis. The freshly harvested mature vegetables were brought to the laboratory and washed primarily with running tap water, followed by three consecutive washing with distilled water to remove the soil particles. Samples were cut into small pieces and dried in oven at  $70^\circ\text{C}$  for 48 hour and then ground to powder 0.5 gm each of soil and vegetable samples were digested (wet acid digestion) with concentrated  $\text{HNO}_3$ ,  $\text{H}_2\text{SO}_4$  and  $\text{HClO}_4$  (5:1:1) at  $80^\circ\text{C}$  (Allen et al. 1986) until the solution become transparent. The digested samples of wastewater, soil and vegetables were filtered through the whatman No.42 filter paper and the filtrates were diluted to 50ml with distilled water. All reagents used were Merck, analytical grade (AR) including standard stock solutions of known concentration of different heavy metals. Heavy metal concentrations of waste water, soil, and vegetable samples were estimated by atomic absorption spectrometer (Perkin Elmer analyst 400). Blank samples were analyzed after seven samples. Concentrations were calculated on a dry weight basis. All analysis was

replicated three times. The accuracy and precision of metal analysis were checked against NIST-SRM, 1570 for every heavy metal. The result were found within  $\pm 2\%$  of heavy metals, mean, median, maximum, minimum, and standard deviation of wastewater, soil and vegetable samples were performed by using Microsoft Excel (version 2007).

### III. RESULT AND DISCUSSION

#### Heavy metal status in wastewater

There are six elements examined in effluent-contaminated water used for irrigation in Allahabad industrial processing zone, the concentration of heavy metals in the untreated and treated sewage used for irrigation. In wastewater heavy metal concentrations (mg/L) ranged from 0.249 to 0.257 for Fe, 0.049 to 0.056 for Zn, 0.028 to 0.036 for Cd, 0.015 to 0.019 for Cu, 0.035 to 0.042 for Pb and 0.031 to 0.038 for Ni. In comparison with the standard guideline for irrigation water (Pescod 1992 and WHO 2007) it was found that mean value of Cd concentration in the wastewater exceeded the recommended level.

Table I: Heavy metal concentrations (mg/L) in wastewater used for irrigation in suburban area of Naini, Allahabad India (n = 27).

	Fe	Zn	Cd	Cu	Pb	Ni
Mean	0.253	0.052	0.032	0.017	0.038	0.034
Median	0.253	0.053	0.033	0.018	0.039	0.035
Minimum	0.249	0.049	0.028	0.015	0.035	0.031
Maximum	0.257	0.056	0.036	0.019	0.042	0.038
Std dev	0.004	0.003	0.004	0.002	0.003	0.003
Safe limit*	2.0	2.00	0.01	0.2	0.5	0.2

\*Source: Pescod (1992) and WHO (2007).

Heavy metals concentration examined in which Fe was highest in wastewater used for irrigation in the study area. The mean concentration of Fe, Zn, Cd and Pb concentration in waste water of the study area were higher than the mean metal concentrations of irrigation water in suburban area of Varanasi, India (Sharma et al. 2007). The higher standard deviation observed for heavy metals of wastewater observe the highest Standard deviation in Cd and Fe in wastewater suggest that these metals were not uniformly distributed in the study area which is reported by Sharma et al. (2006). The data obtained from heavy metal in water from the present study varied more or less regularly with the findings of the other authors (Khan et al. 1998; Al Nakshabandi et al. 1997).

#### Heavy metal status in soil

The concentration of heavy metal in soil (mg/kg dry weight) in agricultural land of the study area (table II) ranged from 1345-1920 for Fe, 38.34-38.78 for Zn, 31.23-31.24 for Cd, 32.54-35.26 for Cu, 18.21-18.32 for Pb and 117.2-117.6 for Ni. Besides Fe, the mean highest concentrations recorded in the soil was for Ni followed by Zn, Cu and Cd and the minimum concentration was observed for Pb which confirmed with the result reported by (Gupta et al.2008). Highest deposition of Fe in soil might be due to its long term use in the production of Machine tools, paints, pigments and alloying in various industries of the study area that may contaminate soil.

Table II: Concentration of heavy metals in wastewater irrigated soil (mg/kg dry soil) in suburban area of Allahabad, India (n = 49).

	Fe	Zn	Cd	Cu	Pb	Ni
Mean	1537	38.35	31.23	34.02	18.25	117.36
Median	1346	38.36	31.24	34.26	18.23	117.3
Minimum	1345	38.34	31.23	32.54	18.21	117.2
Maximum	1920	38.78	31.24	35.26	18.32	117.6
Std dev	331.6	0.744	0.005	1.375	0.058	0.208
Safe limit*	NA	300-600	3.0-6.0	135-270	250-500	75-150

\*Source: Awashthi (2000) and WHO (2007).

The extent of metals observed in agricultural soil of the industrial area in the present investigation exceeded the permissible levels reported by different authors like Kabata - Pendias and Pendias (1992) (except Pb and Fe), Bowen (1966) (except Zn and Pb), and Temmerman et al. (1984) (except Pb and Fe). This variation of result might probably be due to the variations of heavy metals concentration in irrigation water and other agronomic practices of the respective area. The higher standard deviation reveals higher variations in the heavy metal distributions from the point source of emission to the adjacent areas. The low standard deviation of heavy metal in Cd may be described to its continuous removal by vegetables grown in the designated areas among the six heavy metals examined in soil and concentration of Fe was maximum (1920 mg/kg) with variation in its concentrations was several times

higher than those of Kisku et al. (2000). In Naini Allahabad, the agricultural soil is contaminated with heavy metals through the repeated use of wastewater from industries and other sources in irrigation as well as application of chemical fertilizers and pesticides. Heavy metals occur in effluents of industries and in many fertilizers and pesticides. Cd, for example, is found in wastewater and also in phosphate fertilizers due to the presence of Cd as in impurity in all phosphate rocks. On many of agricultural soils, with the use of effluent contaminated water in irrigation, heavy doses of phosphate fertilizers have been applied for over 50 years, and all toxic trace elements found in these sources keep accumulating in soil (Alam et al. 2003).

### Heavy metal status in vegetables

The average per capita consumption of leafy and non-leafy vegetables is 130gm/person/day (Alam et al. 2003). This is considerably less than the recommended amounts of 200gm/person/day from a nutritional point of view (Hasan and Ahmad 2000), the toxic trace elements concentrations in edible parts of vegetables grown in industrial area around Naini Allahabad are shown in figure 2 and 3. The range and mean concentration of trace metals (mg/kg dry weight) in leafy and other vegetables are presented in Table III. In leafy vegetables (Spinach, Cabbage and Coriander) the concentration of trace elements (mg/kg dry weight) ranged between 22.34-556.70 for Fe, 13.3-162.5 for Zn, 1.26-67.66 for Cd, 10.69-202.6 for Cu, 11.36-54.8 for Pb and 9.99-506.2 for Ni (Table III). The mean Fe concentrations varied from (32.49-351.23 mg/kg) which were good agreement with concentrations (111-378 mg/kg) observed in vegetables by Arora et al. (2008). The maximum uptake of Fe was in Tomato (351.23mg/kg) followed by Cabbage (292.35mg/kg) and Spinach (69.98 mg/kg), whereas the levels of Fe in all the vegetables were above the prescribed safe limit of WHO. The upper concentrations of Fe in vegetables were also found very similar to the values (2.11-336.9 mg/kg) reported by Kisku et al. (2000) for vegetables irrigated with mixed industrial effluents in India.

Table III: Heavy metal concentration (mg/kg dry weight) in vegetables grown in waste-water irrigated agricultural land in Allahabad: Mean and (Range).

Vegetables	Fe	Zn	Cd	Cu	Pb	Ni
Tomato (n=29)	351.23 (148.19-650.43)	28.23 (22.42-45.48)	2.36 (1.23-45.63)	23.12 (11.23-51.2)	12.20 (2.20-37.29)	10.11 (2.21-45.24)
Spinach (n=34)	69.98 (54.6-92.99)	36.50 (31.21-92.49)	15.24 (11.2-67.66)	29.20 (15.98-202.6)	16.20 (12.21-38.22)	66.55 (56.98-506.2)
Cabbage (n=26)	292.35 (130.25-556.70)	36.05 (23.54-79.05)	2.97 (1.26-3.92)	15.24 (10.69-26.97)	13.01 (11.36-35.96)	24.08 (9.99-39.35)
Coriander (n=48)	32.49 (22.34-45.32)	37.22 (13.3-162.5)	14.12 (7.65-29.36)	29.39 (17.23-38.26)	16.18 (12.6-54.8)	53.17 (52.9-72.8)
Radish (n=20)	45.26 (41.9-84.7)	34.7 (27.23-139)	18.92 (14.9-29.24)	32.20 (22.6-46.9)	17.26 (23.8-69.6)	58.82 (52.63-79.21)
Safe limit*	NA	50	1.5	30	2.5	1.5

\*Source: (Awashthi 2000) and WHO (2007)

The highest mean concentration of Zn was found in Coriander (37.22 mg/kg) followed by Spinach (36.50 mg/kg). The mean concentration of Zn (28.23-37.22 mg/kg) in vegetables Allahabad industrial processing zone area of Naini was very similar to the vegetables from Beijing, China (32.01-69.26 mg/kg) (Liu et al. 2005), as also from Rajasthan, India (21.1-46.4 mg/kg) (Arora et al. 2008), but substantially lower than the Zn concentrations (3.00-171.03 mg/kg) in vegetables from Titagarh Waste Bengal, India (Gupta et al. 2008), Harare, Zimbabwe (1,038-1,872 mg/kg) (Thandi et al. 2004) and also the vegetables of Varanasi, India (59.61-79.46 mg/kg) (Sharma et al. 2008) and from Delhi, India (46.7-91.9 mg/kg) (Rattan et al. 2005). The maximum accumulation of Cd in Radish plants (18.92 mg/kg) followed by Spinach (15.24 mg/kg) and Coriander (14.12 mg/kg) which exceeded the WHO limit by approximately eight, five, and four times respectively. The present study revealed that the mean Cd level (2.36-18.92 mg/kg) measured in vegetables from Allahabad industrial processing zone area of Naini was higher than the vegetables from Titagarh West Bengal, India (10.37-17.79 mg/kg) (Gupta et al. 2008) and the vegetables from endemic upper gastrointestinal cancer region of Turkey (25 mg/kg) (Turkdogan et al. 2002). But lower than that the vegetables from China (0.03-0.73 mg/kg) (Liu et al. 2005) and significantly more than the vegetables from Egypt (0.002-0.08 mg/kg) (Doghien et al. 2004), where as it was very close to the findings of Sharma et al. (2007) (0.5-4.36 mg/kg) in vegetables from Varanasi, India.

In leafy vegetables (Spinach, Cabbage and coriander) the concentration of heavy metals (mg/kg dry weight) ranged between (22.34-556.70 mg/kg) for Fe, (13.3-162.5 mg/kg) for Zn, (1.26-67.66 mg/kg) for Cd, (10.69-202.6 mg/kg) for Cu, (11.36-54.8 mg/kg) for Pb and (9.99-506.2 mg/kg) for Ni (Table III). The mean Fe content in vegetables (32.49-351.23 mg/kg) was very higher to the result reported in Titagarh west Bengal, India (15.66-34.49 mg/kg) (Gupta et al. 2008) but lower than the Cu content in vegetables (61.20 mg/kg) from Zhengzhou city, China (Liu et al. 2006). However, the variation of Cu concentration in vegetable in the present study was strongly supported by the finding (5.21-18.2 mg/kg) of Arora et al. (2008) and also in good agreement with the values observed in Varanasi, India (10.95-28.58 mg/kg) by Sharma et al. (2007). Higher Cu concentration (202.6 mg/kg) was found in Spinach where as the mean value was (32.20-29.39 mg/kg) for Radish and Coriander, respectively which were lower than the mean value (32.74 mg/kg)

and (36.41 mg/kg), respectively, reported by Sharma et al. (2008) in Varanasi India of the same vegetables. In addition Cu levels in vegetables showed good agreement with the main concentrations in leafy and non-leafy vegetables (15.5-8.51 mg/kg) from Samata Village, Jessor, Bangladesh obtained by Alam et al. (2003). The higher concentration of Cu level obtained in vegetables from present study than those of above authors, reveals the elevated uptake of the heavy metals in plants grown in industrial areas of Bangladesh.

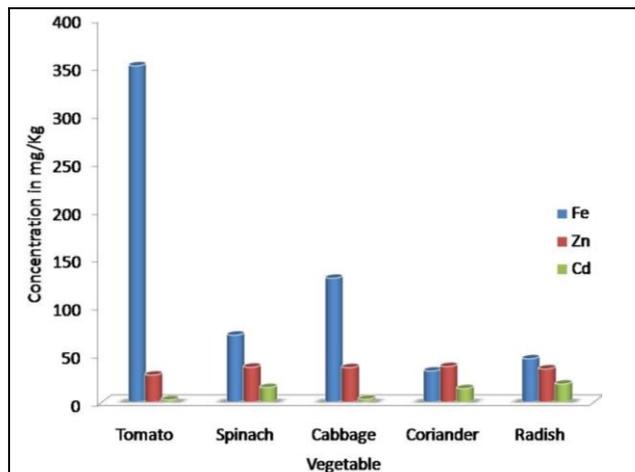


Figure 2: Mean heavy metal concentration (Fe, Zn and Cd) in vegetables of industrial area of Naini Allahabad.

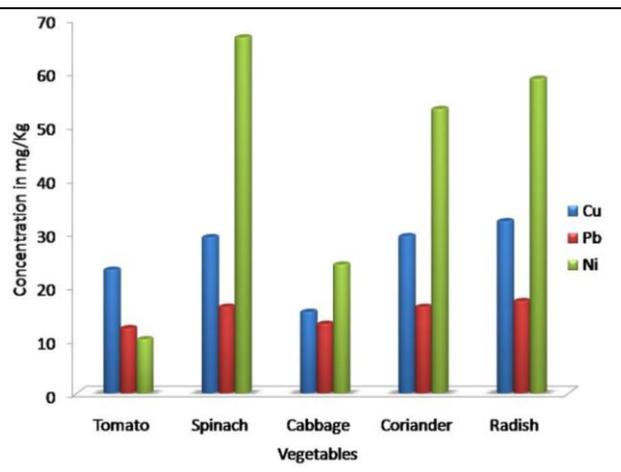


Figure 3: Mean heavy metal concentration (Cu, Pb, Ni) in vegetables of industrial area of Naini Allahabad.

The maximum concentration of Pb was exhibited by Radish (17.26 mg/kg) followed by Spinach (16.20 mg/kg) which exceeded the acceptable tolerance level of WHO for Pb by three and three times, respectively. Pb concentrations in edible portions of all the vegetables examined in the present study were above the permissible levels recommended by WHO, India (Awashthi 2000) The mean Pb content in vegetables (12.20-17.26 mg/kg) was lower than the values reported in Titagarh, West Bengal, (21.59-57.63 mg/kg) (Gupta et al. 2008) but comparatively higher than the Pb level reported in China (0.18-7.75 mg/kg) (Liu et al. 2006), (1.97-3.81 mg/kg) (Liu et al.2005) and in Varansi, India (3.09-15.74 mg/kg) (Sharma et al.2007). However it was significantly lower than the mean concentration of Pb (409 mg/kg) reported in vegetables from Turkey by Turkdogan et al. (2002). Higher concentration of Ni shown by Spinach (66.55 mg/kg) was this fold higher than the recommended safe limit of PFA (Prevention of food adulteration) (Awashthi 2000). The mean Ni concentrations in vegetables varied from (10.11-66.55 mg/kg) which was lower than the data reported by vegetables in Titagarh, West Bengal, India by Gupta et al. (2008). However, it was higher to the findings of Sharma et al. (2007) (1.81-7.57 mg/kg) in Varanasi, India Rattan et al. (2005) (8.78-21.5 mg/kg) in Delhi, India.

**Bioconcentration factor**

Bioconcentration factor or plant concentration factor (PCF) is a parameter used to describe the transfer of trace elements from soil to plant Edible parts. It is calculated as the ratio between the concentration of heavy metals in the vegetables and that in the corresponding soil all based on (dry weight) for each vegetable separately (Liu et al. 2006).

$$\text{Bioconcentration factor or Plant concentration factor} = C_{\text{plant}} / C_{\text{soil}}$$

Where  $C_{\text{plant}}$  and  $C_{\text{soil}}$  represents the heavy metal concentration in extracts of plants and soils on a dry weight basis respectively.

Table IV: Bioconcentration Factor/Plant concentration factor of the study area.

Vegetables	Fe	Zn	Cd	Cu	Pb	Ni
<b>Tomato (n=29)</b>	0.228	0.727	0.075	0.679	0.668	0.086
<b>Spinach (n=34)</b>	0.045	0.941	0.487	0.858	0.887	0.567
<b>Cabbage (n=26)</b>	0.190	0.929	0.095	0.447	0.712	0.205
<b>Coriander (n=48)</b>	0.021	0.959	0.452	0.863	0.886	0.453
<b>Radish (n=20)</b>	0.029	0.894	0.605	0.946	0.945	0.501

The BCF OR PCF value ranges from Fe, 0.021-0.228, Zn 0.727-0.959, Cd 0.075-0.605, Cu 0.447-0.946, Pb 0.668-0.945 and Ni 0.086-0.567. The BCF Value for Zn (0.959) of Coriander was the highest among all considered heavy metals which was supported by the observation of Liu et al. (2006). The trends of BCF For heavy metals in different vegetables studied were in the order of Zn > Cu > Pb > Cd > Ni > Fe, were as more or less similar to result reported by Khan et al. (2008) in Beijing, China. Although Zn concentration in soils of the study area were below the threshold levels of WHO and other authors, the highest mean BCF value of Zn in vegetables might be attributed to the exceeding high concentration of Zn, is (0.052 mg/L), in irrigation water of the study area (Table I).

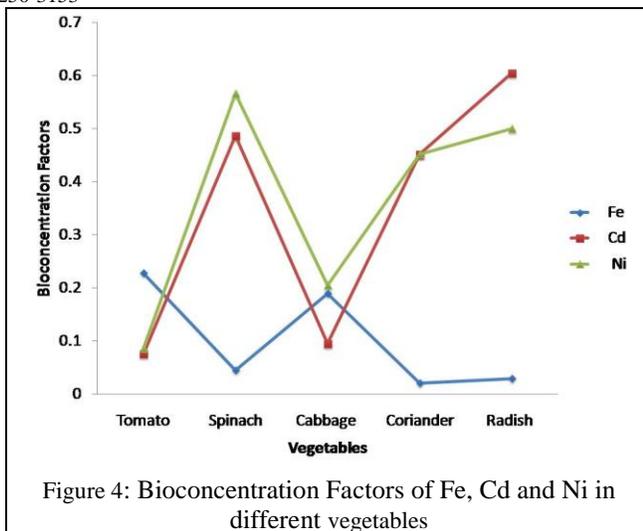


Figure 4: Bioconcentration Factors of Fe, Cd and Ni in different vegetables

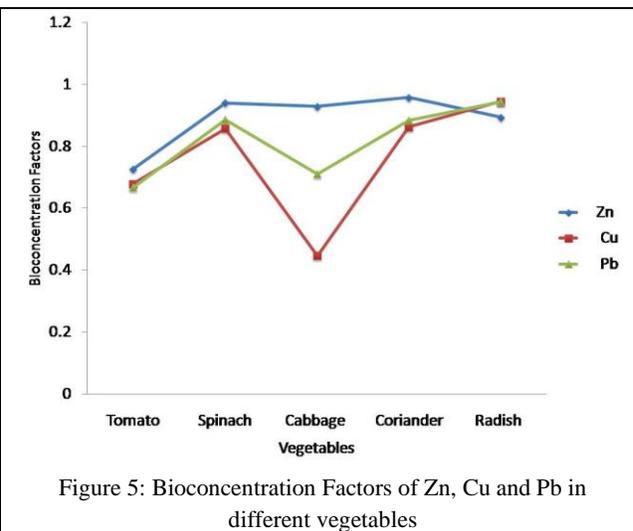


Figure 5: Bioconcentration Factors of Zn, Cu and Pb in different vegetables

Moreover the exchangeable Zn, which was considered readily bioavailable, accounted for  $\leq 10\%$  of the total Zn in Crop soils in general (Wong et al. 2002). Therefore, enrichment of vegetable for Zn might also be another pathway except absorption from soils. Of the five vegetable species, Tomato (for Zn and Cu), Spinach (for Ni), Cabbage (for Fe), Coriander (for Cd) and Radish (for Pb) showed highest metal accumulation. Vegetables differed in their ability to accumulate and concentrate metals in their edible parts, differences between them were significant which was well supported from the studies carried out by Sharma et al. (2006). The variations in heavy metal concentrations in vegetables were due to variations in their absorption and accumulation tendency. Soil properties such as Ph, organic matter, cation exchange capacity, redox botanical, Soil texture, and clay content may also affect the heavy metal uptake (Overesch et al. 2007). The interaction between different heavy metals occurs at root surface and also within the plant, which ultimately affects the uptake and translocation of heavy metals (Sharma et al. 2006). The accumulation of heavy metals also depends on plant age and plants parts (Liu et al. 2007).

#### IV. CONCLUSION

From the results of the present study it is clear that an elevated level of metal accumulation in edible parts of vegetable plants is mainly from their growth habitat like water and soil in and around industrial areas of Naini Allahabad. Long term consumption of these metal-contaminated vegetables can cause different diseases like Brain and Kidney damage, cancer in human body, dermatitis. The data generated must be used as a baseline wastewater quality framework to serve as a basis for monitoring irrigation water quality in urban areas of Allahabad to ensure safety. Responsible agencies should carry out public health education within the consumption area to sensitise the general public on the potential effects of indiscriminate disposal of waste and the potential health hazards associated with the consumption of vegetables cultivated with wastewater. Measures must be taken to reduce heavy metal pollution and nutrient loading of irrigation water and soils to protect the safety of both farmers and consumers.

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# Wind Power Scenario in India: A Review

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**Abstract-** As energy consumption rises with increase in population and living standards, the need to expand access to energy in new ways is growing as is the awareness of the environmental costs. This review paper provides a citizen's view of Wind Energy Generation (WEG) in India, in the backdrop of (a) the ever-rising national demand for primary energy (b) the national electricity policy (c) wind energy policies. Increased recognition of the contribution that renewable energy (RE) can make to energy independence, climate change mitigation, rural development, improved health and lower health costs (linked to air pollution), is shifting RE from the fringe to the mainstream of sustainable development. India has a vast supply of renewable energy resources and it has one of the largest programs in the world for deploying renewable energy products and systems. Indeed, it is the only country in the world to have an exclusive ministry for renewable energy development, the Ministry of Non-Conventional Energy Sources (MNES). Since its formation, the Ministry has launched one of the world's largest and most ambitious programs on renewable energy. Based on various promotional efforts put in place by MNES, significant progress is being made in power generation from renewable energy sources. The remarkable increase in installed capacity for WEG over the past years has not led to a proportionate increase in the kWh of wind power generated. The unbridled growth in this sector has pitted farmer activists against wind energy companies. Policies of doling out excessive incentives for MW-scale under-utilized wind farms that feed inefficient grids must be reconsidered. The people of India must receive direct tangible benefits from WEG for it to be a truly clean option of green energy for them.

**Index Terms-** policy, status, capacity, government, utilisation

## I. INTRODUCTION

Winds are caused by the uneven heating of the atmosphere by the sun, the irregularities of the earth's surface and rotation of the earth. The earth's surface is made of different types of land and water. These surfaces absorb the sun's heat at different rates, giving rise to the differences in temperature and subsequently to winds. During the day, the air above the land heats up more quickly than the air over water. The warm air over the land expands and rises and the heavier, cooler air rushes in to take its place, creating winds. At night, the winds are reversed

because the air cools more rapidly over land than over water. In the same way, the large atmospheric winds that circle the earth are created because the land near the earth's equator is heated more by the sun than the land near the North and South Poles. Humans use this wind flow for many purposes: sailing boats, pumping water, grinding mills and also generating electricity. Wind turbines convert the kinetic energy of the moving wind into electricity.

## II. WIND ENERGY IN INDIA

In 2012, despite a slowing global economy, India's electricity demand continued to rise. Electricity shortages are common, and over 40% of the population has no access to modern energy services. India's electricity demand is projected to more than triple between 2005 and 2030. In the recently released National Electricity Plan (2012) the Central Electricity Authority projected the need for 350-360 GW of total generation capacity by 2022[1]. A cumulative total of 119.5 billion units of Electricity have been fed into the state electricity grids up to 31<sup>st</sup> march, 2012 as shown in table 1 [2]. Historically, wind energy has met and often exceeded the targets set for it under both the 10th Plan (2002-2007) and 11th Plan (2007-2012) periods. During the 10th Plan period the target set was of 1,500 M W whereas the actual installations were 5,427 MW. Similarly during the 11th Plan period the revised target was for 9,000 MW and the actual installations were much higher at 10,260 MW. Wind power contributes a sizeable share of 3 to 4% to country electricity generation mix at present. The total installed capacity of wind power in India as in 31 march was 17,351.60 MW which is 8.7% of total installed capacity in India[2] as shown in table 2. A cumulative total of 119.5 bu of electricity have been fed into the state electricity from wind energy. We have saved 89.72 millions of tonnes of coal and 118.29 million tonnes of CO<sub>2</sub> emission. This indicates environmental and economic validity of wind power in India. However, for India to reach its potential and to boost the necessary investment in renewable energy it will be essential to introduce comprehensive, stable and long-term support policies, carefully designed to ensure that they operate in harmony with existing state level mechanisms so as to avoid reducing their effectiveness [2].

**TABLE1 state-wise and year-wise cumulative wind power generation data in billions units(BU)**

STATE	UPTO MAR2005	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	CUMULATIVE
Andhra Pradesh	.721	.079	.111	.101	.333	.106	.076	.122	1.650
Gujarat	1.332	.286	.455	.851	2.104	2.988	2.881	4.181	15.077
Karnataka	1.409	.935	1.397	1.840	1.723	2.895	2.825	3.279	16.303
Madhya Pradesh	.3000	.030	.070	.069	.003	.082	.090	.130	.775
Maharashtra	2.650	.790	1.714	1.804	2.207	2.779	2.692	3.296	17.931
Rajasthan	.494	.427	.532	.682	.758	1.127	1.387	2.420	7.826
Tamil nadu	11.970	3.444	5.268	6.066	6.206	8.146	8.720	9.855	59.675
Kerala	.047	.000	.000	.000	.000	.065	.065	.070	.246
Total	18.923	5.991	9.547	11.413	13.334	18.188	18.736	23.353	119.483

Source:MNRE

**TABLE2 state-wise and year-wise cumulative wind power installed capacity in MW(upto march,2012)**

STATE	UPTO MAR2002	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	Total
Andhra Pradesh	93.2	0.0	6.2	21.8	.45	.80	0.0	0.0	13.6	55.4	54.1	245.50
Gujrat	181.4	6.2	28.9	51.5	84.640	283.95	616.36	313.6	197.1	312.8	789.9	2966.30
Karnataka	69.3	55.6	84.9	201.5	143.80	265.95	190.30	316.0	145.4	254.1	206.7	1933.50
Madhya Pradesh	23.2	0.0	0.0	6.3	11.40	16.40	130.39	25.1	16.6	46.5	100.5	376.40
Maharashtra	400.3	2.0	6.2	48.8	545.10	485.30	268.15	183.0	138.9	239.1	416.5	2733.30
Rajasthan	16.1	44.6	117.8	106.3	73.27	111.75	68.95	199.6	350.0	436.7	545.7	2070.70
Tamil nadu	877.0	133.6	371.2	675.5	857.55	577.90	380.67	431.1	602.2	997.4	1083.5	6987.60
Kerala	2.0	0.0	.000	0.0	.000	0.0	8.50	16.5	0.8	7.4	0.0	35.1
others	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2
Total	1,665.7	242.0	615.2	1,111.7	1716.17	1,742.05	1,663.32	1,484.9	1464.6	2,349.6	3,196.9	17,351.60

Source: MNRE

availability will be in the order of 1,02,788 MW(not officially declare).Table3 shows the estimated installation potential at hub height of 50m and 80m by C-WET

### III. ASSESSMENT OF WIND POWER SOURCE

Presently, India has an installed power generation capacity of a little over 207.8 GW[3], of which renewables account for about 25 GW and wind makes up a majority of this installed capacity. The wind power generation capacity in India is 49,130 MW as per the official estimates in the Indian wind Atlas(2010) by the centre for wind energy technology(C-WET).The potential is calculated with respect to 2 percent land availability at windy locations and pertains to a 50m hub height level of wind turbine.[4]. If the estimated potential of 102 GW were fully developed, wind would provide only about 8 percent of the projected electricity demand in 2022 and 5 percent in 2032 [5].If the potential of 49,130 MW at 50m `level is extrapolated at 80m standard height, the projected wind potential using the same land

State/UTs	Estimated potential (MW)	
	@50m(\$)	@80m(*#)\$)
Andaman & Nicobar	2	365
Andhra Pradesh	5394	14497
Arunachal Pradesh*	201	236
Assam*	53	112
Bihar	-	144
Chhattisgarh*	23	314
Daman and Diu	-	4
Gujarat	10609	35071

Haryana	-	93
Himachal Pradesh*	20	64
Jharkhand	-	91
Jammu & Kashmir*	5311	5685
Karnataka	8591	13593
Kerala	790	837
Lakshadweep	16	16
Madhya Pradesh	920	2931
Maharashtra	5439	5961
Manipur*	7	56
Meghalaya*	44	82
Nagaland*	3	16
Odisha	910	1384
Puducherry	-	120
Rajasthan	5005	5050
Sikkim*	98	98
Tamil Nadu	5374	14152
Uttarakhand*	161	534
Uttar Pradesh*	137	1260
West Bengal	22	22
<b>Total</b>	<b>49,130</b>	<b>1,02,788</b>

\*Wind potential has yet to be validated with actual measurement

#Estimation is based on meso scale modelling

\$As actual land assessment is not done on a conservative consideration 2 percent land availability for all states except Himalayan and north eastern States, Andaman and Nicobar Islands .In other states .5% land availability has been assumed.

#### IV. STATEWISE WIND POWER INTALLATION

During the period from 2002 to 2012, the growth momentum in Indian wind energy sector picked up. The pace of development was marked by formulation of right regulatory framework, incentive mechanism, flourishing component manufacturing industry, emergence of local players and coming of multinational companies as well as technology advancement. Historically, the States of Tamil Nadu, Karnataka, Maharashtra and Gujarat have been the leaders in terms of total wind installations. The States of Rajasthan, Madhya Pradesh and Kerala are quickly catching up. Interestingly more than 95 percent of the nation's wind energy development to date is concentrated in just five states in southern and western India – Tamil Nadu, Andhra Pradesh, Karnataka, Maharashtra, and Gujarat [LBNL, 2012]. These five states accounted for over 85% of the total installed capacity at the end of the last plan period. Rajasthan is another emerging State with rising wind turbine installations [2] as shown in table2.

#### V. REPOWERING WIND POTENTIAL

The average size of a wind turbine has increased from .77MW in 2004 to 1MW in 2009 and the MW-class turbine now comprise over half of the new wind power capacity installed in the country. One of the immediate benefits after repowering the old wind turbines is that more electricity can be generated from

the same site. In spite of lack of policy and incentive, there are many problems which are faced during repowering such as disposal of old machines, fragmented land ownership in existing wind farms, clarity on the feed-in tariff offered to newly repowered projects and constrained evacuation of the extra power generated. A study on repowering potential conducted by WISE for the Ministry of New and Renewable Energy estimated India's Current repowering potential at approximately 2,760 MW.

#### VI. INDIA: INTERNATIONAL MANUFACTURING HUB

India is emerging as a major wind turbine-manufacturing hub today due to favourable policy framework, low manpower cost, raw material availability and vast market potential. Currently 18 existing manufacturers have a consolidated annual production capacity of over 10,000 MW. Some of the international companies with subsidiaries in India are sourcing over 80% of their components from Indian component manufacturers. Besides manufactures like Enercon, RRB, Suzlon and Leitmer Shriram, Win Wind has also set up a blade manufacturing facility in India [2]. The Indian manufacturers have ramped up their production capacity over a period of time. Besides meeting the domestic demand, some manufacturers have also started exporting turbines. The wind turbine manufactured in India has been exported to countries like Thailand, Turkey, Estonia, Netherlands, the UK and srilanka. According to estimates by WISE the annual wind turbine manufacturing capacity is likely to cross 17,000 MW by the 2013 if all manufacturers go ahead with their plans.

#### VII. NATIONAL POLICY MEASURES SUPPORTING RENEWABLES

In 1993, when the MNES issued guidelines for purchase of power from renewable energy sources by state utilities, it marked the beginning of initial policy support for renewable energy-based power generation in India. The most important development after this was the enactment of the Electricity act, 2003 with specific provision for promotion of renewable energy. However, the EA 2003 changed the legal and regulatory framework for the renewable energy sector in India. The significant provision of this Act are---Section 61(h) which give power to state electricity regulatory commission for fixing preferential tariff for renewable energy projects so as to promote investment while Section 86(1) e enables state commissions to create market for RE and co-generation projects by prescribing a minimum percentage of electricity to be procured from non conventional energy sources. [2]

##### 7.1 NATIONAL ELECTRICITY POLICY

This policy provides direction on determination of percentage for renewable power procurement. The policy also provides a roadmap for gradually increasing the share of renewable power generation.

##### 7.2 TARIFF POLICY

It recommends 'preferential tariff' for purchase of power from renewable energy sources as well as lays out a long-term strategy for pricing of power from RE sources.

## VIII. REGULATORY AND POLICY INCENTIVES FOR WIND POWER

India, as part of its obligations to the United Nations climate convention (UNFCCC), released a National Action Plan on Climate Change (NAPCC) in June 2008[8] that laid out the government's vision for a sustainable and clean energy future. The NAPCC stipulates that a dynamic minimum renewable purchase target of 5% (of total grid purchase) may be prescribed in 2009-2010 and this should increase by 1% each year for a period of 10 years. That would mean that by 2020, India should be procuring 15% of its power from renewable energy sources. Current policy and regulatory incentives for wind power development are listed as-

### 8.1 GENERATION BASED INCENTIVE

Initially implemented in June 2008 and then re-launched in December 2009 by the union government for grid connected wind power projects. A GBI of INR 0.50 per kWh (~ 1 US\$ cent), with a cap of approximately \$29,000 per MW per year, totalling \$116,000 per MW over 10 years of a project's life was offered under this scheme[10]. The GBI scheme includes captive wind power projects, but excludes third party sale. The scheme is applicable for the projects commissioned on/after 17.12.2009. Eligibility criterion is that projects should not avail accelerated depreciation and should sell the electricity to grid at a tariff fixed by SERC/state govt. This scheme expired on 31<sup>st</sup> march and is likely to be announced with some modification by MNRE.

### 8.2 ACCELERATED DEPRECIATION.

There is a provision for accelerated depreciation of 80 percent. This provision has enabled large profit making companies, small investors and captive users to participate in this sector. While IPPs may not be interested in the AD benefit, there is a whole class of small and medium enterprises that would be willing to invest in wind power for captive power consumption provide the AD benefit is available. [2]

### 8.3 RENEWABLE ENERGY CERTIFICATES

The trading of RECs in the Indian market began in February 2011. The RECs were introduced to enable all states to buy a certain proportion of their total power purchase from renewable resources. An REC is a tradable certificate of proof that a renewable energy plant has generated one MWh of electricity. Under this framework, renewable energy generators can trade RECs through a power exchange platform that allows market based price discovery, within a price range determined by the Central Electricity Regulatory Commission. The respective price limits are called forbearance price and floor price and their values are calculated separately for solar and all non-solar sources (i.e. wind, biomass, small hydro). The issued RECs are traded at qualified power exchanges within the boundary set by the floor price and forbearance price as determined by the CERC. For wind power generation as of April 2012, the revised range is

between INR 1,400 (~ \$26) to INR 3,480 (~ \$65) per MWh. By mid-October in 2012 the national REC registry had issued 3,384,257 RECs of which 3,381,714 were non-solar RECs[6]. Some of the States have imposed penalties for non-compliance with RPO targets on the generators or utilities.

### 8.4 NATIONAL CLEAN ENERGY FUND

The government proposed the creation of the National Clean Energy Fund (NCEF) in the Union Budget 2010-2011 by imposing a clean energy tax (cess) of INR 50 (~ \$1) per tonne on all coal produced as well as on coal imports in India. The Ministry of Finance through the Clean Energy Cess rules 2010, set guidelines for the collection and assessment of this tax by the Revenue Department. Thereafter an interministerial group was set up in the Ministry to approve projects and eligibility requirements for accessing funds from the NCEF [9]. However since its inception in July 2010, little information on the operationalization of the NCEF has been released in the public domain other than the guidelines and application form for proposals.[1]

## IX. OTHER INCENTIVE[2]

- 1) 10 years income-Tax holiday for wind power projects.
- 2) Excise duty exemption.
- 3) Concessional import duty on certain components of wind electricity generator.
- 4) Power wheeling and banking facilities.
- 5) Sales tax concession/benefits.
- 6) Loan facility for setting up wind power projects by IREDA.

## X. INDIA SMART GRID TASK FORCE

Especially after the introduction of the IEGC, grids across the country are required to take on electricity produced from nonconventional energy sources under various schemes (RPSs and RECs). Hence the need to revamp and modernize the national/regional and local grids must be one of the primary areas of investment and development. The Ministry of Power (MOP) took the first step towards grid reforms when it set up the 'India Smart Grid Task Force' (ISGTF) in June 2010[7]. The ISGTF is an inter-ministerial group that serves as the government focal point for plans related to Smart Grid development in India. MOP's vision of a smart grid was to bring together the fields of communications, IT and the power sector to establish a comprehensive power grid infrastructure. Further, on the demand side it envisioned giving a choice to the consumer to decide the timing and amount of electricity consumption based upon the real-time prices in the electricity market.

## XI. IMPROVING WIND FORECASTING AND SCHEDULING [1]

In India the grid infrastructure is outdated and an under invested aspect of the national infrastructure. The existing electricity grid code allows inter-state sale of power by relaxing provisions for forecasting and scheduling for renewable based generation. According to the norms laid down in the 2010 Grid

Code (IEGC), wind power generators are responsible for forecasting their daily generation with accuracy up to 70%. In Europe this requirement is closer to 95%. Only in the event of generation being  $\pm 30\%$  of the scheduled the wind generator will have to bear the unscheduled interchange (UI) charges. One way to overcome the lack of forecasting and scheduling is to improve the guidance to wind farm developers on scheduling requirements with suitable non-penal norms over the short to medium term. With continuously rising wind power penetration in the grid, wind power generators will have to work together with grid operators and electricity distribution companies to address issues related to grid stability and power quality in the immediate future. However, partly due to old and often limited infrastructure and in part due to a lack of penalization for non-compliance with forecasting and scheduling requirements, IEGC's implementation has been delayed. For the long-term growth prospects for wind power the industry and the load dispatch centres must proactively prepare for forecasting and scheduling, to ensure its full operationalization.

## XII. CONCLUSIONS

Policies for and status of WEG in India are explored. In spite of maximum contribution of wind energy in term of RE capacity as well as generation, the wind sector is still lacking in its policies. The recent withdrawal of AD has come as a shock to the investors and industry. Another weakness in the system is the manner of fixation of tariff and RPOs. Existing units face problems relating to under-evacuation and grid integration, and operate with poor capacity utilization factors. In order to change this situation for the better, governments must revise their relevant wind energy policies to remove loop-holes. Instead of promoting a headlong rush into WEG projects with further sops, govt. policies must reward generation and optimum utilization of the existing units. Instead of MW-scale grid-connected units, smaller-scale solar-assisted decentralized WEG units that can be installed at community levels must be promoted. WEG must be matched properly with demands of an appropriate kind; in order to maximize the benefits. The target of 15 percent of renewable power by 2020 can be achieved only if wind sector is allowed to grow without brakes and policy withdrawals.

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# Literacy Pattern and its Variation among Scheduled Castes Population in the Brahmaputra Valley, Assam

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**Abstract-** Literacy and educational attainment are considered to be the hallmark of modern society. The traits of modern society such as urbanisation, industrialisation and modernisation are closely associated with the level of literacy and education. The scheduled caste population is socially a backward class in Indian society. In the past they were downtrodden illiterate people of the Indian fabric. Even in the middle part of twentieth century the literacy rate among them was very low. However in the later part of the twentieth century and in the current millennium due to the developmental measures implemented by the central as well as state governments of India and also due to the influence of mass media there has been a change in the pattern of literacy. The literacy rate in the Brahmaputra Valley, Assam is 56.29 percent in 2001 census against 56.09 percent for general population, which is slightly lower than the scheduled caste population in the valley. This situation is mainly due to the presence of large number of general Muslim population in the study area, majority of whom are illiterates. The study of the pattern of literacy among various social groups of scheduled castes in the study area provides an insight into the socio-economic situations. An attempt has been made in this paper to analyse the variation and pattern of literacy among the scheduled caste population in the Brahmaputa Valley, Assam.

**Index Terms-** Brahmaputa Valley, Assam, Literacy, Empirical inductive method, Schedule caste, Educational attainment

## I. INTRODUCTION

Literacy and educational attainment level are considered as significant factors influencing the socio-economic development of any society. The quality of human society can be judged through educational attainment level. Literacy and educational attainment are fundamental features of social uplift of a region. Assam is lagging behind in respect of literacy and education .So far Brahmaputra valley is concerned it is also not satisfactory.

The scheduled castes population is socially a backward class in the Indian society. In the past they were downtrodden illiterate people of the Indian fabric. Even in the middle part of the twentieth century the literacy rate among them was very low. However, in the later part of the twentieth century and in the current millennium due to the developmental measures implemented by the central as well as the state government of India and also due to the influence of mass media there has been a change in the pattern of literacy.

The constitution of India in its Article45 of the directive principle urges the state to provide free and compulsory education for all the children, until they complete fourteen years of age. In this direction the national policy of education, 1968 was a milestone which stressed the need for vigorous effort for the early fulfilment of this aim. The amendment of the constitution in 1976 included education in the concurrent list. The national policy of education, 1986 again emphasised in the universal access and enrolment of the children upto fourteen years of age and a substantial improvement in the quality of education to enable all children to essential levels of learning. Lastly, the Sarba Siksha Abhijan is also implemented by the state government to educate all the people. It may be noted here that influence of these policies has resulted an improvement in the literacy rates among the scheduled castes people. But, the level of education attainment is not significantly improving among them.

According to 2001 census, in the Brahmaputra valley Assam 56.29 percent of scheduled castes population (excluding 0-6 years age group) are literates against 56.09 percent for general population. The male literacy rate is comparatively higher than the Corresponding female literacy rate among the scheduled castes population in the Brahmaputra valley. It is observed from the above analysis that the literacy rate is comparatively higher in case of Schedule caste population than the overall general literacy rate of the valley. This situation is mainly due to the presence of large number of general Muslim population in the study area, majority of whom are illiterates.

TABLE1

Literacy trend of scheduled castes population in the Brahmaputra valley and Assam.1961 to 2001(in percent).

YEAR	BRAHMAPUTRA VALLEY			ASSAM		
	PERSON	MALE	FEMALE	PERSON	MALE	FEMALE
1961	21.73	29.74	12.53	24.55	31.75	16.09
1971	24.86	34.80	13.94	25.29	35.00	15.74

1991	42.93	51.64	33.45	42.46	51.62	34.30
2001	56.29	64.70	47.62	56.09	63.95	47.90

Source: calculated on the basis of census data, Primary census abstract 2001, primary census abstract part II- B(1991)- 1971 part (II) social and cultural tables.1961-volumeIII part II C.

**\*1981-Census survey is not done in 1981 in Assam.**

**\*1991-1991 data population figure include age (0-6)Years age groups.**

It is observed from the table I that the literacy rate among the scheduled castes is not encouraging during the period from 1961 to 2001. when both the male and female literacy rates are considered the female literacy rates are far below the male literacy in case of scheduled castes population. This is due to low status of women and negligence of female education in their society. The parents of the poor families generally have given more importance to the male child in case of education, while the female child generally helps them in the domestic work.

## II. SPATIAL PATTERN OF LITERACY

The literacy rates also vary in different districts of the Brahmaputra valley. According to 2001 census the highest percentage share of scheduled castes literates is found in Sibsagar district with 69.43 percent literacy rate while the lowest is recorded by Dhemaji district with only 46.12 percent literacy rate. The spatial variation of literacy pattern in the Brahmaputra valley is presented in the Table 2 for clear understanding of the situation.

**Table 2**  
**Literacy Rate among the Scheduled Castes Population in Different Districts of the Brahmaputra Valley, 2001**

DISTRICTS/VALLEY	LITERACY IN PERCENTAGE		
	PERSON	MALE	FEMALE
1.KOKRAJHAR	53.43	62.36	43.64
2.DHUBRI	50.42	60.21	41.09
3.GOALPARA	54.49	61.96	46.74
4.BONGAIGAON	47.57	56.99	37.37
5.BARPETA	53.00	62.60	42.65
6.KAMRUP	57.31	65.57	48.50
7.NALBARI	52.89	62.33	42.94
8.DARRANG	49.59	62.33	42.94
9.MORIGAON	50.12	58.51	41.14
10.NAGAON	60.46	67.37	53.15
11.SONITPUR	58.82	66.63	50.48
12.LAKHIMPUR	57.55	66.33	48.40
13.DHEMAJI	46.12	55.69	35.74
14.TINSUKIA	62.66	69.95	54.43
15.DIBRUGARH	63.26	70.48	55.36
16.SIBSAGAR	69.43	75.15	63.48
17.JORHAT	66.05	74.05	57.57
18.GOLAGHAT	59.74	67.30	51.75
BRAHMAPUTRA VALLEY	56.29	64.70	47.62
ASSAM	56.09	63.95	47.90

**SOURCES: CENSUS OF INDIA 2001 ASSAM.**

The table 2 reveals that the literacy rates among the scheduled castes in the upper Brahmaputra valley are higher when compared to the lower Brahmaputra valley. The lowest level of literacy among scheduled castes population is however, found in Dhemaji districts in upper Assam which is an exception

due mainly to the ecological setting of the area coupled with, poverty and lack of adequate educational facilities in the district. Moreover, almost all parts of the district are chronically flood affected and the educational institution are in dilapidated

condition. Interestingly all other social groups also have lower literacy level in this part of the study area.

It is mentioned earlier that among the districts of Assam, the male literacy is higher compare to female literacy. It is due primarily to the fact that upper part of the valley except Dhemaji district which is chronically flood affected are socio-economically advanced when compared to the lower part of the valley. However Kamrup district with Guwahati city is the lower Brahmaputra valley is an exception. It is important to note that since the Ahom rule, people in the upper Brahmaputra valley have been aware of society, social life and living standards. Moreover, most of the areas in this part are accessible with high connectivity. Even during the British period with the growth of Oil and Tea industries, this part of the study area (Upper Brahmaputra Valley) was to some extent economically advanced.

**Literacy rate among different schedule caste groups in the Brahmaputra Valley.**

The study of the pattern of literacy among various social groups of scheduled castes in the study area provides an insight

into the socio-economic situation. Interestingly there exist significant disparities in the literacy rate among various scheduled castes groups.

In order to study the present condition, field survey is conducted in 2010 in different areas of the Brahmaputra valley. In this study only 12 major groups of the Brahmaputra valley having more than one percent of the total scheduled castes population are considered. It is observed that the literacy rate among them in the study area is 56.29 percent, of which male literacy is 64.70 percent and while female literacy 47.62 percent. Among the 12 major groups in the valley the highest literacy rate is recorded by Kaibartta group with 66.79% literates. Interestingly the kaibartta group has also the highest number of population in the valley. The second position is claimed by Jalkeot whose literary rate is 61.9% followed by Dhobi 61.19%. Kaibartta and Jalkeot are indigenous and they lived in both and rural and urban areas of the valley while dhobi group is immigrant and the people of this group are urban dwellers

**Table3  
Bahmaputravally Literacy Rate among Different Groups of Scheduled Castes Population**

GROUP	PERCENTAGE OF LITERATES		
	PERSON	MALE	FEMALE
1.BANSPHOR	51.46	66.67	36.54
2.BHUINMALI	52.77	61.68	39.73
3.BANIA	53.85	63.64	41.18
4.DHOBI	61.19	61.70	60.00
5.HIRA	51.92	59.26	44.00
6.JHALO-MALO	58.3	62.5	50.00
7.JALKEOT	61.70	66.66	52.94
8.KAIBARTTA	66.79	69.87	62.50
9.MEHTAR	57.14	64.14	64.70
10.MUCHI	44.82	50.00	36.36
11.NAMASUDRA	53.01	66.94	39.84
12.SUTRADHAR	48.90	65.38	27.11
BRAHMAPUTRA VALLEY	56.16	65.25	44.58

**SOURCE: Field survey 2010**

The other Scheduled castes groups have more or less same literacy rate. The lowest literacy rate among the groups is recorded by Muchi (44.82percent) who are mostly urban dwellers. So far the male female literacy patterns are concerned, the male literacy rate is comparatively higher than the female literacy rate. It is further observed that among the groups the male literacy rate is highest among the Kaibartta group(69.78%) followed by Namasudra (66.94%). On the other hand the female literacy rate is also highest among the Kaibartta group (62.50percent) followed by Dhobi (60 %). It is interesting to note that the female literacy rates vary from minimum 27.11 percent to maximum 62.50%, indicating high disparity among various groups which, however depends on the status of women in the society.

The above analysis clearly throws light on the fact that though effort has been made by the central and the state

government to educate the people during the different five year plan periods, literacy pattern is very discouraging among the scheduled castes people in the Brahmaputra valley.

**III. EDUCATIONAL LEVEL**

The educational level of a region is better understood, when the level of educational attainment is taken into account. The educational attainment level is analyzed in the present study for Brahmaputra valley for the Year 2010 from the field study(primary data).

**TABLE 4**  
**Educational level of scheduled castes population in the Brahmaputra valley**

EDUCATIONAL LEVEL	PERCENTAGE SHARE OF LITERATES		
	TOTAL	MALE	FEMALE
Below primary(I toIV)	37.57	36.18	40.17
Above primary upto matric(V to X)	29.68	28.99	0.96
Above matric(HSLC) below Graduate	22.66	23.37	21.33
Graduate and Technical	10.09	11.46	7.54
Illiterates	43.84	34.75	55.41
Literates(all)	56.16	65.25	44.58

Source: Field survey

It has been observed from the above table that the percentage of literacy below primary level is the highest claiming 37.57 percent of the total literates. The second position is claimed by the educational level above primary up to class x(29.68%).The H.S.L.C passed upto below graduate level claim 22.66%, while graduate and technical persons claim only 10.09%.It is observed in the field study that there are large scale school drop-outs during and after the primary stage of education among the scheduled castes in case of both male and female primarily due to financial hardships.

The study of male female educational level shows that the percentage share of female below primary level of education is very high with 40.17% of literates which is higher than the main literates (36.18%). Unlike the primary from above primary upto class X the female literacy rate (30.96%) is higher than the male counter part (28.99%). In the next group i.e. above HSLC but below graduates stage the male literacy rate is comparatively higher (26.37%) than that of female literacy (21.33%). In the higher level i.e. in the graduate and technical level also the literacy rate is comparatively higher in case of male (11.46%) than that of the female literacy (7.53%). It is mainly due to the fact that female get married at an early age before completion of the study as there is no social commitment about the continuation of their study after marriage.

The comparison of tables 1, 2, 3 reveals that there has been slight improvement in the literacy rate between 1991 and 2001. Apart from the social awaking, the facilities provided by the Government for socio-economic uplift of the schedule caste people also lead to this slight rise of literacy among them in the Brahmaputra valley. It is mentioned earlier that the indigenous schedule caste people are distributed both rural and urban areas of the study area. Due to the impact of urbanisation the indigenous schedule caste people who settled in urban areas have higher literacy rate when compared to the indigenous schedule caste people living in the rural areas.

It is further observed that the prevailing poor economic conditions among the schedule caste groups coupled with inaccessible conditions in the areas they lived to a great extent responsible for the low level of literacy among them. The recent development of Transport and communication has however added a new dimension to the process of propagation of literacy

and education in the remote areas. There has been also outmigration of the scheduled caste people from rural to urban areas to get higher education or employment which is particularly male selective, resulting in an increase of male literacy.

#### IV. CONCLUSION

The scheduled castes population is mainly distributed in the rural areas of the Brahmaputra valley. The rural literacy rate among the scheduled castes on an average for the valley is 51.11percent while the urban literacy is 65.77 percent. During the period 1971-2001 there is significant development in the literacy pattern among the scheduled castes in the study area. The prevalence of rural urban differential in case of literacy is primarily due to availability of educational facilities and consciousness among the people in the urban areas. on the other hand in the rural areas the educational institutions located in the river banks are submerged under water during four months of summer. Most of scheduled castes people live below poverty lines who, therefore cannot afford to go to other place to get education, resulting in a overall low literacy rate. The level of educational attainment is found to be discouraging among the schedule caste population. Therefore, it may be concluded that increase of literacy and educational attainment level particularly in case of female are vital towards socio-economic development of schedule caste population.

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# GUI Based Performance Analysis of Speech Enhancement Techniques

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**Abstract-** *Speech, being a fundamental way of communication, has been embedded in various applications. In many unavoidable situations, we are rendered helpless trying to deduce the intelligibility of the speech and this is where Speech enhancing technique i.e. removal of unwanted background noise, comes into picture. In this paper, an attempt has been made towards studying Speech Enhancement techniques such as Spectral Subtraction, Minimum Mean Square Error (MMSE), Kalman and Wiener filter. Based on our observations and analysis of various performance parameters, we conclude which of the methods is most suitable for speech enhancement. The implementation of the code for various filters is done using Graphic User Interface on MATLAB.*

**Index Terms-** *Kalman filter, MMSE, SNR, Spectral subtraction, Speech enhancement, Wiener filter.*

## I. INTRODUCTION

Speech is a fundamental and common medium, hence important for us, to communicate. Advancements in technology have made way for many more speech oriented applications like cellular voice calls, VoIP, teleconferencing systems, speech recognition, and hearing aids, etc. In many cases, these systems work well in nearly noise-free conditions, but their performance deteriorates rapidly in noisy conditions. In general, there exists a need to increase the reliability of these systems in noisy environments. Therefore, improvement in existing pre-processing algorithms or introducing entire new class of algorithm for speech enhancement is the basic objective of research community. In speech enhancement, the goal is to improve the quality of degraded speech. Speech enhancement algorithms are noise suppression techniques, using the knowledge from the field of hearing science, that mitigate the effect of the corrupting background noise, and hence improve the perceived speech quality and speech intelligibility.

The problem of improving performance of speech communication systems in noisy environments has been a challenging area for research for more than three decades now. For making speech coders robust to noise, speech enhancement focuses on improving the quality and intelligibility of speech damaged by noise. But if speech is over processed, intelligibility of noisy speech may decrease rapidly hindering effective improvement in enhancing the performance of other speech applications such as speech coding/compression and speech

recognition [1-4]. This project presents an overview of different speech enhancement. Using tables and graphs we compare and review the techniques.

## II. TYPES OF SPEECH ENHANCEMENT

Speech Enhancement methods can be classified in many ways. A standard algorithm alone is insufficient for all the types of noise present in the surrounding. Therefore, speech enhancement algorithms are generated based on the applications. The assumptions and other constraints are determined completely according to the application and the environment. The performance of speech enhancement algorithm is limited by factors like number of noise sources available, limitations in time variations and available a priori data. Model based constraints like restriction of algorithm to uncorrelated noise also play an important role. The Speech Enhancement systems can be classified based on number of channels used i.e. single or multiple, domain of processing i.e. time or frequency and the type of algorithms.

Speech processing strategies can be broadly divided into single and multichannel enhancement techniques [5-6].

### A. Single channel speech enhancement

In applications like hearing aids and mobile phones, where an alternate channel is unavailable, single channel enhancement is used. Single channel enhancement techniques are very easy to build and are less expensive when compared to its multichannel counterpart. A disadvantage of this method is that the signal cannot be pre-processed since there is no noise reference signal present. Hence, single channel enhancement systems make use of a different statistical approach to the unwanted noise [7]. Most of the single channel enhancement algorithms work on the assumption that noise is stationary in nature.

### B. Multi-channel speech enhancement

This method of speech enhancement is better than the previously mentioned method due to presence of reference channel. This channel helps us eliminate noise in an effective way. Phase alignment is performed in one of the channels to reject the undesired noise components. The limitations of single channel enhancement method are overcome and non-stationary noise sources can be addressed in this method of speech enhancement. Multi-channel systems are more complex. This method is implemented in adaptive noise cancellation devices

where a reference of contaminating noise is present in an auxiliary channel. This reference input is then filtered. Noise is hence subtracted from noisy speech input by following an adaptive algorithm. The main drawbacks are fabrication cost and complexity of the algorithm. This technique is currently in application in mobile phones for Noise Reduction using Dual Mic.

### III. BASIC BLOCK DIAGRAM

The basic block diagram for speech enhancement is as shown below in Fig. 1.

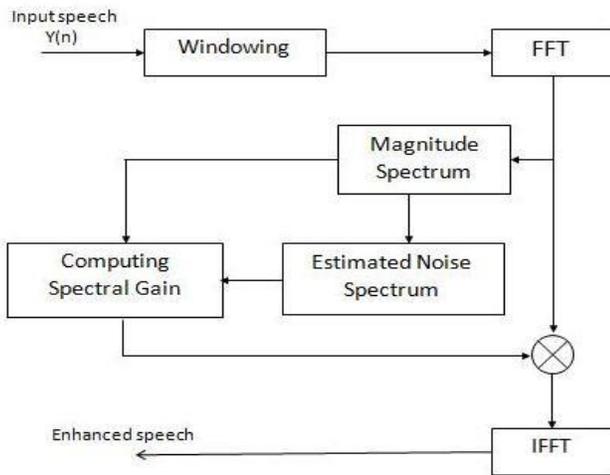


Figure 1: Basic block diagram

The noisy input signal is sent through the analysis window. Here, a few samples of the signal are selected at a time as the signal is continuous and big and cannot be processed in one go. Fast Fourier Transform is applied to convert the signal from time domain to frequency domain. The magnitude of noise and noisy speech are compared and noise is subtracted from the affected speech. The enhanced speech received is in frequency domain and hence requires to be converted back to frequency domain. This is done by taking Inverse Fourier Transform. Overlap and add method is applied to the recovered enhanced signal so as to compensate for the windowing method applied in the beginning.

### IV. TYPES OF FILTERS

#### A. Spectral Subtraction method

The Spectral Subtraction method is one of the most widely used methods of speech enhancement. This is because of the simplicity of implementation and lower computational load. The power spectrum or magnitude Spectrum of the speech signal can be easily restored using approach. The estimated noise spectrum is subtracted from the noisy speech input in order to obtain clean speech. It reduces the effect of background noise based on the STSA estimation technique [8-9].

The effectiveness in enhancing the speech signal, degraded by noise, makes this technique a popular one. The basic principle includes subtraction of magnitude spectrum of noise from that of noisy speech. The noise spectrum is estimated during the periods when only noise is present. The noise is assumed to be uncorrelated and additive in nature. Since phase distortion is not perceived by human ear, it is kept unchanged.

The simple subtraction process perhaps comes with a price. The subtraction process needs to be done carefully in order to avoid any distortion. If too much noise is subtracted, then some speech information might be lost. On the other hand if too little is subtracted then the distortion will remain in the speech.

The block diagram given in [10] is as shown in Fig. 2.

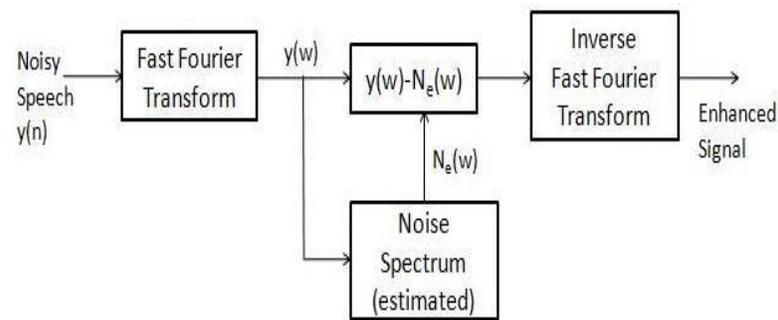


Figure 2: Spectral Subtraction

Noisy Speech,  $y(n)$ , is given as an input to this filter. Windowing is done in order to take fixed number samples of the signal which is continuous in nature. In this method only the magnitude is considered. The phase part is not taken into consideration as it increases the complexity and calculations. Fourier transform is applied to the signal in order to convert the signal from time domain to frequency domain. This helps us to obtain magnitude and phase as separate values. The magnitude of estimated noise,  $N_e(w)$ , is subtracted from the magnitude of noisy signal and an enhanced Speech is obtained at the output of spectral modification block. Inverse Fourier transform of the enhanced speech is taken so as to obtain the signal in its time domain form. Phase of signal, in its original form, is added to the magnitude at this stage. Thus we obtain an enhanced version of the noisy Speech signal at the output end.

#### B. Wiener Filter

For more than two decades, speech processing has been a growing and dynamic field. This clearly indicated further growth and development. To optimize the filter we need to minimize the mean square error value of the filter. This is done by calculating the difference between the desired response and the actual filter output. Wiener filter is described as a class of optimum linear filters [11-12]. These filters involve linear estimation of a desired signal sequence from another related sequence. This technique is widely used in the field of signal processing. Wiener filter is a

common as well as an adaptive filtering technique and is the solution for stationary input signals.

The filter first originated in Kalman's document (1960). In the document [13], it is described as a recursive solution for the linear filtering problems. Estimation of values through the recursive least squares was based on state-space models. Based on different application requirements, a Wiener filter is designed to enhance the signal for that very desired frequency response. But before the actual processing, the spectral properties of the original signal and noise should be known.

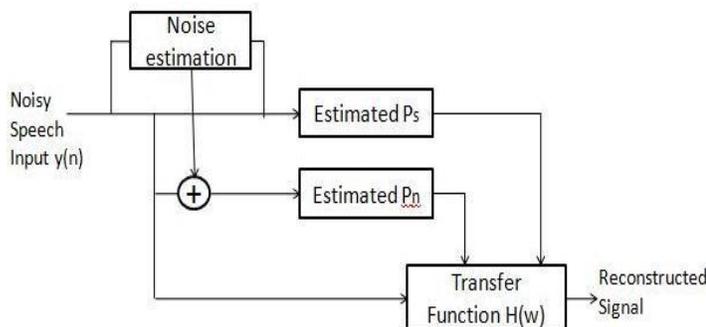


Figure 3: Wiener filter

Shown above in Fig. 3, is the block diagram of Wiener filter. In this process, mean the noisy speech is represented as  $P_s(w)$  and mean of noise power is represented as  $P_n(w)$ , which is calculated for recovering the original signal.

### C. Minimum Mean Square Error

Minimum mean square error technique can be implemented when the input SNR is known. This algorithm minimizes the estimated error due to both noise and clutter. It is an implementation of Wiener Filter. The STSA estimation problem is to estimate the modulus of each complex Fourier expansion coefficient of the speech signal from the noisy speech in that analysis frame [14]. Fourier expansion series are samples of its Fourier Transform and have a close relation [15-17]. The relation between Fourier series expansion and discrete Fourier transform enables use of FFT for efficient implementation of the algorithm.

For implementation of the MMSE STSA estimator, the a-priori-probability distribution of the Speech and noise Fourier expansion coefficients should be known. Since in real-time they are unknown, each probability distribution can be measured or a reasonable statistical model be assumed. In this paper, the Speech and the noise are neither stationary nor Ergodic processes. Thus probability distribution can be obtained by examining independent sample functions belonging to the ensemble of each process. However, due to non-stationary nature of process, probability distributions are time varying, their measurement and characterization by the above way is complicated, and the procedure seems to be impracticable.

The only disadvantage of the MMSE processor [18] is additional complexity in determining the linear estimator. Further, for large problems, the matrix inverse operation required to implement the MMSE estimator is very problematic and can slow down processing speed, like in the field of radar signalling. Another implementation of the MMSE algorithm can be developed and the data vector can be split into smaller segments to reduce processing time.

The basic block diagram of MMSE filter is shown in Fig. 4

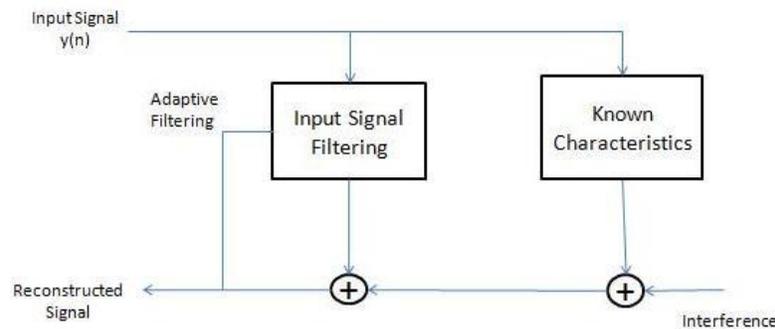


Figure 4: MMSE Filter

### D. Kalman Filter

Kalman filter (KF) algorithm is based on continual implementation of the MMSE estimator [19]. It is a set of mathematical equations providing an efficient computational means to estimate the state of a process. In this way, it recursively minimizes the mean of the squared error. It uses state space model to deliver an admirable way of extracting a signal from noise. These state space models are described by an Auto-Regressive (AR) process. Hence, this fast process is able to produce practical solutions to problems which posed a significant hurdle in the Wiener filter.

The Kalman is a digital filter that automatically adjusts itself (when the input signal and interfering noise change) to give you the best possible idea of what the current state of the system is. The Kalman filter keeps updating and improving itself by trying to predict the newest value and then comparing this to the observed /estimated value. It does not directly refer to estimated iteration, but in fact it makes the best possible use of the entire history of the data to figure out what next estimation, despite the interfering noise. The covariance formed from the prediction described in [20], with a new estimate every step is repeated with every sample of data can be shown as:

$$X_k = K_k \cdot Z_k + (1 - K_k) \cdot X_{k-1} \quad (1)$$

Where,

- $X_k$  is the current estimation,
- $X_{k-1}$  is the previous estimation,
- $K_k$  is Kalman Gain and
- $Z_k$  is measured value.

It is an optimal estimator i.e. it infers parameters of interest from ambiguous, unreliable and indistinct observations. If all noise is White Gaussian, the Kalman filter minimizes the mean square error of the estimated parameters. Given only the mean and standard deviation of noise, the Kalman filter is the best *linear* estimator. Based on a state space approach it models signal generation and the noisy and distorted observation signal is modelled by an observation equation [21-22]. The use of Kalman filter for Speech Enhancement was first introduced by Paliwal (1987).

The advantages of Kalman Filtering Technique are good results in practice due to optimality and structure. The filter is distinguished by its skill to predict the state of a model in the past, present and future, although the exact nature of the modelled system is unknown. The dynamic modelling of a system is one of the key features which distinguish the Kalman method. Because of its apparently simple and easily programmed algorithm, the Kalman filter will continue to play a very important role in GPS-based navigation systems.

The disadvantages of Kalman Filtering Technique are that it is necessary to know the initial conditions of the mean and variance state vector to start the recursive algorithm. There is no general consent over the way of determining the initial conditions.

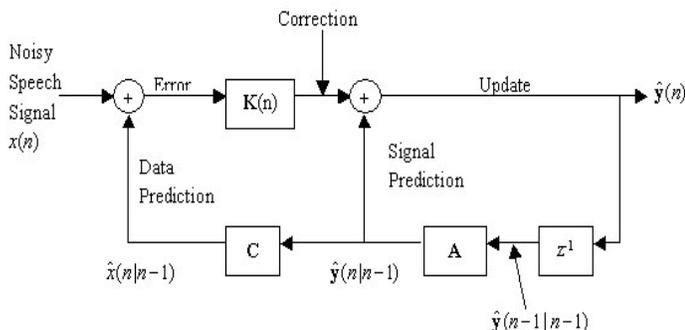


Figure 5: Kalman Filter

As shown in Fig. 5, the input Speech signal is taken and distortion of noise in the signal is found. The current output is based on the past output and current input which is solved using Yule's equation. All the parameters are represented in the form of state space matrix because it makes calculations easier. Next filter gain is calculated and noise is then removed from the noisy Speech input to get enhanced Speech signal.

## V. MEASURES OF PERFORMANCE PARAMETERS

### A. Signal-to-Noise Ratio (SNR)

Signal-to-noise ratio is a measure used in science and engineering that compares the level of a desired signal to the level of background noise as given in [3].

Signal-to-noise ratio is sometimes used to refer to the ratio of useful information to irrelevant data in a conversation or exchange. Signal-to-noise ratio is defined as the power ratio between a signal (meaningful information) and the background noise (unwanted signal). It is measured in dB and is represented as SNR or S/N. The Signal to Noise ratio can be represented as:

$$SNR = 10 \times \log_{10} \frac{\text{mean}(\text{Input}^2)}{\text{mean}(\text{Input}^2 - \text{Enhanced}^2)}$$

### B. Mean Square Error (MSE)

The Mean Squared Error (MSE) measured in dB is one of the ways to determine the difference between values implied by an estimator and the true values of the quantity being estimated. MSE corresponds to the expected value of the squared error loss. MSE measures the average of the squares of the "errors". The difference between

the values implied by estimator and the quantity which is to be estimated gives us the error value of the signal. The randomness of signal or the inability of the system to produce accurate values at the output gives rise to error in the signal. The Mean Square Error can be represented as:

$$MSE = \frac{1}{\text{length}(\text{Input})} \times \sum (\text{Enhanced} - \text{Input})^2$$

### C. Normalized Root Mean Square Error (NRMSE)

The Root Mean Square Error (RMSE) also known as Root-Mean-Square Deviation (RMSD) is a frequently used measure to find the normalised value of difference between the values predicted by an estimator and the values that are actually observed. The RMSE provides us with an average of the magnitude of errors calculated over a period of time. RMSE is a good measure of accuracy of a system. It can be calculated by using the generalized equation given below:

$$NRMSE = \frac{\sqrt{\text{mean}[(\text{Input} - \text{Enhanced})^2]}}{\sqrt{\text{mean}\{[\text{Input} - \text{mean}(\text{Input})]^2\}}}$$

### D. Peak Signal-to-Noise Ratio (PSNR)

Peak Signal-to-Noise Ratio, often abbreviated PSNR, is used to represent the ratio of maximum possible value of a signal to the power of the undesired noise signal. Because many signals have a very wide dynamic range, PSNR is usually expressed in terms of the logarithmic decibel scale. PSNR is generally used to measure the quality of reconstruction of lossy compression codes.

In case of image compression, for example, the signal is the original image and the noise is the error introduced due to compression. PSNR is basically an approximate value to the human perception of the quality of reconstruction of speech signal. A higher PSNR indicates that the reconstructed signal has a better quality but the reverse may be true in case of some applications. PSNR can be calculated by:

$$PSNR = 10 \times \log_{10} \frac{\text{length} \times \max [Input^2]}{Input^2 - Enhanced^2}$$

E. Distortion (AAD)

Distortion is basically the alteration or warping of the original shape or other characteristics of an object, image, sound or waveform. Distortion is usually unwanted, and often efforts are made to reduce it as much as possible. The addition of noise or other outside signals (hum, interference) may lead to distortion of signal. In this project we use the parameter AAD to measure the distortion in the given Speech signal. AAD is generally equated as shown below:

$$AAD = \frac{1}{\text{length}(Input)} \times \sum (Enhanced - Input)$$

VI. EXPERIMENTAL RESULTS

The above mentioned techniques of speech enhancement were applied to the noisy speech input and the performance parameters were evaluated as below.

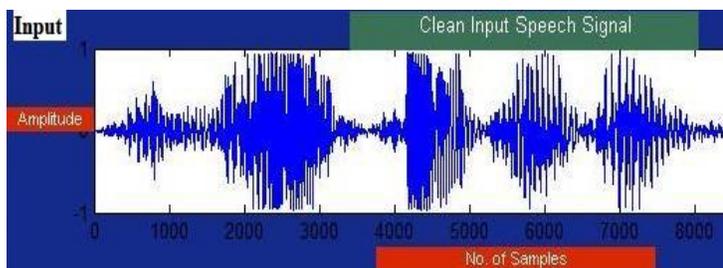


Figure 6: Clean Speech

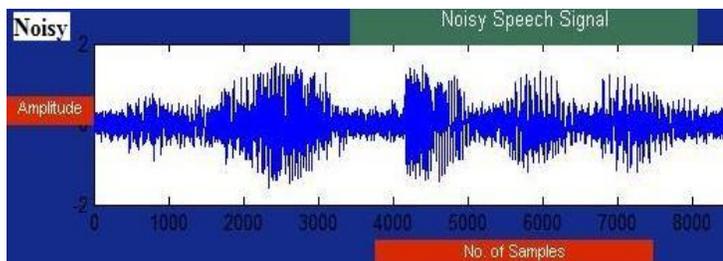


Figure 7: Noisy Speech

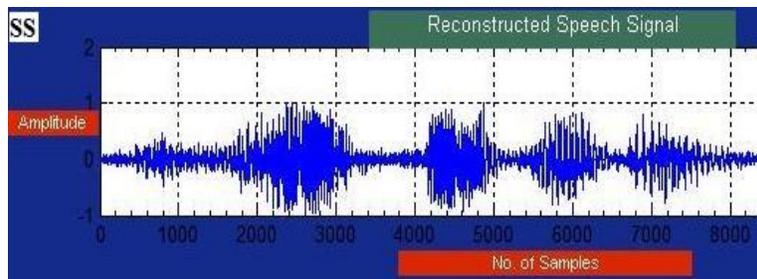


Figure 8: Spectral Subtraction Output

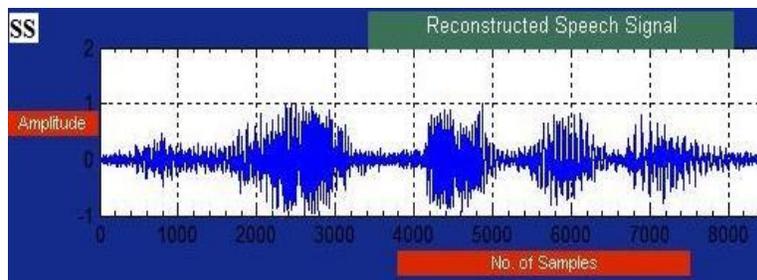


Figure 9: Weiner Filter Output

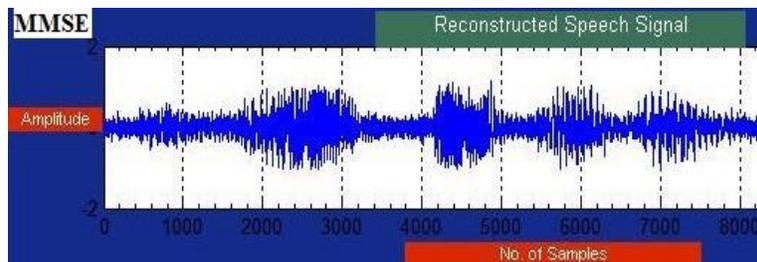


Figure 10: MMSE Filter Output

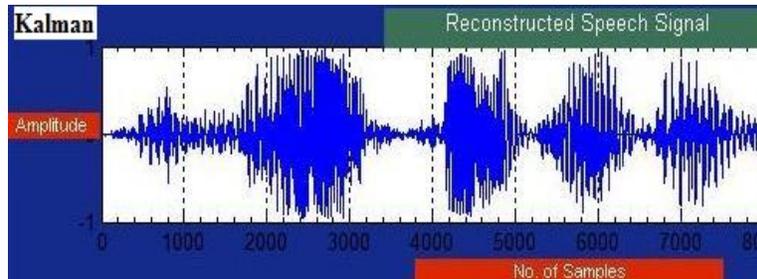


Figure 11: Kalman Filter Output

VII. CONCLUSION

The technique most suitable for speech enhancement is the one which provides robustness to environmental noise contributing factors and robustness to acoustical inputs.

Table 1: Parameters for input SNR of 2dB

PARAMETERS	Weiner	SS	MMSE	Kalman
Output SNR	2	2	4	3
PSNR	25	22	20	23
MSE	5.661e-007	4.405e-006	2.998e-006	5.300e-006
NRMSE	3.306e-001	5.246e-001	6.477e-001	4.621e-001
AAD	8.165e-006	2.277e005	1.879e-005	2.498e-005

Table 2: Parameters for input SNR of 5dB

PARAMETERS	Weiner	SS	MMSE	Kalman
Output SNR	4	3	5	4
PSNR	29	24	20	24
MSE	1.306e-007	2.168e-006	1.574e-006	2.853e-006
NRMSE	2.173e-001	3.829e-001	5.594e-001	3.657e-001
AAD	3.921e-006	1.598e-005	1.361e-005	1.833e-005

Table 3: Parameters for input SNR of 10dB

PARAMETERS	Weiner	SS	MMSE	Kalman
Output SNR	6	4	7	4
PSNR	32	24	20	25
MSE	9.301e-011	2.676e-008	5.544e-008	3.590e-007
NRMSE	1.186e-001	2.863e-001	4.560e-001	2.662e-001
AAD	2.391e-007	1.363e-006	1.761e-005	2.407e-006

Table 4: Parameters for input SNR of 15dB

PARAMETERS	Weiner	SS	MMSE	Kalman
Output SNR	8	4	8	5
PSNR	35	25	21	26
MSE	1.348e-010	1.281e-007	7.085e-007	1.435e-008
NRMSE	7.726e-002	2.365e-001	3.948e-001	2.144e-001
AAD	1.260e-007	3.884e-006	1.663e-005	7.458e-006

Table 5: Parameters for input SNR of 20dB

PARAMETERS	Weiner	SS	MMSE	Kalman
Output SNR	9	4	9	5
PSNR	36	26	21	26
MSE	1.321e-012	3.942e-009	3.696e-007	7.397e-011
NRMSE	6.500e-002	2.186e-001	3.663e-001	1.965e-001
AAD	1.247e-008	6.814e-007	6.597e-006	9.333e-008

In this paper, we have reviewed the methodologies and principles of various techniques and presented the analysis in GUI MATLAB. Based on the performance parameters the following points have been concluded:

- Wiener Filter follows statistical approach and could be tuned to provide optimal performance.
- Kalman has the ability to estimate accurately by using autoregressive (AR) modeling and is suitable for real-time applications.
- Spectral Subtraction is a real time filter which is relatively easy to implement for stationary noise.
- MMSE provides best values for the most parameters under given conditions and hence is most suitable technique for speech enhancement.

A graphical representation for comparison of the above mentioned techniques based on SNR and PSNR values is as below:

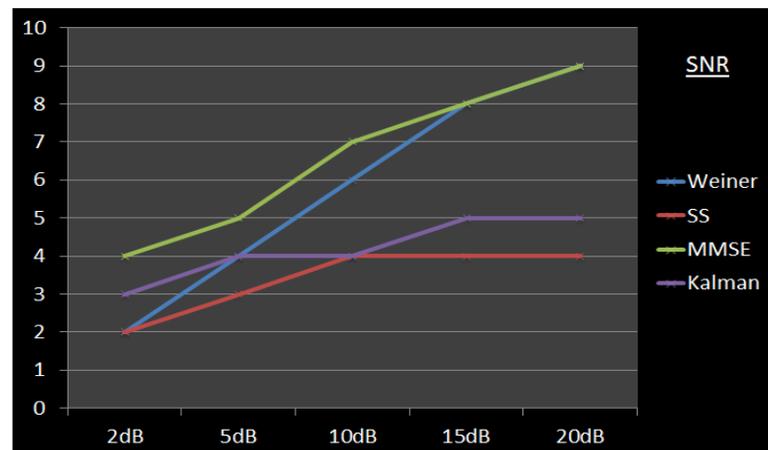


Figure 12: SNR comparison

The above graph provides a comparison between input SNR for each technique and their respective output SNR. The signal to noise ratio for MMSE is more than all filters for any value of input SNR whereas that of Spectral subtraction is the least for all values of inputs SNR.

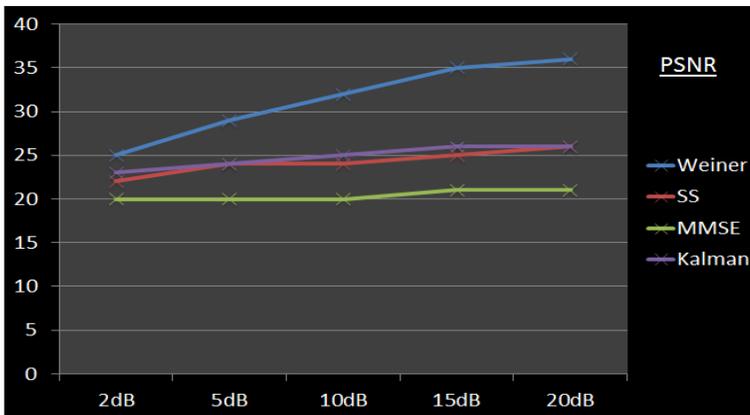


Figure 13: PSNR comparison

The graph given shows the value of peak Signal-to-noise ratio for all speech enhancement techniques. The value of PSNR is greatest for Wiener filter for all values of input SNR. Whereas MMSE filter has the least Peak Signal to Noise Ratio.

### VIII. APPLICATIONS AND FUTURE SCOPE

- Cell phone call quality enhancement
- Pay phones in a noisy environment
- Air-ground communication systems
- Teleconferencing systems
- Hearing aids

### IX. CONCLUSION

From the graphs we can clearly see and eventually conclude that MMSE filter provides the best SNR ratio which a major requirement as we cannot accept a filter degrading the original speech. It also filters out the noise and renders us with clean speech in a more flat line Peak SNR value in a varying loudness of speech. We tried out playing the reconstructed signal after processing the noisy speech using the four filters and MMSE definitely sounded better than the rest.

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# Effect of Siddha Samadhi Yoga Camps on Health and Nutritional Status of Obese and Diabetic Subjects

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**Abstract:** Yoga and meditation have long been considered to have beneficial effects on health. Many yoga camps in India banking on this belief claim to have the powers of reversing the ill effects of degenerative diseases. This paper examines the cumulative beneficial effects of Yoga, Meditation and changed food habits designed by one such camp, the Siddha Samadhi Yoga (SSY) camp on Obese and Non Insulin Dependent Diabetes Mellitus (NIDDM) subjects. Thirty obese and thirty NIDDM male subjects free from additional complications belonging to twenty five to forty five years of age were selected from two camps conducted in Mahaboob Nagar and Tirupathi. The BMI of all subjects was assessed. Blood samples were analyzed for post prandial blood glucose; serum cholesterol; serum iron and haemoglobin levels. Diet Survey was conducted on the basis of food intake record provided by the subjects. The food habits of obese and NIDDM subjects before and after the SSY camp of 18 days was also studied. There was a significant difference in pre and post prandial blood glucose level of obese subjects ( $t = 7.6582 > 2.05$ ) and NIDDMs ( $t = 24.4962 > 2.05$ ). The percent reduction in BMI is 7.8 and 4.1 in obese and NIDDM subjects respectively. Serum cholesterol levels among NIDDM subjects reduced by 4.1% and by 3.4% in obese subjects. Serum Iron and haemoglobin levels improved by 1.2% and 14.7% respectively in obese subjects while by 5% and 7.5% respectively in NIDDM subjects. The SSY camp has a significant effect in decreasing the post-prandial blood glucose and serum cholesterol levels, intake of calories, carbohydrates, cholesterol, fat and significant increase in the intake of fiber, vitamin C, iron and B-carotene.

**Key words:** Blood glucose, NIDDM, Obese, Serum Cholesterol, Siddha Samadhi Yoga Camp.

## I. INTRODUCTION

Degenerative diseases and cancer are emerging as major causes of death not only in India but in other South and Southeast Asian countries as well. If present trends continue, India could emerge as one of the countries with the highest concentration of cases of diabetes mellitus and coronary heart disease (CHD) within the next three decades<sup>1</sup>.

Obesity threatens to become the foremost cause of chronic disease in the world. Being obese can induce multiple metabolic abnormalities that contribute to cardiovascular disease, diabetes

mellitus, and other chronic disorders. Reasons for the rising prevalence include urbanization of the world's population, increased availability of food supplies, and reduction of physical activity<sup>[2]</sup>.

Evidence from several studies indicates that obesity and weight gain are associated with an increased risk of diabetes<sup>[3,4]</sup> and that intentional weight loss reduces the risk that overweight people will develop diabetes<sup>[5]</sup>.

Obesity is generally regarded as one of the most common and serious nutritional problems confronting many communities today. Adults in India suffer from a dual burden of malnutrition; more than one-third of adults are too thin, and more than 10 percent are overweight or obese<sup>[6]</sup>.

Diabetes mellitus is one of the most common chronic diseases across the world and number of diabetic patients is on rise. In 2011 there were 366 million people with diabetes globally, and this is expected to rise to 552 million by 2030. Most people with diabetes live in low- and middle-income countries like India, and these countries will also see the greatest increase over the next 19 years<sup>[7]</sup>. The estimate of the actual number of diabetics in India is around 40 million<sup>[8]</sup>.

Yoga, a form of physical exercise, is rapidly gaining popularity all over the world, not only for health and physical fitness, but also for therapeutic purposes. Yoga interventions are generally effective in reducing body weight, blood pressure and glucose level<sup>[9]</sup>. Yogic training tends to reduce the cholesterol level which is significant in individuals having above normal limits<sup>[10]</sup>. Yoga, a simple and economical therapy can be considered a beneficial adjuvant for NIDDM patients<sup>[11]</sup>. Meditation reduces bodily stress which is evident with reduced blood levels of cortisol and a lowered rate of urinary excretion of nitrogen and may prove useful for persons suffering from anxiety state and depression<sup>[12]</sup>.

Antioxidant deficiency and free radical stress may be a risk factor for the development of diabetes and cardiovascular disease. It is possible that treatment with antioxidant vitamins may be protective<sup>[13]</sup>. Now-a-days a new way of life comprising of *yogasana*, *pranayama*, meditation and changed food habits which is expected to lead a happy purposeful life with heightened consciousness and perceptiveness. One such yoga camp is Siddha Samadhi Yoga (SSY) camp which is said to invoke the true intellectual, emotional, mental and physical potential in each individual. These yoga camps claim to have the powers of reversing the ill effects of degenerative diseases<sup>[14]</sup>.

II. MATERIALS & METHODS

Thirty obese and thirty NIDDM male free from further complications of twenty five to forty five years of age were selected from two camps conducted in Mahaboob Nagar and Tirupathi, Andhra Pradesh, India. General information regarding economic status, educational status, occupation, family size etc. was elicited using General information questionnaire.

The BMI of all subjects were calculated based on the heights and weights recorded. Blood samples were analyzed for post prandial blood glucose; serum cholesterol; serum iron and haemoglobin levels. Diet Survey was conducted on the basis of food intake record provided by the subjects before and at the end of the SSY camp of 18 days.

The height and weight of all subjects were recorded following the methods of Jellifee [15] BMI was calculated using the formula weight in kg / height in (m<sup>2</sup>) and compared with standard classification of James et al(1998). Five ml of the blood was drawn from each subject and divided into three portions, one for estimation of blood glucose by Nelson and Somayagi [16] method, second for the estimation of serum cholesterol by Carr and Dreker [17] Method and the other for serum iron by  $\hat{a} - \hat{a} -$  dipyrldly method [18], and finger prick samples were collected to estimate haemoglobin levels by cyanomethaemoglobin method [19].

Diet survey was conducted to note down the food items consumed over a period of three days (2 working days + 1 holiday) before and at the end of the SSY camp using standard cup to measure the food they consumed. Based on the food intake record food consumed per day was computed. The mean nutrients were calculated by using the tables of food values.

The data on BMI, blood glucose; serum cholesterol; serum iron and haemoglobin levels, Dietary pattern and intake and personal well being of obese and NIDDM subjects was analyzed statistically. The percentages, mean, standard deviation, t- value and their test of significance were calculated.

III. RESULTS & DISCUSSION

The results on the effect of yoga camp on health status of obese and NIDDM subjects with reference pre and post levels of blood glucose and serum cholesterol is presented in Table 1 & 2.

Table 1: Pre and post levels of blood glucose levels of obese and NIDDM Subjects (n=30)

Details of subjects	Levels	Blood Glucose		
		Mean $\pm$ SD	Difference in pre & post mean $\pm$ SD	t' value
Obese Subjects	Pre-level	149.03 $\pm$ 6.20	3.63 $\pm$ 2.59	7.66
	Post-level	145.40 $\pm$ 5.44		
NIDDM Subjects	Pre-level	233.43 $\pm$ 19.84	35.38 $\pm$ 7.91	24.49
	Post-level	198.05 $\pm$ 6.21		

The mean difference between the pre and post blood glucose level of obese and NIDDM subjects were 3.64mg/dl and 35.38mg/dl respectively. The percent reduction of blood glucose was 2.44  $\pm$ 2.59 in obese and 15.2  $\pm$  7.9 in NIDDM subjects.

Statistically there is a significant difference in pre and post prandial blood glucose level of obese subjects (t = 7.6582 > 2.05) and NIDDM subjects (t = 24.4962 > 2.05). The 't' value is greater than 't' critical value at 5 percent level.

Generally among normal subjects before breakfast blood usually contains about 80mg/dl glucose. After a meal the concentration rises because, the glucose absorbed from the gut passes through the liver in to general circulation, it may reach 132mg or even more, but rarely exceeds 177mg at which point glucose usually into the urine and in NIDDM subjects the mean fasting blood glucose level is very high, 120mg/dl and the post prandial level is higher180mg/dl. It is observed that half of the subjects have above the normal range of post-prandial blood glucose level and in NIDDM subjects were having above the limits.

Table 2: Pre and post levels of serum cholesterol levels of obese and NIDDM Subjects (n=30)

Details of subjects	Levels	Serum Cholesterol		
		Mean $\pm$ SD	Difference in pre & post mean $\pm$ SD	t' value
Obese Subjects	Pre-level	258.97 $\pm$ 8.84	8.92 $\pm$ 4.2	11.60
	Post-level	250.05 $\pm$ 7.82		
NIDDM Subjects	Pre-level	225.83 $\pm$ 4.56	9.13 $\pm$ 3.25	15.48
	Post-level	216.64 $\pm$ 6.18		

The mean difference between the pre and post serum cholesterol level of obese and NIDDM subjects were 8.92mg/dl and 9.19 mg/dl respectively. The percent reduction of serum cholesterol level in obese was 3.44  $\pm$  4.20 and 4.069  $\pm$  3.249 in NIDDM subjects.

The effect of yoga camp of obese and NIDDM subjects on the pre and post serum iron is presented in Table 3.

Table 3: Serum iron levels before and after SSY camp (n=30)

Details of Subjects	Levels	Serum Iron		
		Mean $\pm$ SD	Difference in pre & post mean $\pm$ SD	t' value
Obese Subjects	Pre-Levels	139.41 $\pm$ 7.97	6.69 $\pm$ 3.23	11.35
	Post-Levels	146.10 $\pm$ 7.28		
NIDDM Subjects	Pre-Levels	138.79 $\pm$ 8.90	6.94 $\pm$ 3.43	11.06
	Post-Levels	145.73 $\pm$ 8.17		

The difference in pre and post serum iron levels was 1.69  $\mu$ g/dl in obese and 145.73  $\mu$ g/dl in group II. The percent increase in serum iron levels was 1.2  $\pm$  7.28 in obese against an increase of 5.0  $\pm$  3.43 in NIDDM subjects. There was a significant between pre and post serum iron levels of obese (t = 11.354>2.05) and NIDDM (11.063>2.05) subjects.

The effect of yoga camp of obese and NIDDM subjects on the pre and post levels of dietary pattern are presented in Table 4.

Table 4: Blood Haemoglobin levels of male subjects before and after SSY camp (n=30)

Details of Subjects	Levels	Blood Haemoglobin Levels		
		Mean $\pm$ SD	Difference in pre & post mean $\pm$ SD	t' value
Obese Subjects	Pre-Levels	10.16 $\pm$ 0.87	1.49 $\pm$ 0.62	7.85
	Post-Levels	11.66 $\pm$ 0.89		
NIDDM Subjects	Pre-Levels	10.23 $\pm$ 0.98	0.77 $\pm$ 0.61	6.69
	Post-Levels	10.99 $\pm$ 0.97		

The mean pre blood haemoglobin levels of obese and NIDDM subjects were 10.16g/dl and 10.23g/dl respectively. The post levels were 11.66g/dl and 10.99 g/dl respectively. Healthy normal adult man has about 13 – 14g% blood haemoglobin<sup>11</sup>. The difference between pre and post level among obese subjects was 1.49g/dl and percent increase in haemoglobin was 14.71 $\pm$ 0.87 and the difference between pre and post levels of NIDDM subjects was 0.77g/dl and percent increase in haemoglobin was 7.55 $\pm$ 0.61 among NIDDM subjects.

In diabetics as the concentration of glucose in blood rises, more of it gets attached to haemoglobin and the combined molecule chemically estimated as glycosylated haemoglobin. In normal population the glycosylated haemoglobin concentration varies from 4 to 7%, while in diabetics it ranges from 8 to 18% of the total haemoglobin depending on the blood sugar level.

The effect of yoga camp of obese and NIDDM subjects on the pre and post levels of dietary pattern are presented in Table 5.

Table 5: Mean Nutrient intake of Subjects before and during SSY program (n=30)

Nutrients	Obese Subjects		NIDDM Subjects	
	Before	During	Before	During
Energy(Kcal)	1954.55	1667.51	1786.63	1576.84
Carbohydrate(g)	264.79	211.82	247.76	193.89
Protein (g)	59.89	57.95	53.45	50.60
Fat (g)	58.94	43.43	50.03	53.38
Fiber (g)	1.70	4.34	1.69	3.52
Iron(mg)	26.8	28.10	19.89	25.20
B- Carotene( $\mu$ g)	1711.8	1940.38	1735.00	2002.2
Vitamin C(mg)	26.49	35.58	28.30	39.70

14.71 percent reduction of calories was observed in obese and 11.74 in NIDDM subjects. Percent reduction in carbohydrate intake was 20 & 21.74; Protein (3.24 & 5.33); Fat (26.31 & 29.28) dietary cholesterol (12.89 & 12.02) was observed in obese and NIDDM subjects respectively. Percent increase in intake of fiber (60.82 & 51.89) and Iron (31.83 & 26.69) was observed in obese and NIDDM subjects respectively. The percent intake of carotene was 14.71 in obese and 13.4 in NIDDM subjects but these values are still lower than the standard recommended intake which may be due to lowered intake of diet.

#### IV. SUMMARY

The SSY camp has a significant effect in decreasing the post-prandial blood glucose and serum cholesterol levels, intake of

calories, carbohydrates, cholesterol, fat and significant increase in the intake of fiber, vitamin C, iron and B-carotene. The correlations obtained between the health parameters, hematological parameters and the energy and nutrient intakes are very obvious and significant.

#### V. CONCLUSION

A conscious sustained effort practiced through attitudinal changes implemented on right food habits and choices, exercise, yoga and meditation may have a cumulative impact on the continued beneficial effect on health and over all wellbeing.

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# A Comparative Study on the Living Conditions and Nutritional Status of Elderly in Paid and Unpaid Homes of Chennai, India

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**Abstract:** *The transition from the traditional pre-industrial to modern phase of development of society in India has in many ways changed the social context of the adjustment of the aged. In India, the elderly population depends heavily on the family for economic and emotional support. With joint family system, slowly diminishing the elderly are now being placed in 'Homes' and left to the care of such Organizations. This study compares the living conditions and nutritional status of elderly in selected paid and unpaid homes in Chennai, India. The living conditions and physical facilities provided are also assessed and compared. The nutritional status of one hundred and forty elderly from paid and unpaid homes was assessed using subjective, anthropometric and clinical parameters. The BMI of the elderly in unpaid homes was within the normal range of 17.5 to 24.9kg/m<sup>2</sup>. It was found that the women in the age group of 52 to 64 years had higher BMI than their older in both the sexes. The women in the 75+ age group range were malnourished while the rest were normal in paid homes. The clinical signs of nutritional disorders were, in general, not specific and mostly associated with old age. The awareness levels of elderly in nutrition knowledge revealed a mean 36%. Significant differences were observed between homes on their opinion towards food provided, physical facilities available, nutritional knowledge and sanitary conditions. However, individual differences were also observed within the homes in all the criteria assessed.*

**Key words:** *Elderly, Institutionalization, Nutritional Status, Paid Homes, Unpaid Homes*

## I. INTRODUCTION

The population of the aged is on the increase the world over as never before and holds a serious social and economic implication. India is a 'mature' community and with the population above 60 years increasing steadily, by the turn of the century it will become an ageing society.

People over 54 constitute about 12.4% of the Indian population. According to the United Nation's Population Fund (UNPF) and Help Age International, India has around 100 million elderly at present and the number is expected to increase to 323 million constituting 20% of the total population, by 2050<sup>[1]</sup>. Irudaya Rajan and Kumar (2003) analyzed the National

Family Health Survey (1992 – 93) data and found that a large majority (88%) of the older persons in India live with their kin<sup>[2]</sup>. Despite the belief that children are the security of the aged, institutions for the aged are mushrooming since the 1990's. In 1998, India has 728 old age homes<sup>[3]</sup> while the recent statistics reveal that there are 1281 old age homes in India<sup>[4]</sup>

These demographic changes has been accompanied with a fast changing family structure due to forces like urbanization and migration which are not quite conducive to the welfare of the elderly<sup>[5]</sup>. The institutionalization of the elderly which began as early as 1901 still remains inadequate when compared to the structured institutions of the West<sup>[6]</sup>.

The trend clearly reveals that ageing has become a major social challenge and vast resources will be required towards support, care and treatment of the older persons<sup>[7]</sup>.

Many factors are likely to influence the levels of institutionalization among the old. These include the availability of family support for old people who are no longer able to maintain full independence, income, housing, provision of health and welfare services and prevalence of mental and physical disability.

Among the numerous environmental / external factors that modulate ageing, nutrition plays a significant role. The inseparable triad of nutrition, ageing and health is the logical basis for appropriate management of problems that arise and interfere with the interdependent factors.

In India, this section of the population depends on their children for physical, moral and financial support. However, owing to the socio-cultural changes occurring in India and the joint family system slowly diminishing the emergence of institutional homes is on the rise with steady increase in the number of inmates joining institutions.

The elderly taking shelter in old age homes are either willingly or forced to live in such circumstances for varied reasons. With this the elderly may perceive to live in an environment which is either alien to their own and or adapt to the changing environment and circumstances imposed on them. This study focuses on the physical facilities, sanitary conditions, nutritional status and nutritional knowledge of elderly in old age homes and compares the variables between paid and unpaid homes.

## II. METHODOLOGY

### Study design:

**Selection of Homes:** Two paid and two unpaid homes in the city of Chennai were selected based on purposive sampling from the list of homes published by “Vishranthi Charitable Trust” under the Help age India, Chennai Region.

**Selection of sample:** All the inmates aged >52 years willing to respond to the investigator, having no physical disabilities like being stone deaf, dumb, lame and not bedridden were selected from two paid homes (PH1 and PH2 )and two unpaid homes (UP1 and UP2). A total of 140 participants formed the study group out of which 68 and 72 inmates were from paid and unpaid homes respectively.

**Tools for Data Collection:** A pre-tested Interview Schedule; Knowledge Assessment Questionnaire (KAQ); Observation Schedule and Clinical assessment schedule published by NAC ICMR was used to elicit information from the inmates on the a) General information b) Anthropometric measurements which includes Height, Weight, Mid –Arm Circumference c) Nutritional Knowledge and d) sanitation in and around the homes.

**Statistical Analysis:** The data collected were subjected to a) Arithmetic mean and Standard Deviation b) Multiple Analysis of Variance (MANOVA) and c) Distance matrix.

## III. RESULTS AND DISCUSSION

The nutritional status of one hundred and forty elderly from paid and unpaid homes was assessed using subjective, anthropometric and clinical parameters. The sanitary conditions in and around the four homes were also observed.

### General Information

**Age:** The age of the respondents was found to range from 52 to 85 years. 18% belonged to 52-64 years, 37% belonged to 65-74 years and 45 % of them were 72 years and beyond.

**Sex:** 41% men and 59% women were institutionalized in both paid and unpaid homes.

### Life style pattern

**Education:** A majority (61%) of inmates in unpaid homes were high school dropouts in unpaid followed by illiterates (24%), higher secondary school education (11%) and graduates (4%). A majority (40%) of inmates in paid homes were high school dropouts followed by inmates having higher secondary school education (32%), graduates (18%), and illiterates (10%).

**Occupation:** 84% in paid homes had been sedentary workers, 15% heavy workers and 1% moderate workers while 64% in unpaid homes had been sedentary workers, 32% heavy workers and the rest moderate workers. One out of every two women in paid homes had been working before being institutionalized and 59% in unpaid homes had been employed.

**Family Type:** All the respondents had come from nuclear families in unpaid homes while 71% in paid homes had come from nuclear families.

### Nutritional parameter

#### Anthropometry:

The respondent’s height & weight were measured, based on which BMI was calculated for each subject. The mean height of the male inmates in paid and unpaid homes were observed to be 158.6±3.7 and 156.5±1.4 cm respectively. The mean height of the female inmates in paid and unpaid homes were observed to be 151.8±3.0 and 142.0±3.4cm respectively.

The mean weight of the male inmates in paid and unpaid homes were observed to be 55.5±3.3 and 49.9±1.9 cm respectively. The mean weight of the female inmates in paid and unpaid homes were observed to be 58.8±2.1 and 46.4±1.2cm respectively.

The average BMI of males in paid and unpaid homes were 21.9 + 1.6 and 19.4 + 1.9 respectively and the average BMI of females in paid and unpaid homes were 19.9 + 0.8 and 20.6 + 0.3 respectively.

The BMI of all the age groups was well within the normal range except for women in the 75+ age group who were malnourished even extending to the severe malnourished stated of body mass index ≤ 11.5. Maximum deviation was found in men in the 52-64 years age group.

The Mid-arm circumference was found to be higher in men. There was little difference within the age group of both men and women in paid and unpaid homes

#### Clinical assessment:

The clinical signs of nutritional disorders were, in general, not specific and mostly associated with old age.

#### Nutritional knowledge

The Knowledge Assessment Questionnaire (KAQ) developed to assess the knowledge levels on food and its functions; balanced diet; nutrients and its sources; role of nutrients in the human body; common nutritional deficiencies revealed a mean score of 22 against a maximum score of 50. 35% of the subjects scored 22, 27.5% scored 16, 22.5% scored 28 and 15% scored 26.

The knowledge levels of the subjects on disorders due to certain nutrients and therapeutic importance of food was the least followed by role of nutrients in the human body.

**Table 1: Comparison of Paid Home 1 with Unpaid Homes 1 and 2**

S.No.	Variables	PH1 & UH1 F	PH1 & UH2 F
	Height	7.84	0.07
2	Weight	3.14	1.43
3	MAC	1.81	0.77
4	BMI	0.12	1.40
5	Clinical	1.37	0
6	Family Details	36.57*	12.44**
7	Pathology	3.85	9.71**
8	Opinion on Food	29.35*	17.26**
9	Physical Facilities	130.67*	48.74**
10	Nutritional Knowledge	11.68**	13.21**

S\* - Significant at 1% level; S\*\* - Significant at 5% level

The four significant variables found when comparing PH1 and UP1 are the family background, opinion on the food provided, physical facilities and nutritional knowledge. Opinion of food is an additional factor that distinguishes paid homes from unpaid homes. There was a significant difference in opinion concerning food, between these homes. This factor influences the mood of the elderly and in turn the amount of food consumed. Both quality and quantity are important factors in determining the nutritional status of the senior citizens. The clinical signs of nutritional were, in general not specific and mostly associated with old age. The general pathological conditions observed and the administration of drugs do not appear to significantly influence the nutritional status

The five factors that were found to be significant are: family background, pathological problems, opinion on the food provided, physical facilities and nutritional knowledge. The common pathological problems faced by the senior citizens were hypertension, constipation and arthritis. The other problems included loss of memory, hearing, vision, teeth and memory loss.

**Table 2: Comparison of Paid Home 2 with Unpaid Homes 1 and 2**

S.No.	Variable	PH2 & UP1 F	PH2 & UP2 F
	Height	13.51*	0
2	Weight	9.17**	0.43
3	MAC	6.95	0.25
4	BMI	0.03	0.79
5	Clinical	0	2.58
6	Family Details	33.39*	16.52*
7	Pathology	0.95	4.58
8	Opinion on Food	24.54*	16.51*
9	Physical Facilities	6.38	0.49
10	Nutritional Knowledge	11.97**	13.61*

S\* - Significant at 1% level; S\*\* - Significant at 5% level

A significant difference was observed in the weights, family background and opinion on food between senior citizens belonging to PH2 and UP1. There is also a significant difference in the nutritional knowledge between these two homes.

There is a significant difference in the weights of senior citizens belonging to PH2 and UP2. The difference in weights of senior citizens may be contributed by one or more of the factors which are: heredity, socio-economic status, the food and nutritional knowledge. There is significant difference in the opinion on food provided in the homes, family background and nutritional knowledge between these two groups. Hence a significant difference in weight of senior citizens belonging to PH2 and UP2 can be attributed to family background, food provided in the homes, and nutritional knowledge. There is also a significant difference in the physical facilities offered by PH2 and UP2 which reflects the economic factor.

**Table 3: Comparison between PH1 and PH2**

S.No.	Variable	F	Sig. of F
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1	Height	0.11	NS
2	Weight	0.43	NS
3	MAC	0.35	NS
4	BMI	0.26	NS
5	Clinical	2.33	NS
6	Family Details	2.37	S
7	Pathology	0.91	NS
8	Opinion on Food	74.79	S*
9	Physical Facilities	46.88	S*
10	Nutritional Knowledge	0.17	NS

S\* - Significant at 1% level; S\*\* - Significant at 5% level

The only two of the ten variables found to be significant between PH1 and PH2 are food provided in the homes and physical facilities. The opinion was studied in terms of quantity, quality, taste, consistency and the menu pattern.

**Table 4: Comparison between UP1 and UP2**

S.No.	Variable	F	Sig. of F
1	Height	9.91	S**
2	Weight	15.40	S*
3	MAC	7.52	NS
4	BMI	1.04	NS
5	Clinical	1.55	NS
6	Family Details	12.07	S**
7	Pathology	1.64	NS
8	Opinion on Food	0.03	NS
9	Physical Facilities	14.78	S*
10	Nutritional Knowledge	0.08	NS

S\* - Significant at 1% level; S\*\* - Significant at 5% level

The differences between the two unpaid homes were observed with reference to physical facilities and family background. The difference in physical facilities may be associated with the funds received from voluntary organizations.

**Table 5: Comparison between Paid Homes and Unpaid Homes (PH1 and PH2 with UP1 and UP2)**

S.No.	Variable	F	Sig. of F
1	Height	5.71	NS
2	Weight	1.47	NS
3	MAC	0.91	NS
4	BMI	0.51	NS
5	Clinical	0.004	NS
6	Family Details	44.66	S*
7	Pathology	7.29	NS
8	Opinion on Food	0.06	NS
9	Physical Facilities	25.04	S*
10	Nutritional Knowledge	25.23	S*

S\* - Significant at 1% level; S\*\* - Significant at 5% level

There is a significant difference in the family background, physical facilities provided in the homes, and the nutritional knowledge of the senior citizens.

Nutritional knowledge is influenced by the family setup which includes type of family, educational qualification and socio-

economic status. Since paid homes and unpaid homes differ in terms of the financial constraints, the significance was observed would be largely affected by the above mentioned factors. Physical facilities provided in the homes are again a factor dependent on the economic status of the homes. Hence a significant difference in the physical facilities provided to the senior citizens may be justified.

**Table 6: Distance matrix of the observations made on location and sanitation in four homes**

	PH1	PH2	UP1	UP2
PH1	0	7.35	10.05	6.39
PH2	7.35	0	3.61	2.65
UP1	10.05	3.61	0	6.29
UP2	6.39	2.65	6.29	0

The two homes which show a close relationship in terms of location and cleanliness are PH2 and UP2 where as PH1 and UP1 show a wide variation. PH2 and UP2 form a cluster and PH1 stands apart from the rest of the homes.

This suggests that sanitation and hygiene maintained in the homes are not dependent on whether the inmates pay for their facilities or not, but rather on the interest and efficiency of the authorities. UP1 scored the highest on cleanliness and all other facilities provided to the inmates.

#### IV. SUMMARY

The inmates of both paid and unpaid homes had come from varied family background with significant differences among them which reflected on their opinion towards food, physical facilities and nutritional knowledge. The food provided by the homes by itself may not severely affect their anthropometric measures as their mood, appetite, denture problems and other pathological conditions may influence the food intake.

#### V. CONCLUSION

The care for the elderly should focus more on the physical facilities provided, the moral support and concern on part of the care giver. The feeling of warmth and 'home away from home' is what is expected by many – which they truly deserve.

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# Emerging Technologies and Impact on Employee Relations

Telecommunication Industry

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**Abstract-** Emerging technologies have deep impact on employee relations in telecommunication field. The impact is Positive as well as negative on some aspects. Positive aspects of technological trends are manifold and the negative impact can be worked upon to make it sustainable. This paper focuses on emerging trends in technologies and impact on employee relations with respect to Indian market.

**Index Terms-** *Emerging Technologies, Employee relations, Role of Telecommunication*

## Introduction

With the emerging advancement in technological trend in Industry the employee relations trend also resulted in standardized procedures and mechanization of the activity tasks being performed by the employees. This has improved the work quality and also enhanced the performance at organization level. Telecommunication being fastest development demanding industry in India uses technology with latest trend and is constantly going through upgrades. The latest technological trends improved the analyzability, rapid information exchange. Employees become more system oriented and scope for the individual employee level development also increased further. Telecommunication industry has added advantage of the latest technological developments implementation at faster rate. A combination of technology and strategy has an impact on the employee relations.

## Emerging Technologies

Starting from the conventional Public switched telephone network PSTN with rotary dialing telephones the journey of technological development crossed several milestones such as fixed wireline telephones, digital signaling, copper replaced with fiber, wireless technology advanced from 2G to 3G with footprints of 4G in major part of the country. Layman in India nowadays can enjoy the latest mobile phones, high speed data connections such as 3G, wireline high speed digital subscriber lines, leased circuits on fiber connectivity etc. 4G implementation is under the

development stage and expected to be ready to serve in near future.

## Employee Relations

Employee relations are defined as the practices which are concerned with the management and regulation of relationships between the organizations individual staff members, and groups of individuals within the organization. Employee relations involve the body of work concerned with maintaining employer employee relationships that contribute to satisfactory productivity, motivation, and morale. Employee relation deals with interaction among the employees at different levels. The relationship between the employees depends largely on the work profile being handled and the responsibilities which form the part of the key performance indicators of the employees. Telecommunication industries in India are largely customer oriented and follow dynamic strategy for customer services. The information is provided to employees to promote a better understanding of management's goals and policies. Information is also provided to employees to assist them in correcting poor performance. Many organizations are inward focused and fail to recognize the importance of various stakeholders that have an impact on their success. Some organizations have foresight to be focused on some of their internal and external stakeholders that impact on the success of the organizations. An organization is only as strong as its weakest relationship. The relationship centered model can be used to ensure long term success and effectiveness of the organization. The employee relations are based on the various factors such as availability of the individual workplace, availability of upgraded software for performing the day o day activities, pay structure.

## Impact of technologies on employee relations

The technological advancement has a deep impact on the employee relations. The availability of the latest

technology communication devices such as, laptop, Blackberry mail services make the access easy. All employees can communicate freely on mails as and when needed and can reduce response time for the emergencies. In telecommunication industry the use of latest technology is adding value to employee relations.

In case of telecommunication industries the employees have to be available for service all the time. The departments such as customer service, Network operations and maintenance teams need availability of resources within the shortest time duration. The telephonic communication reduces the response time considerably. During the initial days telecom customers need to chase for their problems by visiting personally to telephone exchange and register complaint manually. With the technological advancement the customers can communicate directly from the toll free call centre facility wherein all the feedback is captured online and the resolution confirmation from the customer is also updated on the same toll free number. The employees can communicate with customers on calls which reduce the stress of handling the customers personally.

The telecommunication services form a part of emergency service category hence the employees work in shifts for 24hrs 7 days basis. These employees need to exchange lot of information about the activities that happened in prior shifts. This information exchange is possible due to the online logger system software where all the activities are registered. Hence employee information exchange communication is strengthened.

Since the scope for manual error is reduced in case of technical software system hence employees have better dialogue and no blame game.

The employee relations also depend upon the key performance indicators assigned for every individual. There is a cut throat competition for individual performance appraisal between the employees. The advancement in performance appraisal system also enables employee to communicate directly to the senior management through web base software appraisal system. This has a positive impact on communication with the leadership.

The technological advancement enhanced the analytical ability of the employee. The software system generated reports help the people working together for constructive discussion on the identified improvement plan. With the help of incidences from the system the employees can communicate clearly and realistic action plan can be identified.

## Negative Impact of emerging Technology

The major disadvantage of the emerging technological advancement is that the employees may have very less scope of personal interaction on official issues. Instead of talking personally the employees share mails on systems keeping many people in loop causing the matter escalation to more number of people. This may complicate situation hampering the dialogue between the related parties. The employees need separate activity initiated by Human Resources for internal communication and dialogue. Hence HR plays important role for improvement of employee relations. The employee relations in telecommunication industry largely depend on the individual ownership. The different departments have different employees interacting with same customer for concerned product related query. In such case the employee from sales may feel disturbance caused by customer service employee or network service employee and so on. There is a scope for misunderstanding between the employees from different department due to lack of personal interaction. Here again Human resources plays vital role. The initiatives such as leadership meetings with the employees within the departments and cross functional teams may control this to some extent.

## Conclusion

Hence emerging technologies have deep impact on employee relation and the impact is positive as well as negative. Employee relations become clear and more system based with the implementation of the advanced software systems. The drawbacks of the technological advancement are also there affecting the employee relations and can be controlled by involving employees in Cross functional communication forum periodically and also measuring the employee satisfaction. Human Resource section has an important role in managing the impact of technology on employee relations.

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# Parametric Pair Programming - A Way towards Optimum Output

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**Abstract-** A new set of software development methodologies has become prevalent in previous years, commonly known as Agile techniques. Pair programming (an activity from agile techniques)- where two programmers work on the same module at one computer; with one programmer takes responsibilities of writing the actual code and the other one takes the responsibility for the monitoring of strategies, designing and defect related issues. The incorporation of pair programming leads to a better software development process resulting in a high quality product. The purpose of this paper is to demonstrate some parameters for building an effective team for performing pair programming.

**Index Terms-** Agile, Agile manifesto and values, quality, pair- programming, parameters.

## I. INTRODUCTION

To build an optimum project within cost and schedule is the ultimate goal of all software development processes and for achieving this many models like waterfall, spiral, CMMI, CMM etc. has been evolved in past and are still evolving. For a high scale result, a methodology has to be a pool of sub-methodologies which helps in to keep focus on various life cycle factors.

In February 2001, 17 software professionals published a manifesto that was based on some light weight processes (iterative and incremental like SCRUM, extreme programming etc.) formally known as “manifesto for agile software development” to define the approach agile software development. Agile methodologies encompasses many techniques like whole team involvement, continuous integration, automated testing etc. and pair programming is one of them which works on the principle *two are better than one*. As we know pair means a group of two persons; in pair programming “driver” and “navigator” makes pair. Where driver do source coding and navigator keep close watch on code being written.

In this paper, we first look at pair programming as defined by Agile Alliance a non-profit organization that promotes software development according to the principles of Agile Manifesto and then we demonstrate some parameters for having effective pair-programming teams.

## II. LITERATURE REVIEW

Agile methods are a subset of iterative and evolutionary methods and are based on iterative enhancement and opportunistic development processes. In all iterative products, each iteration is a self-contained, mini-project with activities that Span requirements analysis, design, implementation, and test [1]. A key difference between agile methods and past iterative methods is the length of each iteration. In the past, iterations might have been three or six months long. With agile methods, iteration lengths vary between one to four weeks [1]. The most important technique in Agile methodology is pair-programming. It is arise as an alternative to the traditional programming. As described by Beck in 2000 pair programming “two people working at one machine, with one keyboard and one mouse”.

Lui and Chan (Lui 2006) developed a single measurement method Relative Effort Afforded by Pairs (REAP) formula, to measure productivity achieved over a period of time when undergoing a pair-programming experiment [2].

$$REAP = [(FTP) * 2 - (FTI) / (FTI)] * 100\%$$

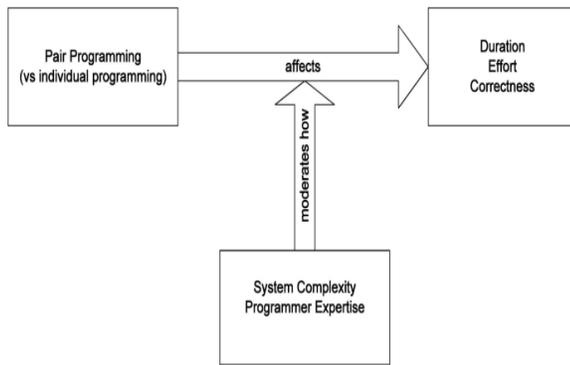
Where,

FTP means finish time of pair

FTI means finish time of individual

Another experiment known as repeat programming, in which subjects were asked to write the same program several times, has been conducted to assess the productivity of pair- programming versus solo programming [3]. Hitherto pair programming reached far with course of time but no effective parameters are described yet for making good pair for pair-programming. This paper is proposing some parameters for making good pairs.

Erik Arisholm, Member, IEEE, Hans Gallis, Tore Dyba, Member, IEEE Computer Society, and Dag I.K. Sjøberg, Member, IEEE defines in their conceptual model, the effects (in our case given by duration, effort, and correctness of the maintained program) of PP (versus individual programming) will depend on the moderating variables, system complexity and programmer expertise[4].



**Figure 1: Conceptual research model of the hypothesized pair programming**

### III. RESEARCH QUESTIONS

After reading many references and papers we found that effectiveness of Pair Programming can still be modified to facilitate agility in any work and to provide highly matured process.

RQ-1:-How the team selection based on some parameters can increases the effectiveness of pair programming?

RQ-2:- What should be the basic parameters for the team selection in pair programming?

### IV. RESEARCH METHODOLOGY

*IV.I Research design*-The research work consisted of an experiment which is described below. The experiment was conducted with 10 under-graduate students. We follow some guidelines given by Jari Vanhanen and Casper Lassenius[5].

*IV.II Experiment setting*-For conducting experiment, five teams of two students (formed randomly) been identified who did similar computer programs using similar computing language, specifications and tools. A two hours pair programming lecture and presentation was given to the students.

We had 10 students for this experiment all at least 3<sup>rd</sup> and 4<sup>th</sup> year B.Tech students at D.N.S. College of engineering and technology, J.P.Nagar affiliated to Uttar Pradesh Technical University. All of them were familiar with software development process, coding phase & practices. All students were used to work in Java technology. Firstly the experiment was conducted normally as pair programming do and then according to our parameters the pairs were selected. The result after that obtained was compared with the previous one.

**Likert Scale:** - A Likert scale is a psychometric scale commonly involved in research that employs questionnaires. It is the most widely used approach to scaling responses in survey research, such that the term is often used interchangeably with rating scale, or more accurately the Likert-type scale, even though the two are not synonymous.

The scale is named after its inventor, psychologist Rensis Likert. Likert distinguished between a scale proper, which emerges from collective responses to a set of items (usually eight or more), and the format in which responses are scored along a range research design [7].

**Table 1. Likert Scale**

Rating	Observation
1	Strongly disagree
2	Disagree
3	Neutral
4	Agree
5	Strongly Agree

### V. PARAMETERS OF EFFECTIVE PAIR-PROGRAMMING

*A. Team Capability*:-Group of individuals is team, teams make department and on combining departments we form an organization so overall efficiency of an organization depends upon team's efficiency. Now for a good team at least one member should have good experience and knowledge. Among members there should be no ego-problem, no communication gap, and no linguistic barrier. "Even when one programmer is significantly more experienced than the other, it is important to take turns "driving," lest the observer become disjoint, feel out of the loop or unimportant"[6].

*B. Switching flexibility*:-Switching means hopping of members from one team to another. Switching plays vital role in pair programming because it helps in enhancing knowledge of members in different domains, later on which provide an extra-edge to members during promotion and doing quality work in different domain.

*C. Level of compatibility*:-Although understanding and compatibility has different meaning in dictionary but they are much related. If there is no understanding between members compatibility will definitely not exist, so for compatibility, understanding is the only requirement. Everyone has their own thinking and their own ideas, a member should respect ideas of others.

*D. Knowledge about application domain*: - Persons, who are working on any module, should know about all functional and non-functional requirements so that it can easily point out in use-cases that this part is not relevant for this domain. So in one line we can say that persons should have vein of sense about every aspect of the project scope of product and its users, so that they can add functionality, if missed.

*E. No involvement in other lifecycle activities*: - Members should be focused for one work and there should not any condition in which they have to run from one floor to another for completing the tasks. A coder should not be treated as a savior and multi tasker that he/she can play any role you want at a time.

*F. No time constraint Vs Time constraint* :- For any team, for any programming there must be a time constraint up to which the team has to complete their task so that the team will perform the best quality working hours otherwise they will become the lazy one and will transfer their work from one day to another. It also effect the overall cost, it's a simple logic more working hour means more wages you have to pay to your workers and more you have to wait for result. In the graph below, it is shown that

up to some extent of time the performance is increased but after that increment in time leads to a deviation in performance.

Figure 2 is showing the performance of the persons with time constraint. If there is a much more time given for completing a work then the performance may down. But if there is limited time, work gets completed more fastly.

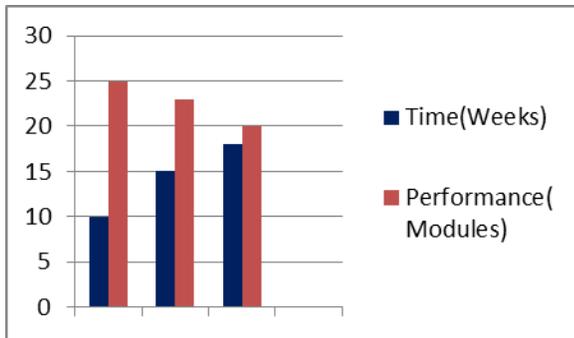


Figure2:Bar Chart for Performance Vs. Time

Table 2. Tabular representation of bar chart

Team	Time(week)	Performance(modules)
A	10	25
B	15	23
C	18	20

Table 3:Analysis of parameters based on Likert scale

Parameters	Pair1		Pair 2		Pair 3		Pair 4		Pair 5		Average
	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2	
Team Capability	4	4	5	3	2	4	5	4	4	4	3.9
Switching flexibility	2	2	2	3	4	2	4	3	3	4	2.9
Level of compatibility	5	4	4	4	3	2	5	4	5	5	4.1
Knowledge about application domain	5	5	4	5	4	3	3	4	4	5	4.2
No involvement in other lifecycle activities	3	4	2	4	5	3	4	4	3	4	3.6
No time constraint Vs Time constraint	2	1	3	4	1	2	2	2	4	3	2.4

## VI. RESULTS

After performing pair programming in its conventional manner, we provide a questionnaire based on Likert scale containing our parameters to the students. We request them to give points to our parameters on scale of 1-5. The most promising parameter get the highest points. On the basis of data filled by the students we prepare table (table :5) and calculate average for each parameter. Here, we assume that if the data is above 3, it means that parameter is liked by majority of participants and will provide a good support in pair programming.

After following this data, a pie chart prepared that shows the total percentage distribution for parameters. At the end, it is concluded that, when the performance was evaluated, the performance of the pairs selected on the basis of parameters was better than the performance of the pair selected randomly.

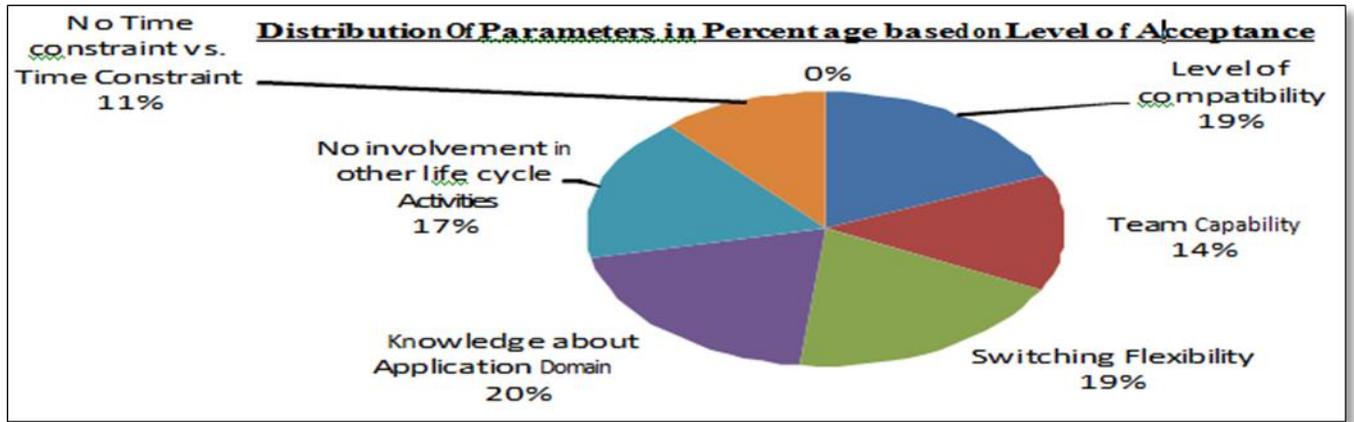


Figure3. Percentage distribution of Parameters

Table 4: Analysis of Performance of various pairs

Pairs	Lines of code	Performance	
		No. of Defects With normal Pair Programming	No. of Defects in Pair Programming with parameters
Pair 1	50	9	5
Pair 2	50	10	8
Pair 3	50	14	12
Pair 4	50	12	9
Pair 5	50	10	6

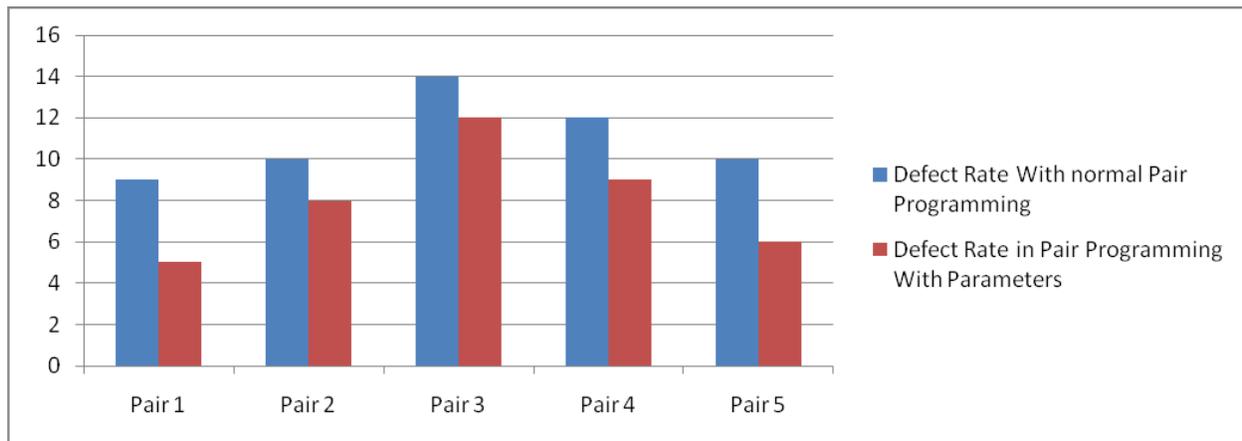


Figure4: Performance based on Defect Rate

### VII. CONCLUSIONS AND FUTURE WORK

One may look back on all that has been said about agile much of its common techniques has been known for decades. This is certainly true. But people do not know much about its

techniques like pair programming. In this research, we conclude that though pair programming is efficient and one of the best techniques in agile methodology but still it depends on the strength of team or pair indulges in pair programming. If the pair is strengthful and compatible, the output becomes more reliable and efficient. The parameters described here leads to a

better way of selecting pairs and so reduce the cost and time used for generating an optimum output.

Here, in research the whole experiment was conducted with students, hence for future work we recommend is to use these parameters of selecting a pair for industry people who rely on different levels so that the expertise of professionals can be utilized in a better way.

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# Extreme Value Control Charts in Some Life Testing Models

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**Abstract-** Variable control charts are based on sub group statistics and variation in the values of the sub group statistics between sub groups. In this paper extreme order statistic of the sub group are considered to develop to the control limits to decide upon the in control status of the process. The quality characteristic is assumed to follow Exponential/Weibull Distributions. Relevant comparisons are also presented.

**Index Terms-** Extreme value control Chart, Extreme order statistic, Variable control charts

## I. INTRODUCTION AND REVIEW OF REVIEW OF LITRATURE

Variable control charts are popularly used to monitor the variability in the quality control data by developing graphical procedures for subgroup statistics such as mean, range, standard deviation etc. Depending on the subgroup size and the sampling distribution of the subgroup statistics separate control chart constants and hence control limits would be constructed in practice. However, some research works appeared in literature that deals with control charts for non-normally distributed process variates (Edgemen (1989), Kantam and Sriram (2001) and the references therein). At the same time, control charts for individual observations in the case of normal process variates are developed and the principle was made use of to propose a procedure for comparison of multiple means known as Analysis of Means (OTT (1967)). On similar lines the well known Gamma and Exponential distributions are assumed as models of process variate and the corresponding ANOM procedure along with control charts for individual observations are developed by Sriram (2004). Motivated from these aspects we extend the same principle to two probability models of exponential and Weibull with shape parameter(2) (Rayliegh distribution) developed alternative pairs of control limits for variable control charts and compare their appropriateness with that of existing pairs of limits in literature. The preliminary narration of the two models, the percentiles of extreme order statistics in samples from the models, their use in developing limits for variable control charts are presented in the section 2. In section 3, we compare our control limits with those existing in literature with an example.

With as the conjecture, we made an attempt to get the pair of control limits using extreme order statistics in samples from Exponential and Weibull with shape parameter (2).

The cumulative distribution functions of these models in standard form are

$$F(X) = 1 - e^{-x}, X \geq 0 \dots\dots\dots(1)$$

$$F(X) = 1 - e^{-x^c}, X \geq 0, c > 0 \dots\dots\dots(2)$$

The percentiles of extreme order statistics for standard exponential distribution can be obtained from the following steps.

$$P[X_n \leq U] = 0.99865$$

$$i.e., [1 - e^{-U}]^n = 0.99865$$

$$\Rightarrow U = -\ln(1 - A)$$

$$where A = (0.99865)^{\frac{1}{n}}$$

$$P[X_1 < L] = 0.00135$$

$$i.e., (1 - e^{-L}) = 0.00135$$

$$\Rightarrow L = -\ln A$$

$$Where A = (0.99865)^{\frac{1}{n}}$$

Similarly the results for Weibull with shape parameter (2) are as follows:

$$P[X_n \leq U] = 0.99865$$

$$i.e., (1 - e^{-U^2})^n = (0.99865)$$

$$(1 - e^{-U^2}) = (0.99865)^{\frac{1}{n}}$$

$$\Rightarrow U = [-\ln[1 - A]]^{1/2} \text{ where } A = (0.99865)^{\frac{1}{n}} \dots\dots\dots(3)$$

## II. RESEARCH METHODOLOGY

### Extreme Order Statistics Based Control Limits:

$$P[X_1 < L] = 0.00135$$

$$i.e., 1 + e^{-A^2} = 0.00135$$

$$L = [-\ln A]^{1/2} \text{ where } A = (0.99865)^{1/n} \dots \dots \dots (4)$$

The values of U and L so obtained for a standard probability model can be used to construct control chart constants as follows.

$$P\{L < \min Z_i < \max Z_i < U\} = 0.9973$$

where  $Z_i$  is standard ordered  $i^{\text{th}}$  variate,  $Z_i = X_i/\sigma$ ,  $\sigma$  being scale parameter.

$$i.e., P\{L < \min (X_i/\sigma) < \max (X_i/\sigma) < U\} = 0.9973$$

$$i.e., P\{L\sigma < \min X_i < \max X_i < U\sigma\} = 0.9973$$

If  $\sigma$  is unknown, using an appropriate estimate of  $\sigma$  say  $\hat{\sigma}$  the above probability statement would be

$$P\{L \hat{\sigma} < \text{all } X_i < U \hat{\sigma}\} = 0.9973$$

Recalling that  $\sigma$  is scale parameter of the model under consideration it can be estimated unbiasedly with sample mean, sample range from the following formula.

In this case Exponential distribution, if  $\sigma$  is not known, it is

$$\frac{\bar{R}}{d_2}$$

estimated by  $\frac{\bar{R}}{d_2}$  where  $d_2 = E[Z_n - Z_1]$  taken from Gupta (1960).

### III. CONTROL CHART CONSTANTS FOR R-CHART

#### Variable control chart

#### Constants of R-chart

#### Exponential Distribution (Sriram (2004))

n	$m_3$	$m_4$
2	0.00013	6.60765
3	0.02495	4.86697
4	0.06388	4.20318
5	0.10214	3.83686
6	0.13587	3.50848
7	0.16495	3.42810
8	0.19006	3.29866
9	0.21190	3.19609
10	0.23108	2.03453

In case of Weibull Distribution  $\sigma$  is estimated by MLE i.e

$$\sqrt{\frac{\sum_{i=1}^n x_i^2}{n}}$$

say  $s$  under repeated sub-grouping  $\hat{\sigma} = \bar{s}$

For Exponential distribution the control limits are

$$\left[ D_3^* \bar{R}, D_4^* \bar{R} \right], \text{ Where } D_3^* = \frac{L}{d_2} \text{ and } D_4^* = \frac{U}{d_2} \quad D_3^*$$

and  $D_4^*$  are given in the following table

For Weibull with shape parameter (2) the control limits are

,  $\sqrt{L^*}$  and  $\sqrt{U^*}$  are given in the following table

#### Exponential Distribution

n	$D_3^*$	$D_4^*$
2	0.00067	7.30046
3	0.00030	5.13721
4	0.00018	4.36006
5	0.00013	3.67832
6	0.000099	3.94395
7	0.000079	3.49101
8	0.000065	3.35016
9	0.000055	3.23943
10	0.000048	3.14942

**Weibull with shape parameter (2)**

n	$\sqrt{L^*}$	$\sqrt{U^*}$
2	0.0259854	2.7019364
3	0.0212098	2.7759346
4	0.0183774	2.8272670
5	0.0164372	2.8664523
6	0.0150066	2.8980420
7	0.0138917	2.8917755
8	0.0129948	2.9472871
9	0.0122516	2.9671998
10	0.0116229	2.9848999

IV. STUDY AND FINDINGS

**COMPARISON OF ABOVE CONTROL CHARTS EXPONENTIAL DISTRIBUTION (Sriram (2004)) WITH WEIBULL WITH SHAPE PARAMETER (2) (RAYLIEGH DISTRIBUTION) WITH EXAMPLES**

**EXAMPLE.1**

Consider the following data

Sample No	Sample Observations	Total	Sample Range	Sample S.D (s)
1	42 65 75 78 87	347	45	71.09
2	42 45 68 72 90	317	48	65.87
3	19 24 80 81 81	285	62	63.97
4	36 54 69 77 84	320	48	66.27
5	42 51 57 59 78	287	36	58.62
6	51 74 75 78 132	410	81	86.27
7	60 60 72 95 138	425	78	89.95
8	18 20 27 42 60	167	42	39.92
9	15 30 39 62 84	230	69	52.05
10	69 109 113 118 153	562	84	115.54
11	64 90 93 109 112	468	48	95.15
12	61 78 94 109 136	478	75	99.01
	Total		716	903.71

The Control limits for exponential Distribution are  $[m_3 \bar{R}, m_4 \bar{R}]$  according Sriram (2004)

For Sub-group size 5 the control chart constants from the above table are

$$m_3 = 0.10214, m_4 = 3.83686$$

$$[D_3^* \bar{R}, D_4^* \bar{R}]$$

$$D_3^* = 0.00013, D_4^* = 3.67832,$$

(From above Exponential Distribution table at n=5)

$$\bar{R} = 52.67$$

$$[m_3 \bar{R}, m_4 \bar{R}] = [5.37971, 202.08741]$$

$$[D_3^* \bar{R}, D_4^* \bar{R}] = [0.00685, 207.7276]$$

The Control limits for Weibull with shape parameter (2) are

$$[\sqrt{L^* s}, \sqrt{U^* s}]$$

$$s = \sqrt{\frac{\sum_{i=1}^n x_i^2}{n}}, \bar{s} = \frac{\sum s}{k}, \text{ k is the Sample number}$$

$$\sqrt{L^*} = 0.0164372, \sqrt{U^*} = 2.8664523$$

(From above Weibull Distribution (2) Distribution table at n=5)

$$\bar{s} = 75.31$$

$$[\sqrt{L^* s}, \sqrt{U^* s}] = [1.2379, 215.8725]$$

**EXAMPLE.2**

Consider the following data

Sample No	Sample Observations	Total	Sample Range	Sample S.D (s)
1	14 8 12 12	46	6	11.70
2	11 10 13 8	42	5	10.65
3	11 12 16 13	52	5	13.13
4	15 12 14 11	52	4	13.09
5	10 10 8 8	36	2	9.05
Total			22	57.62

The Control limits for exponential Distribution are  $[m_3 \bar{R}, m_4 \bar{R}]$  according Sriram (2004)

For Sub-group size 4 the control chart constants from the above table are

$$m_3=0.06388, m_4 = 4.20318$$

$$[D_3^* \bar{R}, D_4^* \bar{R}]$$

$$D_3^* = 0.00018, D_4^* = 4.36006,$$

(From above Exponential Distribution table at n=4)

$$\bar{R} = 4.4$$

$$[m_3 \bar{R}, m_4 \bar{R}] = [0.281072, 18.493992]$$

$$[D_3^* \bar{R}, D_4^* \bar{R}] = [0.00792, 19.184264]$$

The Control limits for Weibull with shape parameter (2) are

$$[\sqrt{L^* \bar{s}}, \sqrt{U^* \bar{s}}]$$

$$s = \sqrt{\frac{\sum_{i=1}^n x_i^2}{n}}, \quad \bar{s} = \frac{\sum s}{k}, \quad k \text{ is the Sample number}$$

$$\sqrt{L^*} = 0.0183774, \quad \sqrt{U^*} = 2.8272670$$

(From above Weibull Distribution (2) Distribution table at n=4)

$$\bar{s} = 11.524$$

$$[\sqrt{L^* \bar{s}}, \sqrt{U^* \bar{s}}] = [0.21175, 32.58142]$$

Since the whole computation is carried out with an example. The conclusions from the above calculations about preferability of one over the other cannot generalize. However, it gives a hint that our control chart limits are preferable.

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# On the Initial, Final and Zero Objects and Zero Morphisms in the Category L-FCyc

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**Abstract-** In our earlier papers[14 &15],we have introduced the category **L-FCyc** whose objects are L-fuzzy subgroups of finite cyclic groups and morphisms are L-fuzzy homomorphisms, and studied some of the properties enjoyed by it. In this paper we discuss the existence of initial objects, final objects, zero objects and zero morphisms in this category.

**Index Terms-** Lattice, L-fuzzy group, category, L-FCyc, initial objects, final objects, zero objects, zero morphisms.

## I. INTRODUCTION

**C**ategory Theory was introduced in 1945 by MacLane and Eilenberg [5].Lattice Theory was developed into a subject of its own right through the works of many mathematicians; Richard Dedekind and Garrett Birkhoff [2] being two among them. Fuzzy Set Theory was introduced by L.A.Zadeh in 1965[17]. J.A.Gougen[7] considered a complete and distributive lattice L as the membership set ,instead of the interval [0,1]used by Zadeh. In 1971, A.Rosenfeld[10]introduced fuzzy groups and later on it was generalized into L-fuzzy groups.

We have presented some results obtained in our studies on categories of L-fuzzy groups in [11]. In that paper, we have formed four categories of L-fuzzy groups and discussed some relations between them. In [12], we have discussed maximal lattices of cyclic groups and developed a method to construct it for finite cyclic groups. The method was further extended to the case of infinite cyclic groups in [13]. As a continuation of these works, in [14] we introduced L-fuzzy homomorphism of L-fuzzy subgroups of finite cyclic groups through an embedding of lattices. We then formed a category whose objects are L-fuzzy subgroups of finite cyclic groups and morphisms are L-fuzzy homomorphisms. We named this category as **L-FCyc** and discussed some categorical properties enjoyed by it. In [15] we discussed isomorphisms in this category. In the present paper, we discuss the existence of initial objects, final objects, zero objects and zero morphisms in this category.

Throughout this paper L denotes a complete and distributive lattice and  $L_i$  denotes sublattices of L. We represent the greatest element of  $L_i$  by  $I_i$  and the least element by  $O_i$ . Terms and notations in lattice theory used in this paper are taken from Bernard Kolman[1] Birkhoff G.[2], Davey B.A.[4] and Vijay K.Khanna[16];those in Algebra are from Fraleigh[8]; in fuzzy algebra are from George J.Klir [6], Zadeh [17],Gougen [7] ,Rosenfeld[10]and Mordeson[9] and those from category theory are from Bodo Pareigis [3].

## II. BASIC CONCEPTS

In this section, we give a summary of the relevant terms and results presented in papers[12 to 15], as they form the basis of the ideas developed in the present paper.

For a given group G and lattice L, a function  $A : G \rightarrow L$  is called an L-fuzzy group on G (or L-fuzzy subgroup of G) if  $\forall x, y \in G$

(i)  $A(x, y) \geq A(x) \wedge A(y)$  and (ii)  $A(x^{-1}) \geq A(x)$ .

We shall denote this by writing  $A \in (G, L)$ .

2.1. *Definition[12]*. Let  $L = (\{a_1, a_2, \dots, a_n\}, \leq)$  be a lattice. We say that L is a *finite lattice* containing n points and write  $|L|=n$ .

2.2. *Example[12]*.  $D_6 = \{1,2,3,6\}$  is a lattice under divisibility. It is a finite lattice containing four points and so  $|D_6|=4$ .

2.3.*Definition[12]*. Let G be a group, L be a finite lattice and  $A: G \rightarrow L$  be an L-fuzzy group. A is said to *saturate* L if  $\text{Im}(A)=L$ . If there is an L-fuzzy group A on G which saturates L, then we say that G *saturates* L.

2.4. *Example[12]*. Consider  $G = \langle \mathbb{Z}, + \rangle$  and  $L = (\{0, 1/3, 1/2, 1\}, \leq)$ . Define  $A: G \rightarrow L$  by  $A(0)=1, A(x)=1/2$  if  $x \in 4\mathbb{Z} - \{0\}, A(x)=1/3$  if  $x \in 2\mathbb{Z} - 4\mathbb{Z}$  and  $A(x)=0$  if  $x \in \mathbb{Z} - 2\mathbb{Z}$ . Then A is an L-fuzzy group on G with  $\text{Im}(A) = L$ . Hence, A as well as G saturates L.

2.5. *Example[12]*. Let  $G = \langle \mathbb{Z}_4, +_4 \rangle$  and  $L = (\{0, 1\}, \leq)$ . Define  $A: G \rightarrow L$  by  $A(0)=1; A(x)=0, \text{ if } x \neq 0$ . Then A is an L-fuzzy group on G which saturates L and so G also saturates L.

2.6 .*Example[12]*. Let  $G = \langle \mathbb{Z}_4, +_4 \rangle$  and  $L = (\{0, 1/2, 1\}, \leq)$ . Define  $A: G \rightarrow L$  by  $A(0)=1; A(x)=0, \text{ if } x \neq 0$ . Here A is an L-fuzzy group on G with  $\text{Im}(A) \neq L$ . Hence A does not saturate L. But if we define  $B: G \rightarrow L$  by  $B(0)=1; B(2)=1/2$  and  $B(1)=B(3)=0$ , then B is an L-fuzzy group on G which saturates L and hence G also saturates L.

2.7. *Definition[12]*. Let G be a group and L be a finite lattice. A sublattice  $L_1$  of L is said to be a *maximal lattice* saturated by G if there is an  $A \in (G, L)$  which saturates  $L_1$  and there is no  $B \in (G, L)$  which saturates a sublattice  $L_2$  of L with  $|L_2| > |L_1|$ .

2.8.*Example[12]*. Consider the sublattices  $L_1 = \{0, 1\}$  and  $L_2 = \{0, 1/2, 1\}$  of  $L = \{0, 1/3, 1/2, 1\}$  and let  $G = \langle \mathbb{Z}_4, +_4 \rangle$ . Define  $A: G \rightarrow L$  by  $A(0)=1; A(x)=0, \text{ if } x \neq 0$ . Also define  $B: G \rightarrow L$  by

$B(0)=1; B(2)=1/2$  and  $B(1)=B(3)=0$ . Then  $L_1$  is not a maximal lattice of  $G$ , because there is  $L_2$  with  $|L_2| > |L_1|$  and  $B: G \rightarrow L$  which saturates  $L_2$ . It can be shown that  $L_2$  is a maximal lattice for  $G$ . We may recall that a group  $G$  is said to be of prime power order if  $|G|=p^n$ , for some prime number  $p$  and positive integer  $n$ .

2.9. Theorem [16]. Let  $G$  be a cyclic group of prime power order. Then the lattice of all subgroups of  $G$  is a chain ■

2.10. Theorem [12]. Let  $G$  be a cyclic group of prime power order. Then a maximal lattice  $L_G$  for  $G$  is a chain isomorphic to the chain of all subgroups of  $G$  ■

It is well-known that every finite cyclic group of order  $n$  is isomorphic to  $Z_n$ . So, henceforth we represent cyclic groups of order  $n$  by  $Z_n$ .

2.11. Proposition [8]. The group  $Z_m \times Z_n$  is isomorphic to  $Z_{mn}$  if and only if  $m$  and  $n$  are relatively prime ■

2.12. Proposition [8]. The group  $\prod_{i=1}^n Z_{m_i}$  is cyclic and isomorphic to  $Z_{m_1 m_2 m_3 \dots m_n}$  if and only if the numbers  $m_i$ , for  $i=1, 2, \dots, n$  are pairwise relatively prime ■

2.13. Theorem [12]. Suppose  $n = p_1^{n_1} p_2^{n_2} \dots p_r^{n_r}$ , where  $p_i$ 's are distinct primes. Then the maximum lattice for  $Z_n = Z_{p_1^{n_1}} \times Z_{p_2^{n_2}} \times \dots \times Z_{p_r^{n_r}}$  is the product lattice of the maximum chains for the factors  $Z_{p_i^{n_i}}$ . ■

2.14. Definition [14]. Let  $A \in (G, L)$ . Then for  $a \in L$ , the set  $A^{-1}(a) = \{x \in G/A(x) = a\}$  is called the *A-pre image* of  $a$ .

2.15. Definition [14]. Let  $A \in (G, L)$ . Then the collection of all *A-pre images*

$Pr(L) = \{A^{-1}(a)/a \in L\}$   
 is called the *A-pre image set* of  $L$

2.16. Definition [3]. Let  $L$  and  $M$  be lattices. A mapping  $f: L \rightarrow M$  is called a *lattice homomorphism* if for all  $a, b \in L$   
 $f(a \wedge b) = f(a) \wedge f(b)$  and  
 $f(a \vee b) = f(a) \vee f(b)$ .

If, in addition, the mapping  $f$  is one-to-one and onto, we call  $f$  a *lattice isomorphism*. If  $f: L \rightarrow M$  is an isomorphism, we say that  $L$  is *isomorphic* to  $M$ .

2.17 Definition [3]. Let  $L$  and  $M$  be lattices. If  $f: L \rightarrow M$  is a one-to-one homomorphism, then  $f$  is said to be an *embedding* of  $L$  into  $M$ . In this case,  $L$  is isomorphic to the sublattice  $f(L)$  of  $M$  and we say that  $L$  is *embeddable* on  $M$ .

2.18. Definition [14]. Let  $G_1$  and  $G_2$  be two finite cyclic groups with maximum lattices  $L_1$  and  $L_2$  respectively, where  $L_1$  is embeddable on  $L_2$ . Let  $A \in (G_1, L_1)$  and  $B \in (G_2, L_2)$ , each of them saturating its respective lattice. Let  $f: L_1 \rightarrow L_2$  be a map such that

- (1)  $f(I_1) = I_2$ , where  $I_1$  and  $I_2$  are maximum elements of  $L_1$  and  $L_2$  respectively, and
- (2)  $f$  defines an embedding of  $L_1$  on  $L_2$ .

Then a map  $F: Pr_{(L_1)} \rightarrow Pr_{(L_2)}$  is said to be an *L-fuzzy homomorphism* from  $A$  to  $B$  through  $f$  if  $F(A^{-1}(a)) = B^{-1}(f(a))$  for every  $a$  in  $L_1$ .

We shall denote this by writing  $F_f: A \rightarrow B$  is a *homomorphism*.

2.19. Definition [3]. A category  $\mathcal{C}$  consists of:

- (1) a class of objects, denoted as  $Ob^{\mathcal{C}}$  and whose members are denoted as  $A, B, C, \dots$
- (2) a family of mutually disjoint sets  $\{Mor^{(A, B)}\}$  for all objects  $A, B$  in  $\mathcal{C}$ , whose elements  $f, g, h, \dots \in Mor(A, B)$  are called *morphisms* and
- (3) a family of maps called *composition*  $\{Mor(A, B) \times Mor(B, C) \rightarrow Mor(A, C)\}$  in which  
 $(f, g) \mapsto gf$  for all  $A, B, C \in Ob^{\mathcal{C}}$ .

satisfying the following axioms:

- (1) Associativity: For all  $A, B, C, D \in Ob^{\mathcal{C}}$  and all  $f \in Mor(A, B)$ ,  $g \in Mor(B, C)$  and  $h \in Mor(C, D)$ , we have,  $h(gf) = (hg)f$
- (2) Identity: For each  $A \in Ob^{\mathcal{C}}$  there is a morphism  $I_A \in Mor(A, A)$ , called the *identity*, such that we have,  $fI_A = f$  and  $I_B g = g$  for all  $B, C \in Ob^{\mathcal{C}}$ , and all  $f \in Mor(A, B)$  and  $g \in Mor(C, A)$ .

2.20. Example [3]. All sets together with the set maps and their composition form a category. This category is denoted by **Set**.

2.21. Theorem [14]. L-fuzzy subgroups of finite cyclic groups which saturate their respective maximum lattices together with L-fuzzy homomorphism of L-fuzzy groups through an embedding form a category ■

2.22. Notation [14]. We shall denote the above category by **L-FCyc**. Whenever we say that  $A$  is an object in **L-FCyc**, we shall mean that there is a finite cyclic group  $G_1$  and a corresponding maximum lattice  $L_1$  such that  $A \in (G_1, L_1)$ . Similarly, the statement  $F_f: A \rightarrow B$  is a morphism in **L-FCyc** shall imply that  $A \in (G_1, L_1)$ ,  $B \in (G_2, L_2)$ ,  $F: Pr L_1 \rightarrow Pr L_2$  and that  $f: L_1 \rightarrow L_2$  is an embedding such that  $F(A^{-1}(a)) = B^{-1}(f(a))$  for every point  $a$  in  $L_1$ .

2.23. Proposition [14]. Let  $F_f: A \rightarrow B$  and  $F_g: A \rightarrow B$  be two morphisms in **L-FCyc**. Then  $f = g$  ■

2.24. Proposition [14]. Let  $F_f: A \rightarrow B$  and  $G_f: A \rightarrow B$  be two morphisms in **L-FCyc**. Then  $F = G$  ■

2.25. Definition [3]. Let  $\mathcal{B}$  and  $\mathcal{C}$  be categories. Let  $\mathcal{F}$  consist of

- (1) a map  $Ob^{\mathcal{B}} \ni A \mapsto \mathcal{F}(A) \in Ob^{\mathcal{C}}$
- (2) a family of maps  
 $\{Mor_{\mathcal{B}}(A, B) \ni f \mapsto \mathcal{F}(f) \in Mor_{\mathcal{C}}(\mathcal{F}(A), \mathcal{F}(B))\}$

for all  $A, B \in Ob^{\mathcal{B}}$

Then  $\mathcal{F}$  is called a *covariant functor* (or simply a *functor*) if  $\mathcal{F}$  complies with the following axioms:

- (i)  $\mathcal{F}(1_A) = 1_{\mathcal{F}(A)}$  for all  $A \in \text{Ob } \mathcal{B}$
- (ii)  $\mathcal{F}(fg) = \mathcal{F}(f)\mathcal{F}(g)$  for all  $f \in \text{Mor}_{\mathcal{B}}(B,C), g \in \text{Mor}_{\mathcal{B}}(A,B)$  and for all  $A,B,C \in \text{Ob } \mathcal{B}$

2.26. Definition [3]. Let  $\mathcal{B}$  and  $\mathcal{C}$  be categories. Let  $\mathcal{F}$  consist of

- (1) a map  $\text{Ob } \mathcal{B} \ni A \mapsto \mathcal{F}(A) \in \text{Ob } \mathcal{C}$
- (2) a family of maps  $\{\text{Mor}_{\mathcal{B}}(A,B) \ni f \mapsto \mathcal{F}(f) \in \text{Mor}_{\mathcal{C}}(\mathcal{F}(B), \mathcal{F}(A))\}$

for all  $A,B \in \text{Ob } \mathcal{B}$ . Then  $\mathcal{F}$  is called a *contravariant functor* if  $\mathcal{F}$  complies with the following axioms:

- (i)  $\mathcal{F}(1_A) = 1_{\mathcal{F}(A)}$  for all  $A \in \text{Ob } \mathcal{B}$
- (ii)  $\mathcal{F}(fg) = \mathcal{F}(g)\mathcal{F}(f)$  for all  $f \in \text{Mor}_{\mathcal{B}}(B,C), g \in \text{Mor}_{\mathcal{B}}(A,B)$  and for all  $A,B,C \in \text{Ob } \mathcal{B}$ .

2.27. Proposition [3]. Let  $\mathcal{C}$  be a category and  $A \in \text{Ob } \mathcal{C}$ . Then  $\text{Mor}(A, -) : \mathcal{C} \rightarrow \text{Set}$  with

$$\text{Ob } \mathcal{C} \ni B \mapsto \text{Mor}(A,B) \in \text{Ob } \text{Set}$$

$$\text{Mor}(B,C) \ni f \mapsto \text{Mor}(A,f) \in \text{Mor}(\text{Mor}(A,B), \text{Mor}(A,C))$$

is a covariant functor. Furthermore,  $\text{Mor}(-, A) : \mathcal{C} \rightarrow \text{Set}$  with

$$\text{Ob } \mathcal{C} \ni B \mapsto \text{Mor}(B,A) \in \text{Ob } \text{Set}$$

$$\text{Mor}(B,C) \ni f \mapsto \text{Mor}(f,A) \in \text{Mor}(\text{Mor}(C,A), \text{Mor}(B,A))$$

is a contravariant functor ■

2.28. Remark [3]. The above proposition says that corresponding to any object  $A$  in a category  $\mathcal{C}$ , one can form a covariant functor  $\text{Mor}(A, -)$  and a contravariant functor  $\text{Mor}(-, A)$ . Of these,  $\text{Mor}(A, -)$  is called *covariant representable functor* and  $\text{Mor}(-, A)$  is called *contravariant representable functor*.

2.29. Definition [3]. Let  $\mathcal{C}$  be a category and  $f$  a morphism in  $\mathcal{C}$ .  $f$  is called a *monomorphism* if the map  $\text{Mor}(B, f)$  is injective for all  $B \in \text{Ob } \mathcal{C}$ .

2.30. Definition [3]. Let  $\mathcal{C}$  be a category and  $f$  a morphism in  $\mathcal{C}$ .  $f$  is called an *epimorphism* if the map  $\text{Mor}(f, B)$  is injective for all  $B \in \text{Ob } \mathcal{C}$ .

2.31. Lemma [3]. (a).  $f \in \text{Mor}(A,B)$  is a monomorphism in  $\mathcal{C}$  if and only if  $fg=fh$  implies  $g=h$  for all  $C \in \text{Ob } \mathcal{C}$  and for all  $g,h \in \text{Mor}(C,A)$ .

(b).  $f \in \text{Mor}(A,B)$  is an epimorphism in  $\mathcal{C}$  if and only if  $gf=hf$  implies  $g=h$  for all  $C \in \text{Ob } \mathcal{C}$  and for all  $g,h \in \text{Mor}(B,C)$  ■

The above lemma enables us to roughly define a *monomorphism* as a *left cancellable morphism*; and an *epimorphism* as a *right cancellable morphism*.

2.32. Theorem [14]. Every morphism in **L-FCyc** is a monomorphism ■

2.33. Remark [14]. All the morphisms in **L-FCyc** are not epimorphisms. We give below an example to prove this.

2.34. Example [14]. Let  $Z_1 = \{0\}$  with the maximum lattice,  $L_1 = \{O_1 = I_1\}$ , the one-point lattice;  $Z_2 = \{0,1\}$  with the maximum lattice,  $L_2 = \{O_2, I_2\}$  and  $Z_6 = \{0,1,2,3,4,5\}$  with the maximum lattice  $L_3 = \{O_3 (=1), 2, 3, I_3 (=6)\}$ . Define  $A: Z_1 \rightarrow L_1, B: Z_2 \rightarrow L_2$  and  $C: Z_6 \rightarrow L_3$  by

$$A(0) = I_1$$

$$B(0) = I_2, B(1) = O_2 \text{ and}$$

$$C(0) = I_3, C(2) = C(4) = 2, C(3) = 3 \text{ and } C(1) = C(5) = O_3.$$

Define  $F: \text{Pr}(L_1) \rightarrow \text{Pr}(L_2)$  by  $F(A^{-1})(I_1) = \{0\}$ ;  $G: \text{Pr}(L_2) \rightarrow \text{Pr}(L_3)$  by  $G(B^{-1})(I_2) = \{0\}$  and  $G(B^{-1})(O_2) = \{2,4\}$  and  $H: \text{Pr}(L_2) \rightarrow \text{Pr}(L_3)$  by  $H(B^{-1})(I_2) = \{0\}$  and  $H(B^{-1})(O_2) = \{3\}$ . Define  $f: L_1 \rightarrow L_2$  by  $f(I_1) = I_2$ ;  $g: L_2 \rightarrow L_3$  by  $g(I_2) = I_3, g(O_2) = 2$  and  $h: L_2 \rightarrow L_3$  by  $h(I_2) = I_3, h(O_2) = 3$ . Then  $F_f: A \rightarrow B, G_g, H_h: B \rightarrow C$ . Here  $G_g \neq H_h$ . But  $G_g F_f = H_h F_f$  ■

2.35. Definition [15]. Let  $G_1$  and  $G_2$  be two finite cyclic groups with maximum lattices  $L_1$  and  $L_2$  respectively. Let  $f: L_1 \rightarrow L_2$  be an isomorphism. Let  $A \in (G_1, L_1)$  and  $B \in (G_2, L_2)$ , each of them saturating its respective lattice. A function  $F: \text{Pr}(L_1) \rightarrow \text{Pr}(L_2)$  is said to define an *L-fuzzy isomorphism* from  $A$  onto  $B$  through  $f$  if  $F(A^{-1}(a)) = B^{-1}(f(a))$  for every  $a \in L_1$ . We write  $F_f: A \rightarrow B$  is an isomorphism.

2.36. Definition [3]. Let  $\mathcal{C}$  be a category and  $A, B \in \text{Ob } \mathcal{C}$ . A morphism  $f \in \text{Mor}(A,B)$  is called an isomorphism if there is a mapping  $g \in \text{Mor}(B,A)$  such that  $fg = 1_B$  and  $gf = 1_A$ .

2.37. Theorem [15]. A morphism  $F_f: A \rightarrow B$  in **L-FCyc** is an isomorphism if and only if the maximum lattices for  $A$  and  $B$  are isomorphic ■

### III. INITIAL OBJECTS, FINAL OBJECTS, ZERO OBJECTS AND ZERO MORPHISMS IN L-FCYC

In this section, we discuss the existence of initial objects, final objects, zero objects and zero morphisms in this category. All these notions are introduced first and then discussed.

3.1 Definition [4]. An object  $A$  in a category  $\mathcal{C}$  is called an *initial object* if  $\text{Mor}(A,B)$  consists of exactly one element for all  $B \in \mathcal{C}$ .

3.2 Example. Let  $Z_1 = \{0\}$  is an initial object in the category **Grp**.

3.3 Theorem. **L-FCyc** has initial objects.

Proof: Let  $G$  be a group consisting of one element 0. Its maximum lattice is the singleton lattice  $L_1 = \{I_1\}$ . Define  $A: G \rightarrow L_1$  by  $A(0) = I_1$ . Let  $H$  be any finite cyclic group and  $L_2$  be the corresponding maximum lattice. Define  $B: H \rightarrow L_2$  which saturates  $L_2$ . Define  $f: L_1 \rightarrow L_2$  be such that  $f(I_1) = I_2$ . Then we can

find exactly one morphism  $F_f : A \rightarrow B$  given by  $F(A^{-1}(I_1))=B^{-1}(f(I_1))$ . Hence A is an initial object in **L-FCyc** ■

3.4 *Definition*[4]. An object A in a category  $\mathcal{C}$  is called a *final object* if  $\text{Mor}(B,A)$  consists of exactly one element for all  $B \in \text{Ob}\mathcal{C}$ .

3.5 *Proposition*. **L-FCyc** has no final objects.

*Proof:* Suppose, if possible, that A is a final object in **L-FCyc**. Then for any B in **L-FCyc** we must have a morphism, say,  $F_f : B \rightarrow A$ . Assume that the maximum lattices for B and A are  $L_1$  and  $L_2$  respectively and that  $L_1$  is not embeddable on  $L_2$ . Then there cannot exist such a morphism. In other words,  $\text{Mor}(B,A)$  is empty, and not singleton ■

3.6. *Definition*[4]. An object is called *zero object* if it is an initial and a final object.

3.7. *Proposition*. **L-FCyc** has no zero objects.

*Proof:* Follows from proposition 3.5. ■

3.8. *Definition*[4]. A morphism  $f : A \rightarrow B$  in  $\mathcal{C}$  is called a *left zero morphism* if  $fg=fh$  for all  $g,h \in \text{Mor}(C,A)$  and for all  $C \in \mathcal{C}$ .

3.9. *Theorem*. The Category **L-FCyc** has left zero morphisms.

*Proof:* Let  $G=\{0\}$  be a group consisting of one element. Let  $L_1=\{I_1\}$  be a lattice consisting one point. Define  $A: G \rightarrow L_1$  by  $A(0)=I_1$ . Let H be any finite cyclic group and  $L_2$  be its maximum lattice. Then  $L_1$  is embeddable on  $L_2$ . Let  $B: H \rightarrow L_2$  be an L-fuzzy group. Then  $B(0)=I_2$ , the maximum element of  $L_2$ . Define  $f: L_1 \rightarrow L_2$  by  $f(I_1)=I_2$ . Define  $F : \text{Pr}L_1 \rightarrow \text{Pr}L_2$  by  $F(A^{-1}(I_1)) = B^{-1}(I_2)$ . Then  $F(A^{-1}(I_1))=B^{-1}(f(I_1))$ .  $\therefore F_f : A \rightarrow B$  is a morphism in **L-FCyc**. We will show that  $F_f$  is a left zero morphism. Let C be any object of **L-FCyc** and let  $L_3$  be the maximum lattice corresponding to C. There arises two distinct cases. *Case(i):  $L_3$  is isomorphic to  $L_1$ .* Then  $L_3$  has only one point say,  $I_3$ . Define  $g : L_3 \rightarrow L_1$  by  $g(I_3)=I_1$ . This mapping is unique in the sense that if  $h: L_3 \rightarrow L_1$  is another mapping, then  $g=h$ . Hence if  $G_g, H_h \in \text{Mor}(C,A)$ , then by proposition 2.24,  $G_g=H_h$ .  $\therefore F_f G_g = F_f H_h$ . *Case(ii):  $L_3$  is not embeddable on  $L_1$ .* In this case,  $\text{Mor}(C, A)$  is empty and the result holds vacuously ■

3.10. *Remark*. We can also form a category whose objects are the L-fuzzy subgroups of finite cyclic groups which have isomorphic maximum lattices and whose morphisms are the L-fuzzy isomorphisms. This category is a full subcategory of **L-FCyc**.

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# Study of Vasectomy Adopters with special reference to Motivational Factors

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**Abstract-** To find out myths and to suggest ways to overcome them among the acceptors of non-scalpel vasectomy (NSV) This study was conducted on NSV acceptors at Family Welfare Centre of SMS Hospital Jaipur (Rajasthan). The subjects were interrogated about the motivational factors, myths they had and the socio-demographic profile was also enquired. On repeat visits complications if any were recorded and treated. Chi-square test was used to find out the significance of difference between proportions. **Conclusions:** Out of total 327 vasectomy acceptors, 251(66.7%) had their wives in the age group of 30 and above. Their wives were significantly ( $P<.001$ ) more literate than their husbands. Satisfied clients were the main motivational factor ( $P<.001$ ). The causes of delaying vasectomy were many fears and out of all fears to lose of sexual desire was the commonest.

**Index Terms-** Contraceptive, Vasectomy, Myths, Chi-square Test

## I. INTRODUCTION

No-Scalpel Vasectomy is one of the most effective contraceptive methods available for males. This new method is now being offered to men who have completed their families, as a special project, on a voluntary basis under the Family Welfare programme. This project is being implemented in the country to help men adopt male sterilization and thus promote male participation in the Family Welfare programme.

Vasectomy is even far safer and easier, and recovery is quicker, than female surgical sterilization and it can be done in an office setting with a local anesthetic and without an incision. Despite its many advantages, vasectomy is widely used in only a few countries, including China, India, Thailand, Korea, United Kingdom, Canada and the United States. About 45 million couples worldwide rely on vasectomy for contraception, compared with about 150 million female sterilization users (1)

Men are often reluctant to consider vasectomy because of inaccurate information and myths. Vasectomy does not affect production of male hormones that control the sex drive, erection, or masculine features, such as facial hair or muscle tone. The method simply prevents sperm from being in the ejaculate (2)

Although vasectomy is considered as one of the most effective contraceptive methods available, there had been very few studies in comparison to research available on male sterilization. So, this study entitled “**Study of Vasectomy Adopters with special reference to Motivational Factors**” is an effort in this direction.

## II. RESEARCH ALLOCATION

This study was conducted on vasectomy acceptors attending Family Welfare Centre of SMS Hospital, Jaipur (Raj.) during last financial year i.e. 1<sup>st</sup> April 2012 to 31<sup>st</sup> March 2013. Just before the vasectomy procedure all vasectomy adopters were interviewed about their motivational factor to adopt this method of contraception along with other desired socio-demographic details. Acceptors having more than two children were asked about their reasons of not adopting it so far after having two children and then they were also asked about the ways they had overcome their myths about vasectomy. After having gone through the procedure each of acceptors was asked to come for follow-up after 3 days, 15 days and 3 months. At each follow-up visit complications were observed and treated. At the time of last follow-up semen examination was also carried out.

Data thus collected was compiled, classified and analyzed with the help of computer to draw inferences.

## III. RESULTS

Out of total 327 vasectomy acceptors, majority 179 (44.7%) were having their wives in the age group of 30 years to 40 years and quite a handsome number of adopters (22%) were having their wives 40 years or more than 40 years i.e. people are adopting permanent method in their later ages. Most of acceptors (83.49%) were Hindus and only few were Muslims and from other religion. Urban rural ratio observed was 2.84. Among acceptors their wives were significantly ( $P < .001$ ) more educated than their husbands. Other studies (3) also revealed the fact that female education has significant role in acceptance of contraceptive methods.

Although majority (55.98%) was accepting NSV after having two children but no less proportion (44.03%) was accepting it after having more than two children, so defeating the purpose of family planning to control population.(4) They were more concerned with male child as only 16(4.89%) had accepted vasectomy without having a male child which was also highly significant ( $P < .001$ ).

Satisfied clients were the main motivational factor observed in 80.12% to accept vasectomy, followed by word of mouth from others, incentives and others, which was again highly significant ( $P < .001$ ). Other authors have also observed the same and advise that involving men who have had a vasectomy to encourage other men and can help to develop an interest in the procedure. (5)

When reasons for delay in accepting vasectomy were asked to acceptors having more than two children, different types of fears (in 96.53%) were the main reason, in which loss of sexual desire was observed the most followed by fear of weakness, loss of erection and fear of operation. More or less similar observations were made by other authors(2, 6). A study in Colombia found that both men and women still believe, incorrectly, that vasectomy affects a man's sexual performance.(2) Vasectomy does not affect production of male hormones that control the sex drive, erection, or masculine features, such as facial hair or muscle tone. The method simply

prevents sperm from being in the ejaculate. In the procedure, the provider cuts the vas- deferentia, through which sperm travel from the testicles to the urethra during ejaculation. After vasectomy, the testicles continue to produce sperm that eventually degenerate and are excreted, like other body cells.

When these acceptors were asked as to how they had overcome these fears and were ready to accept vasectomy, majority (95.68%) said that satisfied clients of vasectomy acceptors convinced them to adopt this method. These differences in reasons for delay in accepting vasectomy, myths they had in their minds and ways to overcome their myths were also observed highly significant ( $P < .001$ ). Out of total 327 acceptors only 4(1.22%) had complications i.e. two (0.62%) had infection and one had hematoma. The study is well supporting with the findings of Nirapathongpron A et al who observed very few complications.(7) A final report of family health survey in five countries on 705 NSV acceptors has also observed only 10 men(1.4%) with hematomas (blood clots) and just one (0.14%) with infection at the procedure site.(8)

#### IV. CONCLUSIONS

Majority of vasectomy acceptors had their wives in the age group of 30 and above i.e. people are adopting permanent method in their later ages, thereby defeating the purpose of family planning to control population. Their wives's education have an important role in adoption of this method. They were having different types of fears about vasectomy and they were motivated mainly by the satisfied clients. So, satisfied clients of vasectomy may be very useful to encourage use among other men, remove the myths about the procedure and helps to develop an interest in the procedure.

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**Table No. 1**

<b>Socio-demographic Profile of Vasectomy Acceptors</b>		<b>N=327</b>
<b>Age Group</b>	<b>No.</b>	<b>%</b>
<25	12	3.67
25-30	64	19.57
30-35	81	24.77
35-40	98	29.97
>40	72	22.02
<b>Religion Wise</b>	<b>No.</b>	<b>%</b>
Hindu	273	83.49
Muslim	40	12.23
Other	15	4.59
NA Info.	9	2.75
<b>Residence</b>	<b>No.</b>	<b>U:R</b>
Urban	240	
Rural	87	
Total	327	<b>2.84</b>
<b>Husband's Education</b>	<b>No.</b>	<b>%</b>
Illiterate	176	<b>53.82</b>
<Primary	47	14.37
Middle	33	10.09
Secondary	43	13.15
Graduate & Above	28	8.56
<b>Wife's Education</b>	<b>No.</b>	<b>%</b>
Illiterate	107	32.72
<Primary	75	22.94
Middle	64	19.57
Secondary	49	14.98
Graduate & Above	32	9.79

**Table No. 2**

**Motivational Factors to adopt Vasectomy**

<b>*Motivational Factor</b>	<b>No.</b>	<b>%</b>
Word of Mouth	43	13.15
Government Schemes	18	5.50
Incentive	33	10.09
Satisfied Clients	262	80.12
	327	100.00

**\*Multiple Response**

**Chi-Squire Test – 620.93 at DF 3, P<.001 LS=HS**

**Table No. 3**

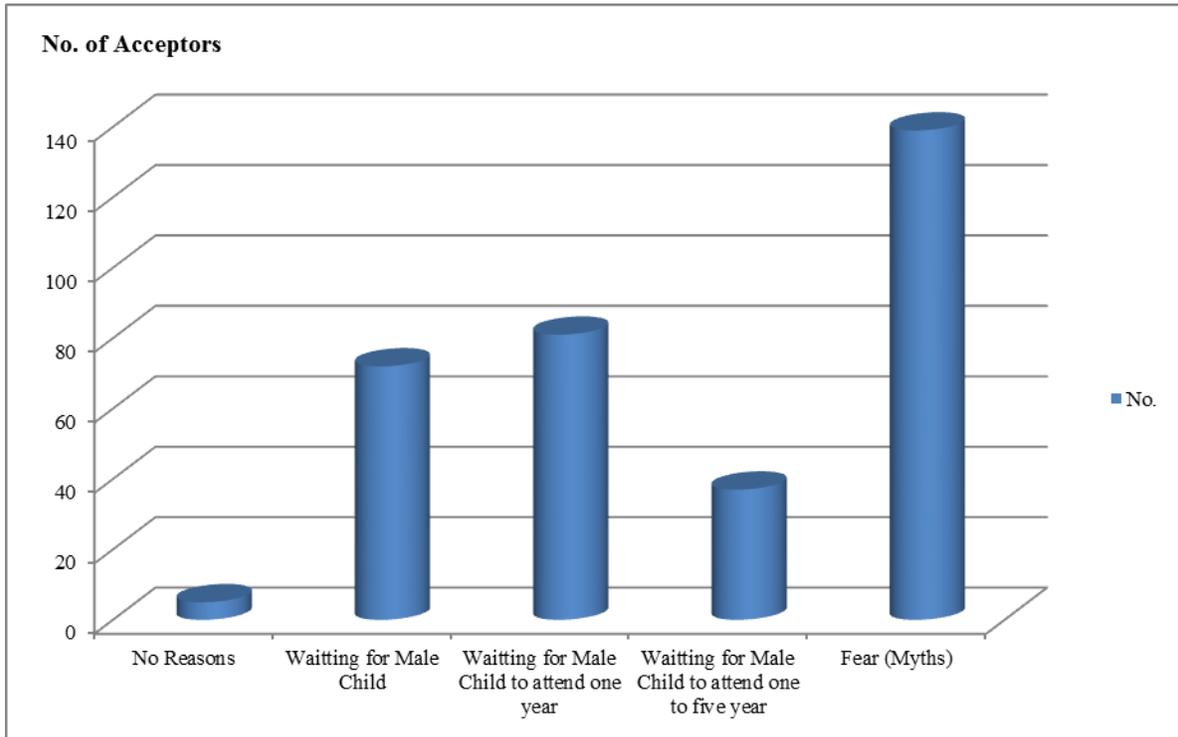
**Myths about Vasectomy causing Delay in adopting Vasectomy**

<b>*Fear/Myths (N=139)</b>	<b>No.</b>	<b>%</b>
Fear of Operation	51	36.69
Fear of Loss of Sexual Desire	123	88.49
Fear of Erectile Dysfunction	87	62.59
Fear of Weakness	94	67.63

**\*Multiple Response**

**Chi-Squire Test - 81.93 at Df 3 P<.001 LS=HS**

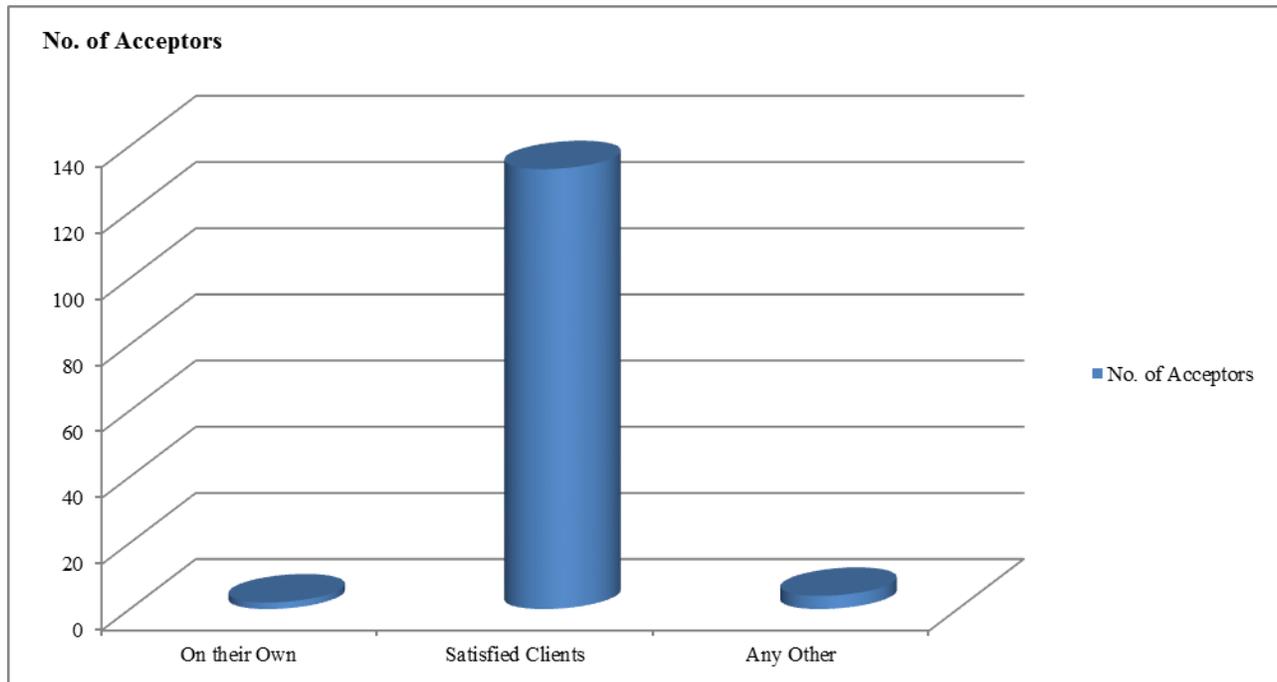
Bar Diagram me - Reasons for Delay in adopting Vasectomy



\*Multiple Response

Chi-Squire Test - 283.39 at DF 4  $P < .001$  LS = HS

Bar Diagram me - Overcome Myths about Vasectomy



# Behavior Integration via MS-ANFIS for Realistic Navigation of Multisensor Autonomous Vehicle

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**Abstract-**In the recent works either the obstacle avoidance of robot in the 2-D unconstrained environment or the wall following behavior of mobile robot in constrained motion has been discussed. In some of them target alignment behavior has been discussed. Also the integration of some but not sufficient behaviors have been discussed in some research works. But all of the behaviors have not yet been integrated. So the problem of designing the optimal controller to perform on all conditions has been a major attraction for the designers and scientists. In this paper the effort has been made to take into account various types of factors like the limitations of suspension system and the physics laws like friction, motion, momentum, centrifugal and centripetal force, Tilting avoidance due to turning Traffic rules, Traffic congestion, signals, overtaking, passing high speed vehicle, speed breakers, single lane road and varying width road, final target alignment in no-road or broad area, limited time to reach the target etc. during the design of the controller. Designing the optimal controller with all the behaviors integrated for proper motion planning in all types of environments needs much treatment. This work mainly deals with designing of the unified controller for optimal navigation of a multisensor mobile robot in real-environment by applying fuzzy rule simplification technique (FRST) via multi-stage adaptive neuro-fuzzy inference system (MS-ANFIS). The Proportional and Derivative (PD) control has also been used in connection with some ANFIS stages for this work.

**Index Terms-** FRST, Fuzzy Rule Simplification Technique, MS-ANFIS, Multistage ANFIS, Multisensor Mobile Robot Optimal Navigation

## Introduction

Modern research in robotics aims to build a self decisive, autonomous and intelligent robot, which can plan its motion in a dynamic environment. A successful use of an autonomous mobile robot depends on its controller. Thus, to generate optimal collision-free path within two side boundaries of a car-like robot during its navigation among several moving obstacles, it should have proper motion planning as well as obstacle avoidance schemes. The obstacle avoidance in unconstrained two dimensional grounds [1],[5],[6],[7] has the drawback that it does not consider the both sides of road because it is necessary to take into account the real environment. The wall following behavior [2], [3] describes the navigation of robotic vehicle in constrained environment only. In this paper we have made effort to design the optimal controller which integrates many behaviors related with real road environment. These behaviors are target alignment, Lane speed, traffic signals, variation of the width of the road, speed breaker, obstacle avoidance, tilting due to excessive turning, wall (divider) following, limited time to reach the target, traffic rules. In this paper various image processing methods have been implemented to sense the sides of roads and the distance of both sides with respect to left and right ends of the robotic vehicle. The concept of template matching has been used to sense the colors of the traffic signal lights. The height of the breaker is also found by processing of the camera image. Based on the concept of multistage fuzzy controller [9] we have introduced here Multistage Adaptive Neuro Fuzzy Inference System (MS-ANFIS) which will have the trainable nature and characteristics like MSFC. For fuzzy rule base reduction (FRST) for step by step getting a number of outputs depending on large no of inputs with reduced complexity due to huge rule base. In the present work the efforts have been done to solve the problem of navigation of a mobile robot within boundaries and real environment in the optimal collision-free path by using multistage adaptive neurofuzzy inference system. An initial effort for this approach (MSANFIS) has been discussed in [16].

## Fuzzy Rule Simplification Technique

We have taken the following assumptions for the basis of Fuzzy Rule Simplification Technique to be used in robotic navigation.

1. In the Robotic vehicles the sensors are incorporated for angle and velocity control.
2. The projections of all the oblique sensors in the direction normal to the moving axis of the robot and sensors in the direction normal to the moving axis of the robot will effect on the angle.
3. The effect of left side sensors will be opposed by the effect of the right side sensors.
4. The projections of all the sensors in the moving axis will effect on the velocity.
5. The sensors in the back side will oppose the effect due to the front side sensors.
6. The effect of all the factors responsible for speed will be taken separately and then the optimal speed will be the minimum of all the speeds.
7. The optimal angle will be found only after the effects of all the behaviors like target alignment, tilting avoidance due to turning obstacle avoidance, wall (divider) following, overtaking, passing, opposite side vehicle collision avoidance have been taken into account for angle.

Till now we have been well introduced by the various types of methods. We have studied about the rule reduction with simple pivoted QR(P-QR) decomposition [8], singular value decomposition (SVD) [10], similarity driven rule base simplification [11], SVD-QR [12]. Linear fuzzy rule interpolation proposed in [13], linear matrix inversion [14]. Now we discuss the procedure Fuzzy Rule Simplification by successive extraction of identical MFs of any input (to be fed in next stage) for the simplification of rule base.

- A. First arrange the fuzzy rules with  $n$  input variables with  $m$  linguistic terms each in which the MF being extracted for the next stage contains the same linguistic terms.
- B. Then arrange the combination of  $n-1$  inputs for each linguistic term of the extractive input.
- C. There will be a common set of combination of  $n-1$  inputs for particular linguistic term of the output variable if decision space is continuous and non empty.
- D. Define an intermediate output  $I$ .
- E. For each combination of  $n-1$  inputs assign a specific linguistic value of intermediate output. Let there are 4 MFs in intermediate output. Assume that,
- F. Now define the combination of particular linguistic values of intermediate output and the extracted output with a particular linguistic term of the output variable.
- G. In this way we get two stages for the Rule base:  $n$ th and  $n-1$ th stage. In  $n$ th stage the result of interaction of  $n$ th and intermediate output is found and another stage.
- H. We repeat the algorithm 1 to 6 until we get all stages with two input and one output

Now because the intermediate output has defuzzified value so we can fuzzify intermediate output in any number of linguistic terms (MF) during feeding it to the next stage according to our convenience. So we see that we can reduce one stage with huge rule base to several stages of reduced rule base as above.

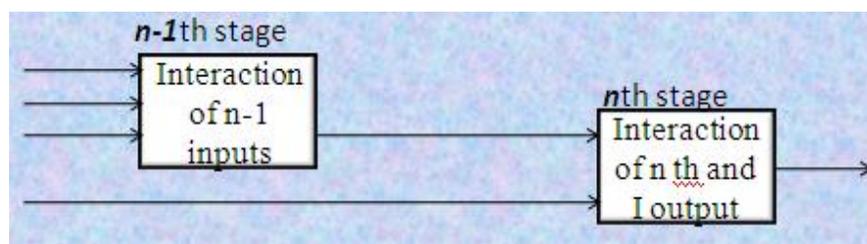


Figure4.1 Conversion of one stage with complex rule base with the two successive stages having reduced complexity

The final output is same value as found from the previous rule base. Though the intermediate output can also be taken as output for control purpose. In this way we will be able to successively reduce the huge rule base complexity and treating each factor separately and then comparing with other factor will turn into ease of designing the optimal controller which will be able perform in all types environment. By this point the necessity of introducing the concept of MSANFIS becomes of much importance. The MS-ANFIS performs the process of fuzzy rule base simplification via extraction of rules with identical MFs of input to be separated for the next stage.

## MS-ANFIS

### Structure of MS-ANFIS

In commonplace fuzzy controllers, usually the error and its derivative are frequently used as inputs to the rule base. There is a rule base (may be several) that produces control signals based on logical algorithms. In these methods, number of error inputs increases considerably if the system has more than one output. Together with above, the inclusion of large number of sensors for excellent control and for precision control inclusion of large no of membership functions per sensor oftentimes leads to a very large and huge rule base which is undesirable for controlling tasks particularly in real time applications. Not only this, but also any modification or readjustment of such a rule base will be really a tiresome and time consuming task. To remedy this problem, an innovative method had been established [9] that while it uses all error signals for control, dimension increment and related problems are subdued well. Conformity on human's experience and reasonable structure of multistage control technique has motivated some researchers to devise and implement controllers based this algorithm [15]. Based on Multistage fuzzy controllers [9] we have designed the Multistage Adaptive neurofuzzy controller. MSANFIS is different from MANFIS [24]. In contrast with usual controllers that produce control signals in one stage, they produce the control signals in several stages together with the capability of learning as a neural network because of adaptive behavior of weights and the inference mechanism like FIS. Multistage Adaptive Neuro Fuzzy control is comprised of many stages of ANFIS has two renowned structures named skew-tree and ternary-tree. Figure.2 and 3 schematically represent these structures.

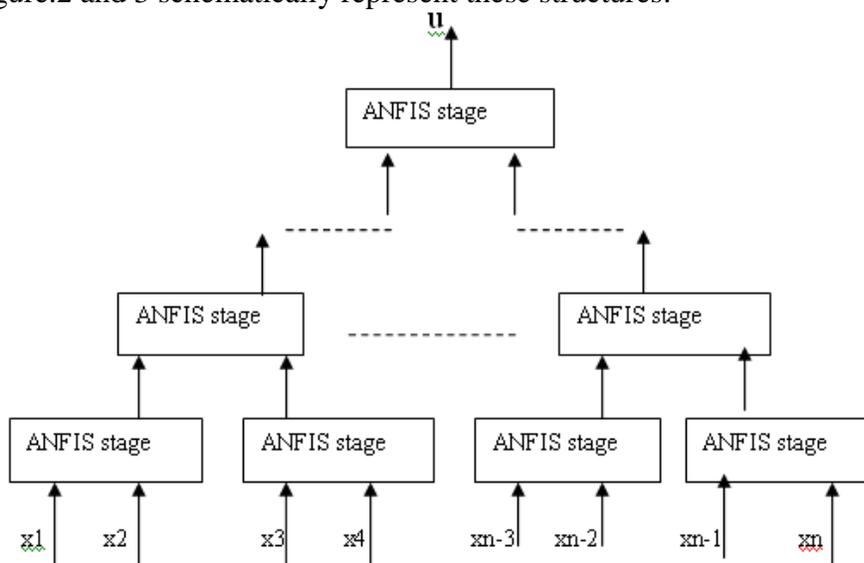


Figure 2: Skew-tree structure of MS-ANFIS

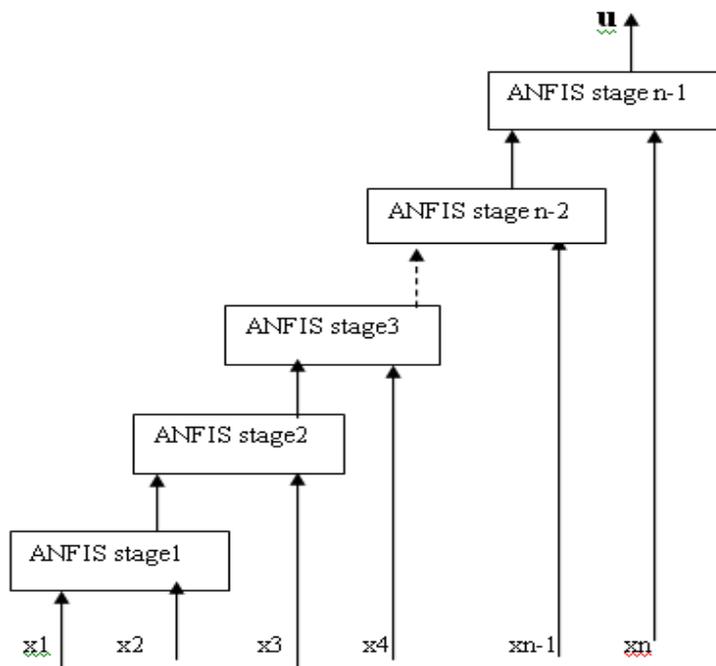


Figure 3: ternary-tree structure of MS-ANFIS

The number of rules and stages are equal in two structures, but logic of producing control signals is thoroughly different. There is a parallel mood in the ternary-tree structure; it means, some stages can be done and computed concurrently. In contrast, in skew-tree structure, each stage is dependent to outputs of former stages, so parallel calculation is not possible. While it seems that the ternary-tree structure is faster than the skew-tree structure, in most cases, skew-tree structure has more conformity on human’s knowledge and experiences in sense of control [9]. Which structure is used is determined based on the underlying system and controlling goals. Next section presents the proposed adaptive neuro fuzzy controller using this structure and human’s experiences together with the learning capability like neurons in human brain.

Based on skew-tree structure and considering two inputs for every stage, number of the stage, should be such that the total inputs equal the inputs required in the conventional fuzzy controllers, and the number of parallel output stages should be such that total out puts including one output per combination (one for speed control and other for angle control) is equal to the total outputs.

In the technique for fuzzy rule simplification we first make an ANFIS stage having two inputs and the output due to the first two inputs is calculated using fuzzification, inference and defuzzification depending on the input membership function and membership grades. This intermediate output is then given as input in the next ANFIS stage and depending on the value of intermediate output and the value of third input; the next intermediate output is obtained. May be any of the intermediate outputs can be used as one of final outputs. let the output 1 depends on the inputs 1,2,3 and 4 and also the output 2 depends on the input 1,2 and 3 then there will be two set of parallel ternary structures. In each set one of the outputs are calculated.

*Behavior of MS-ANFIS*

The behavior of the MS-ANFIS used as desirable component in FRST is like the humanoid thinking characteristics. Let the driver is driving the vehicle then he will lower the speed for the condition when the obstacles have come near. The human acts more for the factor which is more effective for example one obstacle at left is at 2m and another in right at 5m then he will take the speed lowering action for taking into mind the nearer obstacle i.e. at 2m. Now take the angle, the driver at first avoids the left obstacle and then he moving forward turns left to avoid right obstacle. His action is in two stages. So it contains two stage behaviors. The number of sensors and number of behaviors to be incorporated increases the number of stages. Generally the

operator or driver does not know that exactly in how distance what the speed should be and angle value should be, but he knows that if the vehicle is collapsing at left then turns to right and if collapsing at right then turn to left if to if he turns both to avoid collapse but the collapse is further near to happen then he lowers the speed. This type of behavior is contained by MS-ANFIS. Multistage ANFIS has flexibility to design the controller with large number of sensors and large number of behaviors to be included for optimal control in real environment with considerably reduced complexity in designing the controller. Including all above the MSANFIS is also having the trainable behavior. Any of the stages can be trained to give desired performance. If there is some discrepancy in the desired (practical) performance then we can further adjust the scaling factors of the related FIS stage.

## Assumption in Present Work

In our work the following assumptions have been taken into account as seen happening in the real environment.

1. The speed limit has been taken maximum 60 km/hr. This is safe navigation speed.
2. Laser sensors are used for obstacles having shape. The maximum sensing ranges of the laser sensors 30 meters. For other the camera is used like for road side sensing.
3. The FIS range for sensor distance is taken 60 meters to avoid error due to overloading. The sensing range of Laser sensors is taken to be 30 meter.
4. Maximum steering turn angle is -45 to +45 degree.
5. The vehicle has no overhang after the rear wheel. The vehicle width is taken 1.5m, while the mirror projections are 0.25m both sides.
6. The standard clearance crosswise is desired at 0.75m from surfaces of both sides. The clearance less than 0.75 will reduce the speed. At 0.25 the speed will be zero. The absolute clearance of 0.5m is desired to make safe all the outwards projecting accessories like mirrors etc.
7. The front distance (also axial projection of oblique sensors) will reduce the speed if it is less than 30 meters and be zero at the distance of 1.25 m. further reduction of front clearance will reverse the speed (-ve) and max negative speed is -7 km/hr when the clearance is 0.5 m.. The acceleration of starting and retardation at stopping is taken  $4.63\text{m/sec}^2$ .
8. The vehicles are following the traffic rules always but even in case of some randomness also this controller will perform satisfactorily.
9. The target distance is the distance by the road, not by the distance given by Radio Frequency Sensor. RFS distance and RFS angle are the absolute distance and angle of the
10. Until all the obstacles have not been crossed the speed remains within safe limit and as soon as the obstacles clearance increases the speed itself increases if target is distant.
11. When the target has been reached the controller reduces speed to zero and after this, the distance travelled is zero.
12. The vehicle will make effort towards turning to the target side but its turning will be reduced by the positions of obstacles in proximity.
13. According to the Indian Traffic Rules the vehicle will always follow the left lane and overtake from right side, will pass to the right side and remain left to the divider and give the side from right side to the vehicle coming from front.
14. The robotic vehicle will run on fixed speed at fixed distance from divider. If speed is lowered it will turn to left limited by obstacles at left. If speed is increased then the vehicle will start to move towards the divider.
15. It is not necessary that everywhere in the road the masonry dividers or Zebra dividers are present. So we have used the camera sensors which will find the width of the road and the location of divider based on the gray level. The image from camera will be subject to further image processing for edge detection of the road (presently based on vanishing point detection[17]) and then these will be fed to wall following (or divider following subsystem)
16. Various other factors have been introduced for development of controller breaker flatness factor, target alignment factor, wall following factor.

The figure below depicts the sensor locations for optimal navigation. M means middle 30 means 30 degree, 0 means zero degree. F means front, B means back, C means camera, L means left, R means right, for example FR90 means the sensor at left 90 degree in the front side.

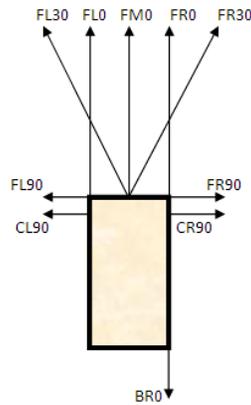


Figure 4.the sensor locations in the robotic vehicle

## Controller Design

During the design of controller we have designed the following controller structure for simulation for integrating the behaviors for speed and angle

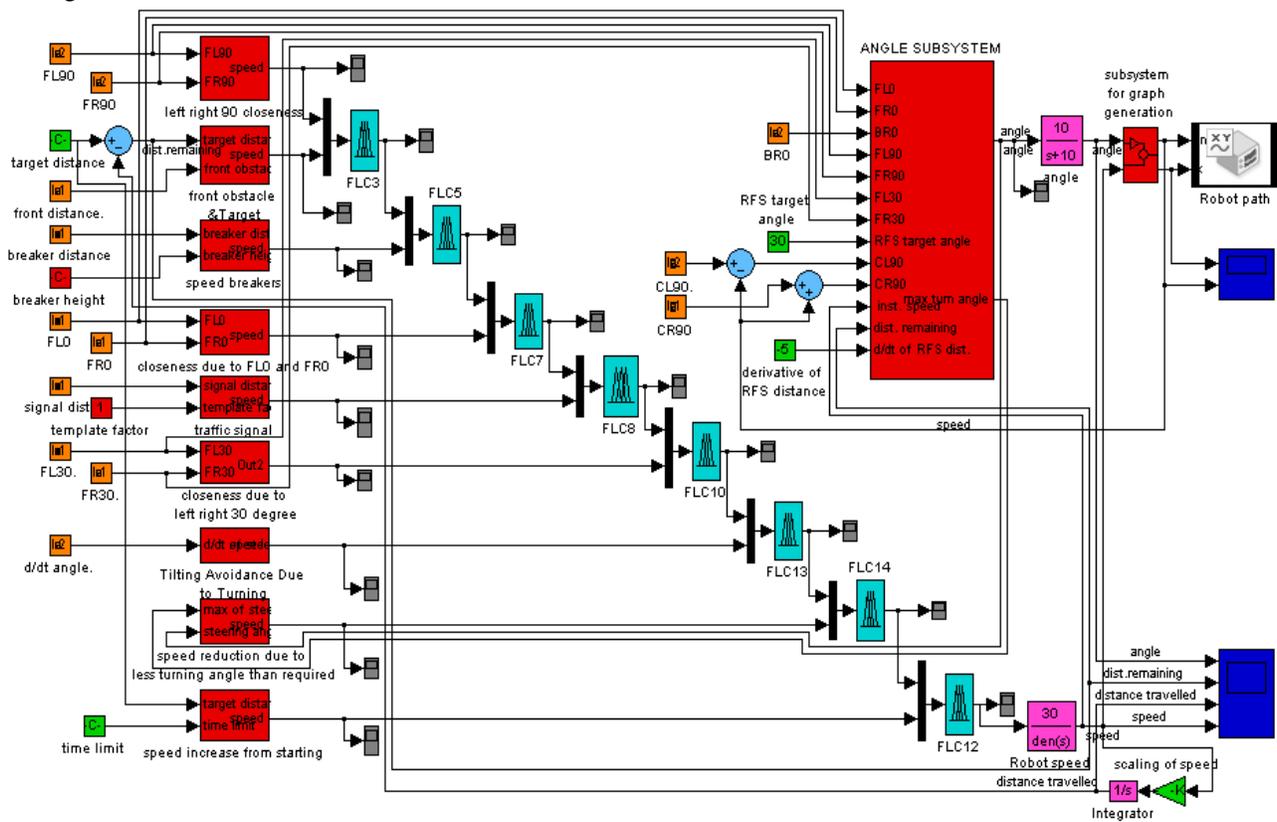


Figure5. The controller design

The angle subsystem shown inside the above controller is shown in the figure below.

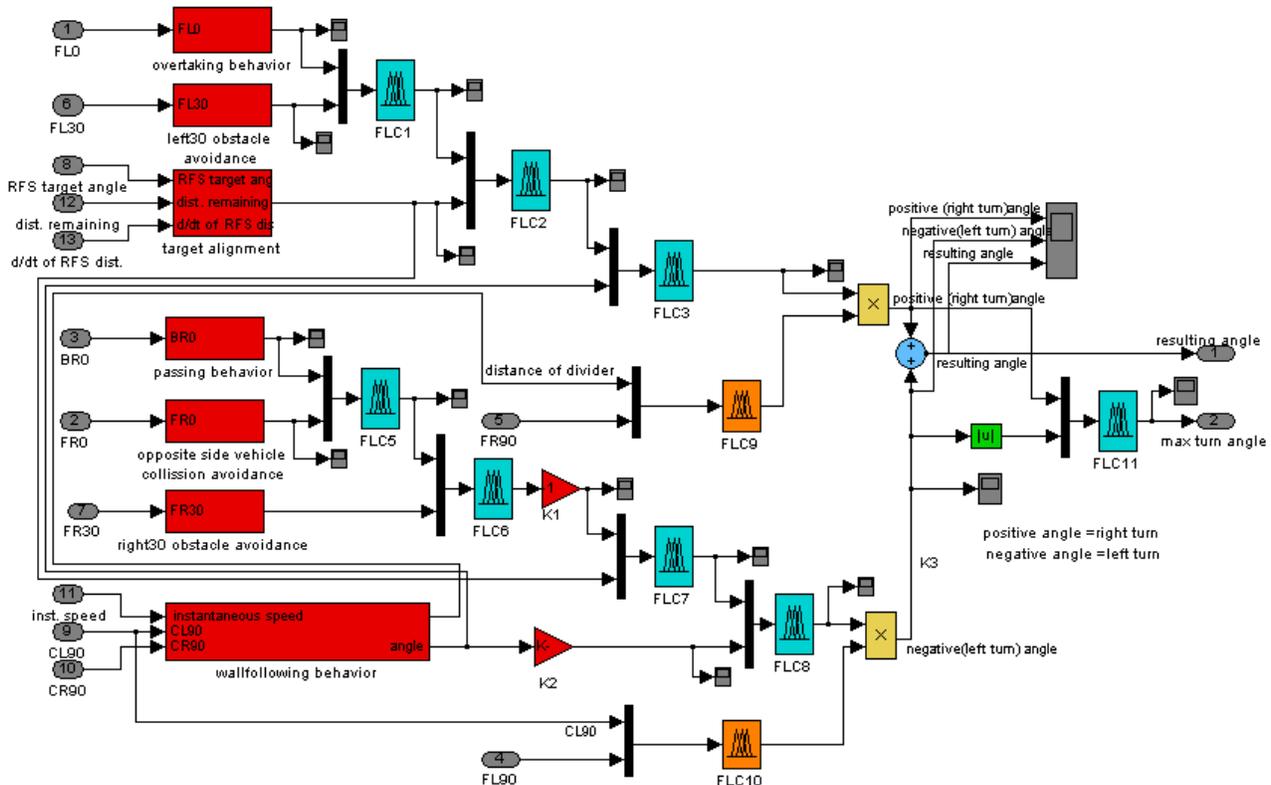


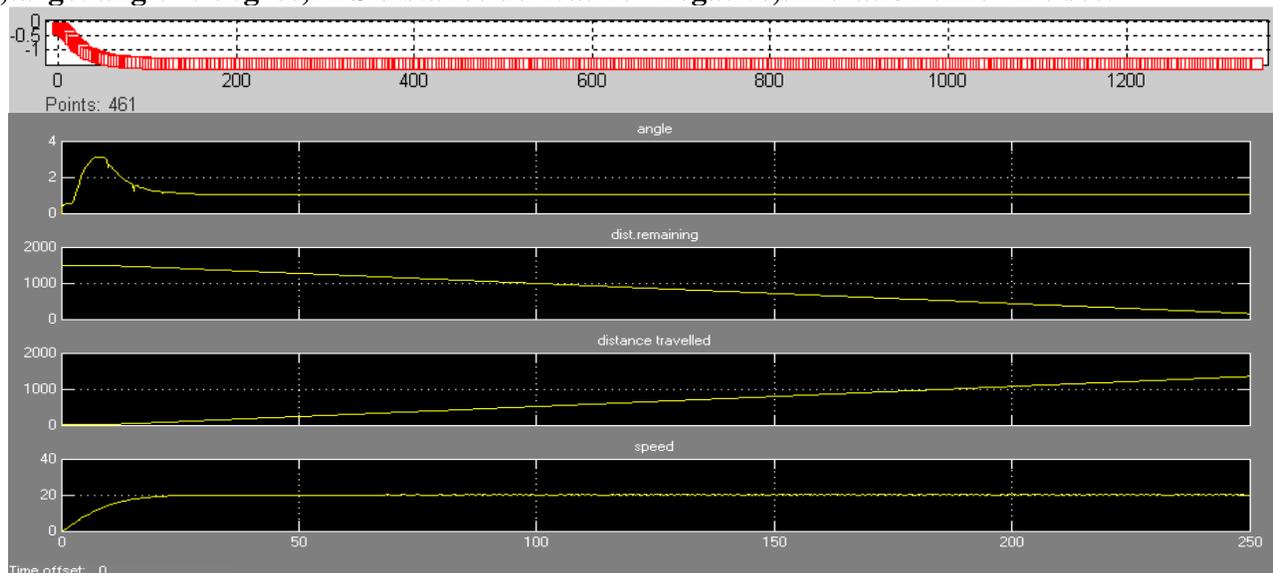
Figure 6. Angle subsystem of the complete controller

It is clear from above figures that the controller structure uses the MSANFIS containing mostly the ternary-tree structure, though at some places the skew-tree or the combination of both structures have been used.

## Simulation Results

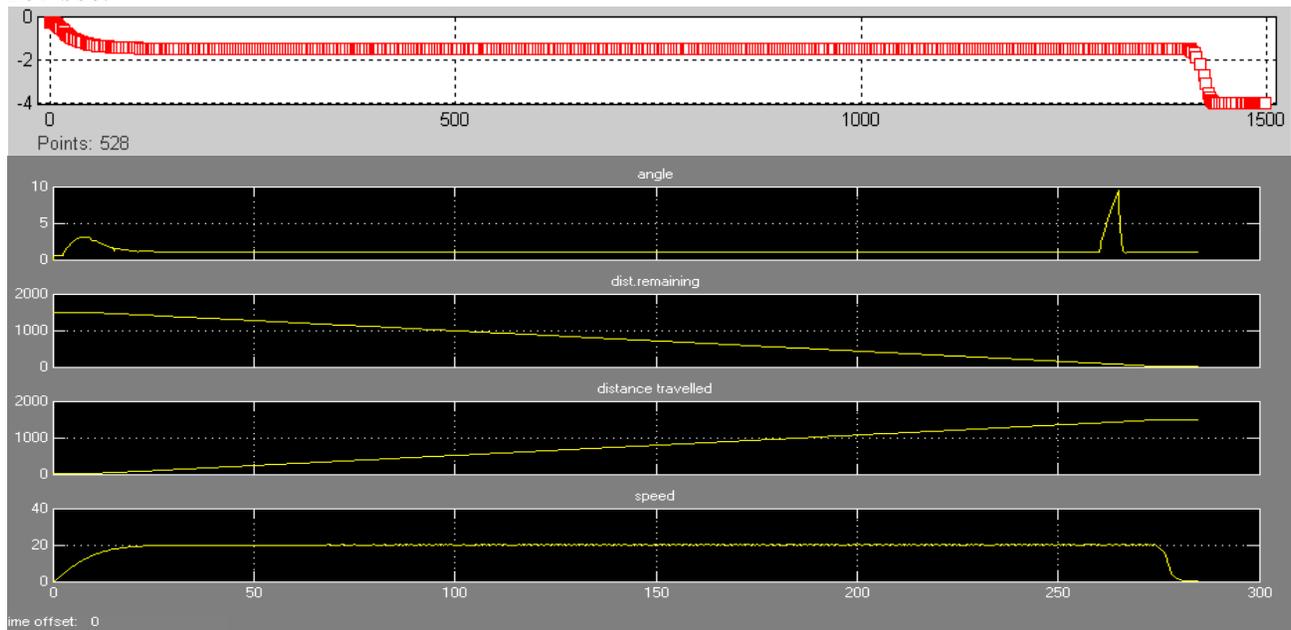
The simulation has been run on a MATLAB 7.6.0 (R2008) and PC with Microsoft XP, Pentium dual core CPU, E5400@ 2.70 GHz, 0.99 GB RAM for various conditions .

**CASE 1: when no other factors are present, speed =20km/hr,road width =10 meter,target distance=1500 meter,target angle=0 degree,RFS distance derivative= negative,simulation time=250 sec.**



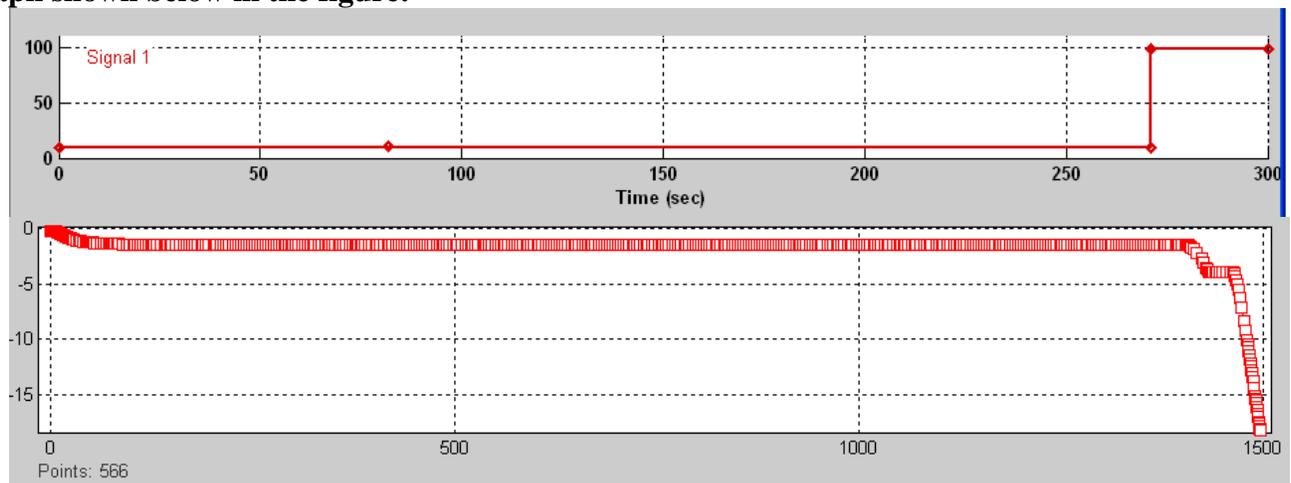
**Explanation 1:** This represents that the speed is increasing from starting and at speed of 20km/hr it takes a distance of 1.5 meter from left side of road after travelling 150 meter.

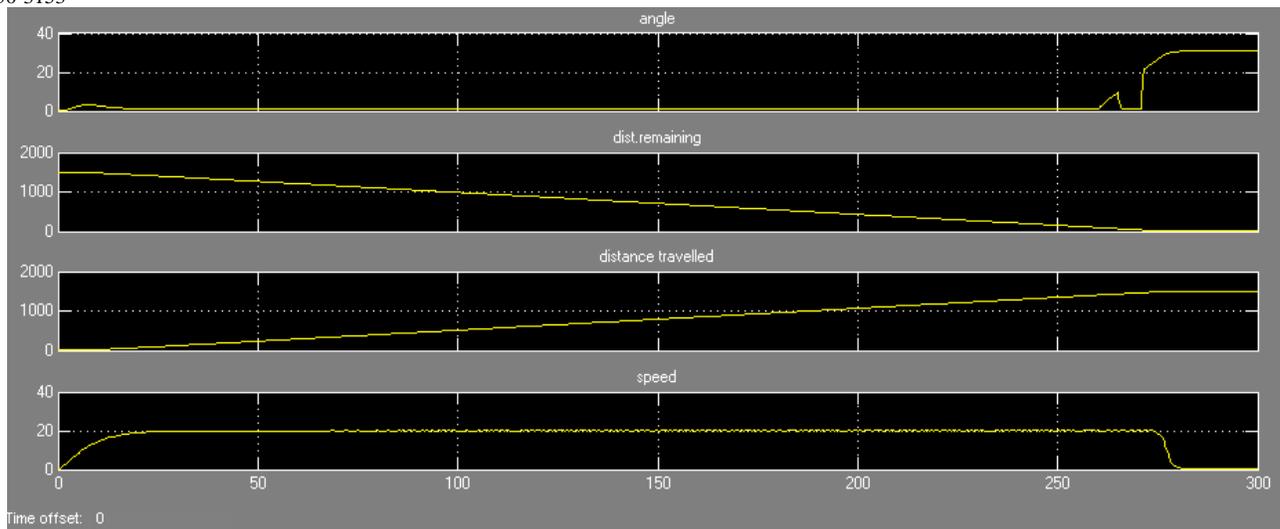
**CASE 2:** when no other factors are present, input speed =20km/hr,road width =10 meter,target distance=1500 meter,target angle=30 degree right, RFS distance derivative= negative, simulation time=285 sec.



**Explanation 2:** The vehicle starts to align towards right when reaching within 100 meters from target but due to presence of the divider it could only travel towards target in right 30 degree until the divider is close in right to the vehicle. When the divider is close the vehicle starts moving parallel to the divider but speed is decreased to zero. Had the square or right turning road been present the vehicle would have moved further towards target. This we will see in next result.

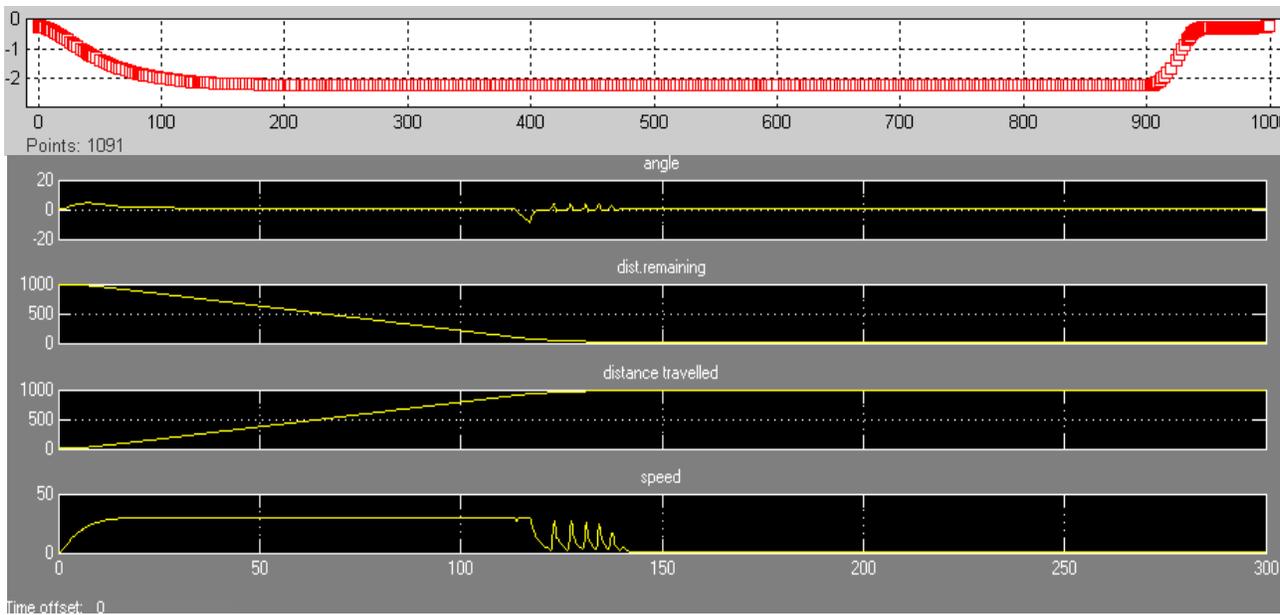
**CASE 3:** Square present near the target , input speed =20km/hr.,road width =10 meter,target distance=1500 meter,target angle= 30 degree right , RFS distance derivative= negative, simulation time=300 sec. The square (absence of divider) is represented by the increased distance sensed by CR90 as in graph shown below in the figure:





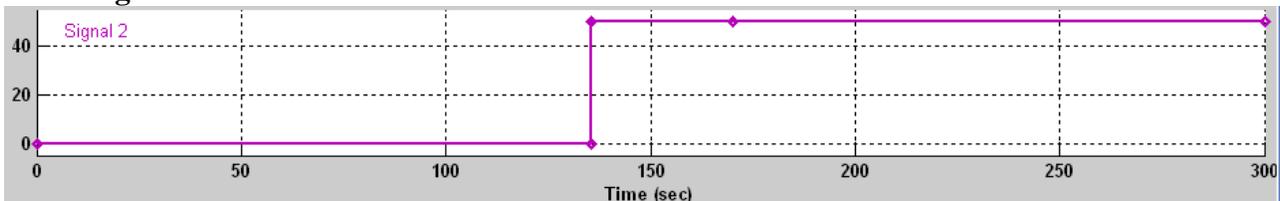
**Explanation 3:** this result describes that the vehicle has aligned towards the target until the divider is close. When the divider is close then the vehicle moves parallel to the divider. As soon as the square is reached the vehicle aligns target very fast.

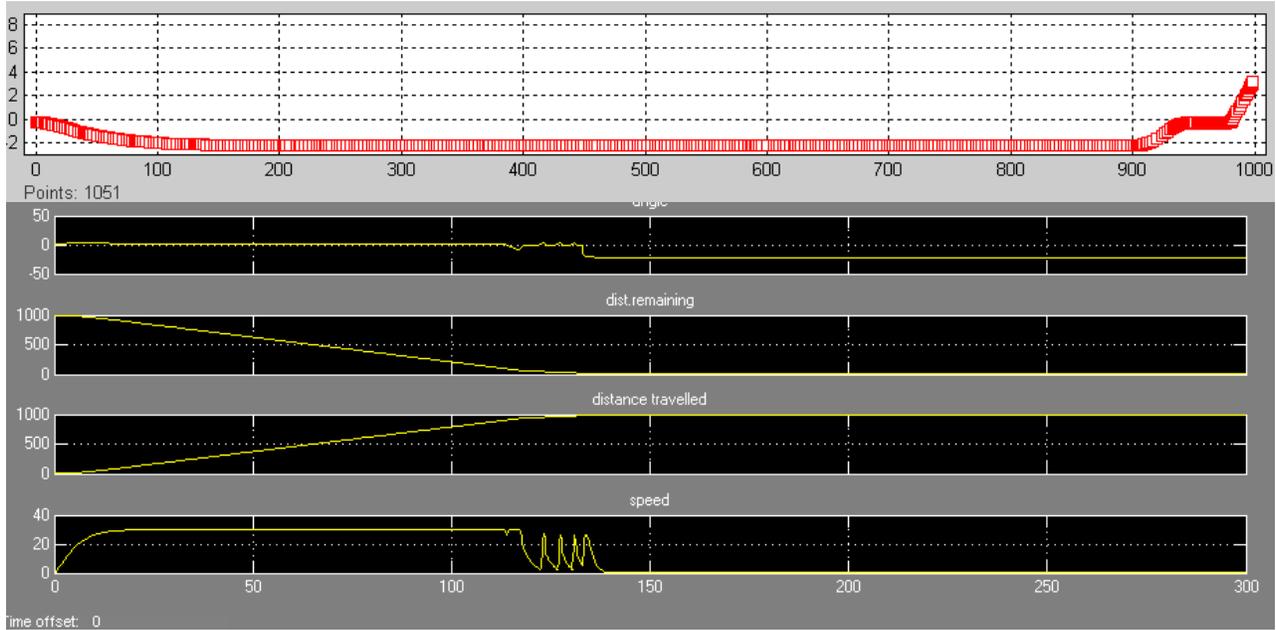
**CASE 4:** when no other factors are present , input speed =30km/hr.,road width =10 meter,target distance=1000 meter,target angle=45 degree left , RFS distance derivative= negative, simulation time=300 sec.



**Explanation 4:** this result describes that the vehicle has aligned towards the target at 45 degree left until the left side of the road is close. When the side is close, the vehicle moves parallel to the side. The speed is very low due to closeness of side.

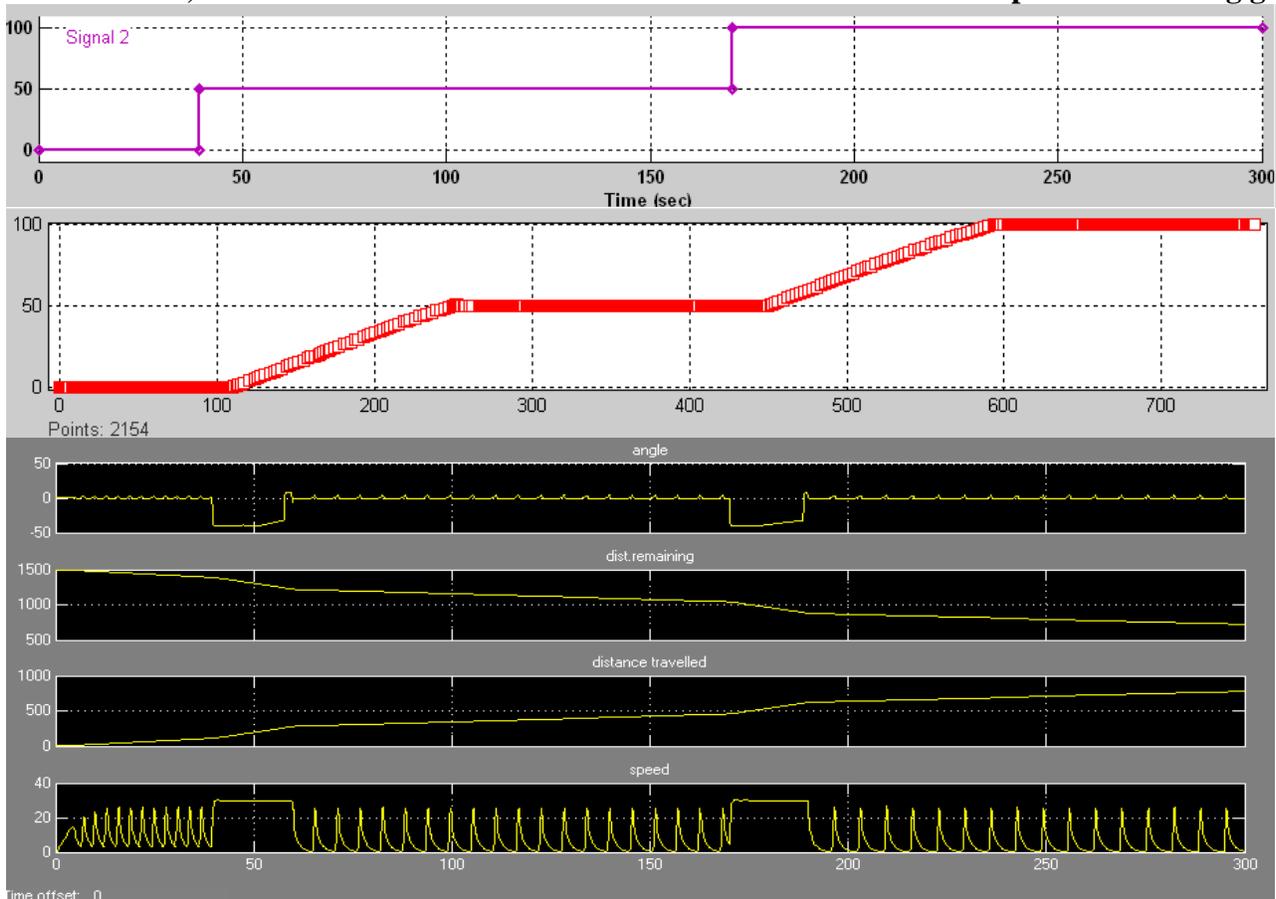
**CASE 5:** Square present near target , input speed =30km/hr.,road width =10 meter,target distance=1000 meter,target angle=45 degree left , RFS distance derivative= negative, simulation time=300 sec. The square (absence of left side) is represented by the increased distance sensed by CL90 as in graph shown below in the figure.





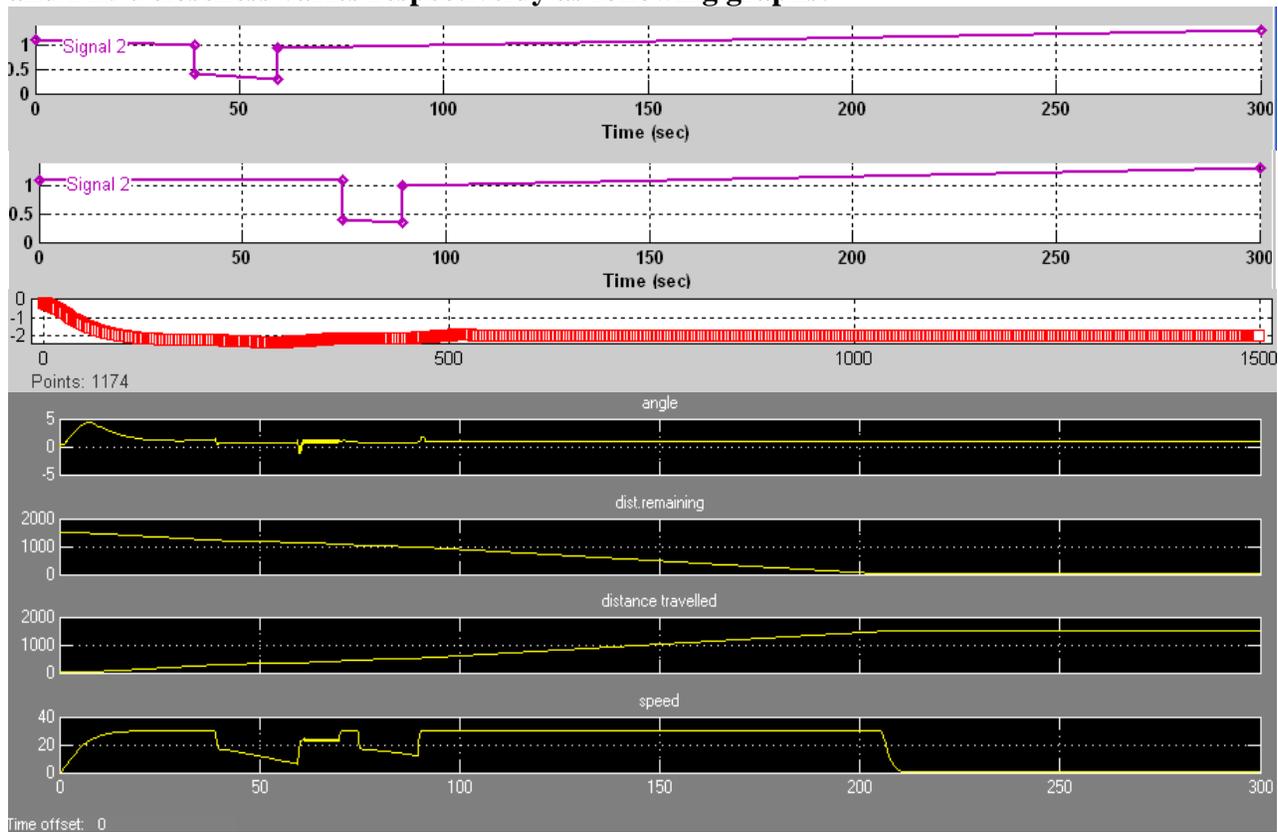
**Explanation 5:** this result describes that the vehicle has aligned towards the target when it is at 45 degree left and within 100 m distance. It aligns until the left side of the road is close. When the side is close, the vehicle moves parallel to the side. The speed is very low due to closeness of side. As soon as the square is reached the vehicle aligns target very fast.

**CASE 6:** Space to turn left available after a small distance of travel target , input speed =30km/hr.,road width =10 meter initially ,target distance=1500 meter,target angle=40 degree left , RFS distance derivative= Positive, simulation time=300 sec. The distance of CL90 increases as per the following graph.



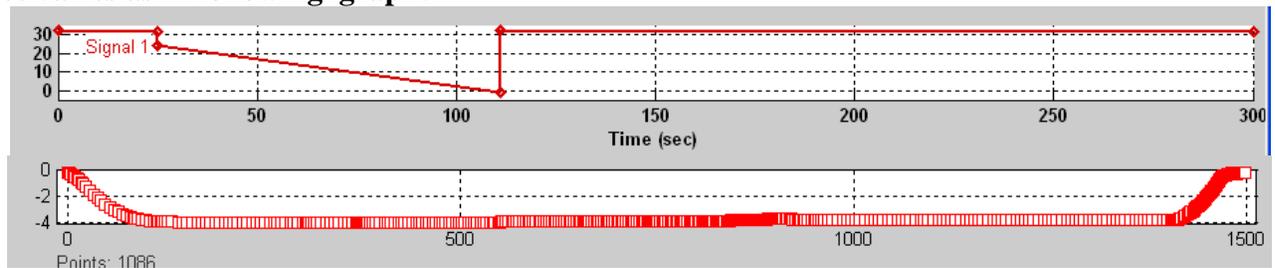
**Explanation 6:** This result describes that the vehicle has aligned towards the target at 40 degree left until the left side of the road is close and RFS derivative is positive. The meaning of RFS positive is that if the vehicle does not align towards the target it will slowly be moving away to the target. When the side is close, the vehicle moves parallel to the side. As soon as the space available in the left, the vehicle aligns towards target again. This process continues though at very low speed but due to side close to vehicle creeps towards the target.

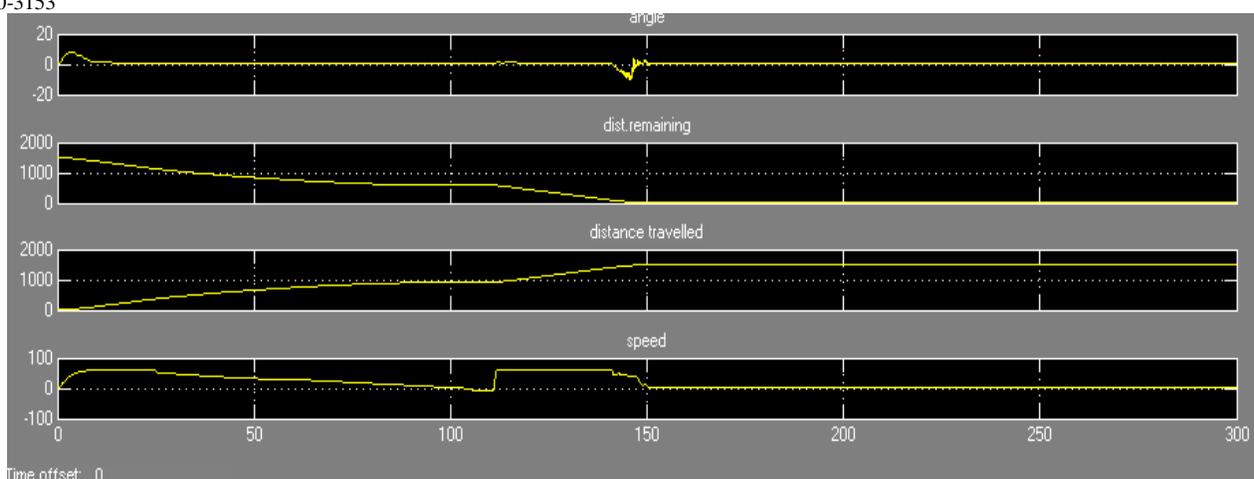
**CASE 7: Left and right 90 degree closeness , input speed =30km/hr.,road width =10 meter,target distance=1500 meter,target angle=0 degree , RFS distance derivative= negative, simulation time=300 sec. FL90 and FR90 closeness varies respectively as following graphs:**



**Explanation 7:** This result describes that the vehicle speed reduces where the left or right closeness distance becomes less than 0.75 m. Higher the closeness (or less the distance FL90 or FR90) higher is the speed reduction. The speed will remain unaffected if the FL90 or FL90 is greater than 0.75m

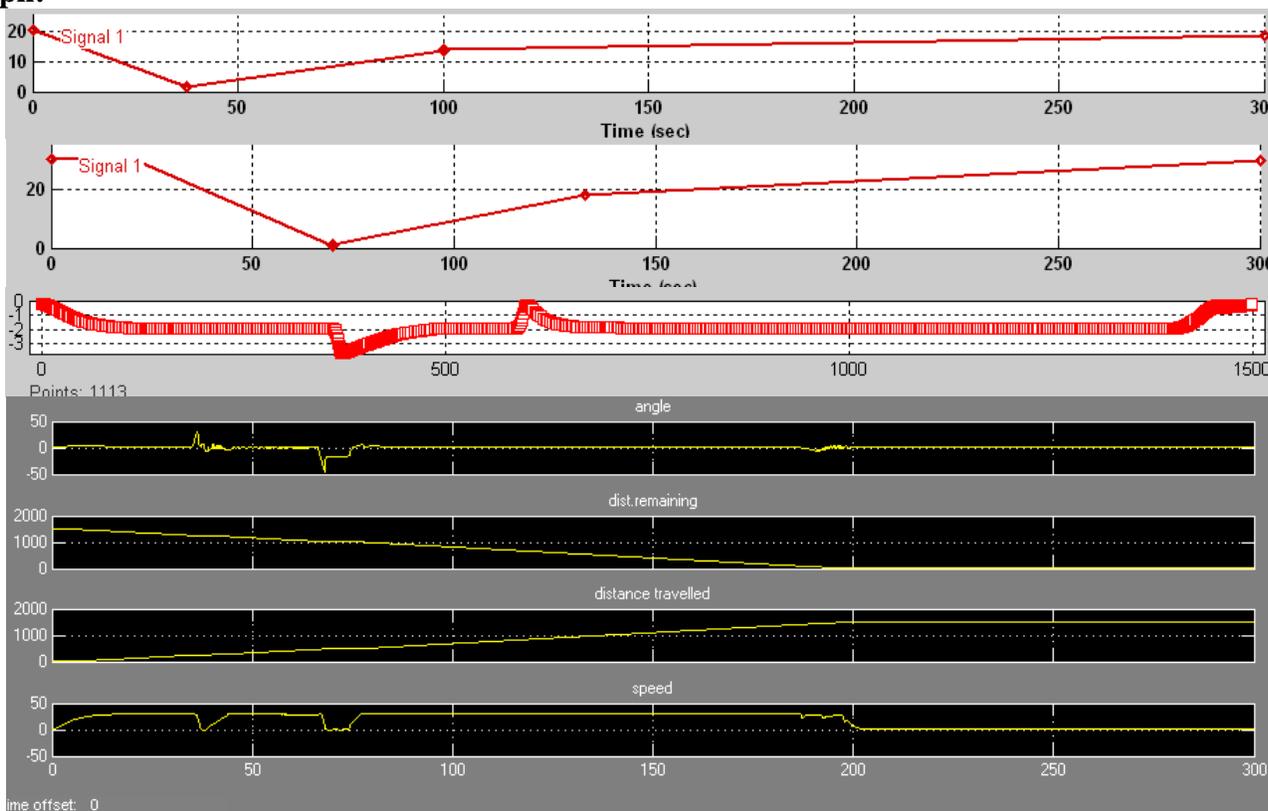
**CASE 8: Front obstacle Avoidance, input speed =60 km/hr.,road width =10 meter,target distance=1500 meter,target angle=20 degree left , RFS distance derivative= negative, simulation time=300 sec. The front distance varies as in following graph:**





**Explanation 8:** This result describes that the vehicle speed reduces where the front obstacle distance becomes 30 m. Higher the closeness from front obstacle higher is the speed reduction. The speed will remain unaffected if the front obstacle distance given by FM0 sensor is greater than 30 meter. At some point between 104 to 111 sec. time the speed is reversed because during this time the front obstacle distance is less than zero. Until the distance becomes equal to or greater than 1.25m the vehicle will be continuing to move backside.

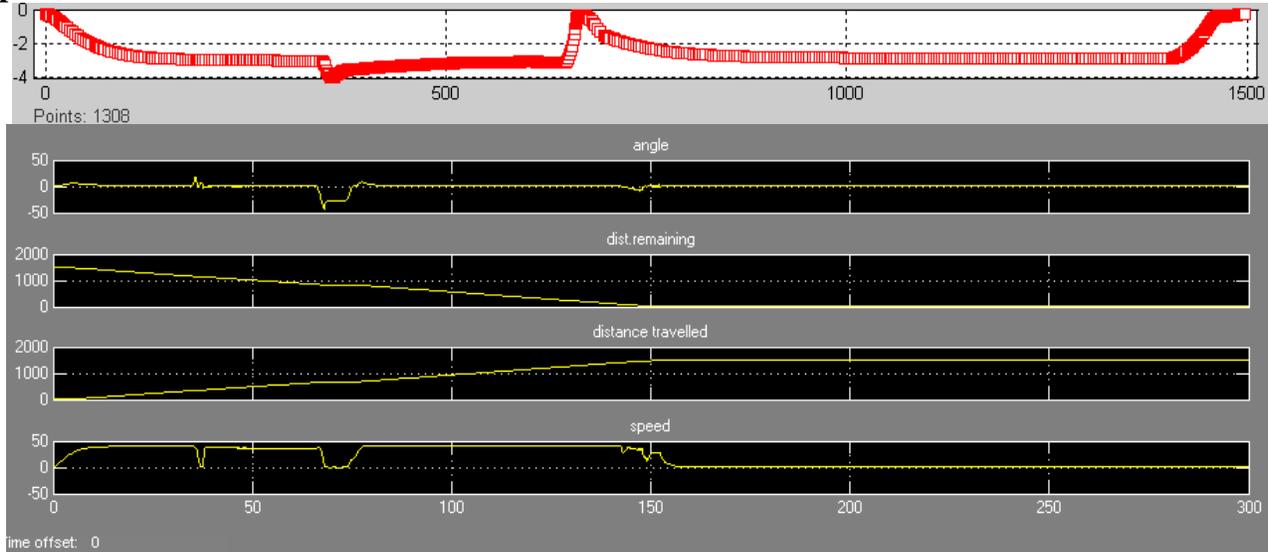
**CASE 9: Left and Right 90 degree obstacle avoidance, input speed =30 km/hr.,road width =10 meter,target distance=1500 meter,target angle=20 degree left , RFS distance derivative= negative, simulation time=300 sec. The distances given by FL30 and FR30 sensor respectively have the variation as in graph:**



**Explanation 9:** The result represents that the vehicle turns right for left 30 degree obstacle and turns left for right 30 degree obstacle. The speed reduction is also seen at the points where the turning occurs. The turning starts if the projected distance of the left obstacle in cross direction to left corner of the vehicle or the projected distance of right obstacle in cross direction to right corner of vehicle is starts to be less than 0.75 meter.

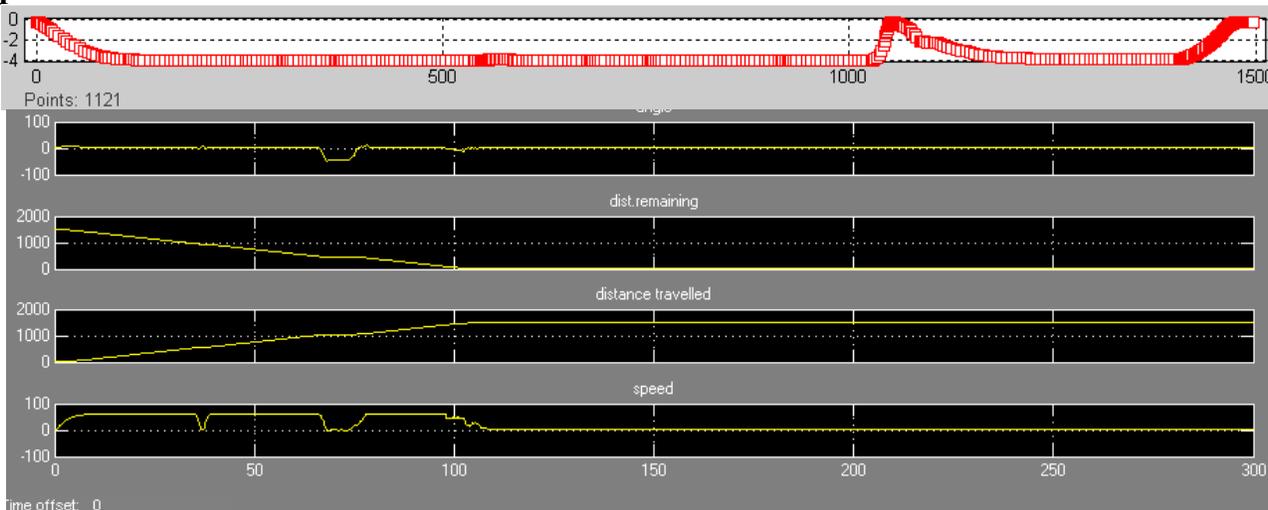
**CASE 10: Left and Right 90 degree obstacle avoidance, input speed =40 km/hr.,road width =10 meter,target distance=1500 meter,target angle=20 degree left , RFS distance derivative= negative,**

**simulation time=300 sec. The distances given by FL30 and FR30 sensor respectively have the variation as in graph as in CASE 9:**



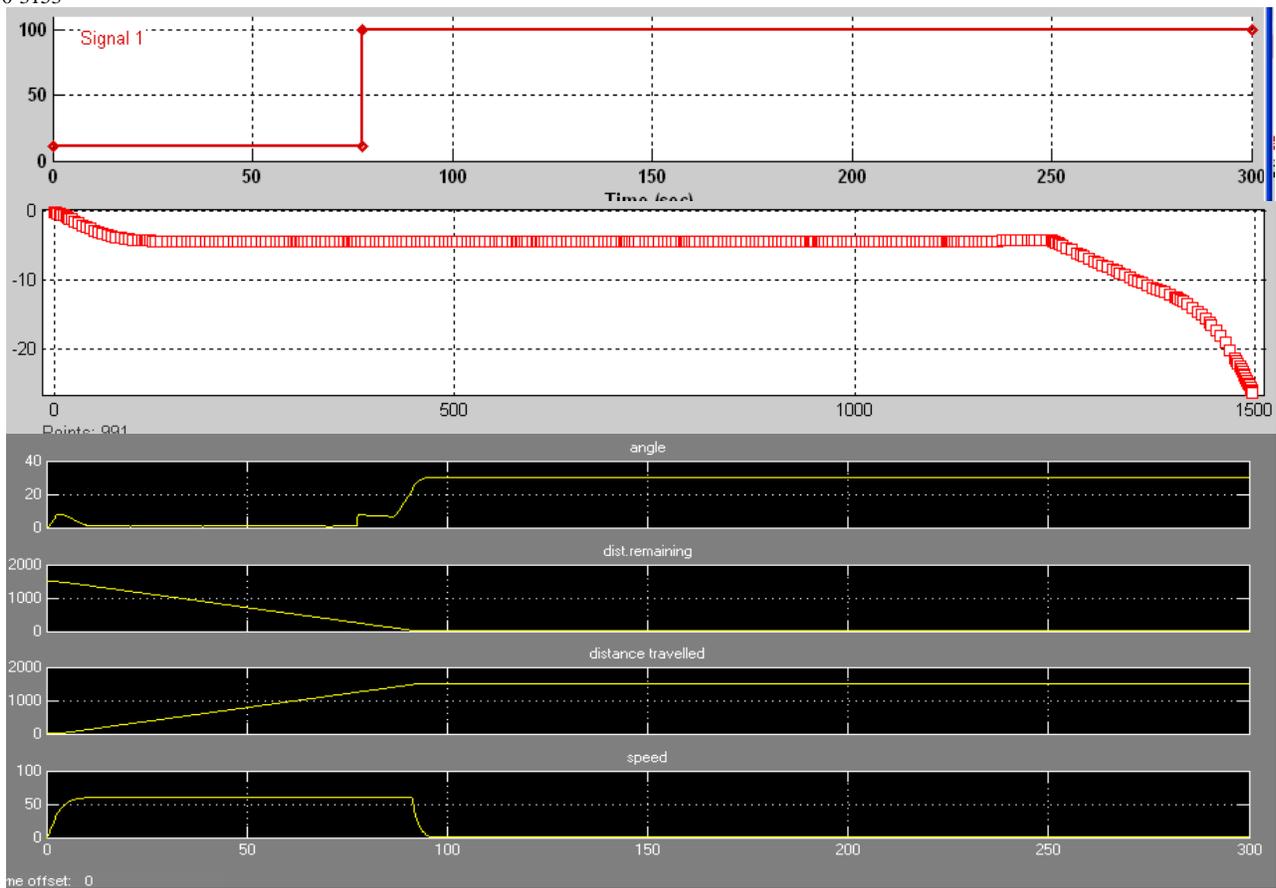
**Explanation 10:** The result represents that the vehicle turns right for left 30 degree obstacle and turns left for right 30 degree obstacle. The speed reduction is also seen at the points where the turning occurs. The vehicle is running near the divider and so the vehicle cannot turn more and more to the right because the divider is faced in closeness.

**CASE 11: Left and Right 90 degree obstacle avoidance, input speed =60 km/hr.,road width =10 meter,target distance=1500 meter,target angle=20 degree left , RFS distance derivative= negative, simulation time=300 sec. The distances given by FL30 and FR30 sensor respectively have the variation as in graph as in CASE 9:**



**Explanation 11:** The result represents that the vehicle is running close to the divider and so the vehicle cannot turn right even though the left turning is same as Cases 8 and 9 .the speed reduction is seen at the points where the turning occurs. Also the target alignment is seen at end.

**CASE 12: Left and Right 90 degree obstacle avoidance, input speed =60 km/hr.,road width =10 meter initially,target distance=1500 meter,target angle=30 degree right , RFS distance derivative= negative, simulation time=300 sec. the variation of the CR90 follow the graph as below.**



**Explanation 12:** Here it is seen that the vehicle follows the divider until the increased distance of CR90 has reached. As soon as this location has been reached the vehicle aligns towards the target.

## Conclusion

The results shown above are in compliance with the practical performance. The results shown above ascertain us that it can perform well in all types of real road environments. So by these results we can conclude that the MSANFIS proves to be excellent techniques by which it could easily be possible to integrate all the behaviors like wall following, target alignment, lane speed, wall (divider) following behavior, tilting avoidance due to turning, obstacle avoidance, traffic signal, speed breaker, speed increase when obstacles crossed, overtaking, passing, opposite side vehicle collision avoidance, limited time to reach the goal, etc. The results related with all the behaviors and in varying conditions of other factors at the same time cannot be shown here due to consistency of paper. These results are shown in the literature. Due trainable behavior, the stages of the MSANFIS structure can be trained to suit any required performance. In future we will be taking the effect of up and down road, Right Lane rule (Left Lane Rule in India). During sudden environmental change (accidental conditions) we will be making the effort to incorporate control scheme that will take the action same as the efficient driver. The action will be the function of rate of sudden change of conditions, velocity, clearances and type of change. The MSANFIS technique will also be used for the manipulator control and biped robot control.

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- [24] Chi-Bin Cheng Department of Industrial Engineering and Management Chaoyang University of Technology, Wufeng 413, Taiwan, R.O.C. E-mail: [cbcheng@mail.cyut.edu.tw](mailto:cbcheng@mail.cyut.edu.tw) PROCESS OPTIMIZATION VIA A NEURO-FUZZY SYSTEM .

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# An Effective Way to Apply Agile Manifesto in Development of Cloud Application through Agile Service Networks

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**Abstract-** This paper attempts to map how the requirements of based applications can be fulfilled by ASN's key features by applying Agile Manifestos. Even though ASN's has many key features like collaborative in nature, emergent, dynamic and business-oriented in nature including agility in this mapping is for the approach of iterative and incremental development. For the continuous change in requirements from the user it is necessary to apply Agile Manifestos to cloud based applications which in turn increases to run business enterprises at good pace.

But agile practices (or principles) relating it in to ASN's key feature are not being implemented in practice.

**Index Terms-** Agile Manifesto, Agile Service Network (ASN), Cloud Computing.

## I. INTRODUCTION

Cloud computing is an emerging paradigm, in which it provides resources as a service over a network ( i.e. internet) in which a business enterprise environment is created by providing a computing infrastructure on-demand and is usually priced as pay-per-use basis. Enterprises aims at reducing cost by converting capital expenditure into the adoption of cloud computing platforms for certain type of applications.

The cloud computing services is mainly divided into 3 categories-

1. **Infrastructure as a Service (IaaS)** – IaaS cloud providers supply resources like Virtual-machine disk image library, raw (block) and file-base storage, firewalls, load balancers, IP addresses, virtual local area networks (VLANs) and software bundles on-demand from their large pools installed in data centers [1]. Examples of IaaS providers includes: Amazon EC2, Google Compute Engine, HP Cloud, Rackspace

2. **Platform as a Service (PaaS)** - In this, cloud providers delivers a computing platform, typically including operating system, programming language execution environment and database and web server [1]. Examples of PaaS are AWS Elastic Beanstalk, Google App Engine, Windows Azure cloud Services, AppScale.

3. **Software as a Service (SaaS)** – In this business model, using SaaS, users are provided access to application software and databases. Cloud providers manage the infrastructure and platforms that run the applications. It is sometimes referred as 'on-demand software' and service is pay-per-use basis [1]. Examples include Google Apps, Microsoft office 365, Petrosoft, Tradecard, and Salesforce.

We are focusing on software engineering challenges for migration to the service cloud paradigm. The challenges are establishing the context, modernizing the software architecture, managing non-functional and QoS requirements in the cloud, verification & validation in the cloud, performance and prime problem is requirements engineering. Requirements engineering is a very important activity, which can affect the entire application development by uncertainty in the user requirements. It gathers all requirements (I.e. from user or consumer), which is concerned with the analyzing and documenting the requirements. As Cloud applications are dynamic in nature, where user or consumer requirements will be changing inconsistently .Hence by using Agile Manifestos, we can overcome the user requirement problems to some extent. The characteristics of agile manifesto are consumer demand focused, communication-oriented, flexible (doesn't affect functionality for expected or unexpected change), fast release (encourages rapid and iterative development on demand), time & cost, responsive and learning (research or iterative work helps in improvement during and after product development)[8].With these characteristics of agility we can satisfy necessary requirement of cloud computing requirements with Agile Service Networks (ASN).Context adaption is used in ASN's to achieve Agility. We are considering ASN's usefulness in modeling cloud computing applications by extracting cloud computing requirements from literature and mapping these on ASN's characteristics.

This paper shows that by combining ASN, the values of Agile Manifesto can be mapped to cloud applications development and not just for iteration. User requirement or consumer interactivity can enhance the cloud applications.

The rest of this paper is organized as follows. Section II summarizes relative work about current state of cloud computing. Section III addresses the characteristics of cloud computing and overview of both Agile Manifestos and Agile Service Networks. Section IV shows our proposed work mapping both agility and ASN concepts can fulfill cloud computing requirements with description and figure pictorize our technique. Section V concludes paper and future work to be done.

## II. RELATED WORKS

The traditional application development model follows a classic waterfall model, each process phase (requirements, design, implementation, verification and maintenance) flows sequentially and cascades downward to the next phase [3].In this approach, specifying the requirements is in the early stage which takes longer time than expected this results to an early,

unfinished end which then negatively impacts on development phase.

For fulfillment of cloud application requirements there are many other techniques and methods like AAS, SOA and SOE and for software development in cloud IEDF and alone ASN features can only be implemented. But user-centric requirements should be highly –prioritized [3]. Hence with that idea mapping some of the cloud based requirements with ASN's key features and Agile principles.

Requirements engineering was the first activity carried out in this paper to support and analyze it with regards to cloud based application. It plays a vital role in success or failure of any project [4]. Mapping the requirements of cloud based application to the key features of ASN's was already worked upon. ASN's was chosen because it's a promising paradigm able to deliver flexible and agile cloud computing application.

Though the previous works have shown the mapping of cloud requirements, but the greatest challenge of cloud which emphasis on user profile is always been the most neglected area and had been the field of research till date.

Our greatest concern here was to bring into focus the prime requirement of cloud based application i.e., customers interactivity and higher priority to customers' requests, which is the most ignored cloud computing application requirement but of greater importance though, using agile manifesto.

Agile principles might have been used elsewhere in other context of research on various topics earlier but our main attempt to use agile principles to mapping of cloud based application to ASN's is the strong characteristics of agile i.e. self-organizing, iterative and incremental development.

There are different agile methodologies like SCRUM applied to different cloud based application prior but the basic characteristics of agile which can satisfy the most basic and demanded requirement of cloud based application is been carried out in this paper by showing how mapping of cloud based application to key features of ASN's can be advantageous using agile manifesto in simpler context.

### III. RESEARCH ELABORATIONS

#### A. Requirements of Cloud Computing

This section provides a list of cloud application development requirements ,elicited from literature [2].This literature was extracted by topic search string "Cloud Computing Requirements OR Challenges" in major search engines(ie. Google ,IEEEExplore) from the papers we have enlisted some main requirements for cloud applications.

The Cloud Computing requirements are summarized as follows :-

- **Additiveness:** They must satisfy all the cumulative needs or resources even when demanded by large number of consumers.
- **Security:** All cloud application must be secured and signed to guarantee privacy. Without security consumer won't accept any policies because they may even withdraw in the middle.

- **Reliability:** The system must be reliable i.e., there shouldn't be any disruption in any services for any changes made.
- **Monitored:** The cloud application needs to constantly monitor all QoS.
- **Composable:** To personalize any resource collection it must be Composable via web 2.0.
- **Managing:** Risk management has to be deployed in cloud computing application in order to satisfy customer needs continuously [2].
- **Consumer Centric:** Client satisfaction should be given higher priority since clients pay for accessing services.
- **Standard:** For the business enterprise, cloud computing application must expose standard interfaces to enable services to be commoditized.
- **Self-healing:** In order to sustain accidental or imminent failure back-up is provided.
- **Data-Integrating:** There is a need to integrate and data to interoperate, logic and users on a global scale [2]. As cloud application users are in global scale, complete synchronizations of a system are done which enables smooth and non-disruptive consolidation.
- **Privacy:** To ensure that there is no third-party involvement in the transaction between end user and application provider to enable silent business environment.
- **User-friendly:** Cloud computing applications are used in different locations hence it should have standard – interfaces to achieve user-friendliness.
- **User-controllable:** As per the user requirement service consumption and QoS is constantly monitored.
- **Consumer-interactive:** Cloud application should iteratively interface with consumer (or user) in order to facilitate changing needs.
- **Control-decoupling:** It should provide decoupled application control, to prevent cloud platform from becoming brittle as demands change dynamically [2] i.e. it should be loosely coupled .Decoupled control in the cloud means that each unit is an independent controller.
- **Dynamic –billing:** The mechanism embedded in the cloud that keeps track of service usage of cloud applications. It must be fault-tolerant and well – monitored.
- **Scalability:** The ability to change services or resources for sudden growth of demand or depreciation in requirements. It accommodates increased business needs or changes with existing resources.
- **Auditability:** There should be clear picture of financial aspects (like gain or loss) if any in adopting applications in cloud and it has to provide automated statistics.

- **Multi-tenancy:** Cloud based applications are sensible to multi-tenancy .It allows seamless sharing of resources and infrastructure among customers.

In the description of the above cloud computing requirements, it can be distinguished as application-specific requirements, in which computations are done in cloud and user-specific requirements, integration with the application is allowed

**Application-specific requirements** are : Additiveness, security, reliability, monitored QoS,composability,risk-managing,self-managing,standard,self-healing,data-integrating,control-decoupling,scalability and **User-specific requirements** are: multi-tenancy, privacy, user-friendly, user-controllable, consumer-interactive, dynamic billing.

**B. Agile Manifesto’s Overview**

Agile methodology confines to iterative process. Iterative application development follows customer needs and allows fast response to changes. This distinguishes agile uniqueness from any other approaches such as “waterfall model”.

The agile manifesto key values are as follows –

- Individuals and interaction over processes &tools-In agile development, providing self-organizations and self-motivated individuals with the environment [3] [1].
- Working software over comprehensive documentation- working software will be more useful than just delivering documentation.
- Customer Collaboration over Contract negotiation-requirements cannot be fully collected at the beginning of the development cycle. Consumer involvement is necessary i.e., iterative delivery approach is used.

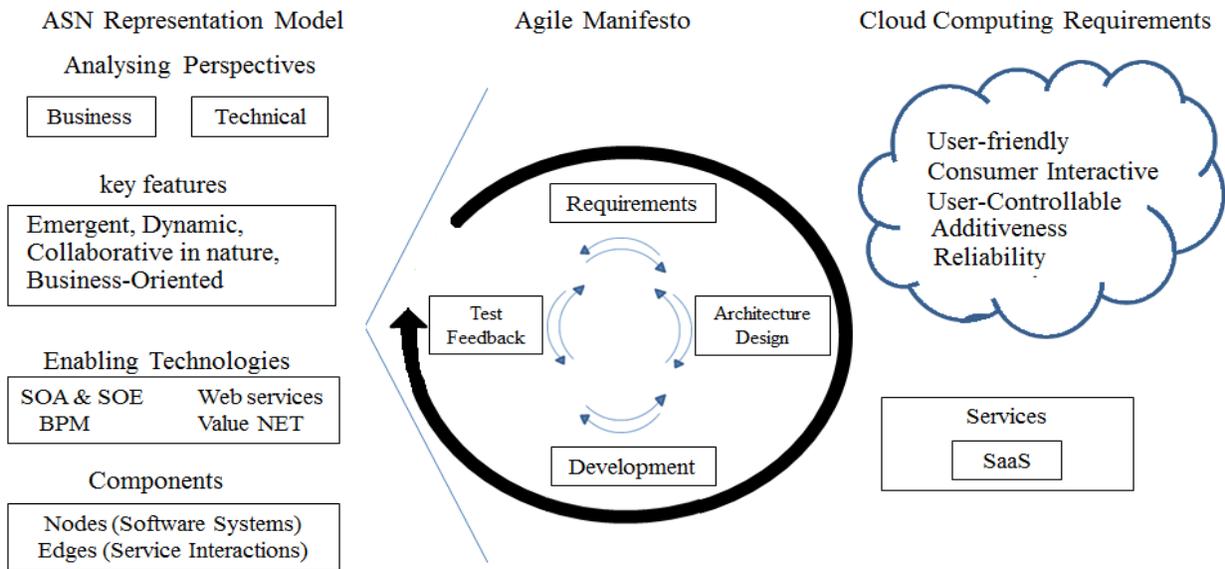
Agile manifesto are used to produce higher quality software in a shorter period of time. If any dynamic change in the consumer requirement persists without any barriers it streamlines the development process. Other popular agile methodologies are SCRUM, Extreme Programming (XP), Crystal, Feature Driven Development (FDD), Avoion E3 and Agile Modeling.

**C. Agile Service’s Network Overview**

Agile Service Network’s (ASN) are an emerging paradigm defined as a global network of service-oriented application applications collaborating to achieve business gain. ASN’s are seen as a dynamic, rapidly changing network of services and it is self-managing from the perspective of enterprise significance of cloud computing. Agility in this context, can be as immediate ability to react against unpredictable changes. Context change is reflected in the application and the content extension where a new content of context is added without rebuilding the whole application this context adaption is used in ASN’s to achieve agility [1]. As ASN’s are business oriented, business values can be computed, analyzed and maximized. These networks which enable collaborative service and emergent feature (considering all aspects) by interaction among many business environments [2].ASN are a promising paradigm able to deliver flexible and agile cloud computing application.

With these key features of ASN and principles of Agile we argue that requirements of cloud based applications can be fulfilled. That analysis is explained in SECTION IV.

IV. RESULTS AND FINDING



**Figure.1. Representation of Cloud Computing requirements with ASN’s features through Agile.**

The figure1 shows, how we facilitating cloud computing requirements with ASN's key features by applying Agile Manifestos (or principles) [3] and table 1. maps with its features [2]. Using this method user-centric requirement can be satisfied to the extent which is necessary for business enterprises of cloud application development.

The figure.1 shows, how we facilitating cloud computing requirements with ASN's key features by applying Agile Manifestos (or principles) [3] and table 1. Shows mapping with its features [2], which is explained further. In figure.1 some of the cloud computing requirements are listed which is mainly focusing on cloud's Software as a Service (SaaS). These

requirement are taken in iterative cycles in Agile Manifesto, where each phases are interconnected and each phase being a feedback mechanism to others [3], it is then fed to the ASN. In ASN depending upon different analyzing perspectives like business or technical different enabling technologies are used like SOA, Web Services, Value NET and BPM as mentioned. With the key features of ASN , which is explained in SECTION IV cloud requirements can be fulfilled.

The below outline diagram simply explains how the application of agile principles lead to successful delivery of the cloud based application. the contributors as stated above are :-

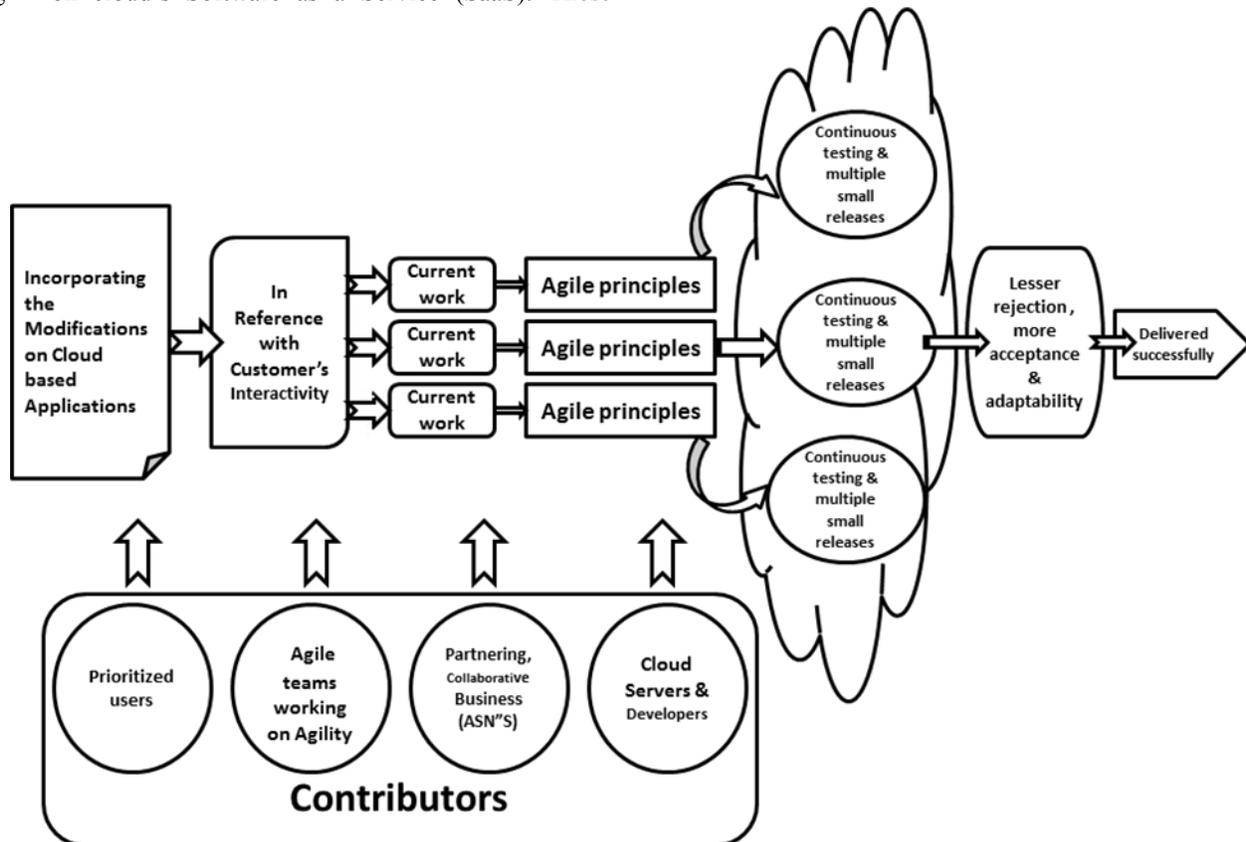


Figure.2.Simplified representation showing the outcome of applying agile principles.

- **prioritized users** who have been given higher priority and according to the users requests the modifications are incorporated in the cloud based applications.
- **agile teams working on Agility** where a team of people work collaboratively to satisfy the users by effectively applying AGILE PRINCIPLES to cloud based application.
- **partnering, collaborative business environments (ASN's)** where ASN's features are mapped to cloud based application using agile principles.
- **cloud servers and developers** here developers deal with cloud based applications and cloud servers take care of services to be provided to users over the internet on pay-use basis.

As we move from left to right side of the diagram the result of applying agile principle shows since agile is iterative and incremental in its characteristics there is continuous testing and multiple small releases of the cloud based application and hence due to this there is lesser rejection and more acceptance by the users and a trust and satisfaction is developed in them which adds on to the successful delivery of the application.

Cloud Computing Requirements	ASN's Key Features	Agile Manifesto's
Additiveness	Emergent	Incremental, Emergent, Evolutionary, Iterative
Reliability	Collaborative, Dynamic	Self-Organizing, Collaborative, Empirical & adaptive, Evolutionary
Self-managing	Emergent, Dynamic	Responding to changes, Self-Organizing
Consumer-Centric	Business-Oriented	Customer – Collaboration, Iterative, Incremental
User-Controllable	Dynamic	Iterative, Individuals & interactions over tools
Consumer interactive	Business-Oriented	Customer-Collaboration, Individuals & interactions over tools
Scalability	Dynamic, Emergent	Self-Organizing, Responding to change
Self-healing	Dynamic	Self-Organizing

**Table 1. Mapping Cloud Computing requirements with ASN's key features by agile Manifesto's.**

The requirements of cloud computing are facilitating by mapping it with ASN's key features by applying agile principles is explained as follows-

- **Additiveness:** ASN support Additively by its key feature emergent [2]. As in Agile Manifesto development process is iterative and emergent additional requirements or services are provided incrementally [3]. Context adaption is used, which is explained in SECTION III C. It exhibits flexibility to accommodate expected or unexpected changes rapidly.
- **Reliability:** As Agile principle states it is incremental [3] contextual change can be made in services and agile is also self-organizing & ASN's collaborative and dynamic nature makes more reliable. QoS measurement can be monitored [2]. So even when any changes made in any services there shouldn't be disruption.
- **Self-managing:** This requirement can be mapped into ASN's feature of emergent and dynamic. Since ASN's are agile and dynamic it focuses on self-organizing

with responding to the changes and continuous development to the agreed level.

- **Consumer centric:** ASN came from a business-oriented study[1] it prioritize consumer requirements which is clearly an agile by iterative and continuous collaboration with a consumer increases their trust about the service which in turn makes sustainable business environment.
- **User-Controllable:** Cloud computing applications should empower users to dynamically control their service [2] consumption and requested QoS according to changing needs which in turn it's an agile's iterative process. Individual's interaction and customer collaboration can be done. As agile supports transparency communication, collaboration will be a significant constraint and it is dynamic in nature.
- **Consumer interactivity:** cloud computing applications should integrate consumer-interactive feedback in order to increase adaptability to changing user needs [2] which is ASN's business oriented feature.
- **Scalability:** Emergent feature of both agile [2] & ASN [3] makes it possible to respond to changes either to grow bigger or shrink accordingly and it allows dynamic feature.

By mapping cloud computing requirements with agile principles and ASN's key features we can list out a few advantages and disadvantages which are as follows :-

**A. Advantages :**

The advantages of using Agile manifestos in developing cloud applications in ASN are listed as follows-

- As in cloud based application development individual and interaction over processes with the consumers is iterative there won't be any chances of cancelling or rejecting the service or resource after its development and, services can be quickly delivered.
- The prime benefits of agility include faster revenue growth, more effective responsiveness to risks and reputational threats and greater, more lasting cost reduction.
- In this method requirements change by delivering the software in multiple small releases increasing the client confidence and enables consumer to communicate the business requirements change at higher pace [3].
- Opportunity to rapidly adopt and apply game changing technologies to the enterprise.
- Enhanced partnering opportunities due to increased business interoperability (I.e., engineering approaches to facilitate compatibility between different clouds, including service deployment across diverse cloud providers) [13].
- It increases flexibility
- Customers interaction is achieved by applying Agile principles, where in the customer and team collaborate to adaptively craft the product given time, cost, quality and functionality [8].

- Capability to measure progress by using empirical technique [11].
- Using Agile, they embrace change, reduce development cycle time and attempt a useful compromise between no process and too much process.

### B. Disadvantages:

The disadvantages of using Agile manifestos in developing cloud applications in ASN are listed as follows-

- Difficulty faced by the consumer- able to authoritatively, comprehensively, unambiguously and defining the requirements of the system which can be understood by the provider.
- The principles of agility some way reinforces the notion of direct communication, the need for collaboration, communication and openness.
- Other requirements of cloud applications like security, multitenancy, dynamic billing, privacy etc. yet to be mapped from ASN using agile manifestos. So it can't be considered for application development.
- Without practical implementation it is difficult to tell, that this technique can be used for all kind of cloud applications.

## V. CONCLUSION AND FUTURE WORK

In this work, we have tried the possibilities of using ASN as a viable engineering paradigm for software engineering in clouds. We then concluded a mapping between Agile Manifestos and ASN's characteristics which can harness cloud computing requirements. Feasibility of ASN in this regard requires further investigation.

This shows that cloud based applications should not only focus on technical aspects but even social aspects and user-centricity, is needed for cloud computing for turbulent business environment.

Large scale agile application development still remains an active research area.

In the study on how both ASN and agility can be implemented on cloud-based application development. Further findings can be done on how-

- Flexible context adaption technique to propose a framework that can be used in Agile Service Networks to increase the agility in cloud applications.
- A socio-concept model for the cloud should be developed. As cloud is more focused on user profiles, social aspect and user-centricity.
- It needs novel software engineering approaches and technologies to deliver agile and to improve business enterprise.

All these tasks are interesting challenges, since a starting concept model for ASN's doesn't exists yet.

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# A Study on Semi-Strong Efficiency of Indian Stock Market

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**Abstract-** The study aims at examining the efficiency of Indian Stock market by studying stock price and trading volume reaction resultant upon the corporate action information. If the market is efficient prices fully reflect all information and to evaluate there is no scope for abnormal returns and dramatic increase in the traded volume consequent upon such release of information. Here the efficiency of stock market is tested by analyzing the dissimulation of corporate event announcements like dividend, Stock Split, merger, Bonus issue.

## VI. INTRODUCTION

Indian stock market is an emerging market. A capital market is said to be informational efficient when stock prices fully reflect all available information. In an efficient market, when a new information item is added to the market its impact will instantaneously incorporated in the share prices and no one can make abnormal return based on the information. A number of factors – both internal and external to the organization can cause changes in the returns of the securities and a study of these factors and the pattern of their impact on security returns have generated considerable interest to all the stake holders of the capital market.

### I. STATEMENT OF THE PROBLEM

Researchers around the world have focused on the effect of various corporate announcements like quarterly earnings, bonus issue, rights issue, stock split, mergers, buy back of stocks etc. The standard methodology used to evaluate the reaction of share prices to these public announcements is conducting an *event study*, which was employed as early as by Dolley(1933). The *event* is what the investigators would like to study, and it conveys information that potentially influences the stock prices.

Detailed literature review and discussions with academicians and researchers have resulted in identifying bonus issue, stock split, merger and dividend as four corporate events of significance and hence the information release regarding these events are selected to arrive at a broad-based result. Out of these four selected events, two of them have monetary implications and the other two have strategic implications. As is evident, dividend and bonus issue have monetary implications and stock split and merger information have strategic implications as far as the shareholders are concerned. This study focuses on the variability of security prices consequent upon the release of corporate information regarding bonus issue, stock split, merger and dividend. According to the theoretical framework, the information about the corporate actions would be incorporated in

share markets and the extent of incorporation of the corporate information in the price of shares would depend upon the form of efficiency viz., Weak, Semi strong or Strong efficiency of the market. As a corollary, the study on the effect of corporate information release on the price and volume of shares would reveal the type of efficiency of the market.

## II. OBJECTIVES OF THE STUDY

- a. To study the security price reaction to corporate information release.
- b. To draw a conclusion on efficient market hypotheses with regard to Indian stock market.

## III. HYPOTHESES

- a. Corporate information release influences share price after discounting the company specific effects and impact of market index
- b. The Abnormal Returns around the event dates are close to zero

## IV. METHODOLOGY

Event study methodology, which tries to measure the effect of an event and how quickly these events are reflected in asset prices, is used to analyse the effect of the selected events, Dividend, Stock split, Merger and Bonus issue. The analysis centers on the “Event Window” or test period when evidence of abnormal behavior in market is sought. In this study the event window is 30 days before the event (announcement) date and 30 days after the event. Total event window is 60 days and it is in line with many other event studies, Bae and Jo(1999), Iqbal and Mallikarjunappa(2007), and Gupta and Gupta (2007).All the companies in BSE 100 index forms the population. From the total population, the sample set for each event is selected based on the availability of the dates of announcement of the selected event. The sample set for each event consists of all the companies which have announced the respective event. Data collected for the study are:

- a. Share price of each company for 5 years
- b. BSE 100 index for 5 years.
- c. Bonus issue, Dividend, Merger, and Stock split announcement dates of each company during the study period of 5 years (2004 April 1st to 2009 March 31st)

The analysis for each event is conducted separately. The abnormal return in price of all the sample companies for each event were calculated for each day before and after the day of announcement. The abnormal return of each day is averaged out across the entire set of companies in the data set, in order to eliminate the company specific impact on information release such as the track record, size, type of the firm etc.

Abnormal returns are analyzed over a sample time frame from thirty days prior to the announcement of bonus issue to thirty days post announcement. Abnormal Return of security *i* during period *t*

$$ARit = Rit - ERit \quad (1)$$

Rit is the actual return of security *i* during period *t*. The daily returns for each sample company have been computed for the event window period and the equation for the same is

$$Rit = (Pit - Pit-1) / Pit-1 \quad (2)$$

Where, Pit and Pit-1 are respective daily prices of company *i* at time *t* and *t*-1. Expected return (ERit) is the return expected on security *i* during period *t* and is calculated using the simplified model of regression for estimating returns on each security by taking the actual returns on the market model and BSE 100 index is used as a proxy for the market portfolio. The market model, which is used for evaluating the expected return, is mathematically expressed as:

$$ERit = \alpha_i + \beta_i Rmt + e_{it} \quad (3)$$

Rmt is the market's rate of return at time *t* (BSE 100).  $\alpha_i$  is the average rate of return the stock would realize in a period with a zero market return. This is the estimate of the intercept of a straight line or alpha coefficient of *i*th security.  $\beta_i$  measures the stock sensitivity to the market return which is the slope of a straight line or Beta coefficient of *i*th security.  $e_{it}$  is known as residual which is the stock's return over and above what one would predict presumably due to the event in question. Hence the above equation provides a decomposition of expected return into market and firm specific factors. There is an assumption inherent in the market model that  $e_{it}$  is unrelated to the overall market and has an expected value of zero. The estimates of the constant and coefficient obtained from the regression are then used to generate a time series of return predictions and, ultimately, a time series of excess returns, which are then divided by the prediction to compute the standardized excess return. The abnormal returns are computed using the following model:

$$ARit = Rit - ERit \quad (4)$$

Rit = Actual Returns of the *i*th security during time *t*.  $\beta$  and  $\alpha$  of the companies having the announcement were calculated for each event window, by solving the regression equation,

$$ERit = \alpha_i + \beta_i Rmt \quad (5)$$

As indicated in the frame work of analysis, the abnormal returns of individual securities are averaged for each day before and after the event day in the event window and the Average Abnormal Return (AAR) are obtained

$$AARit = \frac{\sum_{t=1}^N ARit}{N} \quad (6)$$

Statistical tools of t- test, z test, and non parametric U test were conducted to study the significance of the results. Even though parametric tests are very much useful tests, there are restrictive assumptions about the population from which the sample is drawn. One of the main assumptions is that the population is normally distributed population. The population may not always be normal, especially in this study, where market behavior is considered, which is an abnormal process and hence cannot confirm 100 percentagenormality. The most popular approach to addressing non-normality of the data can be provided by nonparametric tests.

## V. ANALYSIS

The mean of average abnormal return of before the announcement of the dividend is 0.1083 which reduces to -0.1076 after the announcement. To find whether this difference in abnormal return is significant or not, t-test and u test were conducted. The test results indicate that the difference in price before and after the dividend announcement is not significant at 5 percent level of significance. The average abnormal return of before the announcement of the merger is 0.891 and after the announcement which reduces to -0.0896 after the announcement. Here also the application of statistical tests t and u indicates that the difference in price before and after the merger announcement is not significant at 5 percent level of significance. Thus it is concluded that merger information has no significant impact on price of shares and investor cannot earn abnormal return by trading after the release of merger information. The mean value of AAR for 30 days before the split announcement is 0.0148 and that for 30 days after the announcement is -0.0145. t test and U test reveals that this the difference in abnormal returns are insignificant. So it is clear that the split information also will not influence share price of the companies in a significant manner. The average abnormal return of 30 days before the announcement of the bonus issue is 0.1340 which reduces to -0.1323 after the announcement. The statistical test results indicates that the difference in price before and after the bonus announcement is not significant, thus confirm that investor cannot earn abnormal return after bonus information. So it is evident that bonus information has no significant impact on price of shares.

## VI. CONCLUSION

Hence it can be concluded that the bonus information release will not influence the stock price. The analysis reveal that the information release of dividend, bonus issue, stock split and merger do not influence the security returns in any significant manner. From the study of four important corporate information

it is clear that announcement of corporate information do not have any significant effect on security price and volume traded when the market is stable on an average. So the investor cannot earn abnormal returns upon the release of corporate information, irrespective of the nature of such information. As regards the informational efficiency of the market, the results of the study suggest that the Indian stock market tends to indicate semi strong form of efficiency.

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# Comparison of Simulation Results of D-Facts & UPFC Used for Power Quality Improvement

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**Abstract-** Facts devices are used to control power flow in the transmission grid to relieve congestion and limit loop flows. High solutions. This paper introduces the concept of Distributed FACTS (D-FACTS) as an alternative approach to realizing cost-effective power flow control. The UPFC is also capable of improving transient stability in a power system. It is the most complex power electronic system for controlling the power flow in an electrical power system. The circuit model is developed for UPFC using rectifier and inverter circuits. The control angle is varied to vary the real and reactive powers at the receiving end. Details of implementation and system impact are presented in the paper, along with experimental results.

## I. INTRODUCTION

**F**ACTS (Flexible AC Transmission System), which began with EPRI's (Electric Power Research Institute) initiative under the leadership of Dr.N.G.Hingorani, was envisaged as the means of increasing the transmission transfer capability of existing transmission lines, thus deferring the need to build new lines. In USA and other developed countries where rights-of-the-way to build new transmission lines are difficult to secure, FACTS has stimulated R & D and, in some cases, prototype installations of the Thyristor Controlled Series Capacitor (TCSC), the Static Compensator (STATCOM), the Static Synchronous Series Compensator (SSSC), the Unified Power Flow Controller (WFC) and the Interline Power Flow controller.

With the development of interconnection of large electric power systems there have been spontaneous system oscillations at low frequencies in the order of several cycles per minute. These low frequency oscillations are predominantly due to the lack of damping of mechanical mode of the system. Since power oscillation is a sustained dynamic event, it is necessary to vary the applied compensation to counteract the accelerating and decelerating swings of the disturbed machine. The concept of Flexible AC transmission system (FACTS) envisages the use of solid state controllers to achieve flexibility of power system by fast and reliable control of power system parameters affecting power flow in transmission line, namely voltage, impedance and or phase angle. Unified Power Flow Controller (UPFC), a multifunctional Flexible AC Transmission system (FACTS) Controller opens up new opportunities for controlling power and

enhancing the usable capacity of present, as well as new and upgraded lines.

A UPFC supplementary damping controller has been presented in the UPFC control system for damping the electromechanical mode oscillations. In systematic design of four alternative UPFC damping controllers are presented. However, these UPFC damping controller gains are designed on the basis of nominal operating conditions and remain independent of system operating conditions and line loadings. Also the controller gains and hence the control structure is different for the various choices of UPFC control signals. Since damping of low frequency oscillations may be one of the secondary functions of the multifunctional UPFC based on its other major control assignments, the widely varying control structure with respect to the choice of control signals makes the real time.

In the past decade, the demand of electricity in USA has increased by 35%, but the transmission capability has increased by only 18%, so that the transmission grids are operating close to the stability limits. In the same period, the electric utility industry has been preoccupied with the transmission capacity of existing lines thus defining the necessity revamping their monopolistic, regulated structures to market of building new lines. Recently FACTS, such as the Unified Power driven deregulated competitors. Much intellectual energy has Flow Controller (UPFC), have also been regarded as controllers for been devoted to finding the most equitable method of pricing routing power in the market-driven, deregulated power systems. the UPFC has been conceived to control the complex which would invigorate and sustain investment in electricity complex powers of several transmission, lines converging towards (or concluded in the market place can be delivered. Apart from radiating from a transmission node. In order to show that a M-WFC the transmission capacities which are increasingly.

The UPFC parameters can be controlled in order to achieve the maximal desired effect in solving first swing stability problem. This problem appears for bulky power systems with long transmission lines. Various methods to reference identification of the series part, in order to improve the transient stability of the system based on: "optimal parameters", "state variables", and also "injection model" were studied. Finally, a new identification method based on "state variables" was proposed.

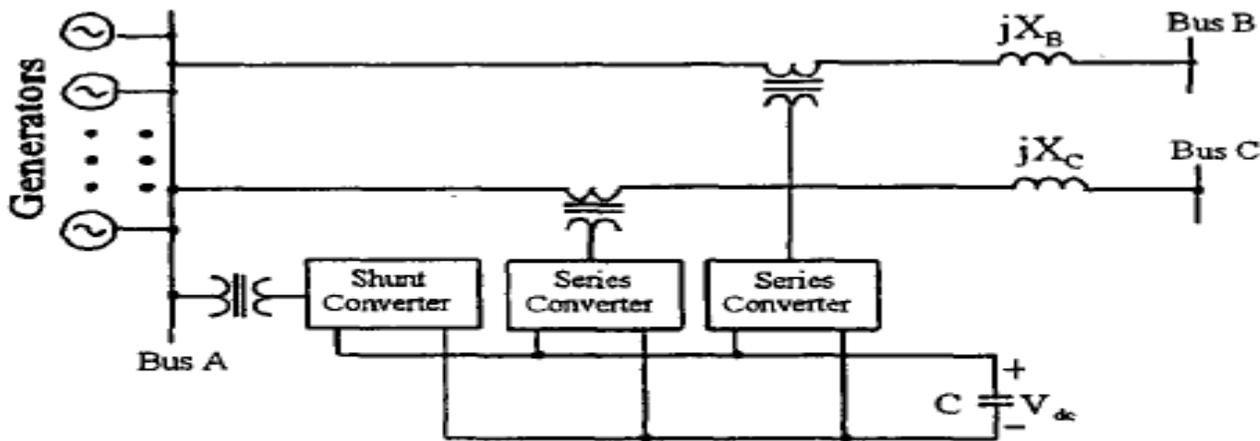


Fig 1. single line dig of UPFC.

## II. UPFC SYSTEM

A simplified scheme of a UPFC connected to an infinite bus via a transmission line is shown in Fig.1. UPFC consists of parallel and series branches, each one containing a transformer, power-electric converter with turn-off capable semiconductor devices and DC circuit. Inverter 2 is connected in series with the transmission line by series transformer. The real and reactive power in the transmission line can be quickly regulated by changing the magnitude ( $V_b$ ) and phase angle ( $\delta_b$ ) of the injected voltage produced by inverter 2. The basic function of inverter 1 is to supply the real power demanded by inverter 2 through the common DC link. Inverter 1 can also generate or absorb controllable power. New method for improving transient stability is given in. Application of UPFC in interconnected power system by presented in. Enhancing transient stability using Fuzzy control is given in. Comparison of field results and simulation results of VSI based facts controller is given in

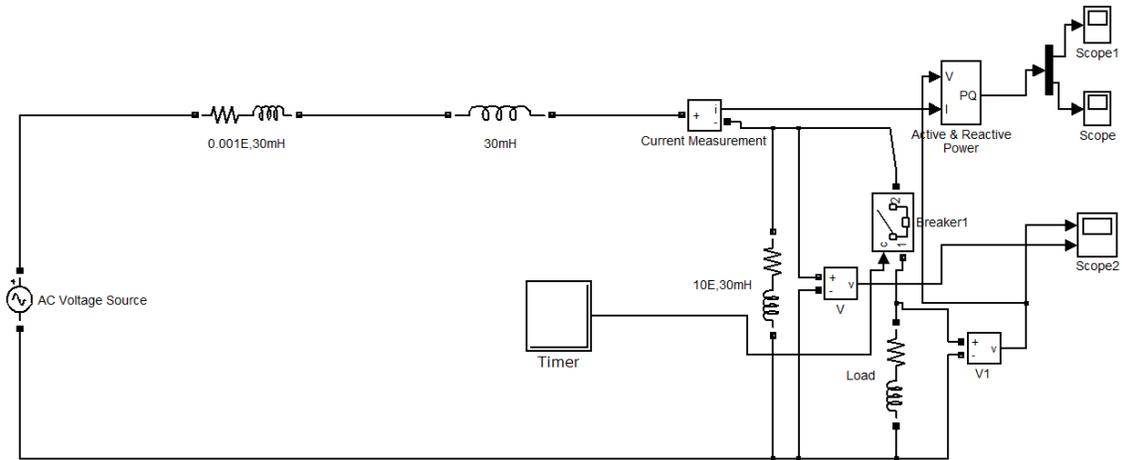
## III. SPECIFICITY OF POWER FLOWS IN ENERGY TRANSACTIONS

Hingorani and Stahlkopf mentioned loop flow (in which currents flow along unintended paths) as one kind of degradation of transmission capacity. They gave an simple of hydroelectric power from Ontario intended for the air conditioners of New York City straying as far west as Ohio and Kentucky. This detour would be costly to Ohio and Kentucky, as in carrying the unwanted power, the transmission transfer capability of their h e s was consumed so that there would be little left to serve their own customers. This example was taken from the pre deregulation era. If FACTS Controllers were deemed desirable in the prederegulation era: how much more would they be necessary in the post deregulation era, as pure pricing mechanism can operate only when the laws of electricity are surmounted by FACTS Controllers such as the UPFC. A simple example is used to illustrate this.

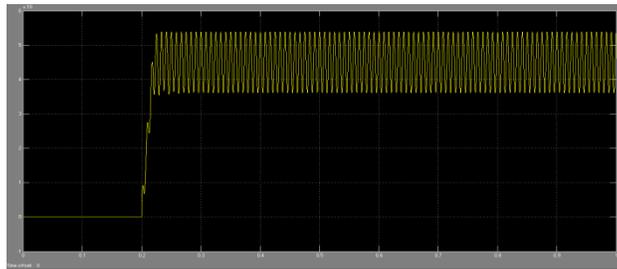
Fig. 1 shows the single-line diagram of buses A: B and C which are extracted from a larger system. The buses are joined by transmission h e s represented by line reactances  $jX_B$  and  $jX_C$ . In the absence of the M-UPFC, the real power transferred from bus A through the lines are  $V^2 \sin(\delta_A - \delta_B)/X_B$  and  $V^2 \sin(\delta_A - \delta_C)/X_C$ , where  $V$  is the line voltage,  $\delta_A$ ,  $\delta_B$  &  $\delta_C$  are the voltage angles of the buses. As buses B and C are connected to the remainder of the large interconnected system (not shown), the angles  $\delta_B$  and  $\delta_C$  play their roles also in determining the real power transfers in other parts of the larger system. When the electricity supplier is contracted to sell powers  $P_A$  and  $P_B$  to bus A and B respectively, then  $P_A = V^2 \sin(\delta_A - \delta_B)/X_B$ , and  $P_B = V^2 \sin(\delta_A - \delta_C)/X_C$ , must be satisfied simultaneously. This would require the co-operation and co-ordination of the entire power grid to adjust  $\delta_B$ ,  $\delta_C$  and with respect to  $\delta_A$ . In -adjusting  $\delta_B$  and  $\delta_C$ , desirably there should be no degradation of the power transmission transfer capability elsewhere.

## IV. SIMULATION RESULTS

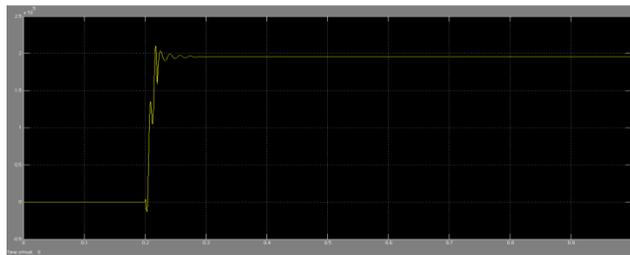
Two bus system without compensation is shown in Fig 2a. Sag is produced when an additional load is added. Voltage across loads 1 and 2 are shown in Fig 2b. The real power and reactive power waveforms are shown in Figures 2c and 2d respectively. Two bus system with UPFC is shown in Fig 3a. UPFC is represented as a subsystem. The details of subsystem are shown in Fig 3a. Voltage across loads 1 and 2 are shown in Fig 3a. Real and reactive powers are shown in Figs 3d and 3e respectively. UPFC using voltage and current sources are shown in Fig4a. Converter 1 is represented as a shunt current source and converter 2 is represented as a series voltage source. Load voltage and current waveforms are shown in Fig 2b. Real and reactive powers are shown in Fig 2c. Variation of powers with the variation in the angle is given in table 1. The real and reactive powers increase with the increase in the angle of voltage injection.



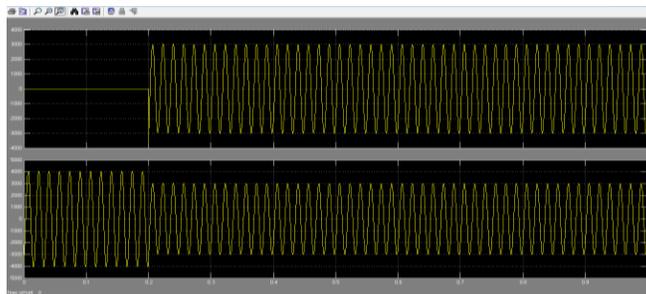
**Fig 2. Compensation With out upfc**



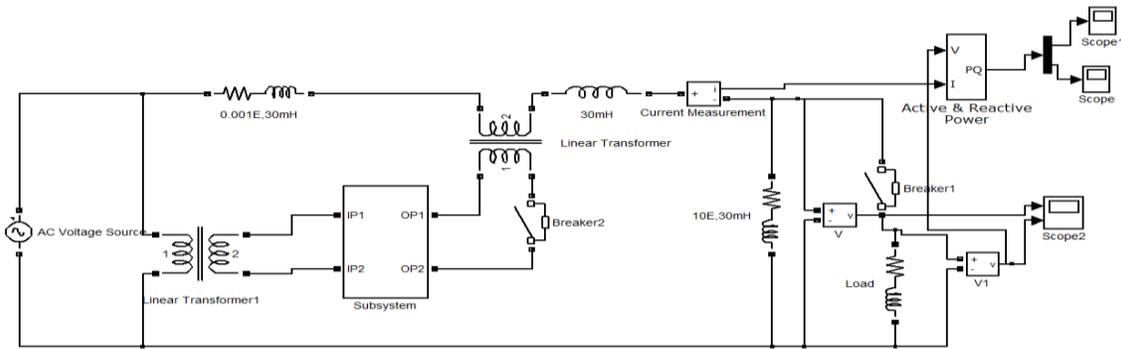
**Fig. 2c. Real Power**



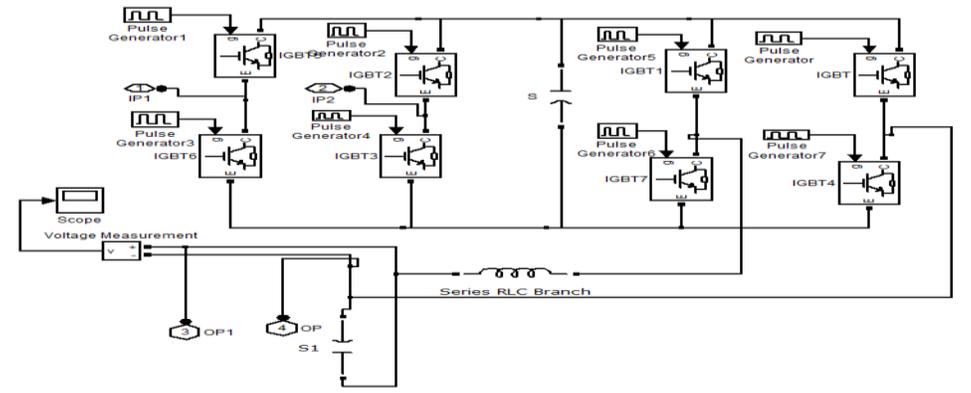
**Fig. 2d. Reactive Power**



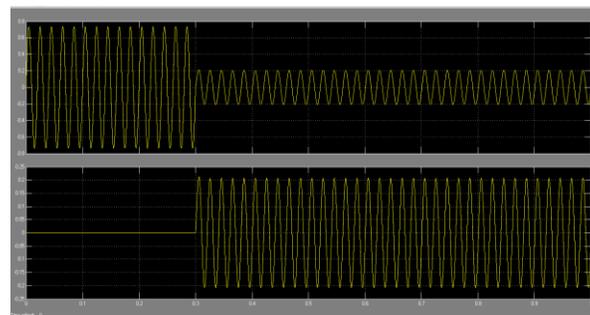
**Fig. 2b. Voltage Across Load 2 and Load 1**



**Fig.3 Compensation With out upfc**



**Fig.4. Series & shunt compensation fact (upfc)**



**Fig. 3c. Voltage across Load 2 and Load**

**V. CONCLUSION**

In the simulation study, mat lab simulink environment is used to simulate the model of UPFC connected to a 3 phase system. In this paper, the simulation results of switching level modeling of UPFC using IGBT developed in MATLAB/SIMULINK have been presented. The linear firing angle and sinusoidal pulse width modulation have been proposed as the switching schemes for shunt & series converters. These

switching schemes have been. This paper presents the control & performance of the UPFC used for power quality improvement. Voltage compensation using UPFC is studied. The real and reactive powers increase with the increase in angle of injection. Simulation results show the effectiveness of UPFC to control the real and reactive powers. The simulation result proves that the UPFC with the proposed switching schemes functions successfully as the real time power flow controller. This controller improves the performance of transient and dynamic

stability and achieves good damping of power and voltage oscillations in the system.

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# PSNR Analysis for MDC Based Video Streaming Over Peer-To-Peer Networks

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**Abstract-** Video streaming applications have newly attracted a large number of participants in a distribution network. Traditional client-server based video streaming solutions sustain precious bandwidth provision rate on the server. Recently, several P2P streaming systems have been organized to provide on-demand and live video streaming services on the wired and wireless network at reduced server cost. Peer-to-Peer (P2P) computing is a new pattern to construct disseminated network applications. Typical error control techniques are not very well matched and on the other hand, error prone channels have decreased the handling of video data greatly for video transmission over wireless networks and wired networks based on IP protocol. These two facts united together provide the essential motivation for the development of a new technique that is capable of dealing with transmission errors in video systems. This paper estimate and analyze the presence of noise in a video sent to a peer over a P2P network using flexible multiple description coding method which improves the frame loss possibilities over independent paths and ensures guaranteed reception of video file even if any of the subsequent frames are lost during the transmission. It introduces concealment technique for the lost frames of transmitted video at the receiver end more effectively. Experimental results show that, the approach attains reasonable quality of video performance over P2P network.

**Index Terms-** Video Streaming, Bandwidth, P2P Network, Multiple Description Coding.

## I. INTRODUCTION

A peer-to-peer (P2P) network is a man made infrastructure which links computers in a small office with copper wires. This network is also grander scale network, in which special protocols and applications set up direct relationships among users over the Internet[1]. The initial use of P2P networks in business followed the deployment in the early 1980s of free-standing computers. In its simplest form, a P2P network is created when two or more computers are connected and share resources without going through a separate server computer. A P2P network can be an ad hoc connection—a couple of computers connected via a universal serial bus to transfer files. Although video compression and streaming have experienced phenomenal growth since the introduction of first video compression methods and commercial streaming products, there still remain many challenges to be addressed to achieve resilient and efficient video delivery over unreliably varying environments like the Internet and wireless channels. The difficulty in the multimedia system is from the fact that both channel characteristics and video content

vary in time which requires adaptation of encoding and streaming techniques to network and video content. Recently, many adaptive solutions have attracted attention of several researchers. Content-adaptive mode selection in video encoders and motion adaptive update step of the motion compensated temporal filtering[2,3] are examples of recently proposed content adaptive solution approaches.

Channel adaptive streaming has already flourished as an area in itself with many recently popular research topics like optimal forward error correction (FEC) assignment in lossy environments[4], rate-distortion optimal channel adapted video streaming[5], optimal redundancy setting in multiple descriptions coding[6], optimal mode switching in lossy networks[7] etc. Some robust and scalable video coding techniques such as Multiple Description Coding (MDC) or Scalable Video Coding (SVC)[8] can be applied in media streaming, these techniques are well suited for situations where the quality and availability of connections vary over time. Using MDC or SVC in a P2P streaming scenario, the demanding host can choose the best hosts/servers candidate to make the transfer, and ask for different descriptors or layers in each case. As all information is travelling by using different routes, if one of the descriptions or layers suffers packet loss or delay, the receiver is still able to decode the video. The technique is MDC because it allows real-time software coding of the media that will be spread all along the P2P network. Currently, real-time coding using SVC technique is still a challenge due to the high computational requirements (to date, there is no SVC real-time software encoder, just there are few real-time hardware encoders below HD resolution).

## II. RELATE WORK

Conventional video compression standards employ a similar design which referred as single-condition systems, since they have a single state (e.g. the previous coded frame) which if lost or damaged and, can lead to the deficit or severe ruin of all consequent frames until the state is reinitialized (the prediction is refreshed). Multiple Description Coding (MDC) [8,9] is an approach proposed to address overcome the traffic loss over transmission channels. It is a source coding technique that generates multiple, equally important bitstreams, called descriptions, for a single video file. Different levels of reconstructed video qualities can be achieved by successfully decoding different subsets of descriptions. The advantage of doing this is that descriptions can be streamed to a receiver using disjoint streaming paths, which can potentially increase the resilience to packet loss. Unlike scalable coding, there is no interdependency among MDC descriptions, and every

description can be separately decoded, successfully decoding more descriptions results in better video quality. This flexible multiple description coding method improves the frame loss possibilities over independent paths and ensures guaranteed reception of video file even if any of the subsequent frames are lost during the transmission. This feature makes MDC appealing for use in the design of a concurrent video streaming.

MDC is particularly beneficial for delay-sensitive, real-time applications such as streaming video, in which packet losses may significantly corrupt the quality. Conventional approaches to combat channel errors such as Automatic Retransmission reQuest (ARQ) and Forward Error Correction (FEC) require retransmission of the lost packets or to addition of redundant bits for the purpose of error detection and correction. However, ARQ-based approaches are not applicable in applications when a back-channel is not available or when the retransmission delay is not acceptable. For FEC-based approaches, because of the highly varying network conditions, it is difficult to adaptively adjust the amount of redundancy, which makes the FEC either inefficient or ineffective.

A simple and practical MDC scheme known as Multiple Description Scalar Quantizer(MDSQ) was proposed by Vaishampayan et al. [10]. In this scheme, two sub-streams are generated by producing two indices for each quantization level. The index assignment is designed to be equivalent to a fine quantizer when both indices are received, but a coarse quantizer when only one index is received. One simple implementation can be created by using two quantizer whose decision regions are offset by half a quantization step size. Another MDC scheme available is Multiple Description Transform Coding (MDTC) [11]. In this ideal source coding, the coefficients used to represent the signal are uncorrelated as possible to maximize the coding efficiency. However, under this paradigm it is very difficult to estimate the value of a lost coefficient from those that remain. To achieve robustness against coefficient losses, the transform coefficients can be divided into multiple groups where the correlations within each group are minimized while inter-group correlations are tolerated.

The Recursive Optimal per-Pixel Estimate (ROPE) [12] algorithm allows the encoder to estimate the pixel-by-pixel predictable distortion of the decoded video appropriate to channel failure. This algorithm needs an input regarding approximation of the packet deficit rate and the information on error concealment method employed in the decoder. An extended ROPE algorithm accurately estimates the rate distortion due to various loss patterns and applies it for optimal mode selection using rate-distortion optimization. The rate distortion selection scheme causes a slight performance degradation while providing advantages of finer priorities over network transmission and lower complexity. Finally, it exhibits high computational costs and long encoding time.

A Slepian-Wolf based inter frame transcoding (SWIFT) scheme [13] transcodes an inter-coded P-blocks to a new type of block called X-block for the purpose of error robustness. The X-block can be losslessly transcoded back to the exact original P-block when there is no transmission error, and can also be decoded robustly like an I-block when there are errors in the predicted block. The compression of the proposed X-block is based on Slepian Wolf coding (SWC) which can achieve

partially intra-like robustness with inter-like bit rate. SWIFT method improves the error resilience capability of off-line compressed video. At the decoder, the transcoded video can be converted back to the original compressed video in error free case and can also be robustly decoded when error occurs.

## 2.1 Multiple Description coding over Peer-to-Peer Networks

Multiple description coding has been introduced as a generalization of source coding subject to a fidelity criterion for communication systems that use diversity to overcome channel impairments. MDC is an interesting tool for robust communication over lossy networks such as the Internet, peer-to-peer, diversity wireless networks and sensor networks..MDC with side information at the receiver is particularly relevant for robust transmission in sensor networks where correlated data is being transmitted to a common receiver, as well as for robust video compression where the encoder's low complexity is a requirement. Marisa Quaresma et. Al[9]. has given the idea that in video streaming, the idea of MDC is to split a single stream several descriptions (bit-streams) and transmit them over several channels to the target. Each description contains a part of the original stream. To restore the original picture all descriptions are needed. The advantage here is, in order to see the video stream one description is sufficient. If one description is lost the video stream still can be played but with lesser quality. MDC is especially helpful in case of unreliable transport channels and the growing interest in voice, image and video communications over the Internet. For example, the loss of one packet can lead to the loss of a large number of source samples and hence in an interruption of the stream. But with MDC there won't be any interruption, only variations in the stream quality. One way to enhance the reliability of a communication system is by using Multiple Description Coding (MDC). With MDC, several coded bit-streams (referred to as descriptions) of the same signal are generated. The coder is designed so that a better signal reproduction can be achieved with more descriptions, but the quality of the decoded signal is acceptable even with only one description. Obviously, for the reconstruction quality from any one of the descriptions to be acceptable, each description must carry sufficient information about the original signal. This requires that a certain degree of correlation be embedded between the multiple descriptions, which will reduce the coding efficiency compared to conventional single description coding (SDC). [14]

## III. PROPOSED SOLUTION

The formal definition of real-time for video service is that the processing time is less than the time to get a sample. In most cases, the word real-time video means decoding the video in real-time. In order to play the media file, after downloading it completely, and saved to the local, it can be played out. On the contrary, streaming video will be played out only after a buffering time which will cause only small delay and at the same time, the successive part of the stream file is kept on downloading. If the video file is split into multiple packets and have no redundancy at all and if one packet is lost, important information will be lost, this will decrease the quality of the received video file. So, in order to solve these problems, many

effective solutions have attracted, out of which the Multiple Description Coding[8] algorithms belongs to such group.

IV. SOLUTION STRATEGY

In this paper it has been shown that how to use multiple description coding together with P2P networks, which will improve the quality of the received video file, since the multiple packets are distributed for more than one source. Therefore, if one of the sources goes down the entire video file will not be lost. This paper defines a solution to the problems of streaming the video content over the peer-to-peer network using the robust multiple description coding algorithm. The Figure 4 shows the simple block diagram of multiple description coding algorithms, with streaming on Real-Time Transport Protocol (RTP) connections, for peer to peer video streaming system.

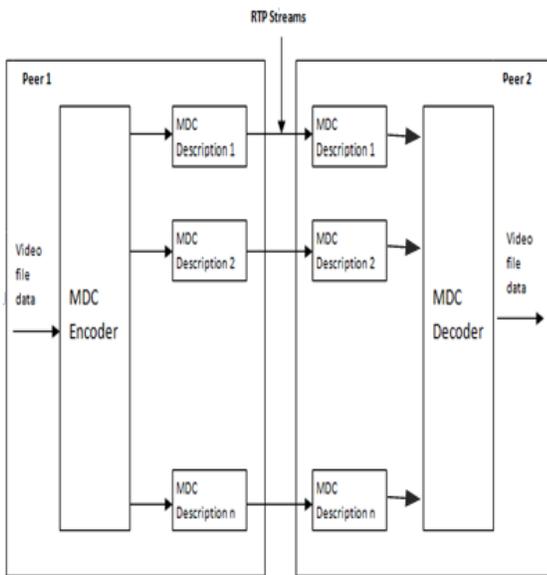


Figure 4. General structure of MDC over RTP Stream

To achieve this, the encoding technique used is multiple descriptions coding, which allows the video to be split into multiple descriptions with redundant information. If one of the descriptions is lost along the network the other will still be received, which will allow the receiver not to lose the entire information of the lost /description, since the received description has information that concerns to the lost description. In this way, the video quality shall not be dramatically decreased.

V. EXPERIMENTAL RESULTS

The Figure 5a) shows the original video file used by local peer on which MDC is applied. After applying MDC, local peer will share the video file, the Figure 5b) shows the video file received by the remote peer. By implementing MDC method, instead of losing the whole video file, remote peer will get video file with less quality. Here the video quality will be reduced because, while transmitting the video file from local peer to remote peer some packets (frames) will be lost. Hence by using MDC method we can avoid reconstruction of video file.



Figure : 5a) Original video.



5b) Received video

Peak Signal to Noise Ratio (PSNR)

The term peak signal-to-noise ratio (PSNR) is an expression for the ratio between the maximum possible value (power) of a signal and the power of distorting noise that affects the quality of its representation. Because many signals have a very wide dynamic range, (ratio between the largest and smallest possible values of a changeable quantity) the PSNR is usually expressed in terms of the logarithmic decibel scale. Image enhancement or improving the visual quality of a digital image can be subjective. The statement that one method provides a better quality image could vary from person to person. For this reason, it is necessary to establish quantitative/empirical measures to compare the effects of image enhancement algorithms on image quality. Using the same set of tests images, different image enhancement algorithms can be compared systematically to identify whether a particular algorithm produces better results. The metric under investigation is the PSNR. If one can show that an algorithm or set of algorithms can enhance a degraded known image to more accurately resemble the original, then the algorithm is better.

For the following implementation, an assumption is made regarding a standard 2D array of data or matrix. The dimensions of the original image matrix and the dimensions of the degraded image matrix must be identical. The mathematical representation of the PSNR is as follows:

$$PSNR = 20 \log_{10} \left( \frac{MAX_f}{\sqrt{MSE}} \right) \dots\dots (1)$$

where the MSE (Mean Squared Error) is:

$$MSE = \frac{1}{mn} \sum_0^{m-1} \sum_0^{n-1} ||f(i, j) - g(i, j)||^2 \dots\dots(2)$$

This can also be represented in a text based format as:  
 $MSE = (1/(m*n))*sum(sum((f-g).^2))$

$$PSNR = 20 * \log(\max(\max(f)) / ((MSE)^{0.5}))$$

where, :

*f* : Represents the matrix data of our original image

*g* : Represents the matrix data of our degraded image in question.

*m* : Represents the numbers of rows of pixels of the images and *i* represents the index of that row.

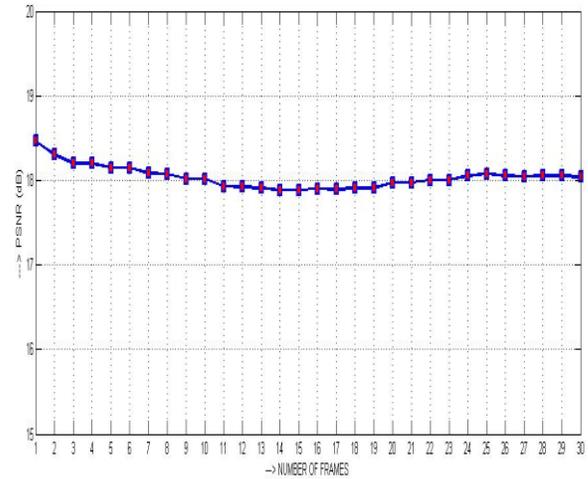
*n* : Represents the number of columns of pixels of the image and *j* represents the index of that column.

$MAX_f$  : Is the maximum signal value that exists in the original “known to be good” image.

In case of videos, PSNR can be computed for *I* frames of original and watermarked video

**Table 6.1 PSNR values (in dB) of test images.**

# of frames	PSNR	# of frames	PSNR
1	18.46	16	17.89
2	18.32	17	17.89
3	18.20	18	17.90
4	18.19	19	17.90
5	18.15	20	17.97
6	18.14	21	17.97
7	18.08	22	18.00
8	18.07	23	18.00
9	18.01	24	18.05
10	18.01	25	18.07
11	17.92	26	18.05
12	17.92	27	18.04
13	17.90	28	18.05
14	17.88	29	18.05
15	17.88	30	18.04



**Figure 6.1: PSNR performances in terms of number of frames.**

The Figure 6.1 shows the graph for Peak Signal Noise Ratio (PSNR) performance in terms of number of frames received by remote peer. Due to this PSNR remote peer will get low quality video. The table 6.1 shows the collected data of PSNR for number of frames. These data are used to draw the graph as shown in above Figure.

## VI. CONCLUSION

This paper proposed the analysis of MDC in which estimation of the noise in a video sent to a peer over a P2P network using flexible multiple description coding method which improves the frame loss possibilities over independent paths and ensures guaranteed reception of video file even if any of the subsequent frames are lost during the transmission. A promising approach for error concealment in video streaming over error prone networks. MDC approach proposed to address overcome the traffic loss over transmission channels. This source coding technique different levels of reconstructed video qualities can be achieved by successfully decoding different subsets of descriptions. The advantage of doing this is that descriptions can be streamed to a receiver using disjoint streaming paths, which can potentially increase the resilience to packet loss. Unlike scalable coding, there is no interdependency among MDC descriptions, and every description can be separately decoded, successfully decoding more descriptions results in better video quality. This feature makes MDC appealing for use in the design of a concurrent video streaming. At the receiver end, this approach can recover the damaged images itself without adding the extra information. Experimental results show that the proposed method efficiently recovers the detailed content and the PSNR quality is improved about 2.5 dB with respect to the conventional spatial concealment algorithms. When the image error ratio goes more than 50%, then the image is mostly corrupt and our approach conceals to some extent with acceptable viewing quality. Presently FST approach checks and conceals a single frame at a time, when multi-frames are lost, modification has to be done in FST approach which is an ongoing work.

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# Productivity Improvement by Enhancing the Bottleneck Station in an Alternator Production Plant with Layout Improvement and Its Cost Analysis

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**Abstract-** Required production output of an alternator plant was carried first. From this study it was clear the plant could not produce even half the required alternators. Present layout was simulated using the discreet simulation software arena and the bottleneck station was identified. next aim was to identify whether the plant layout is flexible to occupy a new VTM . By the CRAFT technique we could find an economic area for the new machine. Then the simulation was done based on the new layout and the utilization of machine, product output of the plant and bottleneck station was determined. From the simulation results it was clear that the production of the plant has increased but could not satisfy the full requirement. Some ratings of alternator production was not enhanced by the new machine were another was the critical machine whose alternator output was not enhanced. Then the layout was again simulated by increasing the number of critical machine and the result was compared.

**Index Terms-** Analysis, Arena, Improvement, Production, simulation

## I. INTRODUCTION

Increased productivity is always considered to be the main driver of competitiveness in the price sensitive market. There are different management tools through which the productivity of a firm can be increased. Green manufacturing , Business process reengineering, total quality management, statistical process control, supply chain management etc are some of such tools. Before implementing above tools we should be in a position to say that this plant exists a good plant layout and machine utilization. If the plant layout is not effective the production will decrease and the production cost increases and the profit reduces. so if we analysis a plant we should give first importance to the plant layout and the machine utilization of the plant etc. Management tools will become more effective only if the basic structure of the plant is correct. This study was carried out on an alternator production plant were first the present and past production order was compared.

## II. IDENTIFY, RESEARCH AND COLLECT IDEA

In this study it was seen that the plant could not produce half of its required quantity. In order to identify the reason we studied the plant layout and it was clear that the layout of the plant was ok . For the clear study we have taken the production plan for the month of January as reference and using discreet simulation software using arena we simulated the plant and could see that the firm have a bottleneck station which is the main reason for the low production.

Table 1:production plane for the month January

Alternator type	Quantity	Time Allotted
LT Induction Motor 100-200 KW	20	170 hours
Traction Alternator 4500 kVA	12	100 hours
2015 (25-35 KVA)	10	30 hours
25 KW Alternator	30	100 hours
Auxiliary Alternator	12	50 Hours

### layout simulation

In order to determine the critical machine in each alternator production they were simulated separately with allotted time. In the first step of simulation we found the most critical path in each alternator production alter all the critical path were simulated for a month. In this simulation using arena we could see that the same VTM machine was the bottle neck station for all the production process. The

next aim was to enhance the bottle neck station for the production improvement. since the production was less than the half the best and easy method to increases the production was to purchase a new machine.

**Combined Simulation for a month**

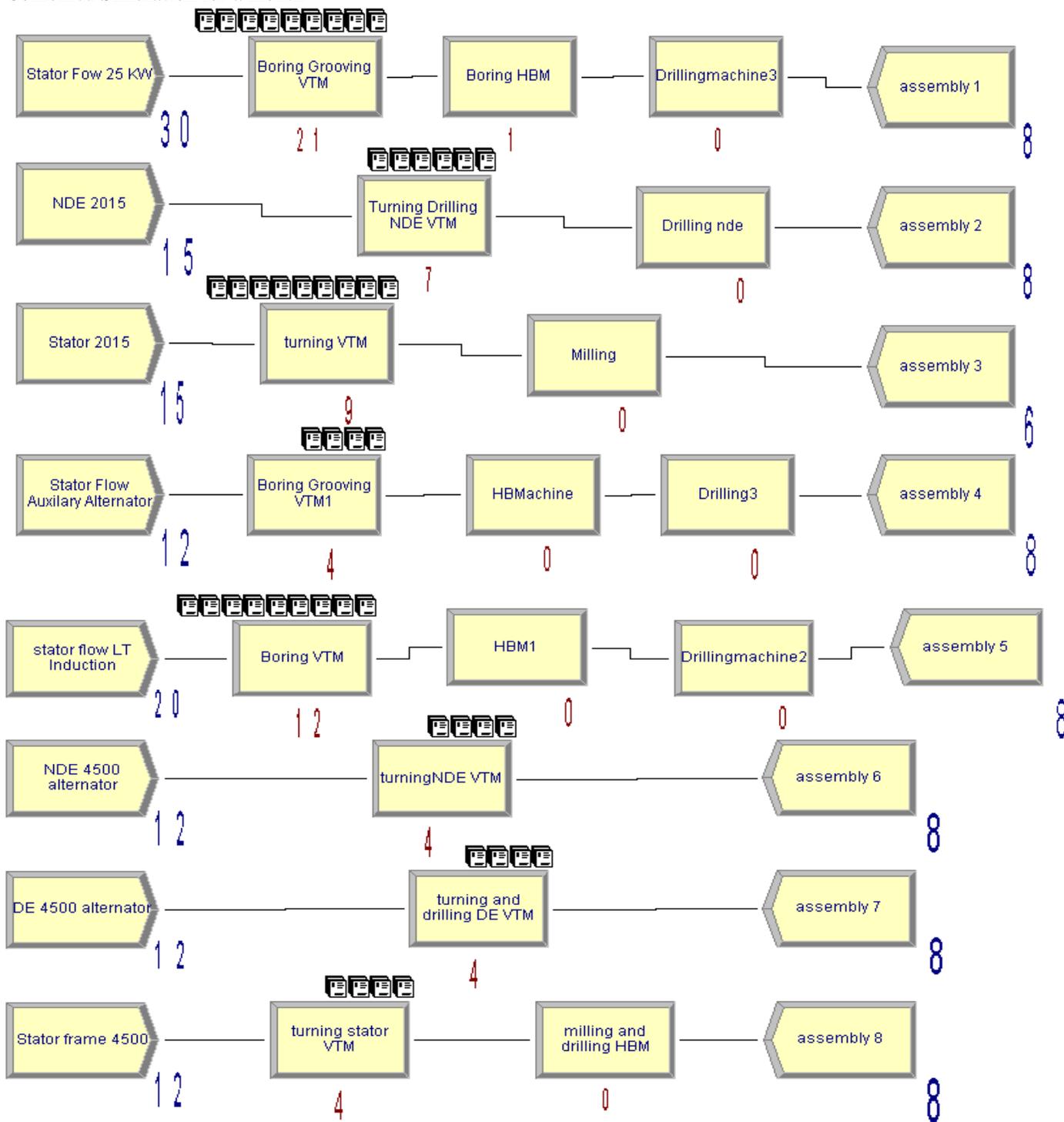


Fig 1: critical path layout simulation using arena

The above figure shows the simulation of the of the plant for the month of January. In this simulation we have considered only the critical path in each alternator production. Critical path was determined by the initial simulation by discreet event simulation arena were the line with least output was considered as the critical path. replication length was set to 450 hours since it is the total working hours of the plant for the month January. Now the plant is working in two shift with eight hours each. Nearly one hour is given for the miscellaneous activities like lunch, tea etc. the actual production can be considered to be 15 hours a day. From the simulation it is clear that the output of the each flow not up to the expected mark showing that there is a bottleneck station which required an emergency enhancement. after simulation it show that the most accumulation of resource is carried out at VTM

**Combined simulation of layout after improvement with a new VTM**

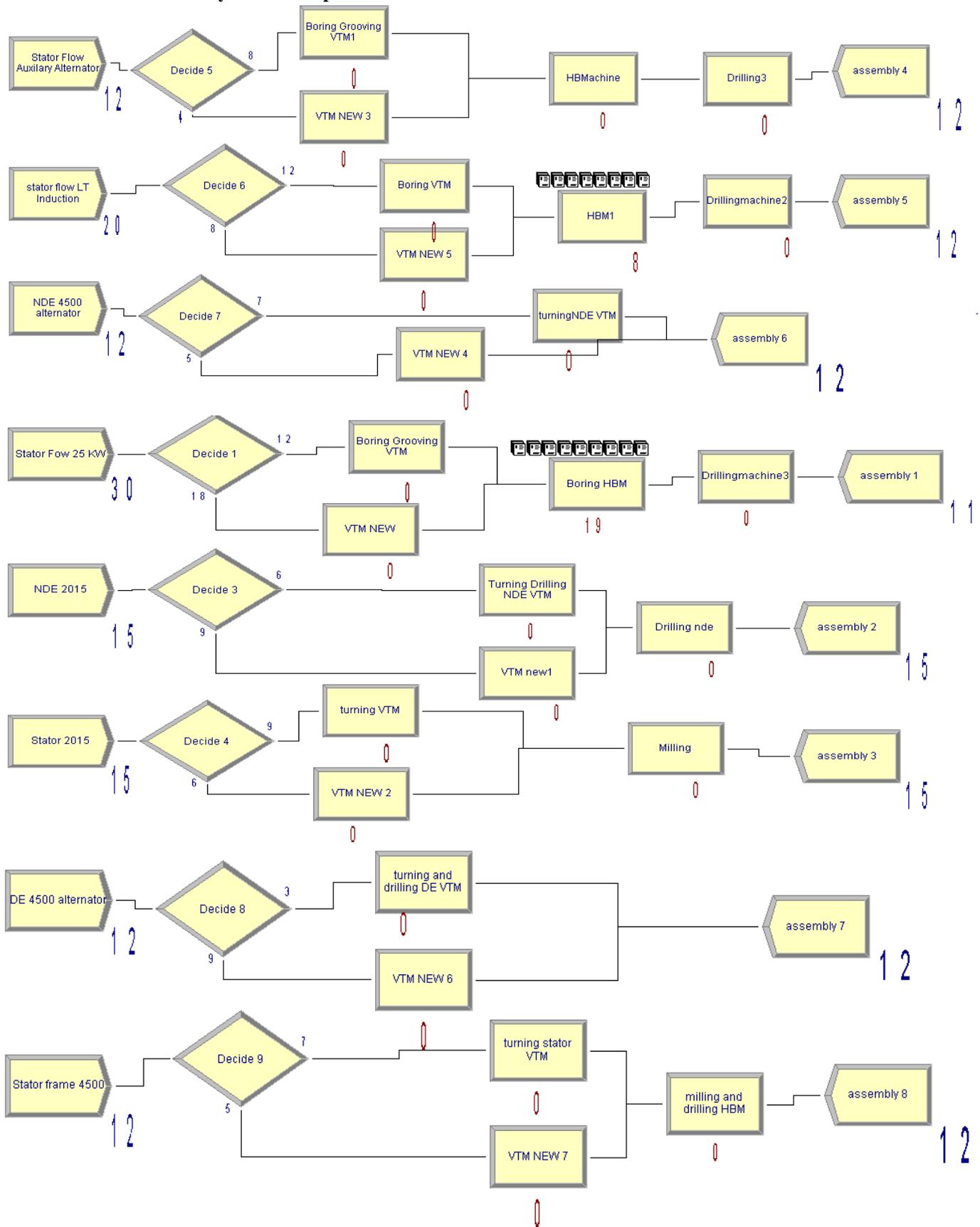


Fig 2: plant layout simulation with two vertical turning machine

Table 2:scheduled utilization of the machines for the month with two vtm

Scheduled Utilization	Value
Drilling machine 2	0.07266667
Drilling Machine 3	0.3133
HBM	0.9656
milling machine	0.03533333
VTM	0.9779
VTM 2	0.9242

The same critical machine is proposed to purchase so that its bottle neck is removed and increase the productivity of the firm. Before purchasing the firm should know weathered the plant layout is flexible for the improvement. For this the new layout is studied and improved using CRAFT technique and then simulated using arena which help as to compare the performance of the plant before and after the changes. The cost analysis is also carried out were the payback period and related data's are checked.

**Machine allocation**

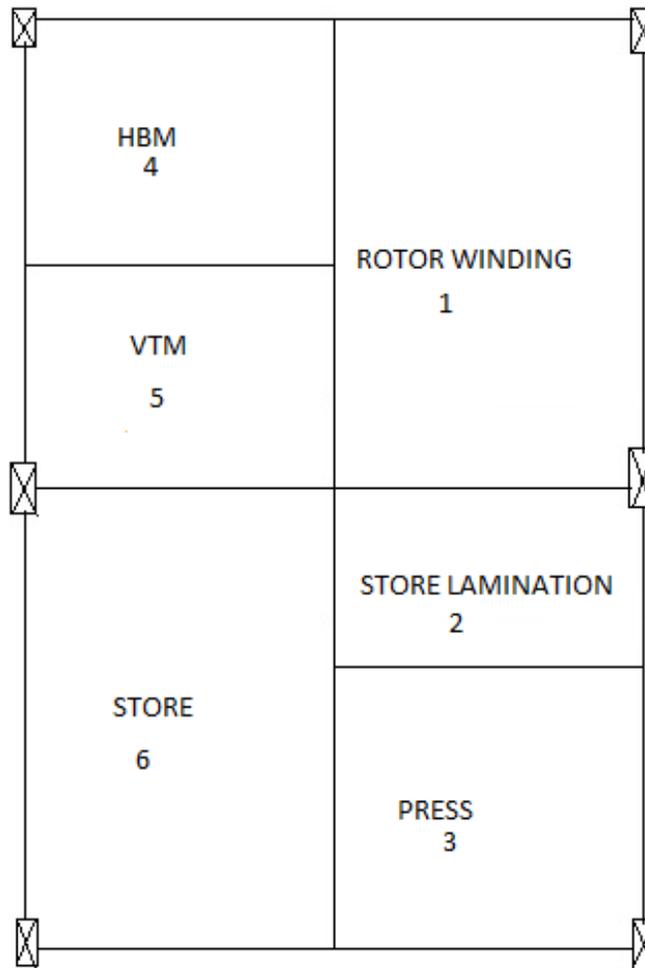
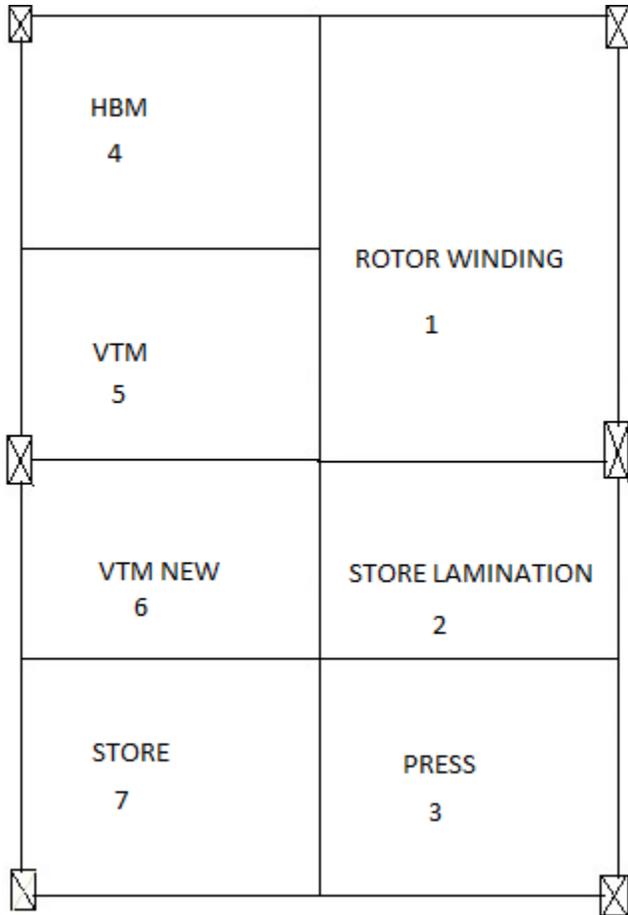


Fig 3: layout of fabrication section

In the above figure we can see the six department were department six and two are now used as store. here we use CRAFT technique were we require some basic input which is collected from the plant. Since we are interested in placing a new VTM in the layout it will be more economical to fix the new VTM near by the present VTM. So here two economic interchangeable are possible. Thus there will be two cases in this situation to determine the most economic one. In order to do the craft technique these are the input required.

1. Number of departments
- 2.Department area
- 3.Unit transportation cost
- 4.Number of transportation

Case 1:



Case 2:

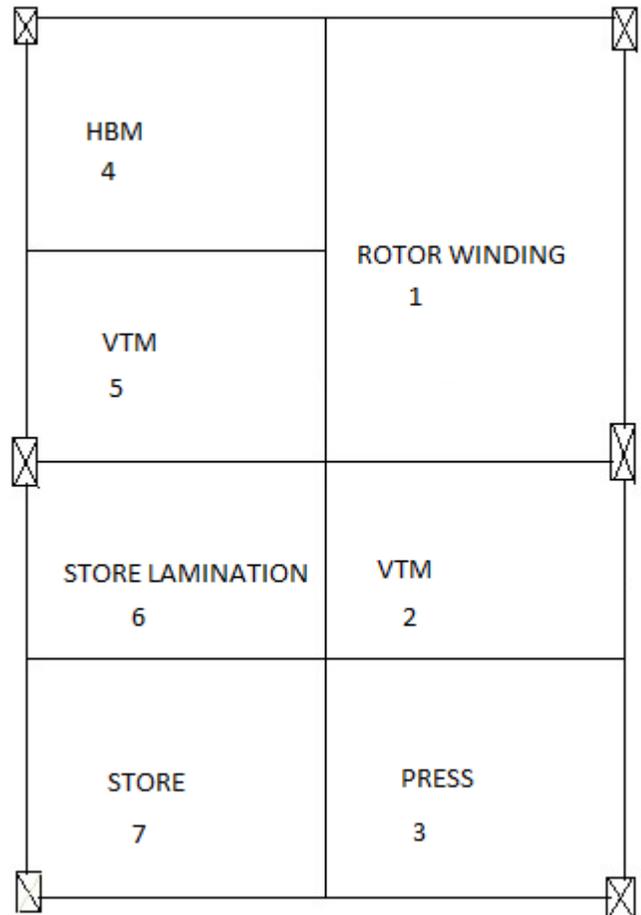


Fig 4:New Plant layout with possible two cases

total number of department =7

total number of interchangeable department =2

Table 3:departmental area in m<sup>2</sup>

1	2	3	4	5	6	7
112.5	45	67.5	67.5	45	45	67.5

From the two total cost case 1 have the least total cost with 4052.50 were in case 2 it is 4252.25. So it is the first layout which is the most economic layout. From this study it is clear that the plant layout can occupy a new machine and we have find an economic area for its installation. Now our aim is to select a good VTM as the plant concerned

**machine selection by scoring technique**

Table 4: Scoring technique to identify the suitable machine for the plant

Priority	Priority scoring	2500 VTC	VTC TOSHULIN
Operation	A	6	6
Flexibility	A	6	9
Size	A	9	9
Operation cost	A	9	6
Cost	B	9	3
Durability	B	6	9
Service	B	3	3
Supply	C	3	3
Style	C	6	3

Benefit	C	6	3
Total score		63	57

In calculation it was clear that 2500 VTC have the higher value so we will select this machine for the plant. This selection was carried based on the scoring technique. There are other effective technique to determine the economic machine since we have only two machine to compare it is easy to use the scoring technique.

**Cost Analysis**

Here in cost analysis we are looking what is the amount of profit the firm have acquired by the arrival of new VTM machine. whether it is good to have another HBM for the firm and what will be the payback period for different cases. Payback period in [capital budgeting](#) refers to the period of time required for the return on an investment to "repay" the sum of the original investment. Payback period as a tool of analysis is often used because it is easy to apply and easy to understand for most individuals, regardless of academic training or field of endeavor. When used carefully or to compare similar investments, it can be quite useful. To calculate a more exact payback period:  $\text{Payback Period} = \text{Amount to be Invested} / \text{Estimated Annual Net Cash Flow}$

Table 5: Production output with improved alternator layout

Alternator	Alternator to be produced	Output with single VTM	Output with	Production increased	Profit for a month
LT	20	8	12	4	30000*4
4500	12	8,8,8	12,12,12	4	130000*4
Auxiliary	12	8	12	4	23000*4
2015	15	6,8	15,15	9	9500*9
25 KW	30	8	11	3	19000*3
Total	89	30	62	24	874500

profit for the month January = Rs874500  
 average profit for an year = 12\*874500= 10494000  
 Amount for the new VTM =Rs 35000000  
 payback period =3500000/10494000 =3.3 years

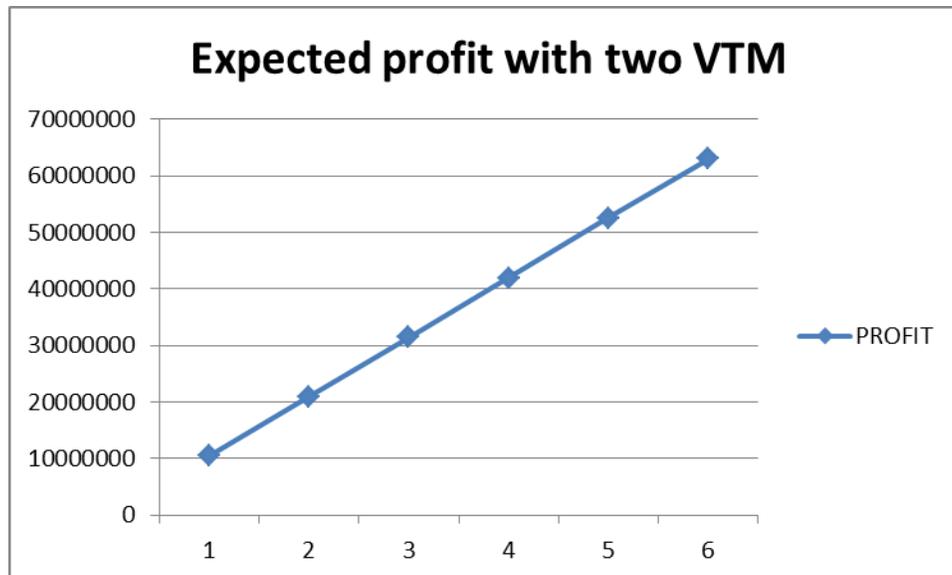


Fig 5 Expected profit for consecutive years

### III. CONCLUSION

The study could really show that the productivity of the firm can be increased with the new VTM which was the critical machine in the former stage. Next we identified the economic location of the machine in the plant layout for the new VTM. For including the machine we used CRAFT technique for locating the new VTM. In the detailed simulation using discrete simulation software arena it was clear that the HBM should be also enhanced for meeting the required output for 25KW alternator and LT induction motor a output of the firm. It was suggested to buy a new HBM machine for the productivity improvement. Then cost analysis is we could find the payback period for the plant with different layout. The proposal is submitted to the management

### APPENDIX

VTM - vertical turning machine

HBM - horizontal boring machine

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# The Study of Interictal Electro Encephalographic (EEG) patterns in different types of Seizures

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## Abstract

**Objective:** The aim of the present study was to determine Interictal Electroencephalographic (EEG) changes in different types of Seizures.

**Methods:** The study covers 80 patients with generalized seizures and partial seizures. The patients were from the neurology out patient department of Little Flower Hospital, Angamaly. Forty-eight cases out of eighty were males and thirty two were females. Selection and clinical definitions of the cases were based on a positive correlation of the following two parameters. 1. Clinical features of seizures. 2. Generalization of prevalent interictal EEG activity. Out of 80 cases; 60 cases were clinically diagnosed as having generalized seizures, It includes 42 cases with Generalized Tonic-Clonic seizures; 8 cases with absence seizures ; 5 cases with Juvenile Myoclonic Epilepsy 2 cases with infantile spasms and 3 cases with alcoholic withdrawal seizures. 20 cases showed partial seizures; it includes 18 cases with simple partial seizures and 2 cases with complex partial seizures.

**Results:** In generalized tonic-clonic seizure, the interictal EEG of 42 patients, 32 were normal record and 10 abnormal recordings. The abnormalities were polyspikes and wave discharges; spike and wave discharges; slow wave discharges and symmetrical and synchronous. The EEG recording of 8 patients with absence seizures showed 3 of them abnormal EEG recordings, while 5 showed normal EEG. EEG shows mild electrophysiological abnormalities and 3Hz generalized spike and wave discharges. The EEG recording of 5 cases with Juvenile myoclonic epilepsy were obtained, 2 of them were normal and 3 of them were abnormal. The abnormal recordings contained polyspike and wave discharges. The EEG was normal for 2 patients with infantile spasms and for 3 patients with alcoholic withdrawal seizure. The interictal EEG of 20 patients with partial seizures showed 8 normal and 12 abnormal recordings. In partial seizures the abnormality was found to be either confined to a discrete area i.e. Focal or the entire brain.

**Conclusion:** The younger males (below 35 yrs) were more prone to seizures. Over 75% of the patients had generalized seizures. The study also revealed that the temporal lobe was the most vulnerable part in partial seizures.

## I. INTRODUCTION

Electroencephalography is a technique of recording the electrical activities of the brain through the intact skull. The activity reflects the electrical currents that flow in the extracellular spaces of the brain and these in turn reflect the summated effects of innumerable excitatory and inhibitory synaptic potentials up on the cortical neurons. Electroencephalogram (EEG) exhibit fluctuations at frequencies in the range of 1 to 50Hz and amplitude fluctuations in the order of 10 to 100 $\mu$ V. Frequency is one of the important criteria for assessing abnormality in clinical EEG. It is divided into four frequency bands namely delta ( $\delta$ ) frequency band under 4Hz, alpha ( $\alpha$ ) frequency band from 8 to 12Hz and beta ( $\beta$ ) frequency band from 14 to 30Hz. Source of EEG: Standard clinical EEG records potential difference (V) between two points; one or both of which are on the scalp. The signals of EEG are based up on the movement of electrical charges in the brain. (De Luchhi et al., 1962) When neuron not conducting an impulse there is an electrical potential difference across the membrane called resting membrane potential. It is generated by the unequal distributions of ions across the membrane that results from the difference in their permeabilities. There is greater concentration of Sodium ions outside the neuron than inside and greater concentration of Potassium ions inside than outside. There are also many negatively charged ions held inside the cell by the membrane. The resting potential makes the neuron about 70mV more negative inside than outside. The resting neurons membrane is not very permeable to sodium ions.

**Epilepsy:** Epilepsy may be defined as an intermittent derangement of the nervous system due to presumably a sudden, excessive, disorderly discharge of cerebral neurons. Each episode of neurologic dysfunction is called a seizure. Seizure may be convulsive when they are accompanied by motor manifestations or may manifest by other changes in neurologic functions like sensory, cognitive or emotional events. Epilepsy is estimated to affect between 0.5 and 2 percent of the population, and can occur at any age.

## II. MATERIALS AND METHODS

EEG was recorded using a 21 channel digital EEG machine (Recorders and medicare systems, India). It consisted of the following parts: Computer, colour monitor, keyboard, photic/head box adapter, head box with stand, photic flash with stand and printer. The recording electrodes used were metal disc electrodes coated with silver-silver chloride. They were fixed to the scalp with the help of bentonite paste, which is a good conductor and to electrode in place and provide good contact with the skull. Pre acquisition notes were prepared prior to the starting of the EEG recording. It consists of patient's name, age, sex, date and time of recording, clinical

diagnosis, co-operation of the patient, last attack/seizure, last meal, sedation, medication, employment of activation procedures like hyperventilation and photic stimulation and level of alertness namely awake, drowsy, asleep or comatose. The scalp was made oil free and the electrode positions are wiped with acetone before the placement of electrodes. The subjects were made aware of the necessity of staying calm during the entire recording period. Recording of the EEG was done with subject in recumbent position with the eyes closed and relaxed. Electrode placement over the scalp was done according to 10 – 20 system.

### III. RESULTS

Of the 80 patients, in generalized tonic-clonic seizure, the interictal EEG of 42 patients, 32 were normal records and 10 abnormal recordings. The abnormalities were polyspikes and wave discharges; spike and wave discharges; slow wave discharges and symmetrical and synchronous. The EEG recording of 8 patients with absence seizures showed 3 of them abnormal EEG recordings, while 5 showed normal EEG. EEG shows mild electrophysiological abnormalities and 3 Hz generalized spike and wave discharges. The EEG recording of 5 cases with Juvenile myoclonic epilepsy were obtained, 2 of them were normal and 3 of them were abnormal. The abnormal recordings contained polyspike and wave discharges. The EEG was normal for 2 patients with infantile spasms and for 3 patients with alcoholic withdrawal seizure. The interictal EEG of 20 patients with partial seizures showed 8 normal and 12 abnormal recordings. In partial seizures the abnormality was found to be either confined to a discrete area i.e. Focal or the entire brain.

### IV. DISCUSSION

The EEG is most useful in evaluating patients with suspected epilepsy. The presence of electrographic seizure activity, i.e. of abnormal, repetitive, rhythmic activity having abrupt onset and termination, clearly establishes the diagnosis. The absence of such electrocerebral accompaniments does not exclude a seizure disorder, however, because there may be no changes in the scalp recorded EEG during simple partial seizure or complex partial seizure. It is often possible to obtain an EEG during clinical events that may represent seizures, especially when such events occur unpredictably or infrequently. The interictal EEG findings are helpful in showing certain abnormalities that are strongly supportive of the diagnosis of epilepsy. Such epileptiform activity consists of bursts of abnormal discharges containing spikes and sharp waves. The EEG findings also have been used in classifying seizure disorders and selecting appropriate anticonvulsant medication for individual patients. The findings in the routine scalp-recorded EEG indicate the prognosis of seizure disorders.

### V. CONCLUSION

The younger males (below 35 yrs) were more prone to seizures. Over 75% of the patients had generalized seizures. The study also revealed that the temporal lobe was the most vulnerable part in partial seizures.

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# Phytochemical Investigation of Different Plant Parts of *Calotropis Gigantea*

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**Abstract-** *Calotropis gigantea* R.Br. (Asclepiadaceae) a widely growing plant has been reported to possess number of medicinal properties and other purposes. Since ancient times plants have been used as source of therapeutic agents. Plants are playing a significant role in the indigenous system of medicine to combat diseases. The traditional medicine involves the use of different plant extracts or bioactive chemicals. This type study provides the health at affordable cost. The result suggest that the Phytochemical properties of the stem, leaves and flower for curing various ailments.

**Index Terms-** *Calotropis gigantea*, Phytochemical, Bioactive chemicals, Traditional medicine.

## I. INTRODUCTION

*Calotropis* species, belonging to the family of Asclepiadaceae in plant kingdom, are the well known plants throughout the tropical world and they are native to the tropical and subtropical parts of Asia and Africa (Sharma, 1934). These plants are commonly known in English as Giant Milk Weeds or Swallow-worts. This species is one of the special classes of plants that can avoid or repel the grazing animals (Sastrt et al, 1990). Various parts of this plant are reported to possess multiple therapeutic properties like antipyretic, analgesic, anticonvulsant, anxiolytic, sedative, wound healing, antidiabetic (Mueen et al, 2005). Chemical investigations of *Calotropis gigantea* report isolation of different types of phytochemicals such as flavonoids, glycosides, triterpenoids, steroids etc. (Habib et al 2012). Here an attempt has been made to investigate the chemical present in the plant for curing various diseases.

## II. MATERIAL AND METHODS

### (i) PLANT MATERIAL:

*Calotropis gigantea* [stem, leaves and flowers] collected in January 2013 from Rewa. The plant material was identified at the field using standard keys and descriptions. Its botanical identity was further confirmed at Pinnacle Biomedical Institute, Bhopal, India.

### (ii) METHOD OF EXTRACTION:

Solvent – Petroleum ether, Methanol

Method – Maceration

### Procedure:

Plant part (leaf, stem and flower) powder was weighed 500 gm and kept in a container in contact with pet ether for seven days, with vigorous shaking at regular interval. Material was filtered a first with muslin cloth and then with filter paper. Filtrate was collected and dried in water bath till no further reduction in mass of extract was observed. Dried extract was weighed and packed in air tight container.

And the marc was air dried then kept in a container in contact with methanol for seven days, with vigorous shaking at regular interval. Material was filtered a first with muslin cloth and then with filter paper. Filtrate was collected and dried in water bath till no further reduction in mass of extract was observed. Dried extract was weighed and packed in air tight container.

### (iii) Phytochemical Screening-

Phytochemical Screening was carried out using standard methods to detect the bioactive compounds like alkaloids, tannins, phenols, steroids, flavonoids, saponins (Trease et al, 1989).

III. RESULT AND DISCUSSION

Table 1: Phytochemical Screening of *Calotropis gigantea*

S. No.	Experiment	Result					
		Pet. ether extract of <i>Calotropis gigantea</i> leaves	Methanolic extract of <i>Calotropis gigantea</i> leaves	Pet. ether extract of <i>Calotropis gigantea</i> stem	Methanolic extract of <i>Calotropis gigantea</i> stem	Pet. ether extract of <i>Calotropis gigantea</i> flower	Methanolic extract of <i>Calotropis gigantea</i> flower
<b>1. Alkaloids</b>							
1.1	Mayer's reagent test	-ve	+ve	+ve	-ve	+ve	+ve
1.2	Wagner's reagent test	-ve	+ve	+ve	-ve	+ve	+ve
1.3	Hager's reagent test	-ve	+ve	+ve	-ve	+ve	+ve
<b>2. Carbohydrates</b>							
2.1	Molish's test	-ve	-ve	-ve	-ve	-ve	+ve
2.2	Barfoed's test	-ve	-ve	-ve	-ve	-ve	+ve
<b>3. Test for Reducing Sugar's</b>							
3.1	Fehling's test	-ve	-ve	-ve	-ve	-ve	-ve
3.2	Benedict's test	-ve	-ve	-ve	-ve	-ve	-ve
<b>4. Flavonoids</b>							
3.1	Alkaline reagent test	-ve	+ve	-ve	+ve	-ve	+ve
3.2	Shinoda test	-ve	+ve	-ve	+ve	-ve	+ve
3.3	Lead acetate test	-ve	+ve	-ve	+ve	-ve	+ve
<b>5. Glycoside</b>							
4.1	Borntrager test	+ve	-ve	-ve	+ve	+ve	+ve
4.2	Legal's test	+ve	-ve	-ve	+ve	+ve	+ve
4.3	Killer- Killiani test	+ve	-ve	-ve	+ve	+ve	+ve
<b>6. Tannin and Phenolic compound</b>							
6.1	Ferric chloride test	-ve	+ve	-ve	+ve	-ve	+ve
6.2	Lead Acetate test	-ve	+ve	-ve	+ve	-ve	+ve
6.3	Dilute Iodine solution	-ve	+ve	-ve	+ve	-ve	+ve
<b>7. Saponin</b>							
7.1	Faom Test	+ve	-ve	-ve	-ve	-ve	+ve
<b>8. Test for Proteins and amino acid</b>							
8.1	Ninhydrin test	-ve	-ve	-ve	-ve	-ve	+ve
8.2	Biuret test	-ve	-ve	-ve	-ve	-ve	+ve
<b>9. Test for Fats and Oils</b>							
9.1	Solubility test	+ve	-ve	-ve	-ve	-ve	+ve
<b>10. Test for Triterpenoids and Steroids</b>							
10.1	Salwonski Test	-ve	+ve	-ve	+ve	-ve	+ve
10.2	Libberman and Burchard's test	-ve	+ve	-ve	+ve	-ve	+ve

(+) indicates presence

(-) indicate absence

Today, traditional medical practice has been recognized by the world health organization (WHO) as a building block of primary healthcare. But it emphasizes the fact that safety should be the overriding criterion in the selection of herbal remedies for use in healthcare (Patil et al 2012).

Chemical investigation of this plant has shown the presence of cardiac glycosides, saponins, flavonoids, steroids, terpenoids (Seniya et al 2011). Almost all the parts of *Calotropis gigantea* have been documented to possess medicinal virtues in ethnobotanical surveys conducted by researchers in India. Flowers have shown promising biological activities such as hepatoprotective, anticonvulsant, antitumour, antiasthmatic and analgesic. The leaves are useful in the treatment of paralyzed parts, the oil in which leaves have been boiled, is also applied to paralyzed parts. It is also used in the treatment of arthralgia, swelling and intermittent fever (Joshi et al 2011). The plant has been used as an antidiarrhoeal (Pratap et al 2010), wound healing (Malwaya et al 2009), anti-inflammatory (Jagtap et al 2010). Mandepudi et al, 2012 have described the pest resistant properties of *Calotropis gigantea*. Kumar et al, 2012 have described the Phytochemical properties of *Calotropis gigantea* commonly known as milk weed. Kshirsagar et al, 2010 have described the acute and subacute toxicity of the ethanolic extract from *Calotropis gigantea* R.Br. flower was investigated. Different parts of *Calotropis gigantea* have been reported to exhibit medicinal and nutritional properties while Phytochemical evaluation of the plant parts revealed the presence of essential and trace elements in varied quantities.

#### IV. CONCLUSION

*Calotropis gigantea* (stem, leaf and flowers) extract made in methanol, petroleum ether contains different secondary metabolites with biological activity that can be of therapeutic index.

Table 1 showed preliminary Phytochemical screening of plant parts of *Calotropis gigantea*. The obtained result provide a support for the use of this plant in traditional medicine and suggest its further advance investigation. Phytochemical screening of the crude extracts revealed the presence of saponins, tannins, alkaloids, other phytoconstituents which were reported during present investigation were cardiac glycosides, flavonoids, glycosides, steroids, terpenes and tannins.

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# Improving Methodology for the Preparation of 2-(Substituted phenyl)-4,5-bis(4-Methoxyphenyl)-1H-imidazoles from 4,4'-Dimethoxybenzil under Microwave Irradiation

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**Abstract-** An efficient synthesis of 2-(2-Substituted Phenyl)-4,5-bis(4-methoxyphenyl)-1H-imidazoles by one step condensation of an substituted aldehyde 4,4'-dimethyl benzil , ammonium acetate under microwave irradiation is described .The structure of the product were characterized by <sup>1</sup>HNMR ,IR ,elemental analysis , and melting point .The advantage of this method is simple methods ,procedure are a green method ,its milder conditions , necessary shorter reaction time and its higher yields and easy workup.

**Index Terms-** Imidazoles, Solvent free, MW irradiation, multi-component reaction.

Al<sub>2</sub>O<sub>3</sub> ,Iodine <sup>23</sup> ,Zr(acac)<sub>4</sub> <sup>24</sup> ,Sodium bisulfite<sup>25</sup> ,L-proline <sup>26</sup> .Most of these synthetic methods suffer from one or more serious drawbacks such as laborious and complex work-up and purification ,significant amounts of waste materials ,high temperature ,low yields , long reaction times and the of expensive reagents

We were promoted a facile , mild and efficient method for one -pot synthesis of 2-(Substituted phenyl)-4,5-bis(4-methoxyphenyl)-1H-imidazole from 4,4'-Dimethoxy benzil and various aromatic aldehydes under solvent free and microwave conditions.

## I. INTRODUCTION

Many heterocyclic compounds due to their specific activity are employed in the treatment of many infectious diseases .The toxicity and volatile nature of many organic solvents, particularly chlorinated hydrocarbons that are widely used in huge amounts for organic reactions have posed a serious threat to the environmental <sup>1</sup> .Thus the design of solvent free catalytic reaction has received more attention in recent times in the area of green synthesis <sup>2-3</sup> .The emergence of microwave technology as a tool for increasing reaction rates is well documented <sup>4-5</sup> .Microwave-assisted reactions are extremely attractive to synthetic organic chemists due to their ability to shorten reaction times <sup>6-7</sup> . Reactions that previously required hours to run for completion can now be finished within minutes <sup>8</sup> . Imidazoles are commonly utilizing substructures within the pharmaceutical industry , as these heterocycles impart unique physical and biological properties to compounds of interest <sup>9-10</sup> . Trisubstituted imidazoles derivatives are widely used as organic materials such as to resist composition on textile <sup>11</sup> ,photographic materials<sup>12-13</sup> .Meantime , it was found that these compound play roles in many kinds of biological activities<sup>14-15</sup>.This versatile applicability highlights the importance of access to efficient synthetic routes to well-designed and highly substituted imidazole derivatives .There are several methods for the synthesis of 2,4,5-trisubstituted imidazoles by three component cyclocondensation of a 1,2-diketone , with an aldehyde and ammonium acetate which comprise the use of microwave <sup>16-17</sup> ,Ionic liquid <sup>18</sup> , refluxing in acetic acid <sup>19-20</sup> ,Silica sulfuric acid <sup>21</sup> ,NiCl<sub>2</sub>.6H<sub>2</sub>O /

## II. EXPERIMENTAL SECTION

**Materials** - Substituted aromatic aldehyde , Anisaldehyde ,Sodium Cyanide ,ethanol ,Conc. Nitric acid ,Ammonium acetate ,glacial acetic acid is required chemicals purchased from merk and S-d fine chemicals .All the reported melting points were taken in open capillaries and are uncorrected .IR spectra were measured by using Perkin Elmer Model 2000 Spectrophotometer and are given in cm<sup>-1</sup> using KBr disc ,<sup>1</sup>HNMR spectra were measured in DMSO by using Bruckner Avance 400MHz spectrophotometer using TMS as an internal standard .The purity of all the synthesized compound was tested by TLC on silica gel plate using ethyl acetate and petroleum ether ( 80 : 20 )and iodine was used as a visualizing agent .Microwave synthesis was carried out on a ETHOS 1600 , Milestone microwave reactor .

- **General procedure for the synthesis of 4,4'-Dimethoxybenzil [ 1,2-bis( 4-methoxyphenyl )-ethan-1,2-dione ] - ( B<sub>2</sub> )**

Took 7.8 gm 2-hydroxy-1,2-bis-(4-methoxyphenyl)-ethan-1-one dissolved in 22ml glacial acetic acid then added 31 ml Conc. Nitric acid slowly to a reaction mixture with controlled temperature by using ice-bath .Refluxed the reaction mixture for 2 hours until the complete evolution of brown gas , stopped reaction and cooled , poured into crush ice-cold water with stirring obtained a solid product , Filter, dried it and recrystallized from ethanol .

**Yield- 67% , M.Pt- 133-135 °C , M.Wt- 270 , Formula- C<sub>16</sub>H<sub>14</sub>O<sub>4</sub>**  
**IR ( KBr cm<sup>-1</sup> )** 3072 (C-H Ar) , 2979 (C-H ali -OCH<sub>3</sub>) , 1690 (C=O) , 1536 (C=C) , 1158 ( C-O ) .  
**<sup>1</sup>HNMR ( DMSO )** 4.0 (s ,3H , -OCH<sub>3</sub>) , 7.3 (d ,2H ) , 7.4 (d ,2H ) .  
**Anal .Caculation for C<sub>16</sub>H<sub>14</sub>O<sub>4</sub>**

Element	C	H	O
Found	71.16	5.27	23.73
Calcd	71.19	5.31	23.69

**\*Synthesis of 2-(Substituted phenyl)-4, 5-bis (4-methoxyphenyl)-1H-imidazoles (3a-3l) under Microwave irradiation**

A mixture of 1, 2-bis (4-methoxyphenyl) –ethan-1,2- dione (1 mmol) , ammonium acetate ( 7 mmol ) , aromatic aldehyde ( 1 mmol ) in a Borosil beaker ( 50 ml ) add 2 to 3 drop of glacial acetic acid .The reaction mixture was mixed properly with the help of glass rod and put in a microwave oven .The mixture was irradiated at 135 W and irradiated for a period 30 sec at a time , After each irradiation the reaction mixture was removed from the microwave oven for shaking .The total period of microwave irradiation was 1- 7 min ( Table -1) .After TLC (Petroleum ether : ethyl acetate 9:1) indicating the starting materials of 4,4'-dimethoxybenzil and aldehyde had disappeared .The reaction mixture was cooled to room temperature and poured into ice water (50 ml) obtained solid product , filter washed with water , dried and recrystallized from ethanol to get the corresponding product ( 3a-3l ) were confirmed by IR ,<sup>1</sup>HNMR and melting point .

**\*Spectral Data for New derivatives of 2-(Substituted phenyl)-4,5-bis-(4-methoxyphenyl)-1H-imidazoles – 1, 2-Phenyl-4,5-bis(4-Methoxyphenyl)-1H-imidazole ( 3a ) --**

**Solid Colourless , M.Pt- 198-200 °C . Formula – C<sub>23</sub>H<sub>20</sub>O<sub>2</sub>N<sub>2</sub> , M.Wt- 356 .**  
**IR ( KBr cm<sup>-1</sup> )** 3450 ( N-H ) , 3048 ( C- H arom ) , 2977 ( C-H aliph ) , 1618 ( C=N ) , 1461.56 (C=C )  
**<sup>1</sup>HNMR ( 400 MHz , DMSO )** 3.90 ( s, 1H -OCH<sub>3</sub>) , 3.98 ( s, 1H, -OCH<sub>3</sub>) , 7.46 (d, 2H ) , 8.36 ( d ,2H )

8.05 (s, 1H) , 7.51 – 8.69 ( m , 8H ) , 8.6 ( S , N-H ) .

**Anal. Calculation for C<sub>23</sub>H<sub>20</sub>O<sub>2</sub>N<sub>2</sub> –**

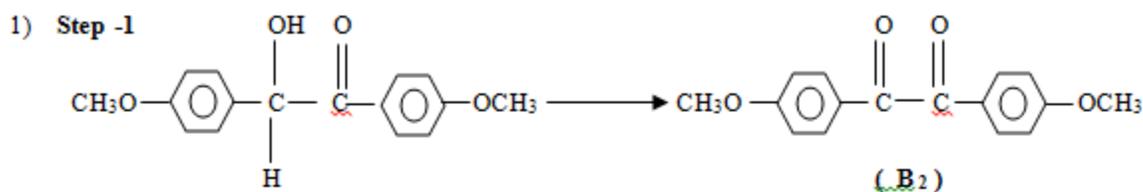
Element	C	H	O	N
Found	77.55	5.63	8.98	7.86
Calculated	77.59	5.56	8.96	7.90

**\*2-(4-Chlorophenyl)-4,5-bis-(4-Methoxyphenyl)-1H – imidazole ( 3 b ) – Solid , Colour- Yellow , M.Pt- 120 – 122 °C , Yield -81% , Formula- C<sub>23</sub>H<sub>19</sub>O<sub>2</sub>N<sub>2</sub>Cl , M.Wt- 390.5**  
**IR ( KBr cm<sup>-1</sup> )** 3448 cm<sup>-1</sup>(N-H) , 3078 cm<sup>-1</sup>(C-H arom) , 2846 cm<sup>-1</sup>(C-H , -OCH<sub>3</sub>) , 1613 (C=N) , 1536 (C=C) , 1012 (C-O Str ) , 829 cm<sup>-1</sup>( 4-Substituted benzene ring ) .  
**<sup>1</sup>HNMR (DMSO)** 3.82 S ( 6H ) , -OCH<sub>3</sub> x 2 , 6.9-7.5 q (8H) , (C<sub>6</sub>H<sub>4</sub> OCH<sub>3</sub>) x2 , 6.9 (m, 2H) , 8.4 (m,2H) , 9.9 broad Singlet (1H , N-H)

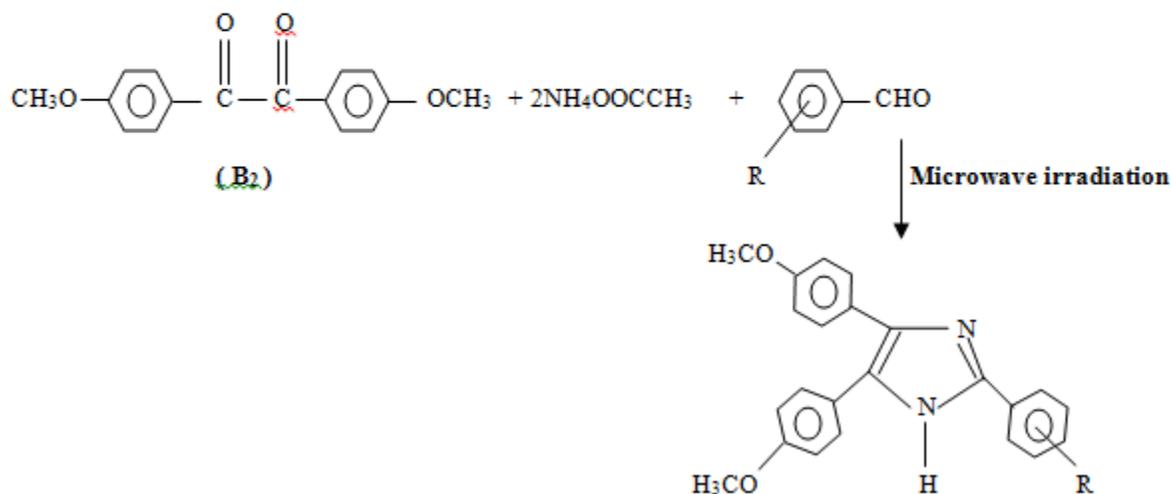
**Anal. Calculation for –C<sub>23</sub>H<sub>19</sub>O<sub>2</sub>N<sub>2</sub>Cl**

Element	C	H	O	N	Cl
Found	70.72	4.83	8.17	7.14	9.07
Calcd	70.76	4.85	8.15	7.19	9.12

**Reaction :-**



2) Step-2



R – H , 4Cl , 4-OCH<sub>3</sub> , 4NO<sub>2</sub> , 4N(CH<sub>3</sub>)<sub>2</sub> , 2(OH) , 4(OH) -3-(OCH<sub>3</sub>) , 3,4,5-(OCH<sub>3</sub>) , 2Cl , 4(OH)

The other compounds of this series (3a-3l) were prepared similarly and are recorded in table-1

**Table :-1 , Physicochemical data of the synthesized imidazole derivatives (3a-3l)**

Entry	R	M.Pt ( <sup>o</sup> C)	Yield (%)	Time (min)	Formula
3a	-H	198-200	85	7	C <sub>23</sub> H <sub>20</sub> O <sub>2</sub> N <sub>2</sub>
3b	-4Cl	120-121	81	9	C <sub>23</sub> H <sub>19</sub> O <sub>2</sub> N <sub>2</sub> Cl
3c	-4OCH <sub>3</sub>	170-171	93	6	C <sub>24</sub> H <sub>22</sub> O <sub>3</sub> N <sub>2</sub>
3d	-4NO <sub>2</sub>	170-173	80	8	C <sub>23</sub> H <sub>19</sub> O <sub>4</sub> N <sub>3</sub>
3e	-2NO <sub>2</sub>	209-212	70	5	C <sub>23</sub> H <sub>19</sub> O <sub>4</sub> N <sub>3</sub>
3f	-4N(CH <sub>3</sub> ) <sub>2</sub>	155-157	71	3	C <sub>25</sub> H <sub>25</sub> O <sub>2</sub> N <sub>3</sub>
3g	-2OH	200-203	75	6	C <sub>23</sub> H <sub>20</sub> O <sub>3</sub> N <sub>2</sub>
3h	-4(OH)-3-(OCH <sub>3</sub> )	228-230	82	3	C <sub>24</sub> H <sub>22</sub> O <sub>4</sub> N <sub>2</sub>
3i	3,4,5-(OCH <sub>3</sub> )	232-234	93	2	C <sub>26</sub> H <sub>26</sub> O <sub>5</sub> N <sub>2</sub>
3j	2-Cl	180-184	79	7	C <sub>23</sub> H <sub>19</sub> O <sub>2</sub> N <sub>2</sub> Cl
3k	-4OH	170-173	78	5	C <sub>23</sub> H <sub>20</sub> O <sub>3</sub> N <sub>2</sub>
3l	-3NO <sub>2</sub>	240-242	79	4	C <sub>23</sub> H <sub>19</sub> O <sub>4</sub> N <sub>3</sub>

**III. RESULT AND DISCUSSION**

2-Substituted-4,5-bis(4-methoxyphenyl)-1H-imidazole (3a-3l) were synthesized by reagent such as P-anisil , Substituted benzaldehyde and ammonium acetate under microwave irradiation in good yield .Ammonium acetate plays an important role in the reaction . If ammonium acetate is deficient , p-anisil

can't transform completely .The physical data of compounds were collected and presented under compound name and spectral data.The yield of the compounds was in the range 70 -93 % , most of them are yellow crystalline solids.The IR spectrum of compound 3a shows the characteristic band at 3450 cm<sup>-1</sup> due to the N-H.The IR spectrum of compound 3a,3b,3c shows the characteristic band at 1500 -1600 cm<sup>-1</sup> due to -C=N .The

<sup>1</sup>H NMR spectrum of compound 3a,3b,3c shows signal of N-H at 8.6 ppm, 9.9 ppm, 8.7 ppm single of N-H at which confirmed the presence of N-H bond of imidazole. **We have presented efficient synthesis of 2-Substitutedphenyl-4,5-bis(4-Methoxyphenyl)-1H-imidazoles in the absence of catalyst in microwave irradiation.**

#### IV. CONCLUSION

In Conclusion a reliable rapid and environmentally benign method for synthesizing 2-Phenyl-4,5-bis(4-Methoxyphenyl)-1H-imidazole(3a-3l) has been developed compared to previous reported methodologies, **the present protocol features, simple operations, short reaction time, environmental friendliness and good yields, low pollution and simple experimental procedure and easy workup.**

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# Monarchy and Democracy in Sikkim and the Contribution of Kazi Lhendup Dorjee Khangsherpa

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**Abstract-** In the contemporary world of Ideologies, Principles, Science and Technology, Information Generation and Globalization, the Democracy plays pivotal role in the greater part of the world's Political System. Democracy defined "as the government of the people, by the people, and for the people" by Abraham Lincoln. Countries like Great Britain, United States of America and India follows the democratic Ideologies and Principles in governmental administration, economic activities as well as. United States of America also called the oldest democracy in the world and India is the largest democracy in the world. Almost all the countries of the world are greatly influenced by the Democracy and its usefulness.

Principles of Secularism, Socialism, Republicanism and Democracy are the pillars of Indian political system right after the independence that is from 1947. Preamble of the Indian constitution starts with "We the people of India having solemnly resolved to constitute India into a Sovereign, Socialist, Secular, Democratic Republic and to secure to all its citizen; Justice, social, economic, political; Liberty of thought, expression, belief, faith and worship; Equality of status and opportunity; and to promote among them all; Fraternity assuring the dignity of the individual and the unity and integrity of the nation.....this clearly described that India is the greatest devotee of democracy.

The present study tries to seek, address and examine the emergence and establishment of democracy in the Small Independent kingdom of Sikkim since the emergence of Namgyal dynasty till the merger of Sikkim with India in 16<sup>th</sup> April 1975. Presently the political System of Sikkim is based on democratic principle but this is not so before 1975. The present paper tries to find the Democracy in Sikkim and the contribution of its First chief minister "Kazi Lhendup Dorjee Khangsherpa" before and after its merger with India in 1975. This paper also explores the major factors which led to follow the principle of democracy by the Independence nation Sikkim before becoming 22<sup>nd</sup> states of India in the year 1975.

**Index Terms-** Democracy, Monarchy, Namgyal Dynasty, Chogyal, Political Parties, Merger, General Election.

## I. INTRODUCTION

Democracy has directly originated from the French democratic, but its real origin is Greek. In Greek there are two words- demos which means people and kratos means rule and this is what we mean in English is the rule of the people. According to David Held "Democracy means a form of government in which, in contradiction monarchies and aristocracies, the people rule. Democracy entails political

community in which there is some form of political equality among the people". Precisely stated democracy is the rule by the people. Among all the above definition perhaps the best and most popular definitions: democracy is the "government of the people, by the people and for the people" this definition is given by the former U.S. President Abraham Lincoln (1909-1865). Democracy always advocates the welfare of the people individually and socially, it promotes social equality, economic opportunity, legal justice and political rights as a whole among the people.

There are various forms of democracy such as Direct Democracy, Representative Democracy, Parliamentary Democracy, Presidential Democracy, Liberal Democracy and Socialist Democracy and so on:

1. Direct Democracy, is a political system where the citizens participate in the decision-making personally, contrary to relying on intermediaries or representatives. The supporters of direct democracy argue that democracy is more than merely a procedural issue. A direct democracy gives the voting population the power to Change constitutional laws, Put forth initiatives, referendums and suggestions for laws, Give binding orders to elective officials, such as revoking them before the end of their elected term, or initiating a lawsuit for breaking a campaign promise.

2. Representative Democracy involves the election of government officials by the people being represented. Representatives may be elected or become diplomatic representatives by a particular district (or constituency), or represent the entire electorate through proportional systems, with some using a combination of the two. Some representative democracies also incorporate elements of direct democracy, such as referendums etc.

3. Parliamentary Democracy is a representative democracy where government is appointed by, or can be dismissed by, representatives as opposed to a 'presidential rule' wherein the President is both head of state and the head of government and is elected by the voters. Under a parliamentary democracy, government is exercised by delegation to an executive ministry and subject to ongoing review, checks and balances by the legislative parliament elected by the people

4. Presidential Democracy is a system where the public elects the president through free and fair elections. The president serves as both the head of state and head of government controlling most of the executive powers. The president serves for a specific term and cannot exceed that amount of time. Elections typically have a fixed date and aren't easily changed. The president has direct control over the cabinet, the members of which are specifically appointed by the president himself. The president cannot be easily removed from office by the legislature,

but he or she cannot remove members of the legislative branch any more easily. This provides some measure of separation of powers. In consequence however, the president and the legislature may end up in the control of separate parties, allowing one to block the other and thereby interfere with the orderly operation of the state. This may be the reason why presidential democracy is not very common outside the Americas.

6. Socialist Democracy: Socialist thought has several different views on democracy. Social democracy, democratic socialism, and the dictatorship of the proletariat (usually exercised through Soviet democracy) are some examples. Many democratic socialists and social democrats believe in a form of participatory democracy and workplace democracy combined with a representative democracy. Within Marxist orthodoxy there is hostility to what is commonly called "liberal democracy", which they simply refer to as parliamentary democracy because of its often centralized nature. Because of their desire to eliminate the political elitism they see in capitalism, Marxists, Leninists and Trotskyists believe in direct democracy implemented through a system of communes (which are sometimes called soviets). This system ultimately manifests itself as council democracy and begins with workplace democracy.

India is the largest democracy in the world which follows the parliamentary democracy having the principles of socialism, secularism, republicanism, etc. has great impact for becoming Sikkim as a democratic state of India.

## II. DEMOCRACY IN INDIA: BRIEF OUTLINE

India is the largest democracy in the world. It has long history of democracy. India is the seventh largest (by area) including 29 states (recently Tilangana got separate statehood) 7 union territory with New Delhi as the nation's capital and the second most populous country in the world, with roughly one-sixth of its population, of about a billion and a quarter. It is the world's largest democracy also because it has lengthiest constitution consisting 22 parts, 12 schedule and 395 articles comparing United States have only seven articles. It is one of the world's oldest civilizations yet, a very young nation. Elections to its Parliament are held once every 5 years. Currently, Prime minister Dr. Manmohan Singh is the head of the government, enjoying a majority in the Parliament, while President Pranab Mukherjee, is the head of state. India is a constitutional republic governed under the world's longest written constitution following the principles of Democracy, Secularism, Democratic Socialism, Republicanism and Unitary in spirit and Federal in nature. The country has four main national parties: the Indian National Congress (INC), Bhartiya Janta Party (BJP), Communist Party of India (CPI) and the Communist Party of India (Marxist) (CPI (M)). The Indian National Congress has governed the country for 3/4th's of the time since independence from Britain in 1947, under the de facto one party system and now, under the Dominant-party system. At the level of its states, many regional parties stand for elections to state legislatures, every five years.

## III. HISTORY OF MONARCHY IN SIKKIM

In The year 1642 Phuntsog Namgyal, by proclaiming himself as king of Sikkim, started the dynastic rule that was to last for nearly 330 years. Sikkim was ruled by Chogyals [kings] since 1642-1975. Chogyals were the monarchs of the former kingdoms of Sikkim which were ruled by separate branches of the Namgyal family. The Chogyal, or divine ruler, was the absolute potentate of Sikkim from 1642 to 1975, when monarchy was abrogated and its people voted in a referendum to make Sikkim India's 22nd state. However, Chogyal meaning "Dharma Raja" or "Religious King" is a title which was also conferred upon a special class of temporal and spiritual rulers.

From 1642 to 1975, Sikkim was ruled by the Namgyal Monarchy (also called the Chogyal Monarchy), founded by the fifth-generation descendants of Guru Tashi, a prince of the Minyak House who came to Sikkim from the Kham district of Tibet (link to Tibet page?) Chogyal means 'righteous ruler,' and was the title conferred upon Sikkim's Buddhist kings during the reign of the Namgyal Monarchy.

The reign of the Chogyal was foretold by the patron saint of Sikkim, Guru Rinpoche. The 8th-century saint had predicted the rule of the kings when he arrived in the state. In 1642, Chogyal Phuntsog Namgyal was crowned as Sikkim's first ruler in Yuksom. The crowning of the king was a great event and he was crowned by three revered lamas who arrived there from three different directions, namely the north, west and south.

### 3.2. NAMGYAL DYANASTY: LIST OF CHOGYALS [KINGS] OF SIKKIM (1642-1975)

#### 3.2.1. Phuntsog Namgyal (1604–1670): First Chogyal [king] of Sikkim;

Phuntsog Namgyal was the first chogyal (monarch) of Sikkim, now an Indian state. He consecrated in 1642 at the age of 38 than onwards Rule of Monarchy begins in Sikkim. Phuntsog was a fifth generation descendant of Guru Tashi, a 13th-century prince from the Mi-nyak House in Kham in Eastern Tibet. According to legend, Guru Rinpoche, a 9th-century Buddhist saint had foretold the event that a Phuntsog from the east would be the next chogyal of Sikkim. In 1642, three lamas, from the north, west, and south went in search for the chosen person. Near present day Gangtok, they found a man churning milk. He offered them some refreshments and gave them shelter. So impressed were they by his deeds that they realised that he was a chosen one and immediately crowned him king. The crowning took place Norbughang near Yuksom on a stone slab in a pine covered hill, and he was anointed by sprinkling water from a sacred urn. Phuntsog, along with the lamas, then converted the local Lepcha people to Buddhism and set about expanding his kingdom up to the Chumbi Valley in Tibet, parts of modern day Darjeeling in the south, and parts of eastern Nepal.

Phuntsog moved his capital to Yuksam and instituted the first centralised administration. The kingdom was divided into twelve Dzongs, or districts under a Lepcha Dzongpon (governor) who headed a council of twelve ministers. During his reign Buddhism was consolidated as the established religion in Sikkim. He was succeeded by his son, Tensun Namgyal in 1670.

#### 3.2.2. Tensung Namgyal (1644–1700):

Second chogyal (monarch) of Sikkim was Tensung Namgyal. He succeeded his father Phuntsog Namgyal in 1670. The most important event during his reign was the shifting of capital from Yuksom to Rabdentse near Geyzing in 1670. He had three wives and was succeeded by his son Chakdor Namgyal, borne by his second wife in 1700. He had one last son with his third wife. Though he is not well known his grandson becomes a king of a small kingdom inside his father's rule.

### **3.2.3. Chagdor Namgyal:**

Chagdor Namgyal was the third Chogyal (king) of Sikkim. He was born in 1686 from the sikkimese wife of Tensung Namgyal and succeeded Tensung Namgyal in 1700 and was succeeded himself by Gyurmed Namgyal in 1717. His half-sister Pendi ongmü tried to dethrone Chakdor, who fled to Lhasa, but was reinstated as king with the help of Tibetans.

### **3.2.4. Gyurmed Namgyal:**

Gyurmed Namgyal was the fourth Chogyal (king) of Sikkim the Tibetan lama Jigme Pao has been appointed as regent due to minor age of the king. He succeeded Chakdor Namgyal at the age of ten in 1717 and was succeeded himself by Phuntsog Namgyal II in 1733. It is said that the appointment of Tibetan regent led to the increase of Tibetan influence in Sikkimese court. During his reign Sikkim was attacked by Nepal and lost its territory Limbuana permanently to Nepal. The then the next king was not his direct heir but his heir gave to his nun sangachelling son name Namgyal Phuntsog or Phuntsog Namgyal II.

### **3.2.5. Phuntsog Namgyal II:**

Phuntsog Namgyal-II was the fifth Chogyal (king) of Sikkim. He succeeded Gyurmed Namgyal in 1733 and was succeeded himself by Tenzing Namgyal in 1780. During his reign the Nepalese raided Rabdentse, the then capital of Sikkim

**3.2.6. Tenzing Namgyal** was the sixth Chogyal (king) of Sikkim. He succeeded Phuntsog Namgyal II in 1780 and was succeeded himself by Tsugphud Namgyal in 1793. During his reign Chogyal fled to Tibet, and later died there in exile.

**3.2.7. Tshudpud Namgyal** (1785–1863) was king of Sikkim from 1793–1863. He gained independence from Nepal in 1815 and ruled under a British protectorate from 1861.

Under his father Tenzing Namgyal, most of Sikkim was appropriated by Nepal. Tshudpud Namgyal returned to Sikkim in 1793 to reclaim the throne. Because the capital of Rabdentse was too close to the Nepalese border, he shifted the capital to Tumlong.

Sikkim allied itself with the British in India, who also considered Nepal an enemy. Nepal overran most of the region, sparking the Gurkha War in 1814 with the British East India Company. The Sugauli Treaty and Treaty of Titalia returned the annexed territory to Sikkim in 1817.

In 1835, Tshudpud Namgyal ceded Darjeeling to the HEIC for an annual fee, but this relation was broken off sharply after he seized two British scientists in Sikkim, Joseph Dalton Hooker and Archibald Campbell. This led to two British military attacks in 1850 and 1861, resulting in the annexation of Sikkim by 1861. The same year, Tshudpud was granted the title of Maharaja of Sikkim by the British, and he abdicated the following year. At his death in 1863, aged 78, he had ruled Sikkim for 69 years,

making him the longest-reigning Chogyal in history; as well, he was also the oldest ever Chogyal of Sikkim.

**3.2.8. Sidkeong Namgyal** (1819–1874) was king of Sikkim from 1863 to 1874. He was son of Tsugphud Namgyal and was succeeded by his half-brother Thutob Namgyal.

**3.2.9. Thutob Namgyal** (1860 – 11 February 1914) was the ruling chogyal (monarch) of Sikkim between 1874 and 1914. Thutob ascended to the throne succeeding his half-brother Sidkeong Namgyal who died issueless. Differences between the Nepalese settlers and the indigenous population during his reign led to the direct intervention of the British, who were the de facto rulers of the Himalayan nation. The British ruled in favour of the Nepalese much to the discontent of the chogyal, who then retreated to the Chumbi Valley and allied himself with the Tibetans.

The British sent a military force (Sikkim Expedition), and after a series of skirmishes between the Tibetans and the British near Jelep La, the Tibetans were pushed back and the Chogyal was put under the supervision of Claude White, the appointed political officer in 1889. In 1894, he shifted the capital from Tumlong to the present location, Gangtok. He was knighted in 1911.

Thutob died in 1914 and was succeeded by his son, Sidkeong Tulku Namgyal. The Sir Thutob Namgyal Memorial (STNM) Hospital in Gangtok was built in memory of him in 1917.

### **3.2.10. Sidkeong Tulku Namgyal:**

Sidkeong Tulku Namgyal (1879–5 December 1914) was the ruling Maharaja and Chogyal of Sikkim for a brief

**3.2.11. Tashi Namgyal** (Sikkimese: Wylie: Bkra-shis Rnam-rgyal) (October 26, 1893 – December 2, 1963) was the ruling Chogyal (King) of Sikkim from 1914 to 1963. He was the son of Thutob Namgyal.

Namgyal was the 11th ruler of the Namgyal dynasty of Sikkim, succeeding his half-brother Sidkeong Tulku Namgyal, who had ruled from February to December in 1914, till his death from heart failure. Born in Tibet and crowned by the 13th Dalai Lama, Thubten Gyatso, he was a strong advocate for closer links with India.

He was married in October 1918 to Kunzang Dechen, and they had 3 sons and 3 daughters. The eldest son died in a plane crash during World War Two.[1] On his death he was succeeded as Chogyal by his second son Palden Thondup Namgyal.

During his reign, he is known for land reform and free elections.[2] He also favoured closer links between Sikkim, India and Tibet. Many people attribute his death to Indian agents.

About a decade after his death, his son Palden Thondup Namgyal, the incumbent hereditary Chogyal was formally deposed to join the Indian Union. Prime Minister Lendup Dorji appealed to India to change the status of Sikkim from protectorate to statehood. On May 16, 1975, Sikkim was officially made the 22nd state of the Indian Union.

**3.2.12. Palden Thondup Namgyal** (May 23, 1923 – January 29, 1982) was the 12th and last Chogyal (king) of Sikkim.

At six, Namgyal became a student at St. Joseph's Convent in Kalimpong, but had to terminate his studies due to attacks of malaria. From age eight to eleven he studied under his uncle, Rimpoche Lhatsun, in order to be ordained a Buddhist monk; he was subsequently recognised as the reincarnated leader of both

Phodong and Rumtek monasteries. He later continued his studies at Saint Joseph's College in Darjeeling and finally graduated from Bishop Cotton School in Shimla, in 1941.

Namgyal served as adviser for internal affairs for his father, Sir Tashi Namgyal, the 11th Chogyal, and led the negotiating team which established Sikkim's relationship to India after independence in 1949. He married Sangey Deki in 1950, a daughter of an important Tibetan family, and together they had two sons and a daughter. Sangey Deki died in 1957.

Namgyal married Hope Cooke in 1963, a twenty-two-year-old socialite from San Francisco in California; she was a graduate of Sarah Lawrence College in Yonkers on the state of New York. The marriage brought worldwide media attention to Sikkim. The couple, who had two children, divorced in 1980.

Shortly after their marriage, his father died and Namgyal was crowned the new Chogyal on an astrologically favourable date in 1965. In 1975, as the result of a referendum, Sikkim became a state of India and the monarchy abolished.

Namgyal was an amateur radio operator, call-sign AC3PT, and was a highly sought after contact on the airwaves. The international callbook listed his address as: P.T. Namgyal, The Palace, Gangtok, Sikkim.

Palden died of cancer in New York City, in the United States on January 29, 1982.[1] Upon his death, 31 members of the State Legislative Assembly offered khadas to the Chogyal as a mark of respect.

His son from his first marriage, Wangchuk Namgyal, was named the 13th Chogyal, but the position no longer confers any official authority.

#### IV. BIRTH OF DEMOCRACY IN SIKKIM: POLITICAL HISTORY

The political upheavals of 1940s precipitated into protest movement of 1973 that finally led to the merger of Sikkim into India in 1975. As the political era from 1919 up to 1947 is referred as Gandhian era in the Modern Indian History, the period of 30 years i.e from 1945 up to 1975 can be regarded as Kazian era in the Democratic History of Sikkim. It is because from 1945, late L.D. Kazi single handedly guided the democratic movement of Sikkim till its merger.

#### V. MOVEMENT AGAINST MONARCHY

Though monarchy exist under Namgyal Rule in Sikkim till 1975 but the amalgamation of the three petty political organizations of Sikkim Rajya Praja Mandal, Rajya Praja Sammelan and Praja Sudhar Samaj in 7<sup>th</sup> December 1947 already gave birth of protest movement against feudal monarchy. On the very date that is on 7th December 1947 they held a joint meeting at today's Palzor Stadium (then Polo Ground) and decided to form a compact body to combat lawless feudalism. The huge gathering of 7th December 1947 led to the birth of first ever political Party of Sikkim known as Sikkim State Congress. Tashi Tshering also popularly known as Tashi Babu of Gangtok was the elected President of Sikkim State Congress.

In 1953, Kazi Lhendup Dorjee Khangsarpa (people of his native place fondly called him Kancha Kazi) became the

President of Sikkim State Congress and held that post till 1958. During his President ship he led a delegation to Delhi in 1954 to call on the Prime Minister of India, Pandit Jawaharlal Nehru. The Sikkimese had been fighting for political and economic reforms and these were discussed by the delegation with Pandit Nehru, who was deeply impressed by the sincerity of Kazi Lhendup Dorjee. The Indian Prime Minister promised to give assistance for the progress and economic welfare of the Sikkimese populace and assured Government of India's support towards political reform in Sikkim.

Above protest movement against Namgyal Dynasty led to the merger of Sikkim with India in 1975.

#### VI. CONTRIBUTION OF FIRST CHIEF MINISTER OF SIKKIM [KAZI LHEDUP DORJEE KHANGSHERPA]

First Chief Minister of Sikkim Kazi Lhendup Dorjee Khangsarpa "*The father of democracy in Sikkim*" has significant contribution in establishing democracy in Sikkim. Kazi Lhendup Dorjee Khangsarpa was born at Pakyong, East Sikkim in the ancient and noble Khangsarpa family in 1904. As a pious Buddhist he entered the Rumtek monastery at the age of 6 years. His uncle Tshurfuk Lama Rabden Dorjee was the then Head Lama of the famous Rumtek Monastery and young Lhendup became his disciple. During his visit, Sidkeyong Namgyal the then Maharaja of Sikkim took a great liking to the young monk Lhendup and took him to Gangtok, where he placed him in a Tibetan School. At the age of 16 Kazi Lhendup returned to Rumtek monastery and underwent strict training of Lamaism for two years. Thereafter, on accomplishment of his training he succeeded as the Head Lama of Rumtek Monastery and its estates on the retirement of Lama Ugen Tenzing. Kazi Lhendup remained as Head Lama at Rumtek monastery for 8 years, and then left the monastery to work with his brother Kazi Phag Tshering, who founded the Young Mens' Buddhist Association at Darjeeling. The two Kazi brothers founded a large number of schools in West Sikkim and were instrumental in bringing about a number of social and other reforms.

Kazi Lhendup a person with the feeling of service to mankind and social development, founded a Political Organization known as Rajya Praja Mandal at his native place at Chakhung in West Sikkim. In 7<sup>th</sup> December 1947 the amalgamation of the three petty political organizations of Sikkim Rajya Praja Mandal, Rajya Praja Sammelan and Praja Sudhar Samaj took place. On the very date that is on 7th December 1947 they held a joint meeting at today's Palzor Stadium (then Polo Ground) and decided to form a compact body to combat lawless feudalism. The huge gathering of 7th December 1947 led to the birth of first ever political Party of Sikkim known as Sikkim State Congress. Tashi Tshering also popularly known as Tashi Babu of Gangtok was the elected President of Sikkim State Congress.

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who was deeply impressed by the sincerity of Kazi Lhendup Dorjee. The Indian Prime Minister promised to give assistance for the progress and economic welfare of the Sikkimese populace and assured Government of India's support towards political reform in Sikkim.

After the foundation of the Sikkim State Congress (which was a pro-peasant party) the pro feudalists founded another political party in 1948 to curb the rising tide of democratic ideas. The new political party was known as Sikkim National Party and it was basically patronized by the palace. The Sikkim State Congress had branded this party as the "party of palace". Kazi Lhendup Dorjee realizing the futility of the communal approach in the political scenario of Sikkim, and having dear to his heart the welfare of the people, decided to form another party, called the Sikkim National Congress in 1960. His main approach was to form a non-communal party which could give the Sikkimese peace, prosperity and progress. Contesting on this platform his party secured 8 seats out of 18 in the third General Elections of Sikkim in 1963. Kazi Lhendup Dorjee formed the opposition in the Sikkim Council and tried to bring about a feeling of communal harmony.

In the General Election of 1970, Kazi Lhendup Dorjee was appointed as an Executive Councillor and was allotted the portfolio of Agriculture and Animal Husbandry and Transport Authority. He, after being realized that Sikkim was an agricultural country, tried to bring about certain reforms to reorganize the economic conditions of the farmers. He was however, removed from the Executive Councillor in 1972. It is to be noted here that the Late Kazi Lhendup Dorjee Khangsarpa had his second wife from Belgium. Her name was Kazini Eliza Maria (also known as Kazini Sahibaof Chakhung) who also had played a vital role in guiding and assisting Kazi Lhendup Dorjee Khangsarpa in his day to day affairs. She was an influential woman who used to do most of the paper works of the party of Kazi from their cozy bungalow at Kalimpong. The General Election of 1973, the last general election based on the notorious parity formulae, did not satisfy the Sikkim National Congress. This led to an agitation in April 1973 which ultimately led to the merger of two influential political parties of Sikkim the Janata Congress and Sikkim National Congress giving birth to Sikkim Congress.

In the elections of 1974, Sikkim Congress secured 31 out of 32 seats in the Sikkim Assembly and formed its government based in principles of Liberty, Equality and Fraternity. He became the first Chief Minister elected according to the credence of Democracy. The Sikkim Congress delegates used to attend the annual session of the Indian National Congress. After the merger of Sikkim in 1975 the political party of Kazi Lhendup Dorjee Khangsarpa was also merged with the Indian National Congress at Kamagatamaru Nagar in Chandigarh.

Personally Kazi Lhendup Dorjee Khangsarpa and Kazini Eliza Maria lost everything -- perhaps not really everything -- because the people of Sikkim still remember him with fondness. The father of democracy in Sikkim was even not allowed to enter Sikkim as he lost the election in 1979 due to some political reasons. The memorable Kazi expired on July 29, 2007. He did not live for personal gains; he lived for the people of Sikkim. "By merging Sikkim with India Kazi Lhendup Dorji Khangsarpa of Chakung brought new prosperity to the people of Sikkim,

restored their rights and gave India a jewel in the crown studded with the silvery Kanchenjunga".

### **5.1. EARLY LIFE OF KAZI LHENDUP:**

Kazi Lhendup Dorjee was born in 1904 in Pakyong, East Sikkim. He was born into the Khangsarpa family, who were Sikkimese nobility. Kazi Lhendup Dorji Khangsarpa entered the Rumtek monastery at the age of 6 years. His uncle, Tshurfuk Lama Rabden Dorji was the then Head Lama of the said monastery and Lhendup became his discipline. Sidkyong Namgyal then maharaja of Sikkim, while visiting the monastery took a great liking to the hong monk Lhendup and took him to Gangtok, where he placed him in a Tibetan School. At the age of 16, Kazi Lhendup returned to Rumtek monastery and under strict training for priesthood for two years. Thereafter on completion of his training he succeeded as the Head Lama of Rumtek monastery and its estates on the retirement of Lama Ugen Tenzing. Kazi Lhendup remained as the Head Lama in Rumtek monastery for 8 years and then left the monastery to work with his brother the late Kazi Phag Tshering, who founded the Young Men Buddhist Association at Darjeeling. The two brother founded a large number of schools in West Sikkim and were instrumental in bringing about a number of social and other reforms.

### **5.2. POLITICAL CAREER OF DORJEE:**

Dorjee dedicated his entire life for the development of democracy in Sikkim. He himself founded many political parties and helped others to established political organizations, associations as well as different forums. Kazi Lhendup founded the political organization called "Sikkim Praja Mandal in 1945" and served as its first president. Dorjee also became president of the first political party of Sikkim that is Sikkim State Congress in 1953 and served as president until 1958. In the year 1962, Dorjee helped to found the Sikkim National Congress political party. The Sikkim National Congress was founded by Dorjee as a non-communal political party. The unity themed political platform of the party helped the Sikkim National Congress to win eight of the eighteen seats up for grabs in Sikkim's third general election. The Sikkim National Congress merged with India's Congress Party in the 1970s following Sikkim's merger with India. Dorjee also formed the Sikkim Council to promote "communal harmony."

Dorjee played very important role and was considered to be a key figure during the merger of Sikkim with Indian Union in the year 1975. Dorjee became the first Chief Minister of Sikkim from 1974, the year before the official merger, and served until 1979. Dorjee was honored by the government of India with the Padma Vibhushan in 2002. He was also awarded the Sikkim Ratna by the state government of Sikkim in 2004.

### **5.3. HIS WIFE KAZINI ELISHA MARIE**

Kazi Lhendup Dorjee is very enthusiastic and ambitious towards his goal of democracy and his "mysteriously charming and conspiring wife", Kazini Eliza Maria, was even shrewder than her husband and was his chief confidante and adviser. Formerly Eliza-Maria Langford-Rae, she had been married twice before. She was of Scottish extraction and had studied law at Edinburgh University. She had lived a very colorful life, working

as a journalist for a French newspaper and lived for a while in Kemal Atatürk's palace in Turkey. She converted to Buddhism and took Sangharakshita as her teacher. In the years 1920s she had been in Burma where for a while she was a close friend of the author George Orwell.

#### **5.4. DEATH**

Kazi Lhendup Dorjee died of a heart attack on July 28, 2007 at his home in Kalimpong, North Bengal in the Indian State of West Bengal. Kalimpong is located just across the state border from Sikkim. Dorjee was 102 years old at the time of his death. Though he died of a heart attack, Dorjee had been suffering from liver problems for several years. Dorjee's funeral took place at the Rumtek Monastery in Sikkim on August 3, 2007.

The current Chief Minister of Sikkim, Pawan Kumar Chamling, called Dorjee a distinguished statesman who helped to motivate Chamling to join Sikkim's democracy movement in 1973. Indian Prime Minister Manmohan Singh released a statement following Dorjee's death saying, "I am deeply shocked and grieved to learn of the sad demise of Shri Kazi Lhendup Dorjee Khang Serpa, the first Chief Minister of Sikkim. He played a historic role as the architect of Sikkim's accession to the Indian Union and had the distinction of spearheading the State as its first Chief Minister from 1974 to 1979. The pride of place occupied by Sikkim as an important State of our country and its impressive progress in many spheres owe a lot to numerous policies initiated by him. In his unfortunate passing away the country in general and the State of Sikkim in particular has lost a veteran public figure whose many sided contributions to nation building endeared him to the people."

### **VII. MAJOR POLITICAL PARTIES OF SIKKIM [PRE-MERGER PERIOD]**

#### **6.1. SIKKIM STATE CONGRESS:**

Sikkim State congress is the first political party of Sikkim. In 7<sup>th</sup> December 1947 the amalgamation of the three petty political organizations; Sikkim Rajya Praja Mandal a political organization was established by the Kazi Lhendup a person with the feeling of service to mankind and social development, at his native place at Chakhung in West Sikkim, Rajya Praja Sammelan and Praja Sudhar Samaj took place. On the very date that is on 7th December 1947 they held a joint meeting at today's Palzor Stadium (then Polo Ground) and decided to form a compact body to combat lawless feudalism. The huge gathering of 7th December 1947 led to the birth of first ever political Party of Sikkim known as Sikkim State Congress. Tashi Tshering also popularly known as Tashi Babu of Gangtok was the elected President of Sikkim State Congress.

The Sikkim State Congress, or SSC, was an annexationist political party in Sikkim worked closely with the Indian National Congress (INC) to successfully achieve the annexation of the Himalayan kingdom of Sikkim to India. Other parties established by the INC to serve India's interests in its near abroad included the Nepal State Congress Party and the Bhutan State Congress Party.

The SSC's main constituents were immigrant Nepalese, while its opponent, the Sikkim National Party, had support among the aboriginal Bhutia and Lepcha people. It campaigned

to change the election system from a confessional system to a "one man, one vote" system. When that reform happened in 1974, the numerically superior Nepalese made the Congress Sikkim's dominant political party. Some anti-clerical and other modernizing elites within the Bhutia-Lepcha community joined the Sikkim State Congress, because of its desire to abolish landlordism. Kazi Lhendup Dorjee, one of these, was president of the party between 1953 and 1958. Subsequently, SSC merged with Sikkim Janata Party in 1972, forming the Sikkim Janata Congress. The party's principles, ideologies and programs were similar to the Indian National Congress. The major programs of the party among other things were the abolition of landlordism, formation of responsible government and accession of Sikkim to India.

#### **6.2. SIKKIM NATIONAL PARTY:**

The Sikkim national party is another political party formed in 1948. This party was in fact sponsored by the palace to counter the growing influence of the Sikkim state congress. The protection of feudal relations, opposition to accession of Sikkim was the major programs of the party. As per their party manifesto, the accession of Sikkim to India was unacceptable and mentioned following reasons for the same:

1. Sikkim has closer affinities with Bhutan and Tibet's traditionally historically culturally;
2. Sikkim is not a part of India according to its geography and ethnicity;
3. Being a Lamaism, Sikkim is distinct from India.

#### **6.3. SIKKIM SWATANTRA DAL:**

Sikkim Swatantra Dal was a political party in Sikkim was founded in the name of Namgay Tsering but it was actually established and led by and Kazi Lhendup Dorji after resigning from Sikkim State Congress. The latter served as the president of the party. The party was launched ahead of the November 1958 election, formed after a split from the Sikkim State Congress. The party called for the abolition of the communal electoral system. Kazi Lhendup Dorji contested the November 1958 election, but lost his seat. All in all, Swatantra Dal won a single seat in the election (a Bhutia-Lepcha seat). Major programmes of the party was to established responsible government, to established welfare state, and development and equality among three communities. it is an anti-communal party in a greater perspectives.

Swatantra Dal took part in a conference, together with the Sikkim National Party, Sikkim State Congress and the Scheduled Castes League, held in Melli September 24-25, 1959. The conference demanded a full-fledged responsible government. In May 1960 Kazi Lhendup Dorji founded a new party, the Sikkim National Congress.

#### **6.3. SIKKIM NATIONAL CONGRESS:**

Sikkim National Congress was political party in Sikkim was founded in 1962 through a merger of Swatantra Dal, Rajya Praja Sammelan and dissidents of the then dominant parties, Kazi Lhendup Dorjee was the leader of the Sikkim State Congress and Sikkim National Party. SNC was formed to be a party representing all ethnic groups in Sikkim, as the previously dominating parties de facto were divided on ethnic lines. SNC

opposed monarchy in Sikkim and worked for democratic reforms. In April 1973 Sikkim Janata Congress merged with SNC.

Major aims and objective of the party was the formation of responsible government, adoption of written constitution, election based on universal adult franchise etc. In 1967 election, the Sikkim National Congress secured eight seats out of eighteen elective seats.

#### **6.4. SIKKIM JANATA CONGRESS OR SIKKIM CONGRESS:**

In the year 1972 in the state of Sikkim emerged new political party called Sikkim Janata Congress (SJC) and later it was changed as Sikkim Congress (SC) with merging of two political parties Sikkim Janata Congress and Sikkim National Congress. The party contested the 1974 election and swept 31 seats out of 32. Government was formed under the leadership of Kazi Khendup Dirjee.

In 1974 the first democratically elected government took office in Sikkim. In the first elections after the fall of the monarchy the party won 31 out of 32 seats. After the merger of Sikkim with India 1975, Dorjee's party merged with the Indian National Congress.

### **VIII. MOJOR POLITICAL PARTIES OF SIKKIM; POST MERGER**

#### **7.1. SIKKIM SANGRAM PARISHAD:**

Nar Bahadur Bhandari founded the Sikkim Janata Parishad in 1977. This party won the state assembly election held in 1979 and he became the chief minister on 18 October 1979. In 1984, he also served briefly as Member of Parliament from Sikkim constituency in the 8th Lok Sabha as an independent candidate. In 1984, Bhandari dissolved the Sikkim Janata Parishad and formed a new party called Sikkim Sangram Parishad. The Sikkim Sangram Parishad Party is a political party emerged in Sikkim after the merger of Sikkim with India in 1975 and is based in the state of Sikkim in India. In 1984, Bhandari dissolved Sikkim Janata Parishad and formed a new party called Sikkim Sangram Parishad. Sikkim Sangram Parishad held on to power in the 198 and 1989 elections. In 1985 party won 31 of the 32 seats in the general elections. In 1989, it swept the elections winning all the seats

Nar Bahadur Bhandari is a former chief minister and great leader of the party SSP in the state of Sikkim in India who governed the state from 1979 to 1994. He was the founder leader of Sikkim Sangram Parishad party. Nar Bahadur Bhandari was born on 5 October 1940 in Malbasay village, near Soreng, West Sikkim. He completed his BA degree from Darjeeling Government College and worked as a school teacher for some years before joining politics. His wife Dil Kumari Bhandari is a former member of parliament (Lok Sabha) from Sikkim. She is the current president of Bharatiya Gorkha Parisangh, an organization of the Indian Gorkhas.

In 1994, Bhandari's party Sikkim Sangram Parishad lost the assembly elections to Pawan Kumar Chamling-led Sikkim Democratic Front. Sikkim Sangram Parishad also lost the 1999 assembly election. In the 2004 state assembly elections, Bhandari contested under the Congress party but the party lost the election, winning only one seat. Again in the 2009 assembly elections the

Congress party under Bhandari failed to win any seat in the state assembly. But there are cases pending in the Court of Law regarding the conduct of elections. There are charges of elections being rigged.

#### **7.2. SIKKIM DEMOCRATIC FRONT:**

Sikkim Democratic Front is a political party in the north Indian state of Sikkim. The party was founded by Pawan Kumar Chamling in 1993. Main Ideology of the party is Democracy, Secularism, Socialism, welfarism, Rule of Law etc. Policies are democratic-oriented for the welfare of the people from grassroots level. The Party, the Sikkim Democratic Front, firmly upholds the cause of Sikkimese people in their struggle for Democracy and Rule of Law. This party truly stands democratic Principles which always strive to protect and preserve the democratic rights and privileges of the people, It has ruled the state since 1994 with Pawan Kumar Chamling as the chief minister. The party consolidated its position sweeping the 1999 and 2004 state elections. It won 31 of the 32 assembly seats in the 2004 election. In the 2009 assembly election, the party made a clean sweep, winning all 32 seats. It also retained the lone Lok Sabha seat.

Aims and objectives of the party are as follows:

1. S.D.F. shall bear true faith and allegiance to the sacred Constitution of India as by law established and to the principles of Socialism and Democracy and shall uphold the Sovereignty, Unity and Integrity of the Indian Union.
2. It shall fight to uphold the political, social and economic rights and privileges of the people of Sikkim as provided under the Indian Constitution.
3. It shall strive hard for the uplift of the socially and economically backward sections of people of Sikkim.
4. S.D.F. shall work ceaselessly to promote peace, progress and communal harmony amongst the people of Sikkim and shall make utmost endeavor to promote fraternity, tolerance and harmony with all other communities of our country.
5. The Party is committed to save equal opportunity to all Sikkimese people and shall ceaselessly work for the emancipation and uplift of Sikkimese women and other sections of oppressed people.
6. The Party shall be ever ready to fight against all forces that threaten to disrupt the unity and integrity of the nation.
7. While giving due recognition to the principle of human dignity, this Party shall pledge to fight against all kinds of injustice and inequality perpetrated on ground of caste, creed, color, religion and gender.
8. The Party shall especially not yield back from working for the interests and welfare of the backward and depressed communities, constitutional rights of the Scheduled Castes, Scheduled Tribes and Other Backward Classes and security and prosperity of the entire Sikkimese people.
9. The Party is committed to uphold, preserve and promote the age-old traditions, customs and rich cultural heritage of different ethnic communities of the State who have been living in perfect communal harmony down the ages.

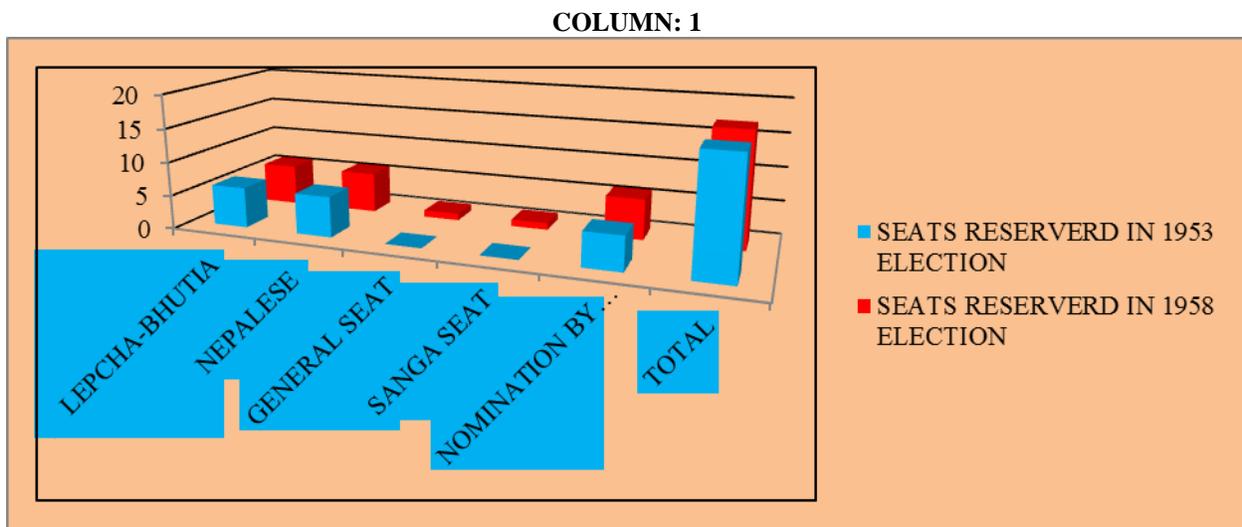
10. The Party holds enduring faith in the "Son of Sikkim" policy and sincerely safeguards the interests of the Sikkimese people.
11. S.D.F. shall tirelessly wage a struggle against poverty, illiteracy and internal backwardness in the State possible means to raise the average conditions of Sikkimese of at levels so as to make them educationally, socially and, above all; economically self-reliant and self-sufficient and work justly for the poor and depressed people of Sikkim.
12. The Party is predetermined to bring upon improvement in the existing situation in Sikkim and will resort to all.

7.3. Other political parties emerged recently in Sikkim are Sikkim Himali Rajya parishad (SHRP), Sikkim Gorkha Prajantantric Party (SGPP), Sikkim Jan Ekta Party (SJEP), Sikkim National People's Party (SNPP),

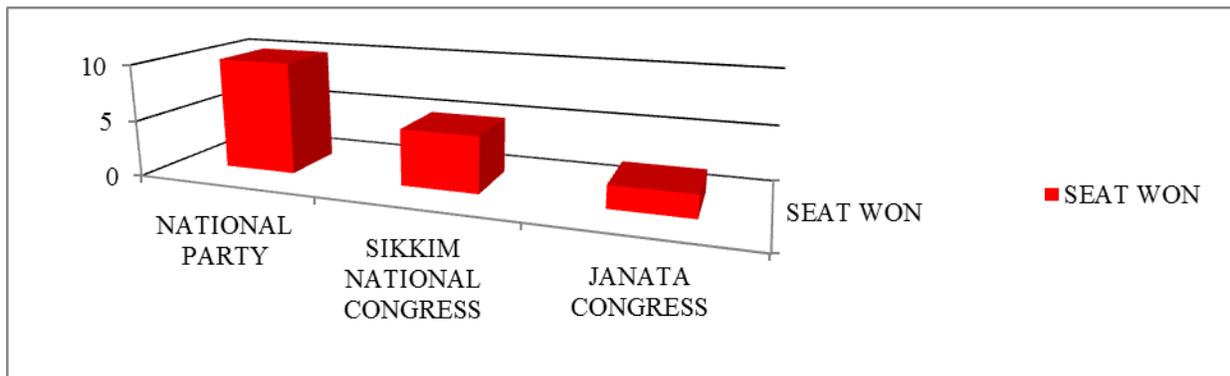
**7.4. ELECTION IN SIKKIM AND THE PERFORMANCE OF VARIOUS POLITICAL PARTIES SINCE 1975:**

Election is the heart and soul of the democracy which provides the opportunity to the general masses to choose and elect their representatives according to their choice. Election is the only democratic medium through which peaceful change of government and their policies is significant. During Namgyal Dynasty, Sikkim had limited experience of election. The Royal proclamation of 1953 constituted the Sikkim State Council and made the provision of election to form the council. A council consists of a president 12 elected and 5 nominated members further the members was divided into different caste such as 6 seats was reserved for Lepcha\_Bhutia and 6 seats were reserved for Nepalese.

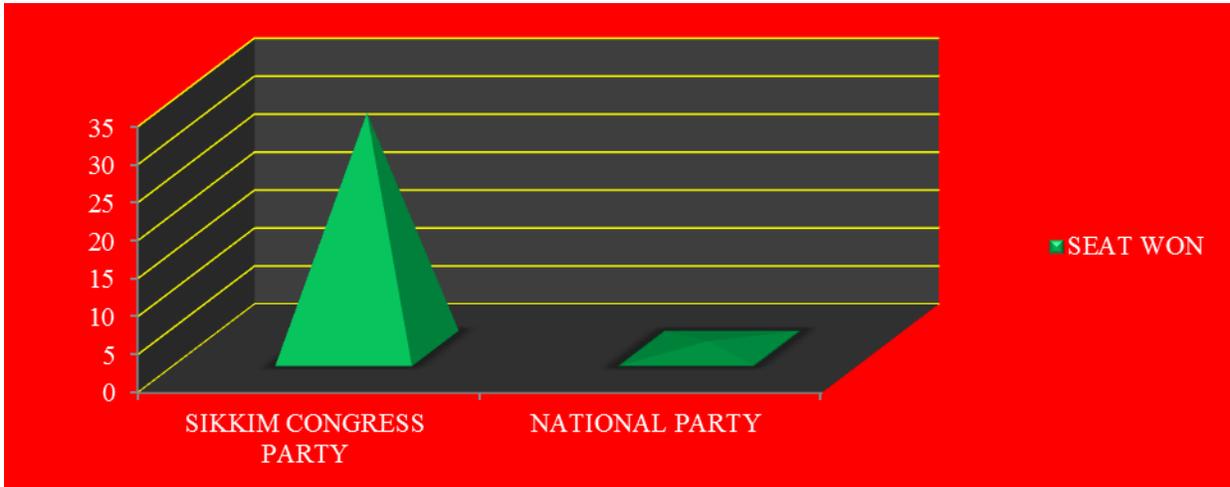
**7.4.1. Distribution of seats in election since 1953.**



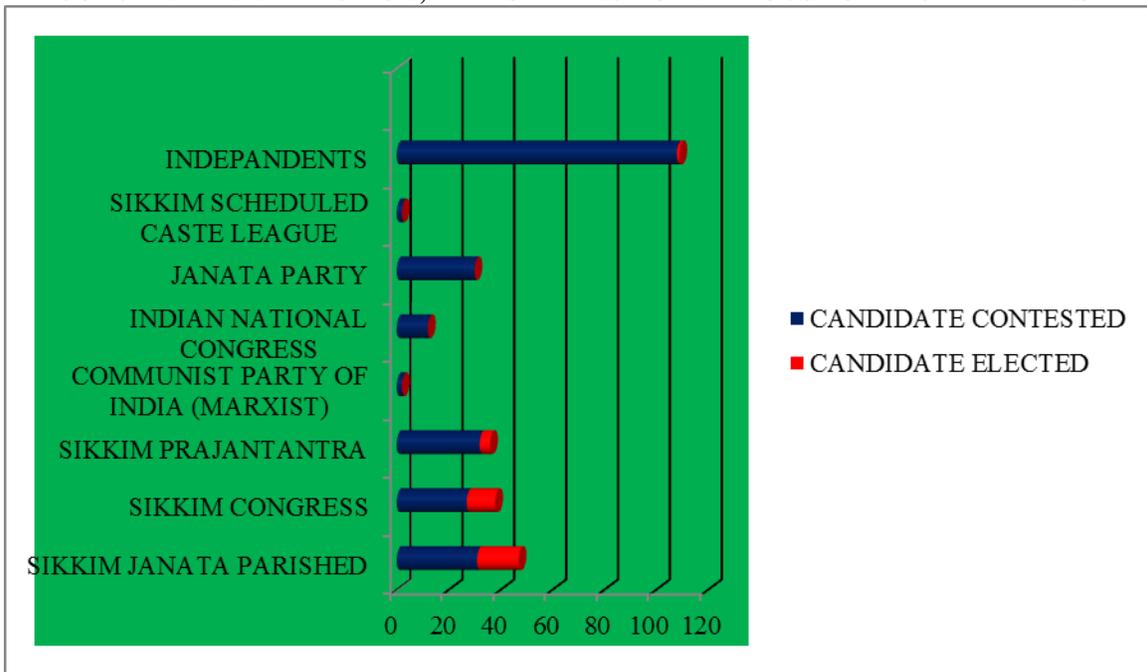
**7.4.2. PERFORMANCE OF MAJOR POLITICAL PARTIES IN GENERAL ELECTION SINCE 1973: COLUMN: 2. 1973 ELECTION**



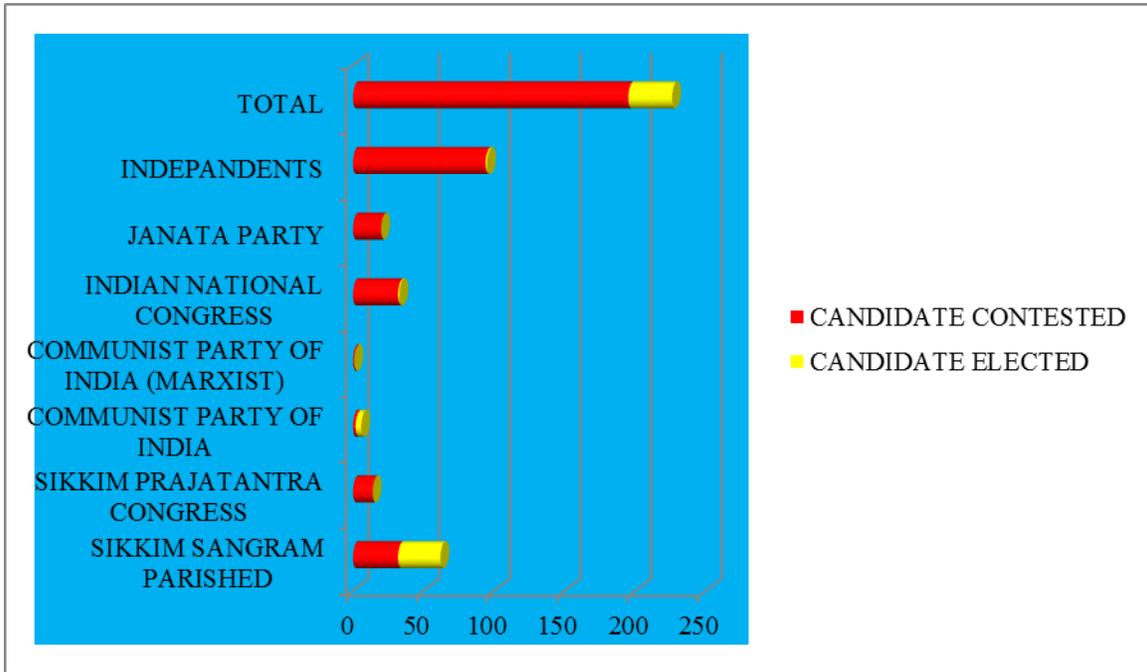
**COLUMN: 3. 1974 ELECTION GENERAL ELECTION PERFORMANCE BY POLITICAL PARTIES:**



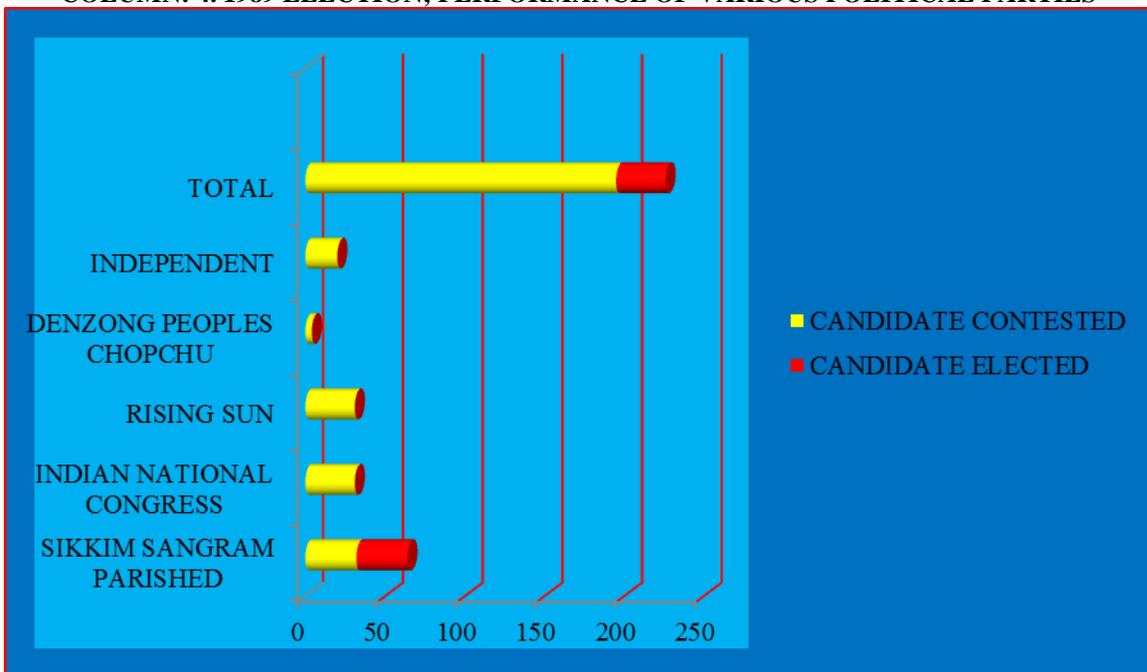
**COLUMN: 4. 1979 ELECTION; PERFORMANCE OF VARIOUS POLITICAL PARTIES:**



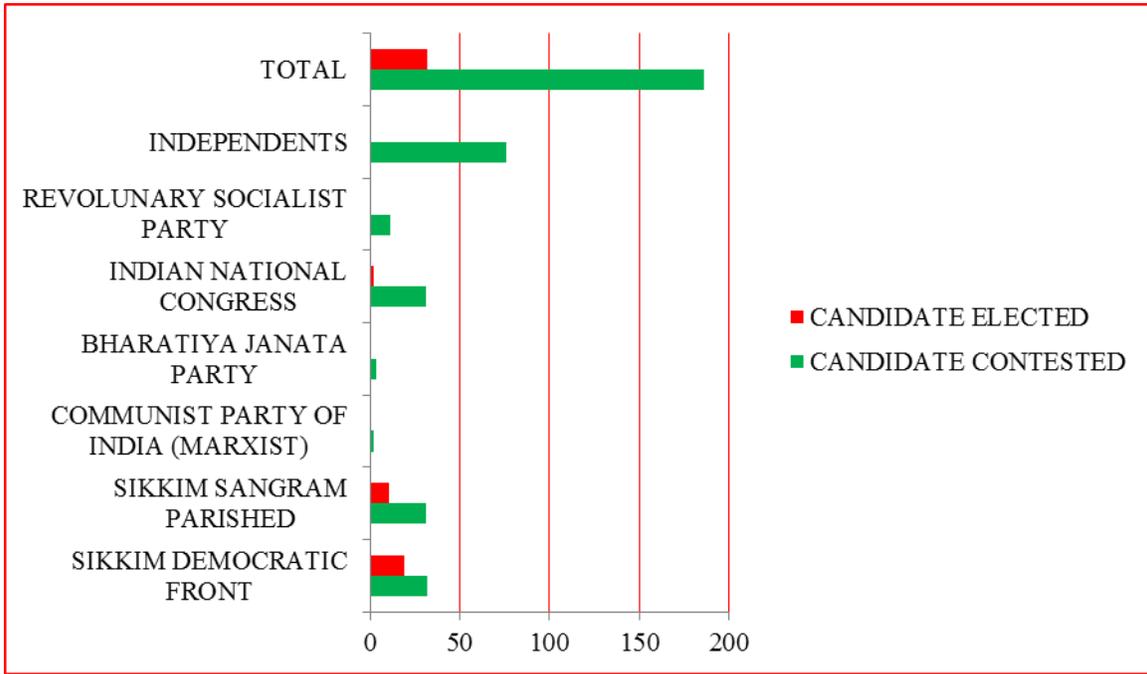
**COLUMN: 4. 1985 ELECTION; PERFORMANCE OF VARIOUS POLITICAL PARTIES:**



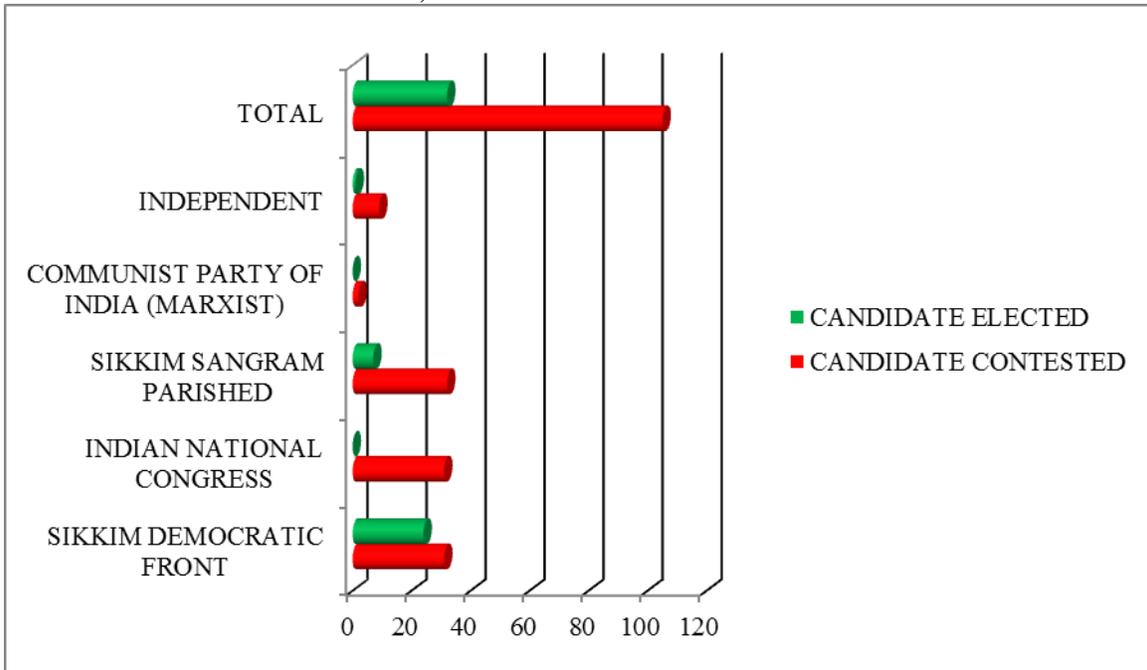
**COLUMN: 4. 1989 ELECTION; PERFORMANCE OF VARIOUS POLITICAL PARTIES**



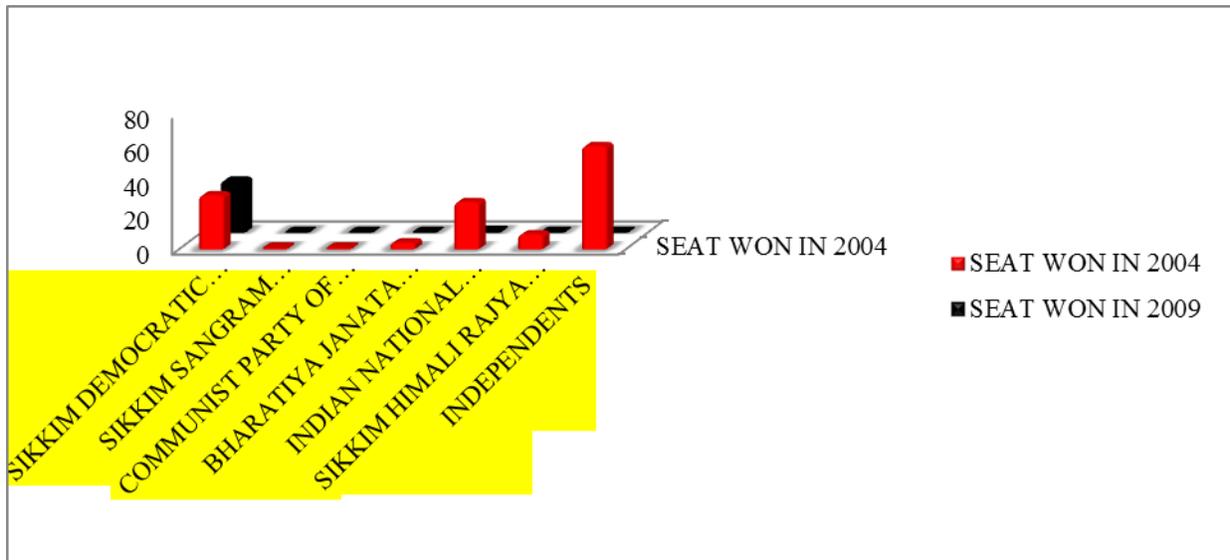
**COLUMN: 4. 1994 ELECTION; PERFORMANCE OF VARIOUS POLITICAL PARTIES:**



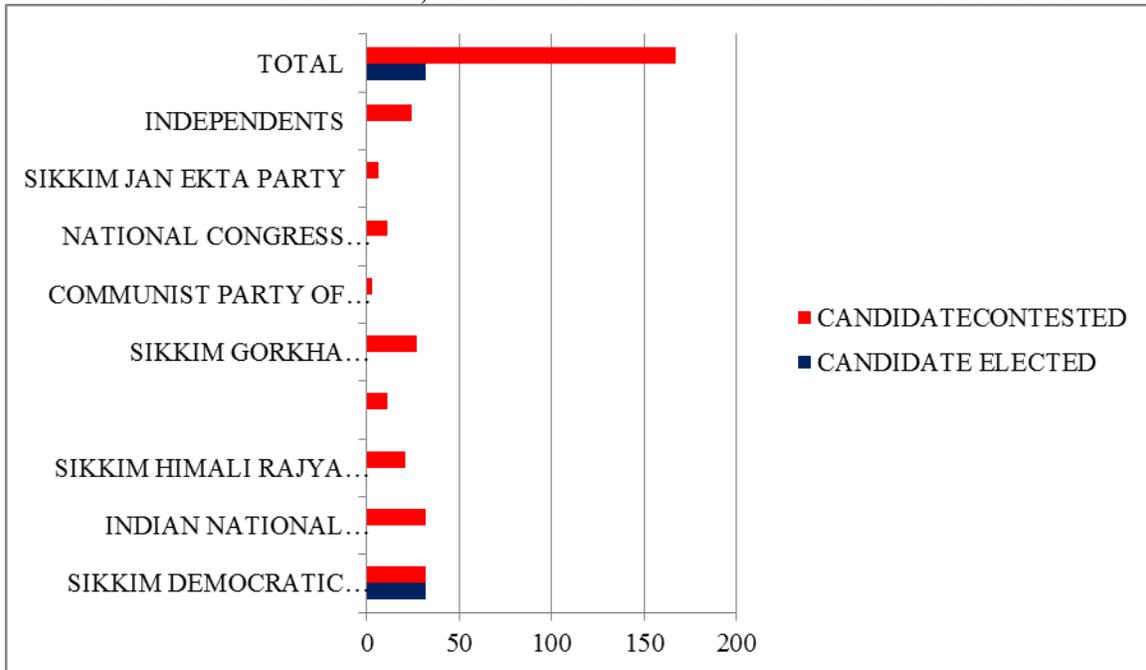
**COLUMN: 4. 1999 ELECTION; PERFORMANCE OF VARIOUS POLITICAL PARTIES:**



**COLUMN: 4. 2004 GENERAL ELECTION; PERFORMANCE OF VARIOUS POLITICAL PARTIES:**



**COLUMN: 4. 1999 ELECTION; PERFORMANCE OF VARIOUS POLITICAL PARTIES:**



#### IX. COLLECTION OF DATA AND METHOD USED

The paper is highly theoretical in nature and the data has been collected from various primary and secondary sources including Government and Non-Government agencies. The development of the problem for the present study has been traced in the light of theoretical and research background and the following steps of method and procedure adopted in conducting the study.

1. Under a broad canvas of survey method of research a questionnaire is made for survey.
2. Investigations and interview has been conducted in various governmental and non-governmental institutions to collect data and statistics.
3. Meetings and research questionnaires has been conducted with various political parties and their leaders.

4. Data has also been collected from various journals, articles, books, newspaper etc.

#### X. RESULTS AND FINDINGS

Above study helps to find the political changes in Sikkim from ancient Tribal Dom to Monarchy and monarchy to Democracy. Above study brings the historical outlook of monarchy and their political system. The above research significantly concluded the contribution of the first chief minister of Sikkim Kazi Lhendup Dorjee Khangsherpa in pivotal in forming Democratic political system in Sikkim. His contribution is honored as **“FATHER OF DEMOCRACY IN SIKKIM”**.

## XI. DELIMITATIONS OF THE STUDY

1. The present study of democracy and the contribution of Kazi Lhendup Dorjee Khangsherpa is limited to very small regions i.e. the Indian state of Sikkim.
2. It is limited because the above paper highlighted only the political factor of downfall of Monarchy in Sikkim. Other factors like Social, Cultural, Caste and India's interference are equally important for the downfall of Monarchy in Sikkim.
3. The study has been further limited because it focussed only the contribution of Kazi Lhendup Dirjee in establishing Democracy in Sikkim. There are other prominent figures who have contributed equally perhaps more.

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## XII. CONCLUSION

From the foregoing discussion it is clear that the democracy plays important role in the present globalized world. India is the largest democracy in the world and it has great impact in the establishment of Democracy of Sikkim. Sikkim was under the rule of Namgyal Dynasty or under monarchy since 1642 for long 330 years. After the establishment of the first political party in Sikkim, Sikkim State Congress in the year 1947 the monarchical rule has been ruined slowly and gradually and finally in the year 1975 monarchy was destroyed completely after the Merger of Sikkim with Indian Union.

Sikkim was ruled by various heir of the Namgyal Dynasty after the consecration of the first chogyal [king] of Sikkim phuntsuk Namgyal in 1942. One after the heir of Chogyal's family ruled Sikkim till 1975.

Main aims and objectives of the above paper are to examine how democracy was established in the small kingdom of Sikkim. What factors led to downfall of Namgyal Monarchical Dynasty? This paper mainly highlighted the contribution of Sikkim's first chief minister, Kazi Lhendup Dorjee Khangsherpa in establishing democracy in Sikkim. He has been honored as "father of Democracy in Sikkim".

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# Human Resource Management Techniques Dealing With Deficit & Retention of Skilled Labor in Construction Industry

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**Abstract-** In construction industry, a project mainly focuses on two things, one is optimum utilization of resources and the other is speedy completion of project. In line to this trend, construction industry has seen Human Resource Management as a primary entity for every company or a project. Human Resource Management is managing organizational workforce. It has been broadly defined as a field of organizational activity and professional practice covering functions related primarily to training, career development, organizational development and research development. Human Resource Management is not structured in construction industry but the awareness about the need and importance of HRM is growing. Though the construction sector is booming, with urbanization at its peak, the industry is not bereft of its share of woes. The biggest problem that the industry confronts is the acute shortage of skilled and trained manpower. Getting skilled and trained workforce these days has become an uphill task. There is wastage of about 7-10% of the construction material due to the lack of skills in workmanship. Thus the main task for the industry is to withhold the skilled workforce till the project gets completed.

The paper mainly deals with the study of Human Resource Management in construction industry, Present scenario of requirement of labor in live projects and how the companies are trying to retain them till the completion of project. We have prepared a questionnaire to support our study. This study also included face to face interview with project managers. The scope of this paper is to identify problems faced in manpower management and obtain solution by using structured interview/questionnaire survey.

**Index Terms-** construction human resource, retention of labor

## I. NEED OF THE STUDY

In construction the migration of labor is high. Employees tend to work at other industries; offering good salary, working conditions, career opportunities and that are seen as being the most glamorous and attractive to work within.

- In India many of workers are not trained professionally, they learn the work from their superior. It leads to less quality of work due to their unprofessionalism & lack of in depth knowledge.

- To meet the high requirement of skilled workers and quality in work, it is essential to train the workers. Study addresses the efficient way of training the workers.
- At present there is about 40% deficit of skilled man power in India.

## II. LITERATURE REVIEW

In India, construction industry is second largest industry after agricultural industry. The development of physical infrastructure, consequently the construction sector has been focusing from last decade. It was given more importance to infrastructure development from the tenth five year plan (2002 – 2007). During the period of 2007 -2011 Indian construction industry had witnessed a rapid and strong growth. Due to the country's expanding economy, increasing investment of India's government in development of infrastructure and with support of foreign direct investment (FDI) system. . In 2011 the industry was valued at INR18.5 trillion (US\$403.4 billion), and grew at a CAGR of 14.71% over the review period. It was observed that infrastructure development such as industrial, mining infrastructure, roads and highways, railways, ports, airports, power projects, irrigation and agricultural systems (irrigation systems), telecommunication systems, hospitals, institutions, townships, urban infrastructure including water supply, sewerage, drainage, rural infrastructure contributes in improving economy directly and indirectly by increasing the economy of other sectors. The construction sector has been growing at a compound annual growth rate of 11.1% over the last eight years. At present the construction accounts for the 9.0% of GDP (Gross Domestic Product). The contribution of construction to GDP from 2005 to 2009 is given in table (As per Draft of an approach to twelfth five year plan 2012 – 2017, pg.no: 122).

**TABLE 1.2 Percentage Contribution Of GDP by Construction Sector To Total GDP**

Year	GDP (at current Prices) (new series) (Rs. crore)	GDP: Construction (at current prices) (new series) (Rs. crore)	Percentage Contribution of GDP by Const. Sector to Total GDP
2005	28,77,701	2,12,807	7.4
2006	32,82,385	2,64,173	8.0
2007	37,79,385	3,19,180	8.4
2008	43,20,892	3,76,266	8.7
2009	49,33,183	4,37,017	8.9

The following table shows the requirement of Human Resource for Construction (2022) as per approach plan 2012.

**TABLE 1.3 Requirement Of Human Resource For Construction by 2022**

Type of Manpower	Required man years
1. Engineers	3.72 million man years
2. Technicians	4.32 million man years
3. Support Staff	3.65 million man years
4. Skilled Workers	23.35 million man years
5. Unskilled/ Semi skilled workers	56.96 million man years
<b>Total Manpower</b>	<b>92 million man years</b>

### III. RESEARCH METHODOLOGY

Construction industry contains various types of human resources such as strategic managers, project managers, architects, construction managers, engineers, construction

supervisors and labor. Each has their own roles & responsibilities. In this study we concentrate on the labor only. This study gives information about construction labor in some parts of India. Those contain Goa and some parts of Andhra Pradesh, Karnataka, Gujarat and Maharashtra.

#### Data Collection (Questionnaire technique):

For this study we select two ways to collect data. One is through structured interview of HR, PM and engineers and second is through structured questionnaire. For the data collection, in Goa we met the HR, PM & engineers of different companies and we collected data through structured interview and questionnaire. We found answers of experienced people are more appropriate & shows importance of human resource management in industry. So we decided to consider a sample which provides us potential and prevailing information about the industry. These mainly pertain to educational qualification and experience. These are as follows:

- i. People completed his/her diploma and 4-5 years of experience in construction field,
- ii. People completed his/her Graduation or Post graduation in engineering and 2 years of experience in construction field,
- iii. People completed his/her Post graduation in Management or from NICMAR and 1 year of experience in construction field.

#### Inference from the data collected:

Deficit percentage of Local available Manpower: Out of 48 respondents only 21 respondents give the information about manpower required and available for the project. So we analyzed deficit percentage for those 21 responses only.

The study show that on an average 47.77% of all levels of labor, 53.06% of skilled, 49.71% semi skilled and 40.54% unskilled are deficit in overall industry. This deficit % is changed based on type of project and location of project. Study shows deficit of 51.50% in real estate sector, 46.40% in infrastructure sector. Responses indicates deficit of 41.04% in urban, 54.61% in sub urban, 46.50% in rural area. The following table shows deficit % as per level of labor.

**Deficit percentage of labor w.r.t Type of Project**

Type of Project	Sample size	Deficit percentage			
		Skilled	semiskilled	unskilled	Average
Real Estate	7	53.47	56.39	44.64	51.50
Infrastructure	12	55.13	47.54	36.54	46.40
Industrial	1	58.33	60.00	88.00	68.78
Others	1	20.00	18.75	12.50	17.08
Total	21	53.06	49.71	40.54	47.77

**Deficit percentage of labor w.r.t Location of Project**

Location of Project	Sample size	Deficit percentage			
		Skilled	semiskilled	unskilled	Average
Urban	7	47.97	47.41	27.76	41.04
Sub urban	8	56.09	53.38	54.36	54.61
Rural	6	54.95	47.50	37.04	46.50
Remote	0	0.00	0.00	0.00	0.00
Total	21	53.06	49.71	40.54	47.77

**Effects due to lack of manpower**

In a project the requirement of labor is important, if the labor is not available the effects for the projects are generally Delay, Low quality, Cost implications for which 97.9% of the respondents say there is effect of delay, 87.5% of the respondents

say their will a low quality and about 81.3% of the respondents say there will be cost implications and whereas about 14.6% of respondents say they may be other effects.

**Effects due to lack of manpower**

Effects	Yes		No	
	Frequency	Percent	Frequency	Percent
Delay	47	97.9	1	2.1
Low quality	42	87.5	6	12.5
Cost implication	39	81.3	9	18.8
Others	7	14.6	41	85.4

**Ways to cope with lack of manpower:**

From the entire survey, we found some ways to cope up with deficit skilled labor as follows:

- i. By providing training to local available labor.
- ii. We should provide good incentives, better pay scale and facilities need by labor to keep them with company and to attract other sector labor to meet requirement.
- iii. Mechanization reduces the labor required in the site. But it needs high skilled persons to operate machines. So many companies selection the operators trained from diff training institutes or giving training to available labor. Some of the companies maintain the departmental labor with the company and training them in operation & maintenance of machines for better product. Most of the times they are taking lease from equipment banks
- iv. Proper labor management and monitoring. Making the best use of available labor by increasing the work hours, use for multiple works or motivating them to work to maximum capacity and not to waste time during work hours etc.
- v. Recruiting the multi-skilled workers decreases the workers required and ideal time of worker. It increases the productivity and labor requirement at site.
- vi. Shift workers from other site or try to attract/contact new labor contractors.
- vii. Providing incentives on target achievement to labor contractor and labors. This attracts labor to work in project.

- viii. Providing P.F, G.F, on behalf of labor contracts to attract more labor contracts.
- ix. Offering competitive rates.
- x. Increase the period for completion of project.
- xi. Giving works to sub-contractors and distributing the work or project.
- xii. Advance payments to contractors.

**IV. CONCLUSION**

In this study we were only concentrated on low level work force such as labors/workers.. Responses are from different projects located in different areas, out all responses 47.9% from urban, 31.3% from sub urban and 20.8% from rural area. Responses from projects located in remote area were not obtained

Research shows that overall 47.77% of labors are deficit locally in all the sectors, about 53.06% of skilled workers are deficit in all the sectors. Compare to urban and rural workers are deficit in suburban areas accounted to 54.61%. Research indicates that most of workers about 41.7% are leaving within 6 months, workers leaving after 6 months and before end of the project is very less about 16.7%. It gives idea that workers sustained up to 6 months will leave after completion.

Due to lack of skilled manpower projects are suffered with mainly delays, cost over runs and low quality works. A few other effects such as wastages of materials, loss of reputation of firm in

industry and accidents which reduce confidence in workers etc. are listed.

About 50% responses indicates only 50 – 79% of workers shows the interest towards training. Lack of motivation in workers, low education, communication and time consumption are main barriers in training, others like short term contracts, financial & family problems of workers and fewer profit margins in project also increases barriers for training.

Factors that motivate workers are money, hygiene environment and good working culture. Many companies keep

their skilled workers with them by paying competitive wages, timely payments, good working culture, hygiene environment and sufficient work. In addition to these companies providing bonuses, incentives, and gifts on achievement of targets and also providing PF through labor contractor.

Many companies are mechanizing there construction or giving training to local labors to cope with lack of manpower. To reduce people required for project many companies are procuring multi-skilled workers.

Identify the constructs of a Journal – Essenti

**APPENDIX : QUESTIONNAIRE**

1. Name : Mr./Mrs.
2. Age and Experience :
3. Educational Qualification :
4. Designation and Department :
5. Contact Address :

Personal	Professional
Phone No:	Phone No:
Email:	Email:

6. Duration of the Project (Select appropriate Option)

7. Total Project Cost \_\_\_\_\_

8. Project Location(Select appropriate Option)

Urban  Sub Urban  Village  Remote

9. Optimal Man Power<sup>10</sup> Required For Project & Availability at the near Location (Local Labor) (Give Approximate no)

	No. of Required	No. of Local Available
Skilled		
Semi Skilled		
Un skilled		

10. How frequently skilled workers leaves the company (Select appropriate Option)

Within 3 months	
Within 6 months	
Within 12months	
After completion of project	

11. What is the best way of procuring the manpower (Select appropriate Option)

Migrating skilled manpower	
----------------------------	--

<sup>10</sup> Manpower/ Workers means Labor

Local semi Skilled by giving training	
Others (Please Specify)	

12. Ways to cope with the lack of manpower

--

13. Unskilled manpower required basic domain Knowledge of work they are doing (Select appropriate Option)

Yes  No  May/ May not

14. Effects due to lack of required manpower (Select appropriate Option/s)

Effect	
Delay of Project	
Quality Deviation	
Cost over runs	
Others ( Please Specify)	

15. What are the different techniques used to train the Workers, in those which will be the economical and effective (Select appropriate Option/s)

	Techniques adopted	Economical	Effective
By using face to face demonstration how to do			
Video demonstration how to do			
Practical Demonstration			
Drama / Role playing			
Other techniques (Please Specify)			

16. What is the percentage of positive response by workers to take training (Select appropriate Option)

17. What are different welfare programs provided to workers (Select appropriate Option/s)

Accommodation and Food	
Facilities like drinking water, electricity etc	
Others (Please Specify)	

18. What are different motivational factors motivates workers (Select appropriate Option/s)

Money	
Hygiene Environment	

Good Working Culture	
Others (Please Specify)	

19. What are different ways to keep the skilled workers to work for the company for long time Select appropriate Option/s)

By paying more wages	
By providing sufficient work	
By providing good working culture	
By providing hygiene environment	
Others (Please Specify)	

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# Mine-Music: A Music Player Based on Data Mining Technology

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**Abstract-** This report describes the concept and implementation of a system which allows users to play music as per their preferences and provides the users with recommendations as well from the system after log in. The data mining technology has been utilized in the making of this system in order to rate the users' likes and choices, taking into consideration the similarity in the backgrounds and personal information of the users obtained during account creation. When a new user creates an account in the system and chooses to listen to a song for the first time, the system automatically provides him or her with a number of initial options based on the data already present in the database, which have been specifically sorted out on the basis of the information provided by the user during the creation of his or her. From the options available, the system further ranks the songs according to their popularity among users sharing the same background. However, if an existing user logs in and chooses to listen to a song, then the system provides him or her with options based on his previous records, taking into account the songs he or she has listened to in the hour which matches the hour of the user's log in time. Furthermore, the system ranks the filtered options based on the number of times the user has listened to them. If the user finds what he is looking for among the displayed options itself, then he can select the respective option. If not, then he can search for his choice in the database. If available, then the user can play the song and if not, then the system asks him or her to enter further details regarding the song, which is saved in the database so that it can later be used to fetch the song from other sources and thereby make it available to the users.

**Keywords:** Data mining, recommendation system, python, Graphical User Interface, SQL.

## I. MOTIVATION

The acceptance of a system mainly depends on its feasibility, its efficiency and its compatibility with the user. We have many music players already available which instantly play songs chosen by the user. However, I wanted to create a system which not only plays songs but also recommends a few appropriate ones for the corresponding user, based on certain parameters like nationality, language, age or the time of the day when the user has logged in. Using this recommendation technique makes the system much more user friendly since it makes it much easier for the users to access their favorite songs. It also ensures that a user requires much less time in order to play a song of his or her choice. In addition to it, I have used a popularity index parameter for all the songs which aids in keeping the user updated

regarding songs that are highly popular among other users who share similar interests. Also, if an existing old user logs in, the system notes the log in time and displays the names of mainly those songs which the user has listened to maximum number of times during that same hour of the day, thereby saving much time which would otherwise be required search for the song. Thus, the system helps the user in many ways to make it easy for him or her to listen to a song by providing options, based on the statistics stored in the database, most likely to match his or her choice.

## II. INTRODUCTION

The system utilizes the following features for efficient performance:

### 2.1 PYTHON PROGRAMMING LANGUAGE

Python is an interpreted, high-level programming language, pure object-oriented, and powerful server-side scripting language for the Web. Like all scripting languages, Python code resembles pseudo code. Its syntax's rules and elegant design make it readable even among multiprogrammer development teams. The advantages of using python as a programming language include:

- syntax is clear and readable. It is excellent for beginners, yet superb for experts.
- self adjustable. Python provides full dynamic run-time type checking and bounds checking on array subscripts. It employs garbage collection so there is no problem with dangling pointers or memory leaks.
- supports object oriented programming.
- runs everywhere. Python programs are platform independent, which means that regardless of the operating system, it will run on any other computer with Python.
- open source. In addition to python being free, its license also allows us to modify python.
- highly scalable, suitable for large projects as well as small ones
- portable, cross-platform
- embeddable
- easily extensible
- powerful standard library

### 2.2 STRUCTURED QUERY LANGUAGE

SQL (Structured Query Language) is a special-purpose programming language designed for managing data held in a relational database management system.

Originally based upon relational algebra and tuple relational calculus, SQL consists of a data definition language and a data manipulation language. The advantages of using SQL include:

- High speed. SQL Queries can be used to retrieve large amounts of records from a database quickly and efficiently.
- SQL makes it easier to manage database systems without having to write substantial amount of code.
- The scope of SQL includes data insert, query, update and delete, schema creation and modification, and data access control.

### 2.3 GRAPHICAL USER INTERFACE

In computing, graphical user interface (GUI) is a type of user interface that allows users to interact with electronic devices through graphical icons and visual indicators such as secondary notation, as opposed to text-based interfaces, typed command labels or text navigation. The actions in GUI are usually performed through direct manipulation of the graphical elements. The advantages of using a graphical user interface include:

- User friendly. GUI systems offer a comparatively intuitive approach. Even users without any significant training can learn to use the systems with ease and hence use softwares to accomplish their goals.
- Multitasking. GUI systems offer a simple means of multitasking. Users can maintain multiple open applications and transition between them with a click of the mouse. This enhances productivity.
- Visuals. GUI systems provide a more pleasant visual environment to work with on the computer, which makes GUI a desirable feature for most end-users.

### 2.4 DATA MINING

Data mining is the computational process of discovering patterns in large data sets involving methods at the intersection of artificial intelligence, machine learning, statistics, and database systems. The overall goal of the data mining process is to extract information from a data set and transform it into an understandable structure for further use. Aside from the raw analysis step, it involves database and data management aspects, data pre-processing, model and inference considerations, interestingness metrics, complexity considerations, post-processing of discovered structures, visualization, and online updating. Data mining uses information from past data to analyze the outcome of a particular problem or situation that may arise. It is extremely user friendly, reduces access time to data and also allows us to filter or extract only a small portion of required data from a huge database.

Step 4: Select login.

Step 5: Open a new window where the user enters username and password and selects OK.

Step 6: Check whether the username and password are a match with those present in the database.

Step 7: If username and password are valid, go to step 8. Else enter correct username and password.

Step 8: Login successful.

Step 9: Note down the time of logging in.

Step 10: Check in the database to see if the user has listened to any song in the past at that particular hour of the day. If so, then go to step 11, else go to step 13.

Step 11: Check to see the number of times the user has listened to the songs and accordingly arrange the list of recommended songs, keeping the most listened to songs at the top.

Step 12: If the total number of recommendations are fulfilled, then go to step 15. Else, for the selection of remaining songs, go to step 13.

Step 13: Check the main Songs database to see which songs are most listened to by the users having the same nationality, age group and language as that of the logged in user.

Step 14: Out of the selected songs, select the ones with the highest popularity index and arrange them accordingly.

Step 15: Display the entire list of recommended songs for the user to choose. If the user selects from among them, then continue. Else go to step 18.

Step 16: Play the song.

Step 17: Update the database which keeps track of the users' past records of the songs which the users listen to. Go to step 26.

Step 18: If the desired song is not displayed, then ask the user to enter the name of the song that he wants to listen to.

Step 19: If available, go to step 16. Else continue.

Step 20: Ask the user to enter the details of the song – Song name, Artist, Album name, Year released, Genre and language of the song.

Step 21: Store the details in the database for unknown songs. Go to step 26.

Step 22: Select Sign up.

Step 23: Enter the details – Name, Address, Country, Language, Date of Birth, Username and Password.

Step 24: Check to see if the username already exists in the database. If not, then continue. Else, re-enter username.

Step 25: The account is successfully created. Go to step 4.

Step 26: Stop.

## III. METHODOLOGY

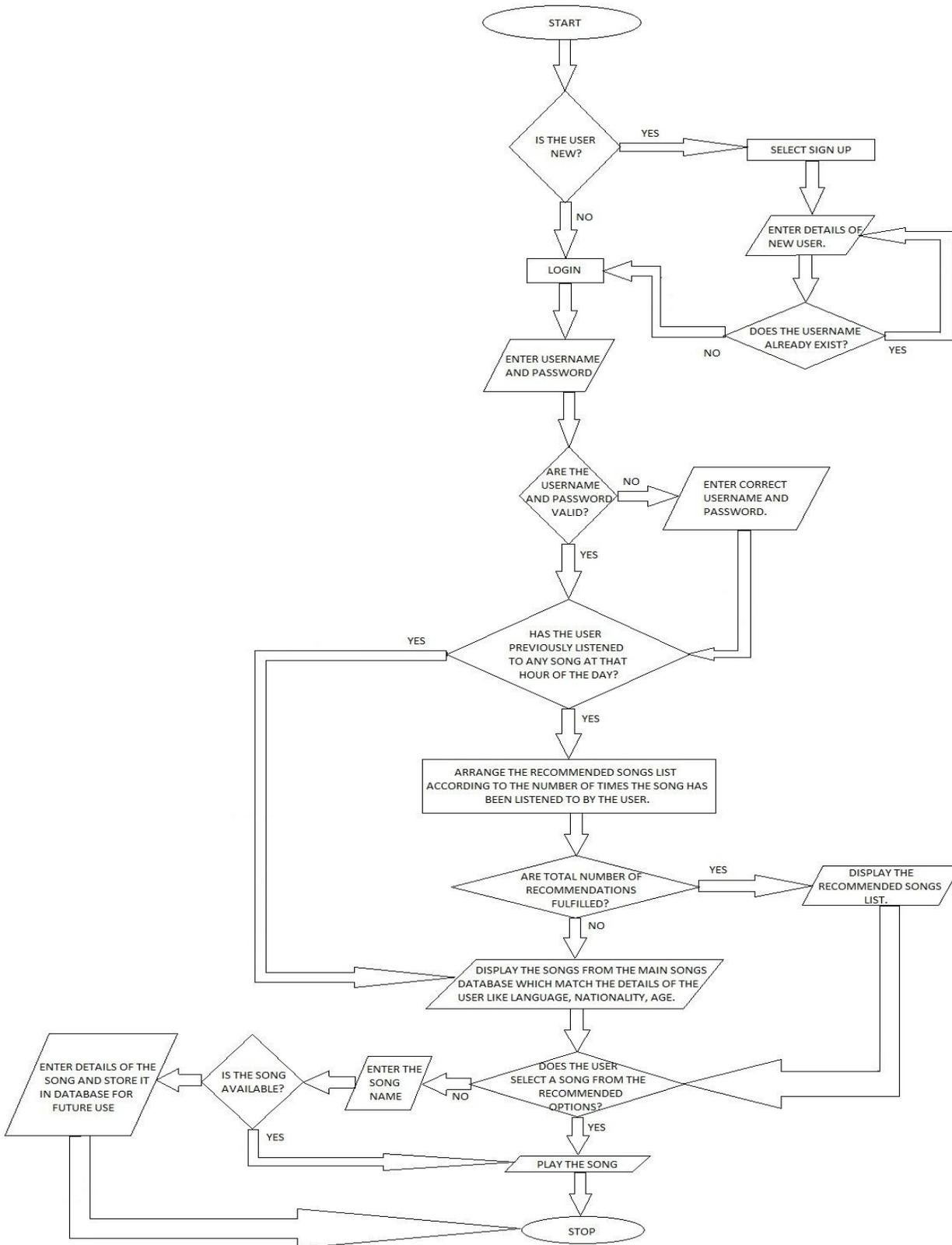
### 3.1 STEP ALGORITHM:

Step 1: Start.

Step 2: Display a window for old users to log in and new users to sign up.

Step 3: If new user, go to step 22, else continue.

### 3.2 FLOW CHART:



### 3.3 DATABASES:

- User Accounts database:  
Name, Address, Country, Language, DateOfBirth, Username, Password.
- Songs database:  
SongID, SongName, Artist, Genre, AgeLow, AgeHigh, Language, Country, Time, PopularityIndex.
- Preference database:  
Username, SongID, Time, Count.
- Unknown Songs database:  
SongName, Artist, Album, YearReleased, Genre, Language.

### IV. RESULTS



Fig. 1.

The above screenshot shows the songs recommended by the system in case of a new user who has logged in for the first time.



Fig. 2.

After logging in a number of times and listening to multiple songs, the system suggests the above songs. There has clearly been a change in the order as well as the name of the recommended songs, since the first time the user had logged in.

### V. CONCLUSION AND FUTURE WORK

Thus, we see that the system proposed can be made to work efficiently. The methodology section describes how the entire process can be implemented and how the entire system can be developed to achieve our goal. The screenshots provided in the results section show that the system is working.

The system can be further developed in order to add security features to it. The system created is vulnerable because no measures have been taken to make the overall process secure. Thus, we need to import security measures in order to protect the system. Also we can try to import better data mining algorithms so as to make the system much more efficient both in terms of time as well as cost. As a whole, we hope the implementation process described will aid the developer's community in near future.

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# A Comparative Study of Customer Perception toward E-banking Services Provided By Selected Private & Public Sector Bank in India

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**Abstract-** The purpose of this paper is to determine the customer's perception toward the e-banking services. A total of number of customer taken for the study is 196. Analysis of variance technique is employed to study the significant relationship between the occupation and customer perception of e-banking services and significant relationship between the age and customer perception of e-banking services. The result of the study clearly shows that different age group of customer and different occupation group of customers have different perception toward the e-banking services. The results also propose that demographic factors impact significantly internet banking behaviour, specifically, occupation and age. Finally, this paper suggests that an understanding about the customer's perception regarding the e-banking services of public and private banks it will help to the banker to understand the customers need in better way.

**Index Terms-** ANOVA, Customer Perception, E- banking, Public and Private Bank

## I. INTRODUCTION

The fast advancing global information infrastructure including information technology and computer networks such as the Internet and telecommunications systems enable the development of electronic commerce at a global level. The nearly universal connectivity which the Internet offers has made it an invaluable business tool. These developments have created a new type of economy, which many call the 'digital economy'. This fast emerging economy is bringing with it rapidly changing technologies, increasing knowledge intensity in all areas of business, and creating virtual supply chains and new forms of businesses and service delivery channels such as E-banking. As a direct consequence of the emergence of the 'digital economy', the balance of power seems to be shifting to the customers. Customers are increasingly demanding more value, with goods customised to their exact needs, at less cost, and as quickly as possible. To meet these demands, businesses need to develop innovative ways of creating value which often require different enterprise architectures, different IT infrastructures and different way of thinking about doing business.( Shah, Mahmood and Clarke ,Steve ,2009).Information technology has been one of the powerful tools in the changes that have occurred in trade and economy. It is the use of computer hardware and computer software to store, convert, and process, retrieve, transmit and protect information. Technology has become more accessible, cheaper and easier to use, which has had a major impact on the world's trade and commerce. With the introduction of the Internet and the World Wide Web companies recognized IT as a tool to do business while consumers acknowledged it as not only an opportunity to purchase goods over the internet and services but also to obtain information. (Aronsohn et al, 2006). It has also changed the way of doing banking transaction. It creates new products, service market opportunities and better service output. Technology adoption by the banks has enabled the use of different technology tools in banking, which enable bank to reduce transaction cost, saving money and also save more time. It categorized as an electronic banking (Wandaogou ,Abdil Mumuni Moro and Jalulah ,Stephen Pambiin ,2011).

E-banking is referring to the deployment of banking services and products over electronic and communication networks directly to customers (Wandaogou ,Abdil Mumuni Moro and Jalulah ,Stephen Pambiin ,2011). It has emerged as a strategic resource for attaining efficiency, control operations, productivity, and profitability. It has changed the traditional way of banking transactions. Through the e-banking customer do not visit to the bank office in order to carry out banking transaction. For instance, customer are using automated teller machines (ATM) in place of cashier tellers, and credit cards and electronic cash in place of bank transactions (Alagheband,Parisa ,2006). It also allow customers to submit their applications for different services, make queries on their account balances and submit instructions to the bank and also electronically transfer funds to their accounts, pay bill, and conduct other banking transaction online (Afrouz, Firouzeh, 2006).It relies greatly on information and communication technology (ICT) to attain its promise for 24 hours availability and faster delivery of financial services.

E-banking is now a global phenomenon. It is a precious and influential tool for heavy development, supporting growth, promoting innovation and enhancing competitiveness. A physically powerful banking industry is an essential in every country and can have a major affect in supporting economic development through competent financial services. It has had huge impact on the banking industry. Banks require developing creative solutions of how to make full use of the new technology and how to provide their customers with high online service quality. When lacking face to face interaction banks must increase the experienced online service quality among customers in order to attain and sustain competitive advantages and customer relationships. (Aronsohn et al, 2006).

### *A. Basics of Electronic Banking:*

Electronic banking is a high-order construct, which consists of several distribution channels. It should be noted that electronic banking is a bigger platform than just banking via the Internet. The term electronic banking can be described in many ways. In a very simple form, it can mean the provision of information or services by a bank to its customers, via a computer, television, telephone, or mobile phone (Daniel, 1999). Electronic banking has different types of delivery channels: telephone, PC, mobile and the Internet. Moreover, Personal Computer allow customer to use all e-banking facility at home without go to the bank. It gives consumers a variety of services so they can move money between accounts, pay bills, check balances, and buy and sell mutual funds, securities and also submit electronic loan applications through PC Banking. A mobile banking service is the newest service in electronic banking Customers can check their balance and make adjustments between accounts, account transactions, payments etc. Internet is the interconnection of computer communication networks which enable the customer to perform all the banking activities over the internet. It is the latest wave in the information technology. The NET is changing everything, from the way of conduct commerce and the way of distribution of information. Several benefits of strong electronic service have also been identified as including satisfied and retained customers, attraction of new customers, development of customer relationships, increased sales and market shares, enhanced corporate image, reduced costs and increased profit margins and business performance (Parasuraman et al., 2005; Bauer et al., 2005). These benefits may explain the observed increase in the level of technology adoption in the delivery of banking services (Kalakota and Whinston, 1997; Bauer et al., 2005).

### *B. Conception of Internet Banking:*

The most general type of electronic banking in our times is banking via the Internet, in other words Internet banking. This type of banking allows consumers to check the balances in their accounts, transfer funds and order electronic bill payments. Internet banking systems allowing customers to apply for loans, trade stocks or mutual funds, and even view actual images of their checks or deposit slips. The services available for Internet banking vary from bank to bank. Nowadays the Internet is the main channel for electronic banking. Internet banking offers many benefits to banks and their customers (Karjaluto, 2002). The main benefits to banks are cost savings, reaching new segments of the population, efficiency, enhancement of the bank's reputation and better customer service and satisfaction (Jayawardhena and Foley, 2000). To customers Internet banking offers also new value. With the help of the Internet, banking is no longer bound to time or geography. Consumers all over the world have relatively easy access to their accounts 24 hours per day, seven days a week. It makes available to customers a full range of services including some services not offered at branches. Internet banking has the advantage that the customer avoids travelling to and from a bank branch. In this way, Internet banking saves time and money provides convenience and accessibility (Karjaluto, 2003). Customers can manage their banking affairs when they want, and they can enjoy more privacy while interacting with their bank. It has been claimed that Internet banking offers the customer more benefits at lower costs (Mols, 1998). Turban et al. (2000) indicated that Internet banking is extremely beneficial to customers because of the savings in costs, time and space it offers, its quick response to complaints, and its delivery of improved services, all of which benefits make for easier banking.

## II. LITERATURE REVIEW

Safeena et al (2010) determines the consumer's perspective on internet banking adoption. Finding shows that perceived usefulness, perceived ease of use, consumer awareness and perceived risk are the important determinants of online banking adoption and have strong and positive effect on customers to accept online banking system.

Uppal, R.K (2011) threw light on growth of information technology in various banks. The objective of this research is to analyze the extent of technological developments in various bank groups. Findings shows as compared to new private sector banks and foreign banks, in public sector banks very less IT has taken place. The maximum technology is taking place in new generation private sector banks and foreign.

Rao, K. Rama Mohana and Lakew, Tekeste Berhanu (2011) examines the service quality perceptions of customers of public sector and private sector banks in the city of Visakhapatnam, India. The author reveals that the Reliability and Assurance dimensions of service quality scored the highest ratings while the Tangibles dimension got the lowest score. Moreover, the study found a strong dissimilarity in service quality perceptions between customers of private sector and public sector banks.

Santhiyavalli, G. (2011) determined the customer's perception of service quality of the select branches of State Bank of India and study the major factors responsible for their satisfaction. In this research SERQUAL Model has been used and study indicates that among five dimensions 'Reliability', 'Responsiveness', 'Empathy' and 'Tangibility' are the major factors responsible for customer satisfaction.

Dharmalingam, S. And Kannan, K. V. (2011) evaluate the service quality in retail banking in the Tamil Nadu, based on different levels of customers' perception regarding service quality. Data are collected from Three Private Banks, ie. ICICI, AXIS and HDFC Bank. Sample size of this research is 240. The result indicates that customers' perception is highest in the tangibles area and lowest in the Product Variety area.

Bahl ,Sarita ,(2012) determined that security and privacy issues are the big issue in e-banking. If security and privacy issues resolved, the future of electronic banking can be very prosperous.

Rahman., et al (2012) determined that e-banking is still a new technology in Bangladesh.

Chibueze., et al (2013) shows that electronic banking has improved returns on the equity of Nigeria banks.

Kaur ,Jasveen and Kaur ,Baljit ,(2013) shows that there is no significant difference in facilities determining the customers' usage of internet banking services of Public-sector, Private-sector and Foreign Banks in India.

### III. OBJECTIVES OF THE STUDY

The study aims at identifying the overall customer perception towards the e-banking services. The study also aims at knowing whether demographic variables of the customer have influence on customer satisfaction on e- Banking.

### IV. HYPOTHESES

The study is based on the following hypotheses.

There is no relationship between demographic variables of the respondents like Age, Occupation, and their perception regarding services of e-Banking.

**A. Hypothesis<sub>1</sub>:** There is no significant difference between Age of the customer and their perception toward the services of E-banking.

**B. Hypothesis<sub>2</sub>:** There is no significant difference between occupation of the customer and their perception toward the services of E-banking.

### V. RESEARCH METHODOLOGY

In a view to precede the research in a systematic way the following research methodology has been used. By means of obtaining detailed opinion of the customers, this research falls under the category of descriptive research. Both primary and secondary data collection was made. To collect the primary data Questionnaire is prepared. A pilot study was conducted to validate the reliability of the questionnaire. The questionnaire includes questions on demographic variable and the respondents were asked to rate their perception level of e-banking services on a five point Likert scale. The questionnaires were widely circulated to the customers of different banks (any customer who uses the e-banking services of any bank in Aligarh city - Sample respondents are selected using convenient sampling method) through direct method and also through email. About 250 questionnaires are being circulated and responses were received from 196 customers and 54 questionnaires were found to be incomplete. The secondary data is collected from magazines, journals, books and websites.

Using the remaining 196 complete questionnaire the data is edited, coded and analyzed using SPSS 11.5 using the tests like ANOVA.

### V. LIMITATIONS OF THE STUDY

The study was conducted in Aligarh city and sample is very small hence the results cannot be generalized.

### VI. ANALYSIS AND INTERPRETATION

To analyze the two hypotheses, different demographic variables are considered. They are Age Group of the respondents and Occupation.

**A. Hypothesis<sub>1</sub>:** There is no significant difference between Age of the customer and their perception toward the services of E-banking.

**Table 1.1. Age Group and Perception of customer on e-banking services - Cross tabulation**

TOTAL	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Lower Bound
19	20	2.50	.607	.136	2.22	2.78

<b>20-29</b>	70	2.73	.635	.076	2.58	2.88
<b>30-39</b>	50	2.10	.763	.108	1.88	2.32
<b>40-49</b>	45	2.00	.739	.110	1.78	2.22
<b>50-59</b>	11	1.91	.831	.251	1.35	2.47
<b>Total</b>	196	2.33	.769	.055	2.22	2.44

The above table depicts the relationship between the age and customer satisfaction on e-banking at 5% level of significance. Majority of the respondents belong to the age group of 20-29 have high level of perception regarding the e-banking services. Majority of respondents who are between the age group of 30-39 have medium level of perception regarding the e-banking services and majority of them who are between 40-49 have low level of perception and majority of them who are between 50-59 have very low level of perception regarding the services of e-banking

**Table:1.2 ANOVA Table**

TOTAL	Sum of Squares	Df	Mean Square	F	Sig.
<b>Between Groups</b>	21.192	4	5.298	10.736	.000
<b>Within Groups</b>	94.252	191	.493		
<b>Total</b>	115.444	195			

The above table depicts that the p value is .000 which is less than 0.05. So we reject the null hypothesis and accepted the alternative hypothesis. So there is significant relationship between age of the customers and their perception towards the services of e-banking performance.

**B. Hypothesis<sub>2</sub>:** There is no significant difference between occupation of the customer and their perception toward the services of E-banking.

**Table 2.1. Occupation and perception of customer on e-Banking services-Cross tabulation**

TOTAL	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
<b>SERVICE CLASS BUSINESS CLASS</b>	40	2.32	.829	.131	2.06	2.59
<b>PROFESSIONAL</b>	49	2.14	.764	.109	1.92	2.36
<b>STUDENTS</b>	55	2.13	.771	.104	1.92	2.34
<b>Total</b>	52	2.73	.564	.078	2.57	2.89
<b>Total</b>	196	2.33	.769	.055	2.22	2.44

The above table depicts the significant difference between the Occupation of the customer and customer perception on e-banking services. Majority of the respondents who are students have high level of perception, majority of service class customer have medium level of perception towards the services of e-banking and business class and professional customer have very low level of perception regarding the e-banking services.

**Table: 2.2 ANOVA Table**

TOTAL	Sum of Squares	Df	Mean Square	F	Sig.
<b>Between Groups</b>	12.329	3	4.110	7.652	.000
<b>Within Groups</b>	103.115	192	.537		
<b>Total</b>	115.444	195			

The above table depicts that the p value is .000 which is less than .05. So we reject the null hypothesis and accepted the alternative hypothesis. So there is significant difference between occupation of the customer and their perception on e-banking services.

## VII. RECOMMENDATIONS

Above analysis reveals that in private banks customers are happier as compare to public banks about the services of e-Banking. Different age group customers have different perception towards the e-banking services, Mainly the old age people are having the reluctance for using e-banking facilities, so importance to be given to those people and proper training on the usage of e-banking should be given to them and bankers have to adopt the right strategies to attract different age group and give more information about the e-banking services. Most of the customers prefer e-banking for quickness. So banks should try in all the ways that e-banking is working 24 hour round the clock and service is available to customers without any hassles. Online Customers are mainly concerned on safety issues so the banks should educate their customers on the safety use of their passwords and pin numbers and it should insist the customers that they should change the passwords and pin numbers frequently so no unauthorized fraudulent practices happen in the online banking.

## VIII. CONCLUSION

Thus, this study has analyzed the overall perception of customers regarding the services of e-banking. Age and occupation are the important demographic factors in the banks which have used to measure the perception of the customers on e-banking services. E-Banking will be successful for banks only when they have Commitment to e-Banking along with a deeper understanding of customer needs. This can come only when the bank has a very big base of customers, best people, and a service attitude. Banks should concentrate on above lines in order to have effective e-banking practices

The study concluded that different age group of customers have different perception toward the e-banking services and the usage level of these banks' customer is different so bank should concentrate on all the age group of customers for betterment of e-banking banks. It has also seen that different occupation group of customers have different perception toward the e-banking services. There are good number of customer in every group like student, service class, business class and professionals, it shows that they all are keen interesting in using the e-banking services.

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# Distribution of Trace Metals in Two Commercially Important Fish Species (*Tilapia Zilli* and *Oreochromis Niloticus*) Sediment and Water from Lake Gudbahri, Eastern Tigray of Northern Ethiopia

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**Abstract-** Distribution of trace metals (Zn, Cu and Cr) in water; bottom sediment and two fish species (*Tilapia zilli* and *Oreochromis Niloticus*) collected from Lake Gudbahri were analyzed using Varian AA240FS Atomic Absorption Spectrophotometry in order to ascertain their suitability for consumption and other domestic uses. Results indicated that *Tilapia zilli* contained the highest concentration of Zn (84%) of the detected heavy metals, followed by Cu (15%), while Cr (1%) was the lowest value. Similarly, *Nile Tilapia* contained the highest concentration of Zn (77%), followed by Cu (21%). Bioaccumulation factors of *Nile Tilapia* were Cu (409), Zn (110), Cr (57) and *Tilapia zilli* showed 345.5, 112 and 28.6 for Cu, Zn and Cr respectively. The distribution of heavy metals in sediment and water samples were in the order of magnitude as by Zn>Cr>Cu and Zn>Cu>Cr respectively whereas the order of heavy metals concentration in fish samples were found to decrease in sequence as Zn>Cu>Cr. The levels of the heavy metals concentration were compared with permissible limit values provided by WHO, FEPA and various national and international agencies. These levels of heavy metals accumulated in the two fish species might be due to the increase in agricultural influx waters, domestic wastes and some anthropogenic activities.

**Keywords:** Heavy metals, *Tilapia zilli*, *Oreochromis Niloticus*, Bioaccumulation factor, % Bioavailability, Lake Gudbahri

## I. INTRODUCTION

Water pollution has become a global problem. Contamination of aquatic ecosystems with Heavy Metal (HMs) has long been recognized as a serious pollution problem. When fish are exposed to elevated levels of metals in a polluted aquatic ecosystem, they tend to take these metals up from their direct environment [1]. Metal contamination may have deleterious effects on the ecological balance of the recipient environment and diversity of aquatic organisms [2].

During the last decades the rapid economic development of Africa has led to an increase in environmental pollution [3-5]. Heavy metals released into the environment find their way into aquatic systems as a result of Agricultural practices – for instance, the use of fertilizers and pesticides for the control of pests in the cultivation of coffee, cotton, tea and sugarcane and other activities such as mining and industry as well as growth of the human population have increased the discharge of waste effluents into lakes and rivers rendering it environmentally unstable. Consequently, aquatic organisms may be exposed to elevated levels of heavy metals due to their wide use for anthropogenic purposes [6].

Heavy metals are non-biodegradable and once discharged into water bodies, they can either be adsorbed on sediment particles or accumulated in aquatic organisms. Fish may absorb dissolved elements and heavy metals from surrounding water and food, which may accumulate in various tissues in significant amounts [7] and are eliciting toxicological effects at critical targets. Also, fish may accumulate significant concentrations of metals even in waters in which those metals are below the limit of detection in routine water samples [8], therefore, fish might prove a better material for detecting metals contaminating the freshwater ecosystems. Various studies were conducted on the levels of heavy metals in different water bodies [9-14].

Toxic heavy metal can cause dermatological diseases, skin cancer and internal cancers (liver, kidney, lung and bladder), cardiovascular disease, diabetes, and anemia, as well as reproductive, developmental, immunological and neurological affects in the human body. It is also possible that environmental toxicants may increase the susceptibility of aquatic animals to various diseases by interfering with the normal functioning of their immune, reproductive and developmental processes [15]. Long exposure to water pollutants even in very low concentrations have been reported to induce morphological, histological and biochemical alterations in the tissues which may critically influence fish quality.

Total bioaccumulated metal concentration in any organism that is a net accumulator of the metal is informative about metal bioavailability summed across exposure routes. However, there is typically no one universal metal concentration that is indicative of

toxicity, especially across species, largely because of interspecies differences in detoxification [16]. The level of bioaccumulation of heavy metals can be determined through calculation of the bioaccumulation factors. Bioaccumulation factor of heavy metals is defined as the ratio between the concentrations of heavy metals in the body of the organism with the concentration of heavy metals in the environment where the species was settled [17]. The present study was carried out to investigate the bioaccumulation of heavy metals (Cr, Cu and Zn) in *Tilapia zilli* and *Oreochromis Niloticus*.

Currently, Ethiopia has set no guideline values on the levels of heavy metals in fish resources. The purpose of this study was to produce baseline data on the distribution of heavy metals (Cr, Cu and Zn) in water, sediment and commonly consumed fish species *Tilapia zilli* and *Oreochromis Niloticus* (Nile Tilapia) obtained from Lake Gudbahri. In addition, analysis of the enrichment of these heavy metals in water, sediment and fish samples was used to evaluate the magnitude, impacts and possible sources of heavy metal contamination on the Lake. The results obtained from this study would also provide information for background levels of metals in the water, sediment and fish, contributing to the effective monitoring of both environmental quality and the health of the organisms inhabiting the Lake. To the best of our knowledge, from literature survey, no work has been carried out on the level of heavy metals concentration in fish samples of the Lake and their potential impacts on human health risks and the food chain.

## II. MATERIALS AND METHODS

### A. Description of study area

Lake Gudbahri (figure 1) is located **directly at the edge of Wukro town 47 Kms from Mekelle city near the red rock- cut church of Wukro Cherqos**. The study area lies between latitudes 13 47' 31" N and longitudes 39 35' 57"E in Eastern Tigray of Northern Ethiopia at an elevation of 1930 meters above sea level.

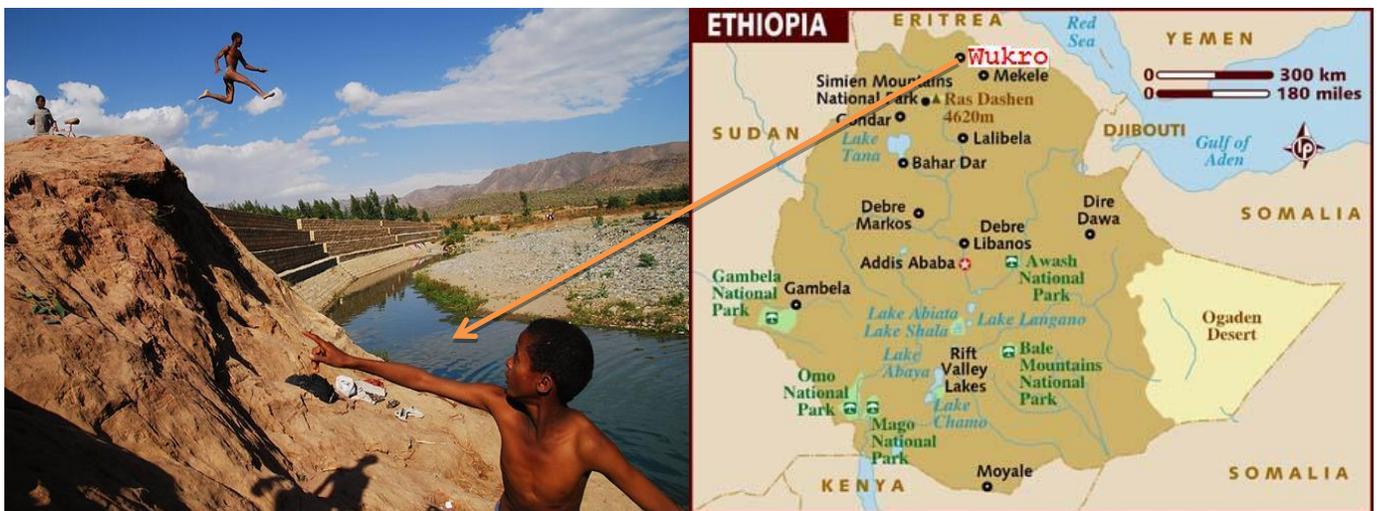


Figure 5: Lake Gudbahri

### B. Sampling

Samples of water, sediment and two most common fish species (*Tilapia zilli* and *Oreochromis Niloticus*) were brought directly from the study area. The sampling bag were pre-conditioned with 5% HNO<sub>3</sub> and later rinsed thoroughly with distilled de-ionized water. At each sampling site, the polyethylene sampling bags were rinsed at least three times before sampling was done. Water samples were taken from three different points at surface, middle and bottom of the lake using 3L Heart Valve water sampler. Homogenized water samples were collected in cleaned 2 liter polythene bags. The fishes were sampled with gill nets from the lake. Adult individuals of similar size were selected from both fish types of the lake and fish samples were taken for analysis. Sediment samples were collected from the lake using bottom sediment Grab Sampler. All samples were brought to the laboratory using portable ice box and stored in refrigerator until analysis.

### C. Sample preparation

The collected fish samples were stored in a cooler packed with ice block in order to maintain the freshness and latter transported to the laboratory for dissection of the organs and washed thoroughly. The fish samples were dried for 24 hours to constant weight in an oven at 105°C. The dried samples were pooled and milled with a mortar and pestle. They were put in dry labeled plastic containers and

stored in desiccator until digestion. A standard procedure was used to digest the samples [18]. This involved digesting 10 g portion of the ground samples with 10 mL HNO<sub>3</sub> and 2 mL HClO<sub>4</sub> was heated on a hot plate for one hour. After complete digestion, the residue was dissolved and diluted with 0.2% HNO<sub>3</sub>. The digest sample was stored in pre-cleaned polyethylene bottles until analysis using Atomic Absorption Spectrophotometer.

About 100 ml water sample was filtered through Nitrocellulose filter membrane of 0.45 μm pore size prior dried in 105<sup>o</sup>C for 2 hours. The filtrated and unfiltered water samples were preserved in 2 ml concentrated nitric acid to prevent precipitation of metals and growth of algae. Dissolved metals were determined from the filtrate water samples whereas the total metals from the unfiltered water samples using nitric acid digestion. Finally 20 mL of filtered and digested samples were taken for analysis.

Sediment samples taken from the lake were air-dried, mixed and one fourth of each sample was dried in an oven at 105<sup>o</sup>C for 12 hrs. The dried samples were then ground and sieved with 75 mm mesh size. A 20 g ± 0.05 g of pulverized sample was weighed into a 400 ml tall beaker. An acid mix of 50 ml HCl and 20 ml HNO<sub>3</sub> was slowly added to the sample while swirling, to ensure the sample is properly wetted and simmered on the hot plate for a minimum of 45 minutes at 160<sup>o</sup>C, stirring with a glass rod. It was removed from the hot plate before dryness, cooled and diluted on a 200 ml volumetric flask with distilled water, shaken and poured back into the beaker and settled for 30 minutes. Finally some amount of the digested sample was taken and analyzed for trace metals.

*D. Sample Analysis*

All samples were analyzed at the Central Analytical Laboratory, EZANA Mining Development PLC, Mekelle, Ethiopia. Heavy metals (Cr, Cu and Zn) were determined with Varian AA240FS Fast Sequential Atomic Absorption Spectrometer, which is fully automated PC-controlled true double-beam AAS with Fast Sequential operation for fast multi-element flame AA determinations, Features 4 lamp positions and automatic lamp selection, Operated with SpectraAA base and PRO software versions, was used in this research. Values were recorded in mg/kg dry weight. Bioaccumulation Factors (BAF) between the fish tissues and the water were calculated. Data were analyzed using statistical software package SPSS and Analysis of Variance (ANOVA). Detection limits for the analyzed metals on the instrument were: Cr: 0.006 mg/Kg, Cu: 0.003 mg/Kg and Zn: 0.001 mg/Kg.

*E. Bioaccumulation Factor (BAF)*

The bioaccumulation factor (BAF) is the ratio between the accumulated concentration of a given pollutant in any organ and its dissolved concentration in water and it was calculated [13] using the following equation:

$$BAF = \frac{\text{Concentration of HMs in dry fish muscle (mg kg}^{-1}\text{)}}{\text{Concentration of HMs in water (mg l}^{-1}\text{)}}$$

*F. Bioavailability*

Bioavailability is defined as the degree to which heavy metals in a water-soluble form that plant and animal communities can readily uptake and assimilates [19]. Bioavailability of a contaminant to the receptor will depend upon its chemical and physical characteristics. The bioavailability of metals with respect to total metal content can be calculated as follows:

$$\% \text{ Bioavailability} = \frac{\text{Dissolved metal concentration (}\mu\text{g l}^{-1}\text{)}}{\text{Total metal concentration (}\mu\text{g l}^{-1}\text{)}} \times 100$$

III. RESULT AND DISCUSSION

*A. Heavy metal concentration (μg/L) in water sample from Lake Gudbahri*

Heavy Metal concentrations in water samples from Lake Gudbahri are presented in Table 2. Heavy metals concentration in water sample were found to be in the following decreasing sequence: Zn (196.67±5.77) > Cu (11±9.50) > Cr (7.0±5.2). Zinc concentration (91.63 %) in water sample constituted a major portion of the total metal ions determined, while Cu and Cr concentrations were the lowest value (5.12%) and (3.27%) respectively. The average concentrations of Zn, Cr and Cu in water sample were below the permissible limits provided by WHO [20], and USEPA [21].

Table 4: HMs concentrations (μg/L) with Stdev in water and comparison with Water Quality Guidelines

Sample	Parameter	Heavy Metals		
		Cr	Cu	Zn

<b>Water</b>	Mean ±Stdev	7.0±5.2	11±9.50	197±5.77
	WHO (2008)	50	2000	5000
	USEPA (2011)	100	1300	5000

**B. Heavy metal concentration (mg/kg) in bottom sediment from Lake Gudbahri**

Table 2 shows the total extractable metals from Lake Gudbahri sediment and sediment quality guidelines of WHO and USEPA. Heavy metal concentration in sediment samples were found to be in the following decreasing order Zn (43.00) > Cr (31.33) > Cu (22.00). Zn concentration in the sediment sample constituted a major portion of the total metal ions determined (44.64%), whereas Cu concentration was the lowest (22.84%). Therefore the obtained results showed that the average values of Zn (43.00), Cr (31.33) and Cu (22.00) in sediment samples were lower than the respective reference values for USEPA [22] and ISQG [23].

**Table 5:** HMs (mg/kg dry weight) in sediment and comparison with sediment quality guidelines

Sample	Parameter	Heavy Metals		
		Cr	Cu	Zn
Sediment	Mean ± Stdev	31.33±0.58	22.00±1.00	43.00±1.00
	USEPA (2010)	43.4	31.6	121
	ISQG (2002)	37.3	35.7	123

**C. Heavy metal concentration (mg/kg) in Nile Tilapia and Tilapia zilli**

Concentration heavy metals in the two fish species (*Nile Tilapia* and *Tilapia zilli*) from Lake Gudbahri are shown in Table 3. Several studies indicated that metal bioaccumulation in fish tissues depend on a number of factors such as food habits and foraging behavior of the fish [24]; trophic status, source of a particular metal, distance of the organism from the contamination source and the presence of other ions in the environment [25]; food availability [26]; bio-magnification and/or bio-diminishing of a particular metal [27]; metal detoxifying proteins in the body of the fish [28]; temperature, transport of the metals across the membrane and the metabolic rate of the animal [29]; species, age, size of fish and exposure time [30]. Metal accumulation in the tissues of fish varied according to the rates of uptake, storage and elimination [6]. Our study also showed that accumulation of each heavy metal varied between the fish species, i.e. in *Tilapia zilli* were found to decrease in sequence as Zn (84%) > Cu (15%) > Cr (1%) and in *Nile Tilapia* Zn (77%) > Cu (21%) > Cr (2%). Results showed that the highest and lowest contents of HMs in both fish samples were related to Zn and Cr concentration, respectively. The extent of the concentration of the HMs in the two fish species were compared to the tolerable values provided by IAEA-407[31, 32], FEPA [33], FAO/WHO [34] and WHO [35].

**Table 6:** Mean concentration (mg/kg dry weight) with Stdev of HMs in fish species from Lake Gudbahri.

Fish species	Parameter	Heavy metals		
		Cr	Cu	Zn
<i>Nile Tilapia</i>	Mean± Stdev	0.004±0.005	0.060±0.024	0.217±0.234
<i>Tilapia zilli</i>	Mean± STDV	0.002±0.004	0.038±0.013	0.220±0.214
<b>IAEA-407 (2003)</b>		0.73	3.28	67.1
<b>FEPA (2003)</b>		0.15	1.3	75
<b>FAO/WHO (1989)</b>		0.15	30	40
<b>WHO (1985)</b>		0.15	3.0	10-75

Figure 2 shows the comparative accumulation of heavy metals in *Nile Tilapia* and *Tilapia zilli*. Zn was the highest in both species but relatively higher in *Tilapia zilli* (84%) than *Nile Tilapia* (77%) and Cr was the lowest in both species with Cr (2%) for *Nile Tilapia* and Cr (1%) for *Tilapia zilli*. Though, there are no data's on heavy metal distribution in fishes in Ethiopia, compared to literature reported [36] the concentrations of Cu and Cr were very low in both *Nile Tilapia* and *Tilapia zilli* of Lake Gudbahri than fishes from Lake Awassa and Ziway. But a high concentration of Zn was observed in Lake Gudbahri than Lake Awassa and Ziway.

Level of heavy metals in water, sediment and different fish species indicates that there is an interrelation of metal accumulation in the various components of the fish as suggested [37] fish acquires metals both directly from water and sediment and indirectly through the food chain.



Figure 6:

MHs content (%) in fish samples of *Nile Tilapia* and *Tilapia zilli* from Lake Gudbahri

Table 4 shows that the Bioaccumulation Factor (BAF) of the three HMs in the study area. The BAF of heavy metals in *Nile Tilapia* and *Tilapia zilli* was in the order of Cu (409) > Zn (110) > Cr (57) and Cu (345.5) > Zn (112) > Cr (28.6), respectively with highest BAF of Cu (409) for Nile Tilapia and (345.5) for Tilapia zilli from water. It is obvious from the data given in Table 4 that the highest bioaccumulation factors (BAF) were recorded from water while the lowest values of BAF were recorded from sediment in both species.

**Table 7:** Bioaccumulation (BAF) of HMs in *Nile Tilapia* and *Tilapia zilli* from Lake Gudbahri

Fish species	Parameters	Heavy metals		
		Cr	Cu	Zn
<i>Nile Tilapia</i>	water → fish	57	409	110
	sediment → fish	0.013	0.205	0.504
<i>Tilapia Zilli</i>	water → fish	28.6	345.5	112
	sediment → fish	0.006	0.172	0.52

The bioavailability of heavy metals is shown in Table 4. The dissolved metal concentration is determined via analysis of filtered water samples and the total metal concentration of unfiltered water samples. The results obtained were decreased in the sequence Cu (45.45%) > Cr (42.86%) > Zn (27.41%). The bioavailability of the heavy metals exhibited maximum and minimum values for Cu (45.45%) and Zn (27.41%) respectively. Bioavailability of the HMs depend in part on the concentration of anions and chelating ligands present in the water, pH and Redox status and the presence of absorptive sediments [38] of the lake.

**Table 8:** Bioavailability (%) of HMs in *Nile Tilapia* and *Tilapia zilli* from Lake Gudbahri

Sample	Parameter	Heavy metals		
		Cr	Cu	Zn
<i>filtered</i>	average	3	5	54
<i>unfiltered</i>	average	7	11	197
<b>Bioavailability %</b>		42.86	45.45	27.41

#### IV. CONCLUSION

Fish is one of the most commonly consumed diets of man therefore, it is necessary that regular biological monitoring of the water and fish for consumption should be done to ensure continuous safety of the seafood. Safe disposal of agricultural, domestic sewage and industrial effluents should be practiced and where possible, recycled to avoid these metals and other contaminants from going into the ecosystem.

It is logical to say that the high concentration of metals in river become gradually accumulated on the sediments (as a function of pH) and in due course get transferred to fish. Finally, the high level of bioaccumulation factor of Cu and Zn shows that they were good bio-indicator to monitor pollution in the lake for the two fish species. Although, we did not investigate the role of adsorption, precipitation of metal ions and influence of interference in this work these will be considered in our next work.

The results of this study revealed that consuming fish from Lake Gudbahri, Tigray, Northern, Ethiopia may not be harmful to consumers because the observed values of heavy metals were below the permissible limits issued by IAEA-407, 2003; FEPA, 2003 and WHO, 1985, for human consumption.

The values reported in this study can serve as baseline data to monitor future anthropogenic activities along the coast, information on concentrations and distribution of heavy metals in *Nile Tilapia* and *Tilapia zilli* of Lake Gudbahri, eastern Tigray, Northern highlands of Ethiopia. The study showed a need for continuous pollution assessment study of aquatic organisms in Ethiopia and recommends the country to set guideline values on the levels of toxic heavy metal contaminants in fish resources.

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# Cell Phone Technology: “Substitute or Complement to Web Based Services”

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**Abstract-** In this modern era, the communication technology has always advanced at a tremendous pace. Along with that our dependency towards electronic devices also has grown to a larger extent. At present, cell phones are the most widely used electronic device worldwide. As technology advances, this little device is being capable of doing almost everything. Now we can use cell phone for web browsing, instant messaging, bill payment and for many other purposes. Modern people are using their cell phones to do what they used to do with their computer and internet. This thesis report emphasizes on people’s adaptability and conveniences towards cell phone technology and their motivation to switch from web services to cell phone services. This report consist of detailed review of our survey results which we conducted as part of our pre-thesis to judge current social scenario of cell phone & web users, people’s interest towards using cell phone services and their thought on the system that we intended to develop as part of our thesis. It also consists of the system design of our implemented system. Our objective is to prove the potential of cell phone services as the substitute or complement to web based services.

## I. INTRODUCTION

**M**obile phone usage throughout the world is increasing at a very fast pace. In economically advanced world it has already flourished to its maximum, and recent facts say that the number of mobile phone users in developing countries is also booming rapidly. Various researches conducted on this topic that took place in low-income regions show cell phone has an enormous possibility of taking over the place as the principal communication means for mass population of the whole world.

To utilize this opportunity to reach the mass people up to root level with various services that are now accessible only to people privileged with more expensive technologies, new ideas are needed to be developed and implemented. Hence we thought of investigating about the existing expectancy for a new service and the feasibility of implementing such a service. We aimed to innovate and initiate a new trend of mobile based services which would be a model for other service providers.

As the commencement for our goal, we studied the existing services based on mobile phone and also the global and local scenario of mobile phone usage. Our study encouraged us to work with more complex services than that are available on cell phone.

Let us at first look upon some facts from global and national perspective on this regard.

**1.2 Our proposition: A brand new service with cell phone**

We thought of introducing something totally new and innovative in the domain of Cell Phone based services, something that could change people’s view about them. Several services were already in the market, and several others were about to launch. When we analyzed them, we found many of them to be entertainment based; whereas we wanted to create something practically useful. However, a few existing services were of this sort, but they were using only the simple features like single SMS help-lines, etc. An implementation of a more complex service would allow more facilities in public life. Our goal was to relocate a service from internet to cell phone, which could have impact on the mass people’s life if available this way. Hence we come with the concept of implementing a system for accessing job databases with cell phones: a “**Job Access System**”.

### 1.3 A Brief as How a System is being Developed (In General)

- Once upon a time, software development consisted of a programmer writing code to solve a problem or automate a procedure. Nowadays, systems are so big and complex that teams of architects, analysts, programmers, testers and users must work together to create the millions of lines of custom-written code that drive our enterprises.
- To manage this, a number of system development life cycle (SDLC) models have been created: waterfall, fountain, spiral, build and fix, rapid prototyping, incremental, and synchronize and stabilize.

The oldest of these, and the best known, is the waterfall: a sequence of stages in which the output of each stage becomes the input for the next. These stages can be characterized and divided up in different ways, including the following:

- **Project planning, feasibility study:** Establishes a high-level view of the intended project and determines its goals.
- **Systems analysis, requirements definition:** Refines project goals into defined functions and operation of the intended application. Analyzes end-user information needs.
- **Systems design:** Describes desired features and operations in detail, including screen layouts, business rules, process diagrams, pseudocode and other documentation.
- **Implementation:** The real code is written here.

- **Integration and testing:** Brings all the pieces together into a special testing environment, then checks for errors, bugs and interoperability.
- **Acceptance, installation, deployment:** The final stage of initial development, where the software is put into production and runs actual business.
- **Maintenance:** What happens during the rest of the software's life: changes, correction, additions, moves to a different computing platform and more. This, the least glamorous and perhaps most important step of all, goes on seemingly forever.

## II. SURVEY REVIEW

### 2.1 Introduction

To implement a completely new type of service we were required to check its feasibility first. We conducted a survey with an objective to measure the amount of local people's willingness to shift to mobile services from web based services if available and how much adaptable they are to mobile phone technologies.

### 2.2 Survey Conclusion

The survey was used as a means of collecting information from general people about their cell phone use tendency and curiosity to adopt new services with cell phones. Facts that were found consist of a mixture of positive and negative sign for our proposal, although positive responses outnumbered negative ones. After reviewing the statistics found in the survey, following decisions can be made:

- The 100% of surveyed subjects have mobile phones. It shows how cell phone has spread out among general people in Bangladesh. It also indicates the importance of Mobile Phone based Services here.
- 80% subjects are aware of web services, from which 72% use job websites to search jobs.
- This 80% web users will help in deciding if the regular web users are inclined to migrate to Cell Phone services from regular web services.
- 100% of our test subjects use SMS on their cell phone, 68% of our test subjects use Value Added Services (VAS), although about 35% of don't think VAS is useful.
- 65% thinks VAS is useful.
- This is a sign that people are already used to using VAS while most of them thinks VAS are useful. So, a new value added service has a good possibility of being accepted by general people.
- 67% of our test subjects liked the concept "Applying to jobs are now just 2 SMS away".
- Applying to jobs through SMS is likely to become a popular and useful service, because majority of the participants thought the concept was good. Although some of the participants had web access, they liked the idea.
- More than 70% of our test subjects' think "Instantly informing you about job posting suitable for you over SMS" is the best service they can think of.

Most of the participants thought that mobile phone can be very useful as a means of notifying about available jobs. Personal

computers still do not have the mobility of being carried, and mobile users get to know instantly as an SMS is received by their cell phone. So they prefer cell phones as a means of notifications.

## III. SYSTEM DESIGN

### 3.1 Our System

After studying (1) the background of Cell Phone in Bangladesh, (2) the survey outcomes and (3) the current scenario of services provided through cell phones, it can be decided that the proposed service must have following characteristics:

1. The complete process has to be very easy to understand and learn.
2. At every step, users have to be provided with thorough guidance.
3. The service has to be completely obtainable through cell phones.
4. The number of steps needed to use every feature of the service has to be reduced to minimum.
5. Various features should be available with just one registration.

Now, a design has to be developed for the service and the complete system which fulfills this requirement. For that and to make it user-friendly, these measures were taken:

- The system was designed based on Human Computer Interaction (HCI), a discipline of Computer Science, which basically studies machines' interactions with human beings and suggests effective ways for designs.
- Different types of Value Added Services (VAS) were studied and SMS and IVR were selected for this project.

HCI and different types of VAS are discussed later in this chapter.

To manage the system, three different interfaces are needed for three types of user agents. They are:

1. **The Job-seekers:** They are the core users of this service. A complete cell phone based system is needed for this part of design.
2. **The Employers:** This type of users will provide job opportunities for job-seekers, while benefiting themselves by accessing a large available job-seeker database. This module does not require to be implemented with cell phone, so a web-solution will be good enough for it. Employers will access the database through internet with the web-browsers on their desktop computer.
3. **The System Administrators:** They will administer and manage the whole system on the server. So this part has to be implemented on desktop. For this module web-based admin panel was selected, which will be accessible to administrators through web-browsers from any computer provided internet connectivity.

### 3.1(A) Human Computer Interactions

**Human-Computer Interaction (HCI)** is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them. A basic goal of HCI is to improve the interactions between users and computers by making computers more usable and receptive to the user's needs. Specifically, HCI is concerned with:

- Methodologies and processes for designing interfaces (i.e., given a task and a class of users, design the best possible interface within given constraints, optimizing for a desired property such as learning ability or efficiency of use)
- Methods for implementing interfaces (e.g. software toolkits and libraries; efficient algorithms)
- techniques for evaluating and comparing interfaces
- developing new interfaces and interaction techniques
- developing descriptive and predictive models and theories of interaction

A long term goal of HCI is to design systems that minimize the barrier between the human's cognitive model of what they want to accomplish and the computer's understanding of the user's task.

Professional practitioners in HCI are usually designers concerned with the practical application of design methodologies to real-world problems. Their work often revolves around designing graphical user interfaces and web interfaces.

Researchers in HCI are interested in developing new design methodologies, experimenting with new hardware devices, prototyping new software systems, exploring new paradigms for interaction, and developing models and theories of interaction. HCI differs with human factors in that there is more of a focus on users working with computers rather than other kinds of machines or designed artifacts, and an additional focus on how to implement the (software and hardware) mechanisms behind computers to support human-computer interaction. It means that human factors are a broader term, and human factors of computers can be described as HCI - albeit some experts try to differ in these areas.

#### **Design principles:**

When evaluating a current user interface or designing a new user interface, it is important to keep in minds the following experimental design principles:

#### **Early focus on user(s) and task(s):**

Establish how many users are needed to perform the task(s) and determine who the appropriate users should be; someone that has never used the interface, and will not use the interface in the future, is most likely not a valid user. In addition, define the task(s) the users will be performing and how often the task(s) need to be performed.

#### **Empirical measurement:**

Test the interface early on with real users who come in contact with the interface on an everyday basis, respectively.

Keep in mind that results may be altered if the performance level of the user is not an accurate depiction of the real human-computer interaction. Establish quantitative usability specifics such as: the number of users performing the task(s), the time to complete the task(s), and the number of errors made during the task(s).

#### **Iterative design:**

After determining the users, tasks, and empirical measurements to include, perform the following iterative design steps:

- Design the user interface
- Test
- Analyze results
- Repeat

#### **Design methodologies**

A number of diverse methodologies outlining techniques for human-computer interaction design have emerged since the rise of the field in the 1980s. Most design methodologies stem from a model for how users, designers, and technical systems interact. Early methodologies, for example, treated users' cognitive processes as predictable and quantifiable and encouraged design practitioners to look to cognitive science results in areas such as memory and attention when designing user interfaces. Modern models tend to focus on a constant feedback and conversation between users, designers, and engineers and push for technical systems to be wrapped around the types of experiences users want to have, rather than wrapping user experience around a completed system.

#### **User-centered design:**

User-Centered Design (UCD) is a modern, widely practiced design philosophy rooted in the idea that users must take center-stage in the design of any computer system. Users, designers and technical practitioners work together to articulate the wants, needs and limitations of the user and create a system that addresses these elements. Often, user-centered design projects are informed by ethnographic studies of the environments in which users will be interacting with the system. This practice is similar, but not identical to Participatory Design, which emphasizes the possibility for end-users to contribute actively through shared design sessions and workshops.

#### **Principles of User Interface Design:**

Principles of User Interface Design are intended to improve the quality of user interface design. According to Larry Constantine and Lucy Lockwood in their usage-centered design, these principles are:

#### **The structure principle:**

Design should organize the user interface purposefully, in meaningful and useful ways based on clear, consistent models that are apparent and recognizable to users, putting related things together and separating unrelated things, differentiating dissimilar things and making similar things resemble one another. The structure principle is concerned with overall user interface architecture.

### **The simplicity principle:**

The design should make simple, common tasks easy, communicating clearly and simply in the user's own language, and providing good shortcuts that are meaningfully related to longer procedures.

### **The visibility principle:**

The design should make all needed options and materials for a given task visible without distracting the user with extraneous or redundant information. Good designs don't overwhelm users with alternatives or confuse with unneeded information.

### **The feedback principle:**

The design should keep users informed of actions or interpretations, changes of state or condition, and errors or exceptions that are relevant and of interest to the user through clear, concise, and unambiguous language familiar to users.

### **The tolerance principle:**

The design should be flexible and tolerant, reducing the cost of mistakes and misuse by allowing undoing and redoing, while also preventing errors wherever possible by tolerating varied inputs and sequences and by interpreting all reasonable actions.

### **The reuse principle:**

The design should reuse internal and external components and behaviors, maintaining consistency with purpose rather than merely arbitrary consistency, thus reducing the need for users to rethink and remember.

### **3.1(B) Value Added Service (VAS)**

Value-added services (VAS) are unlike core services. They have unique characteristics and they relate to other services in a completely different way. They also provide benefits that core services can not.

The future network will be an integrated network based on IP technology. The integration of data, voice, and multi-media services is not only a challenge for the development of voice service, but also an opportunity. Nowadays, China is under-going a period of rapid growth of voice services both in quality and quantity; meanwhile diversified technique platforms of voice service market and communication carriers make the competition fiercer. How to explore value-added voice business is a task for both fixed network operators and mobile operators.

Interactive Voice Response (IVR) gradually comes out to be the next goldmine for operators and SPs. Its market status of has drawn great attention within the field. Value-added voice service was premiered in Japan and the USA at an early stage, and has now won a remarkable market size, which provides larger space for the development of mobile communication. On all overseas countries that adopt GSM networks, value-added voice service has a bigger business than that of data service. The market size of mobile IVR service in USA reached about 2 billion US dollars last year.

### **Value-added Service Characteristics:**

All VAS share the same characteristics:

1. Not a form of basic service but rather adds value total service offering
2. Stands alone in terms of profitability and/or stimulates incremental demand for core service(s)
3. Can sometimes stand alone operationally
4. Does not cannibalize basic service unless clearly favorable
5. Can be an add-on to basic service, and as such, may be sold at a premium price
6. May provide operational and/or administrative synergy between or among other services – not merely for diversification

### **3.1(C).a Data-flow in Push and Pull service**

Every VAS will demonstrate one or more of the above characteristics. Furthermore, a value-added service will never stand in stark contrast to any of the above characteristics. VAS also have certain time dimensions associated with them. Subjectively speaking, a value-added service today becomes a basic service when it becomes sufficiently common place and widely deployed to no longer provide substantive differentiation on a relative basis.

### **Relationship to other Services**

There are two types of VAS. The first service type are those value-added services that stand alone from an operational perspective. These types of services need not be coupled with other services, but they can be. Many non-voice services fall into this category. They are often provided as an optional service along with voice services, but they could be offered and used by themselves without the voice service. For example, SMS could be offered and used as a service without voice calling.

The second, and arguably more numerous and important type of VAS, are those services that do not stand-alone. Instead, this category adds value to existing services. While it seems implicit in the definition of value-added, this is an important principle that makes value-added services stand apart from other services.

### **Value-added Services Examples**

There are many services that could be considered "value-added". For discussion purposes,

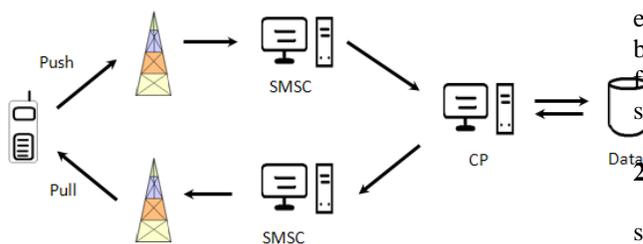
- IVR (Interactive Voice Response )
- PTT(Push To Talk)
- SMS Push-Pull Service
- Call Management

### **3.1(C) Push & Pull Service**

SMS Push is a rapid, efficient and straightforward communications and marketing medium employed to send a few lines of data to end recipient, to the effect of sending information, or reminding of events. SMS Pull is a reliable, mass medium over which users can send triggers for events and services Short messages may be used to provide premium rate services to subscribers of an Operator network. Mobile terminated short messages can be used to deliver digital content such as news alerts, financial information, logos and ring tones.

- Send SMS (push).

- Read Received SMS (pull)



### 3.1(D) Interactive Voice Response (IVR)

Interactive voice response (IVR), or IVR, is a technology that allows a computer to detect voice and keypad inputs. IVR technology is used extensively in telecommunications, but is also being introduced into automobile systems for hands free operation. Current deployment in automobiles revolves around Satellite Navigation, audio and mobile phone systems. IVR system can respond with pre-recorded or dynamically generated audio to further direct users on how to proceed. IVR systems can be used to control almost any function where the interface can be broken down into a series of simple menu choices. In telecommunications IVR systems generally scale well to handle large call volumes.

It has become more common in industries that have recently entered the telecom industry to refer to an Automated Attendant as an IVR. This means that when discussing an IVR application, it is important to ensure that the person you are talking to understand the term to mean the same thing as you do. Generally-speaking, those with a traditional telecom background are more likely to refer to an Automated Attendant and IVR as separate things, whereas those from an Emerging Telephony or VoIP background are more likely to use the term IVR to define any kind of telephony menu, even the most basic Automated Attendant.

#### Typical Use of IVR

IVR systems are typically used to service high call volumes, reduce cost and improve the customer experience. Examples of typical IVR applications are: telephone banking, televoting, and credit card transactions. Large companies use IVR services to extend the business hours of operation. Call centers use IVR systems to identify and segment callers. The ability to identify customers allows the ability to tailor services according to the customer profile. It also allows the option of choosing automated services. Information can be fed to the caller allowing choices such as: wait in the queue, choose an automated service, or request a callback. (At a suitable time and telephone number) The use of CTI(Computer Telephony Integration) will allow the IVR system to look up the CLI (Caller Line Identification) on a network database and identify the caller. This is currently accurate for about 80% of inbound calls. In the cases where CLI is withheld or unavailable, the caller can be asked to identify themselves by other methods such as a PIN or password. The use of DNIS will ensure that the correct application and language is executed by the IVR system.

### 1. Voice-activated dialers

(VAD) Voice-activated IVR systems are now used to replace the switchboard or PABX (Private Automatic Branch eXchange) operators which are used in many hospitals and large businesses to reduce the caller waiting time. An additional function is the ability to allow external callers to page hospital staff and transfer the inbound call to the paged person.

### 2. Entertainment and information

The largest installed IVR platforms are used for applications such as voting in TV game shows such as Pop Idol and Big Brother which can generate enormous call spikes. IVRs have also been widely used to take orders for mobile content, such as ringtones and logos, weather forecasts, crossword answers, and the whole spectrum of adult entertainment.

### 3. Anonymous access

IVR systems also allow callers to obtain data relatively anonymously. Hospitals and Clinics have used IVR systems to allow callers to receive anonymous access to test results. This is information that could easily be handled by a person but the IVR system is used to preserve privacy and avoid potential embarrassment of sensitive information or test results.

### 4. Clinical trials

IVR systems are used by large pharmaceutical companies to conduct global clinical trials and manage the large volumes of data generated. The caller will respond to questions in their preferred language and their responses will be logged into a database and possibly recorded at the same time to confirm authenticity. Applications include patient randomization and drug supply management.

#### Technologies used

DTMF signals (entered from the telephone keypad) and natural language speech recognition interpret the caller's response to voice prompts.

Other technologies include the ability to speak complex and dynamic information such as an e-mail, news report or weather information using Text-To-Speech (TTS). TTS is computer generated synthesized speech that is no longer the robotic voice generally associated with computers. Real voices create the speech in tiny fragments that are spliced together (concatenated) before being played to the caller.

An IVR can be utilized in several different ways:

- Equipment installed on the customer premise
- Equipment installed in the PSTN (Public Switched Telephone Network)
- Application service provider (ASP).
- Virtual Hosted IVR

Many business applications employ this technology including telephone banking, order placement, caller identification and routing, balance inquiry, and airline ticket booking.

A simple Voicemail system is different from an IVR in that it is person to person whereas an IVR is person to computer. IVR Voice forms can be used to provide a more complex voicemail

experience to the caller. For example, the IVR could ask if the caller wishes to hear, edit, forward or remove a message that was just recorded.

An Automatic Call Distributor (ACD) is often the first point of contact when calling many larger businesses. An ACD uses digital storage devices to play greetings or announcements, but typically routes a caller without prompting for input. An IVR can play announcements and request an input from the caller. This information can be used to route the call to a particular skill set. (A skill set is a function applied to a group of call-center agents with a particular skill)

Interactive voice response can be used to front-end a call center operation by identifying the needs of the caller. Information can be obtained from the caller such as account numbers. Answers to simple questions such as account balances or pre-recorded information can be provided without operator intervention. Account numbers from the IVR are often compared to caller ID data for security reasons and additional IVR responses are required if the caller ID data does not match the account record.

IVR call flows are created in a variety of ways. A traditional IVR depended upon proprietary programming or scripting languages, whereas modern IVR applications are structured similar to WWW pages, using VoiceXML, SALT or T-XML languages. The ability to use XML developed applications allows a Web server to act as an application server, freeing the developer to focus on the call flow. It was widely believed that developers would no longer require specialized programming skills, however this has been proven to be misguided as IVR applications need to understand the human reaction to the application dialogue. This is the difference between a good user experience and IVR hell.

Higher level IVR development tools are available in recent years to further simplify the application development process. A call flow diagram can be drawn with a GUI tool and the application code (VoiceXML or SALT) can be automatically generated. In addition, these tools normally provide extension mechanisms for software integration, such as HTTP interface to web site and Java interface for connecting to a database.

In telecommunications, an audio response unit (ARU) is a device that provides synthesized voice responses to touch-tone keypresses (DTMF) by processing calls based on (a) the call-originator input, (b) information received from a database, and (c) information in the incoming call, such as the time of day. ARUs increase the number of information calls handled and to provide consistent quality in information retrieval.

### 3.2 SMS Service

#### 3.3.(A) SMS Design: Registration Process

In this system following features are implemented through SMS:

- |                    |                            |
|--------------------|----------------------------|
| - Job Registration | - Job Notification         |
| - View Résumé      | - Apply to job             |
| - Edit Résumé      | - View Job Details         |
| - Un-register      | - Turn On/Off Notification |
| - Help             |                            |

An interested client can anytime register to the service through SMS and also deregister from it using the 'unregister' keyword. Following a registration, a new account is created corresponding the newly registered client and a 'personal profile' is also created with this account. This personal profile is called a "Résumé" and it is saved in the database.

Now if the client wants to view the status of their résumé and/or edit it, they can use the 'view' and/or 'edit' SMS for it.

Someone can forget the keywords or the process easily, so a 'help' service is there. Clients or any individual can use this help service through SMS to know the keywords. When using those keywords an individual starts any of the features, they are completely guided through that process by means of SMS responses. An interaction is build with the users, so they feel comfortable with the manner.

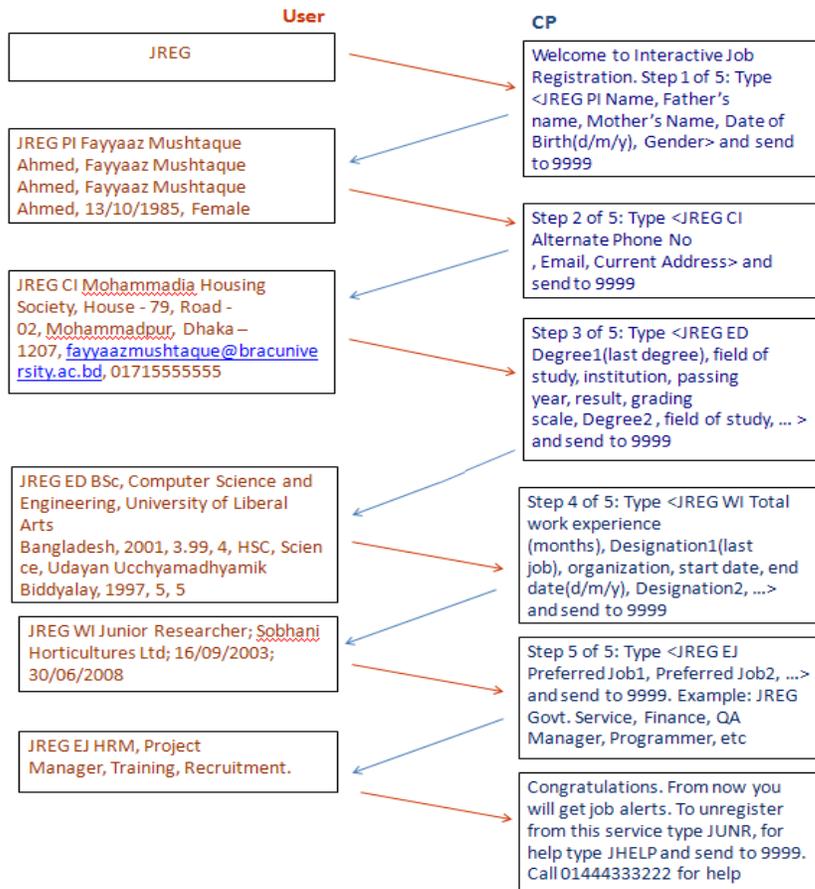
Job-seekers will be notified via SMS instantly when a new job is posted suitable for him. Even they can apply job using SMS. They can immediately apply to that job with a single SMS or choose to view the job-detail first using another SMS. They can also turn the notification service on or off according to their needs.

We introduce some keywords to differentiate user's request. Key words we used are as follows:

- Registration: JREG
- View Job Details: JDET
- Apply to Job: JAPP
- View Job Profile: JVIEW
- Edit Job Profile: JEDIT
- Help: JHELP
- Notification On/Off: JNOT ON/ JNOT OFF
- Unregister: JUNR

A format for writing SMS and sending them has been developed. At each step of registration or other features, the user will be guided as how the text in the message has to be typed and they will be provided with necessary writing format. Expected interactions between users and server for different features demonstrated through sample SMS are following:

### 3.3(A) JREGSMS Service –



### 3.3(B) Notifications

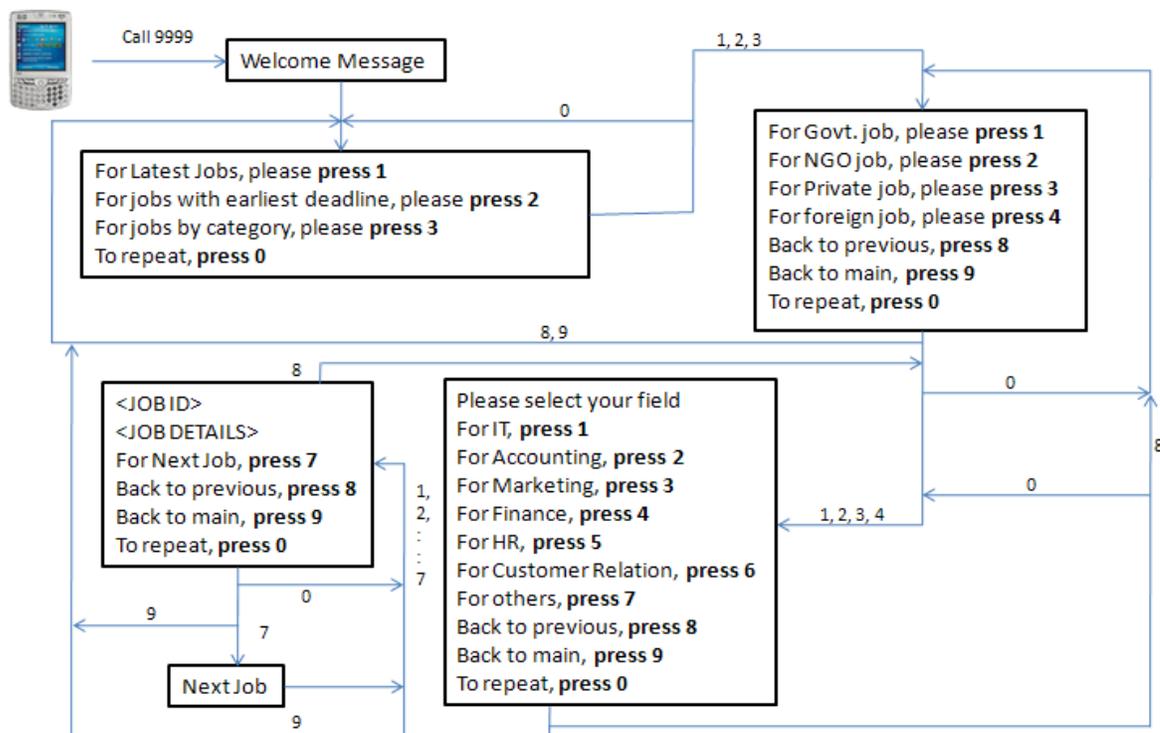
- Users will be notified in following cases:
  - New Job Posted that matches their criteria.
  - Interview alerts: When a job applicant is primarily selected for a particular job, s/he will be notified through an SMS and informed the venue and time. The SMS sent to him/her will be in following format:
  -

Dear Subscriber, you have an interview alert for <JOB ID xxxxxx>. You are requested to be present at 9:00AM on 15-01-09. Venue: <Company Name>, <Company Address>

### 3.3(F) SMS Design: Interview Alert Service

#### 3.4 IVR Service

- IVR service will mainly used for browsing jobs manually and learning about them. It will also tell the way to apply to a particular job through SMS. The illustration below shows how the steps are executed in our IVR system:



3.4.a IVR Design: Browsing Jobs

IV. CONCLUSION

Our main objective was to establish a fresh and apparently complex service with mobile phones so that it can show the way to other service providers to come forward with such services, which will enable a greater part of population, which is outside the reach of the most advanced technologies such as Internet, Satellite Radio, etc but inside mobile network coverage, to access a greater portion of facilities presently unavailable to them.

The hardest part of the project was designing a 'Registration' process only using SMS push and pull. We believe that by designing this process we have succeeded to demonstrate that implementing similar services and procedures is possible, and they only requires some optimization works. We hope to see other service providers will also come with different services and this will contribute in our country's development in various areas such as communication, access to information and business.

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# A Time-Series Analysis of Export-Led shipping demand Hypothesis for Sri Lanka

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**Abstract-** Aim of this study is to evaluate the development of Sri Lankan exports over the recent past and try to highlight a relationship between exports and shipping services, which can be used for forecasting future demand for shipping services derived by country's exports. Evolution of Sri Lankan exports from early post-independence era to present and the historical background of country's economic policies that have affected the export sector are being studied to get an in depth understanding of trend, patterns and performance of country's export sector. Data analysis is carried out using already established statistical methods and deep researches in to the plausibility of those methods are not aim of the study. The study is structured to test the plausibility of two hypotheses. Regression analysis used to find relationship between cargo loaded and value of exports. Vector Auto regression analysis used to forecast a best forecasting model for shipping demand using export in the country. First hypothesis is Sri Lankan exports derive a demand for shipping services and the second is that the derived demand for shipping by exports can be forecasted by using export performance data over a period of time. The conclusion of the study is that the two hypotheses that were tested are valid.

**Index Terms-** Derived Demand, Cargo Loaded, Sea Cargo, export

## I. INTRODUCTION

Export sector of a country is critical for a country's overall growth and contributes substantially to bring foreign currency in to the country. Values of exports and imports decide the trade balance of the country and will be reflected in the Balance of Payments. The contribution of Sri Lankan export to country's Gross Domestic Product has been as high as 33.6 per cent in 2001 even though it has declined to 17.8 per cent by 2011 due to various reasons (EASL, 2012). Sri Lanka being an island nation there are only two ways available for its exports to leave the country in search of their foreign markets. That is either as sea cargo or as air cargo. Due to the costly nature of air cargo services, shipping is the best mode of transport available for majority of Sri Lankan exporters. Figure I highlights the domination of shipping as the preferred mode of transport for Sri Lankan exports.

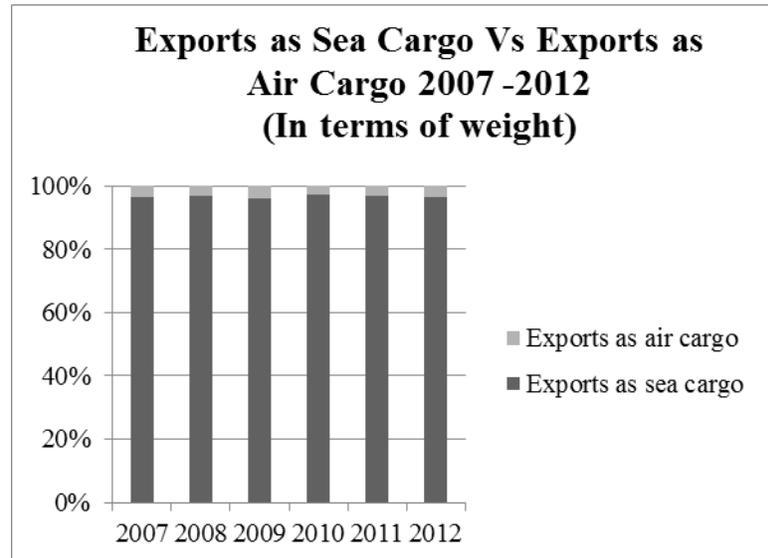


Figure I: Exports as Sea Cargo Vs Exports as Air Cargo 2007 -2012

Therefore, it can be seen that Sri Lankan exports create a demand for shipping services.

## II. AIM OF THE STUDY

Aim of the study is to evaluate the development of Sri Lankan exports over the recent past and try to highlight a relationship between exports and shipping services, which can be used for forecasting future demand for shipping services derived by country's exports. Evolution of Sri Lankan exports from early post-independence era to present and the historical background of country's economic policies that have affected the export sector are being studied to get an in-depth understanding of trends, patterns and performance of country's export sector. Data analyses are carried out using already established statistical methods and a deep research in to the plausibility of those methods is not an aim of this study.

## III. THE HYPOTHESES

The study is structured to test the plausibility of below hypotheses.

H1a: Sri Lankan cargo loaded does depend on exports (exports derive a demand for shipping services)

H1b: The derived demand for shipping by exports can be forecasted by using export performance data over a period of time

#### IV. LITERATURE SURVEY

The relationship between Sri Lankan exports and economic growth has been studied by many economists. Though there is a straight forward relationship between the exports and the shipping industry, this is much less discussed in Sri Lankan scenario. The demand for shipping has been extensively studied worldwide but not much attention given to this aspect in Sri Lankan scenario. The "Export Led Growth" hypothesis is a hot topic in this subject area and its validity has been tested by many academics around the world with reference to various countries including Sri Lanka (Dilrukshini, 2008). Some have concluded supporting the hypothesis and some the other way. The literature survey of this study first looks in to the historical background of economic policies affecting the Sri Lankan exports. Then related literature is being referred to understand the content and behaviour of Sri Lankan exports. Finally a brief reference of some literature is made on demand for shipping services.

Further stressing on this fact he points out that in 1966/67 wool; meats; iron and steel products accounted for 39.2 per cent of the value of exports, but only 3.3 per cent of the volume. Coal and coke and iron ore, on the other hand accounted for only 3.9 percent of the value, but 41.1 percent of the volume. Pointing out the derived demand for shipping services by Australian exports, he has tabulated the changes in vessels and net tonnage cleared from Australian ports towards various markets in the world for the period 1960/61 to 1965/66. Then he has highlighted the varying levels of demand stability derived by different categories of exports by tabulating the indices of export tonnage levels for the period of 1961/62 to 1966/67. The seasonality patterns of primary exports have also being heighted by tabulating the monthly variations in terms of „000 freight tons for the period of July 1966 to June 1967 by categorizing the primary exports as bulk, refrigerated and non-refrigerated.

Akdemir, B., Bilgili, E., Ziarati, M., & Stocton, D. (2008) in their study on Supply and Demand in Shipping Market, have used intelligent neural networks to forecast demand. An attempt has been made to forecast the total dry bulk fleet. In this study the forecasting results from the neural networks have been compared with the forecasting results from multi-variable regression analysis.

#### V. METHODOLOGY

The study is designed to answer two research problems.

1. Do Sri Lankan exports derive a demand for shipping services?

2. Can that demand be forecasted by analyzing export performance data of the country over a period of time?

Finding the answers is carried out by a statistical analysis of relevant data gathered from secondary sources. Targeted sources of data are the Central Bank of Sri Lanka and Sri Lanka Customs. These two governmental organizations carry out collection and storage of data related to Sri Lankan exports and publishes them in their annual reports of statistics.

#### VI. IDENTIFICATION OF KEY VARIABLES

The main variable in focus is "**demand for shipping services**". A demand for shipping services is generated when there is cargo available to be transported by ships. A country (or a port) can generate a demand for shipping services in two ways.

1. When there is out bound cargo available to be loaded
2. When there is inbound cargo available to be landed

This study is focusing on the first aspect, as the exports are out bound cargo. There we can identify another variable which can be used to interpret demand for shipping generated by out bound cargo in quantitative terms; that is "**amount of cargo loaded**" to ships calling Sri Lankan ports.

Another key variable is the "**number of vessels arrived**" to Sri Lankan ports. While it is reasonable to expect a positive correlation between exports and vessels arrived (or between cargo loaded and vessels arrived), it should be notated that vessels arrival will be substantially affected by the amounts of imports and transshipment cargo. The number of vessels arrived also includes the number of passenger ship arrivals even though it is very small compared to the total number.

The other key variable is "**exports**". The study is aimed at studying the dependability of demand for shipping up on exports. Exports can be measured in terms of quantity and in terms of value. Since this study is aimed at forecasting demand for shipping, ideally exports should be measured in terms of quantity in order to avoid the effect of price changes when it is measured in terms of value. But due to the difficulties faced in data collection, the export data used in final statistical analysis is measured in value terms.

#### VII. LIST OF IDENTIFIED KEY VARIABLES

1. Demand for shipping services
2. Amount of cargo loaded to ships calling Sri Lankan ports
3. Number of vessels arrived at Sri Lankan ports
4. Amount of Sri Lankan exports

#### VIII. PROCUREMENT OF DATA

Following data was collected from various issues of "Economic & Social Statistics of Sri Lanka" published annually by the Central Bank of Sri Lanka.

- Number of vessels arrived at Sri Lankan ports each year from 1987 to 2011
- Amount of cargo loaded to ships at Sri Lankan ports each year in MT „000 from 1987 to 2011
- Total value of Sri Lankan exports in each year in Rs. Mn. From 1987 to 2011

In addition, the amounts of exports (registered) that left the country as sea cargo and as air cargo in each year from 2007 to 2012 measured in MT.000 were obtained from Sri Lanka Customs.

**Table I: Descriptive Statistics of Key-Variables**

<b>Descriptive Statistics Summary: Vessels Arrived, Cargo Loaded, Exports</b>						
<b>Variable</b>	<b>Mean</b>	<b>StDev</b>	<b>Variance</b>	<b>CoefVar</b>	<b>Minimum</b>	<b>Maximum</b>
Vessels Arrived	3976	643	413026	16.16	2614	4814
Cargo Loaded	10717	6418	41186792	59.88	3464	25610
Exports	418159	329418	1.08516E+11	78.78	41133	1167588

During the period from 1987 to 2011, maximum number of vessel arrivals is recorded in 2008 where as the minimum is recorded in 1987. Average number of vessel arrivals per year is 3976 during the period. The cargo loaded has been at its lowest in 1987 and at its peak in 2011. Data series of the number of

vessel arrivals shows a relatively low dispersion with a coefficient of variation at 16.16, however, the dispersion of cargo loaded and export data series are high.

**Table II: Correlations: Vessels Arrived, Cargo Loaded, Exports**

<b>Correlations: Vessels Arrived, Cargo Loaded, Exports</b>		
	Vessels Arrived	Cargo Loaded
Cargo Loaded	<b>0.588</b> 0.002	
Exports	<b>0.606</b> 0.001	<b>0.979</b> 0.000

Above values suggest good correlations between all three key variables. Especially the correlation between cargo laded and exports is shown to be very strong. This strong correlation is explained by the fact that majority of Sri Lankan exports using Shipping as the preferred mode of transport. Relatively weaker

correlation values of cargo loaded vs. vessels arrived and exports vs. vessels arrived can be explained by the fact that the number of vessels arrive will also depend on imports, trans-shipments and re-exports apart from cargo loaded or exports.

**Table III: Results and Findings: Sri Lankan Exports Derive a Demand for Shipping**

The regression equation is					
cargo loaded = 2742 + 0.0191 export					
Predictor	Coef	SE Coef	T	P	
Constant	2741.8	437.6	6.27	0.000	
export	0.0190725	0.0008284	23.02	<b>0.000</b>	
S = 1336.92    R-Sq = 95.8%    R-Sq(adj) = 95.7%					
Analysis of Variance					
Source	DF	SS	MS	F	P
Regression	1	947373739	947373739	530.04	0.000
Residual Error	23	41109263	1787359		
Total	24	988483003			

Table III, a regression analysis is carried out to check the relationship between the amounts of cargo loaded to ships arrived at Sri Lankan ports and the Total value of Sri Lankan exports using annual data from 1987 to 2011.

If there is cargo to be loaded at a certain port, ships will call that port for business. Thus, availability of cargo creates a demand for shipping services. If it can be proved that the availability of cargo depends on exports, the hypothesis, Sri

Lankan Exports Derive a Demand for Shipping Services can be proven valid.

Above results show a linear relationship between the amount of cargo loaded and the value of exports. R-square value of 95.8% suggests a strong dependency of the amount of cargo loaded upon the value of exports; substantially supporting cargo loaded does depend on exports. Thus, the null hypothesis can conveniently be not accepted.

**Table IV: Vector Auto regression Estimates for Variables**

Vector Autoregression Estimates  
Date: 04/30/13 Time: 13:45  
Sample (adjusted): 3 25  
Included observations: 23 after adjustments  
Standard errors in ( ) & t-statistics in [ ]

	CARGO_LOA DED	EXPORT	VESSELS_AR RIVED
CARGO_LOADED(-1)	0.641306 (0.31313) [ 2.04806]	8.722872 (13.9636) [ 0.62469]	-0.047471 (0.08396) [-0.56543]
CARGO_LOADED(-2)	0.395868 (0.43190) [ 0.91657]	2.086358 (19.2601) [ 0.10833]	0.020734 (0.11580) [ 0.17905]
EXPORT(-1)	-0.001902 (0.00806) [-0.23580]	0.923035 (0.35960) [ 2.56684]	0.003338 (0.00216) [ <b>1.54392</b> ]
EXPORT(-2)	0.005412 (0.00932) [ 0.58064]	-0.016179 (0.41568) [-0.03892]	-0.002814 (0.00250) [-1.12594]
VESSELS_ARRIVED(-1)	0.712211 (0.92002) [ 0.77413]	-17.13061 (41.0273) [-0.41754]	0.727592 (0.24668) [ <b>2.94959</b> ]
VESSELS_ARRIVED(-2)	-1.050521 (0.96027) [-1.09398]	2.657624 (42.8222) [ 0.06206]	-0.055372 (0.25747) [-0.21506]
C	1011.999 (2108.16) [ 0.48004]	33534.43 (94011.1) [ 0.35671]	1356.104 (565.240) [ <b>2.39917</b> ]
R-squared	0.973269	0.979545	0.724426
Adj. R-squared	0.963245	0.971875	0.621086
Sum sq. resids	23658696	4.70E+10	1700778.
S.E. equation	1216.005	54226.34	326.0347

F-statistic	97.09182	127.7017	7.010106
Log likelihood	-191.8387	-279.1834	-161.5633
Akaike AIC	17.29032	24.88551	14.65768
Schwarz SC	17.63590	25.23110	15.00326
Mean dependent	11316.13	450692.3	4090.348
S.D. dependent	6342.707	323340.9	529.6554
<hr/>			
Determinant resid covariance (dof adj.)	2.51E+20		
Determinant resid covariance	8.44E+19		
Log likelihood	-625.5530		
Akaike information criterion	56.22200		
Schwarz criterion	57.25875		

Final multivariate model of forecasting shipping demand with the use of export:

#### IX. CONCLUSION

Analyses of data resulted in a forecasting model as expected. The developed final forecasting model can forecast the expected number of vessels that will arrive at Sri Lankan ports using the value of exports, amount of cargo loaded and number of vessels arrived during the past two years. Even though it would have been more meaningful to have a model to forecast the amount of cargo to be loaded in order to interpret demand for shipping better, the results of vector auto regression estimates indicated that such a model would be reliable.

To check the level of accuracy of the model, it was used to calculate the number of vessels arrived from 2002 to 2011 and compared with the actual values. The comparison is shown in table V. The percentage error of the forecasted values has varied from 6.91 per cent to 0.04 per cent. The average percentage error in forecasted values is 2.32 per cent. If only the two years of 2010 and 2011 were considered. The last two years in the studied time series, the average percentage error of forecasting is 0.7 per cent.

**Table V: Checking the Accuracy of Forecasting Model**

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
<b>Vessels Arrived</b>	4062	4,032	3,883	4,139	4469	4710	4814	4456	4067	4323	NA
<b>Forecasted value of vessels arrived</b>	4043	4118	4151	4167	4262	4505	4825	4562	4068	4264	4727
<b>Error</b>	19	-86	-268	-28	207	205	-11	-106	-1	59	NA
<b>Percentage of errors</b>	0.47	2.14	6.91	0.68	4.63	4.34	0.22	2.39	0.04	1.35	NA

The final conclusion of the study is that the two hypotheses that were tested are valid. The first hypothesis was proven to be valid and there the results of regression analysis suggested a strong straight line relationship between the value of exports and the amount of cargo loaded. The second hypothesis was proven valid and the final output was a model which can forecast the demand for shipping in terms of number of expected ship arrivals. Much better model would have been a one that can forecast the amount of cargo to be loaded. The vector auto regression analysis indicated that such a model would be significantly accurate.

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# Socio-cultural Context and Sexual Health Risks of Men who have Sex with Men (MSM) and their Female Partners in Gujarat, India

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**Abstract-** After more than two decades of programming and activism aimed at prevention and control of the sexual transmission of HIV, the HIV pandemic continues to grow worldwide. Despite giving sexuality a prominent position in responses to the epidemic, there exist limited context specific understandings of sex health risks of Men who have Sex with Men (MSM) and their female partners of socio-cultural context. This paper discusses socio-cultural determinant of risk behaviors of MSM and their female partners of Targeted Intervention in Vadodara city, India. Such an improved understanding of the sexuality and sexual health risks of MSM is crucial for creating a scientific reference base for designing effective behavior change strategies in targeted interventions (TI).

**Index Terms-** Sexuality and sexual health risks of men who have sex with men, female partners of MSM, targeted interventions (TI)

## I. INTRODUCTION

In Indian society, having sexual relationships with people of the same-sex is considered abnormal. Homosexual behaviors are seen in society as immoral, dirty, and unnatural. As a result, these behaviors are secretly practiced without adequate knowledge about safe sexual practices; hence, Men who have sex with men (MSM) tend to be more vulnerable to sexually transmitted infections (STIs) and host of psychiatric morbidities. MSM population constitute as one of the core groups (such as injecting drug users-IDUs and female sex workers-FSWs) for HIV prevention targeted interventions in India. According to 2009-2010 Annual Report of National AIDS Control Organization<sup>6</sup>, HIV prevalence among MSM population is 7.3 percent, which is second highest HIV prevalence among core groups as HIV prevalence among IDUs is 9.1 9 percent while FSWs is 4.94 percent [1]. Various researches on risk behaviors of MSM population have enhanced HIV prevention interventions across the country. However, there is scarcity of adequate scientific and programmatic researches on socio-cultural determinants of risk behaviors of MSM population as well as their female partners in targeted interventions (TIs).

Lack of refined understanding on invisible socio-cultural determinants that put MSM population as well as their female partners at higher risk of HIV transmission essentially precludes health professionals from receiving adequate and scientific understanding on the topic. Familiarity of invisible socio-cultural

determinants may provide reference to health professionals' to design appropriate strategies and to strengthen effective implementation of TIs in the country. The objective of the present study was to understand socio-cultural determinants of risk behaviors of MSM and their female partners.

## II. METHODS

This study was conducted using qualitative research method in the Vadodara city, which is also known as Baroda in the Gujarat State, India. Qualitative research methodology was applied for the study. Total 38 self-identified homosexual and bisexual men were interviewed using semi-structured interviews [2]. Twenty respondents, who were open about their sexuality and availed health services of Lakshya Trust, were purposively selected for the study while eighteen respondents who were closeted and not open to others yet accept their sexuality were recruited using snowball techniques. Since there exist no institutional review board (IRB) in India for self-financed social science researches, approval for the study was taken from the community members of the organization. Further, all respondents were informed about the study objectives, procedures, possible risks, benefits and their verbal and written informed consent was taken before an interview. Respondents' participation was primarily voluntary and they were not paid any incentives. Respondents were interviewed, face-to-face, at their convenient time, at counseling centre, drop-in-centre (DIC) of the community-based organization, Lakshya Trust, and/or respondents' home. All interviews were conducted in the vernacular language Gujarati based on semi-structured interview protocol. Interviews ranged in length from one to two hours. Interview protocol was initially developed in English and was translated and back-translated into Gujarati language by authors. Respondents were asked questions from predefined themes such as experiences of being different from others, awareness about proclivity toward same-sex, development of sexual identity, same sex sexual activities and uptake of HIV prevention activities and so. As interviews progressed, new themes such as strategies to meet heterosexual norm, disclosure of sexual identity and sexual activities, motivations for disclosure and non-disclosure of sexual identity and sexual activities were emerged and added in the interview protocol. Some respondents were followed up when some information was missing or further clarification was needed on the topic. After the data collection, the interview texts were transcribed and translated into English

by authors. Data was organized into categories that were emerged from the interview texts [3]. Data was then, coded using thematic content analysis [4]. In order to maintain trustworthiness of the study, coding and analysis were shared with two external experts and incorporated their feedback.

### III. RESULTS

This section presents the demographic profile of the respondents and socio-cultural determinants of health risks.

#### 3.1. Demographic Profile of Respondents

Amongst 38 men, 13 were self-identified themselves as “Koti,” (feminized men, usually sexually receptive partners), 9 identified as “double-decker,” 7 “bisexual,” 6 respondents were those men who accepted themselves as “ghadiya,” (masculine, usually active partners) and 3 were “gay.” Table 1 represents demographic profile of respondents.

##### 3.1.1. Education.

From the total sample, 15 respondents were ranged between 18-27 years of age, 11 were between 28-37, and 8 were ranged between 38-47, and rest 4 ranged between 48-57 years of age. Majority of respondents, 27, were educated upto 10<sup>th</sup> year of schooling and then dropped out, 8 respondents had completed under-graduate studies (12 years of schooling plus 3 years of college education) and 3 respondents were illiterate.

##### 3.1.2. Occupation.

More than a quarter, 12, respondents were engaged in daily wage labor. Almost one fourth of the total sample, 9, were working in companies; municipal corporations; and non-governmental organization while 7 respondents were doing small business such as photography, catering business, vegetable vendor, food stall and tea stall. Other 5 respondents were students. Total 5 respondents were unemployed at the time of interviews. From the total sample explained above, 4 respondents (three unemployed men and *one* daily laborer) were engaged in sex work as a source of income but did not identify themselves as sex workers.

##### 3.1.3. Marital Status.

Total 22 respondents were heterosexually married while 2 respondents were cohabitating with their male partners and reported having estranged relations with their respective families, as their families did not accept these cohabitations. Total 14 respondents were not married at the time of the study. India has a strong traditional “joint family,” (a system where multi generations of family live together), which is quite evident from the data as 33 respondents were living with their joint family, rests 5 were staying in nuclear family.

#### 3.2. Socio-cultural Determinants for Health Risks

The study revealed socio-cultural determinants of health risks such as sexual labels and identities, disclosure of sexual identities, sexual practices and issues related to female partners of MSM.

##### 3.2.1. Sexual labels and identities.

MSM population is diverse in labelling their sexual identities, roles with respect to their sexual behaviors. Some identify themselves with the modern ‘gay,’ who performs as active (sexually insertive) as well as passive (sexually receptive) partner or ‘bisexual,’ who are sexually active with men as well as women; interestingly some bisexually identified men closely identified themselves with women and others identified as “Koti” who are feminized men, who strongly identify themselves with women and are usually sexually receptive partner. Some homosexual men labelled themselves with “Double Deckers (DD),” those are not necessarily feminized men but shift their sexual role as active and passive partners— sexually insertive and receptive. Men who are masculine and usually sexually insertive are labeled as Ghadiya by Koti and DD. However, these men started identified themselves as Ghadiya. Many men identified them with MSM. These indigenous terms such as Ghadiya, MSM and DD, are labels, however, some men adopted them as identities based on sexual roles associated with it. There are some men indulge in homosexual activities and identify themselves with any of above sexual identities but do not disclose it to anyone and remain closeted.

##### 3.2.2. Disclosure of sexual identities.

Based on disclosure status of respondent’s sexuality, two categories were emerged: 1) Open MSM –who have disclosed their sexual identity and practices to Peer Educators (PEs) of the organization and other community members and 2) Closeted MSM – who have not yet disclosed their sexual identity and practices to anyone except few close MSM friends. Open MSM were twenty while closeted MSM were eighteen. Out of twenty open MSM, 9 were married while 13 closeted MSM were married. Open MSM attributed disclosure of their sexuality as positive aspect. Lakshya Trust was considered as catalyst to provide knowledge about sexuality, and HIV prevention.

In contrary to open MSM, closeted MSM did not disclose their sexuality to protect their heterosexual status in the family and community. They expressed that any kind of associationship with the Lakshya Trust or its team was threat to their secret homosexual identity and practices as the organization was very popular for working with MSM population in the Vadodara City. One respondent mentioned during an interview, *“I am staying with my wife, children and parents. They don’t know about me. Lakshya Trust is very well-known organization working with MSM. If I meet any member, it is obvious that people might think I am part of MSM...”* Another said, *“...Peer Educators of Lakshya Trust behave feminine and claps on the road, which considered cheap [by community members and society at large]. If I talk with them, people [neighbors and any known people] might think I am also one of them. Therefore, it is better to keep distance with them...”* While first author asked, “What might happen if people think that you are MSM or part of the organization?” Common response was defamation of societal prestige as a real man, which is clear from following remarks of respondents.

Real man is one who is manly, strong and protects family...men acting as neither women neither considered men nor women, rather considered “hijra.” There is no place for “hijra” in the society. They have their own society.

One respondent replied, *"I am not prepared to face such situation. It will defame my status in the society and I won't be able show my face to my wife and children."* The organization's popularity and fear of disclosure motivated many MSM not to avail and access HIV prevention services, which further put them at risk.

### 3.2.3. Sexual Practices.

Across both groups, each Koti, DD and gay had a lover or lovers with whom they are romantically committed and sexually active and at-least one regular partner that they are emotionally attached to and have regular sexual relations with them. Bisexually identified men, MSM identified men and Ghadiyas too reported to have multiple male partners primarily *Koti, DD* as well as female partners such as girlfriends, sex workers and/or wives. Average weekly same-sex relations among Koti & DDs was 9 while average weekly same-sex relations among Ghadiya, Bisexual and MSM were 5 and their average weekly heterosexual relations were 3.

Among both groups, anal sex was nearly universal; only 3 men had practiced oral-penile sex (that too without a condom!) In most cases, anal sex was followed by oral-penile sex. Oral-penile sex was always unprotected as one respondent mentioned, *"How can taste ice-cream with plastic cover on it? I do not like my partner use condom during oral sex. We both don't get taste of skin while condom is on."*

Closeted MSM were reported to irregular use of condoms. Primary reason for non-use of condom was attributed to faith in the partner, partner's insistence on non-use of condom, exchange of money or gift for unprotected sex, alcohol use before sex, unavailability of condoms, and inability to use condom in public places like park, beach, cinema, public toilets or open grounds. While open MSM reported irregular condom use with wives, (homosexual) lovers and regular partners; however, they reported regular condom use during anal sex with strangers (male partners) and female sex workers. Anal sex usually followed by oral sex and no one reported condom use during oral sex. Common reasons assigned to non-use of condom were faith in the partner, partner's insistence on non-use of condom. Both open and closeted MSM had different sexual health practices.

### 3.2.4. Female partners of MSM.

Bisexual relationships were also common among MSM population as most MSM were heterosexually married. Koti reported to have exclusive male partners; however, most Koti were married heterosexually and therefore, had active heterosexual life. Ghadiya, MSM and bisexually identified men had multiple male partners and had female partners such as girlfriends and/or female sex workers.

Majority respondents, *twenty nine*, confirmed to have sexual relationships with women either as a married partner or with girlfriends, or female sex workers. Only *seven Koti* and *two* gay identified men expressed to have only men as their sexual partners and never had vaginal sex in their lives. While sexual relationship with women, vaginal sex was common; however, *three* respondents reported to have oral-penile sex while *fives* reported to have anal sex with women. Further, condoms were not used while oral-penile and anal sex with women. This evidence highlighted the sexual health risks. Targeted

interventions do not provide specific message to prevent sexual risks during anal sex with women and wives. Beliefs about condom use resulted into risk behaviours. Very few, *three*, married men were using condom during vaginal sex for family planning; rest were not using condom with their wives due to primarily three reasons. First reason was sterilization-*four* wives underwent sterilization after desired child; second reason was planning of a baby and third reason was to maintain faith in wives and create safe space to hide multiple partner sexual activities with men as well as women outside marriage. These reasons challenge outcomes of previous studies [5], [6] and established that the use of protection among married MSM was minimal. In addition, the study revealed that condoms were also not used with lovers and their regular partners among both groups. It depicts changing nature of sexual practices and justifications for risky practices.

### 3.3. Knowledge about HIV/AIDS and Access to Sexual Health Prevention Services

All MSM who were open, 20, knew the meaning of STIs, HIV/AIDS and strategies to protect themselves from STIs; however, sexual health services such as treatment of STIs, health check-ups, free condoms, and HIV counseling offered through targeted interventions were availed regularly by only 11 MSM. Primary reasons for not availing services were service timings, fear of disclosure of their identity and attitudes by service providers.

Among closeted MSM, many misconceptions around condom use, STIs and HIV existed. For instance, one respondent, who was closeted, shared, *"I use two condoms because one condom is not safe...sometimes it break off."* One respondent (*Koti*) said, *"When I have boils on penis, I wash it with water boiled in neem leaves."* Another respondent mentioned that HIV can be spread while staying with HIV positive people. Closeted MSM had not availed sexual health services, despite some of them knowing about sexual health services, due to fear of unexpected disclosure of their sexual identity and sexual practices. In general, across both groups, MSM had reported various common misconceptions such as, alcohol consumption before sex gives more power and enhances pleasure; anal sex is not high-risk behavior; masturbation weakens sexual power and lead to impotency; homosexual men have excessive sexual drive than others; and sexual acts between men is masti or khel (fun or play).

Many respondents expressed satisfaction from a sexual act without condom use. One respondent mentioned during an in-depth interview, *"...I feel satisfied only when my partner ejaculates in my anus and feel the semen in my anus."* Another expressed, during the focus group interview, *"...condom is like a plastic cover on ice cream. You cannot eat and taste an ice cream with a plastic cover on it. Similarly, when penis covered with condom, we do not get taste or feel the penis skin during oral sex and its sensation during anal sex."* Belief that sex is only pleasurable without condom can put MSM at considerable risk of transmission of STIs including HIV and chances of transmitting STIs to their female partners.

#### IV. DISCUSSION

##### 4.1. Open Vs. Closeted MSM

Men, who were closeted, had not availed sexual health services, as they feared unexpected disclosure of their sexual identity and sexual practices. They reported that they avail condoms from peer educators of the organization and from condom outlets. It was also evident from the data that closeted MSM had high frequency of new partners and unprotected sex while the frequency of sexual activities with lover/s, regular partners and wives was higher among those MSM who were disclosed their sexual identity and availed HIV prevention services.

##### 4.2. Sexual labeling and identity

Research has also shown that Indian men often do not evaluate their "self" in terms of sexuality. For example, number of recent studies have discussed that the context of sexual interactions between men as "Musti" (Fun) (See, [7] and [8]). This research revealed that sexual behaviors are important determinant for deciding one's homosexual behaviors. It disproves what Alderson (2003) mentioned that sexual behavior is least important in deciding up on one's sexual orientation<sup>y</sup> [9]. Koti, DD, Gahdiya are essentially performance based labels to their roles, later are adopted as identities in given socio-cultural context. Further, many men identified themselves with "Ghadiya," who are masculine and usually active partner. This particularly disproves the notion presented by Venkatesan and colleagues in 2002 that "Ghadiya," "Panthi," "Parikh," or "Giriya," are labels used by Koti for other men with masculine traits and not necessarily "identities" [10].

##### 4.3. Gender and well-being

Men who were effeminate and identified as Koti, were prone to indulge in high risk sexual behaviors as well as psychiatric morbidities due to gender roles and power dynamics. Koti being a receptive partner, they are more prone to STIs including HIV as well as stigma, discrimination and domestic violence. It is largely perceived femininity of many MSM as a performance based identity often becomes determinant of stigma, discrimination and domestic violence. Further, low socioeconomic condition paves the way for sex work. Need for money triggers indulgence into high-risk behaviors despite they are aware of such behaviors, for instance, they agree not to use of condom, if clients promise to give more money.

Institution of marriage provides safe social space and an opportunity to explore secretive homosexual and bisexual relationships safely. Usually unaccepted extra marital homosexual and bisexual relationships are accepted within popular culture. The term popular culture is interpreted by here as widely accepted cultural practices of groups, which are usually prohibited in the larger society, for example, going to sex worker or having extramarital affair is prohibited in the society; however, in popular culture going to sex worker or extramarital relationship by men is considered as normal, natural and one of the characteristic of masculinity. Further, married feminized men who are submissive in their homosexual relationship often face domestic violence such as beating, cheating, emotional blackmailing etc. Similarly these married feminized men exert

frustration to their wives. Such transference of domestic violence is very important human rights and social justice issue. Within this patriarchal social structure feminized men as well as women become recipient of social, sexual and mental health risks.

#### V. CONCLUSION

Present study highlighted socio-cultural determinants of health risks. The study established that not all MSM are at same risk. Sexual health risks vary among MSM population. Therefore, each MSM have varied health needs. It is clear that there are invisible socio-cultural structures that put MSM and their female partners at various health risks.

Misconceptions regarding HIV/AIDS, sexual practices among both open as well closeted MSM needs to be addressed through appropriate strategies. This study also highlighted the prevalence of bisexual behaviors among MSM, chunk of unreached MSM population and unavailability of HIV prevention services to female partners (FP) of MSM within TI framework. As a result, closeted MSM and FPs of MSM are not able to avail HIV prevention as well as care and support services.

Existing targeted interventions lack communication and counseling strategies to address unique socio-cultural issues of MSM. There is a need to make present targeted interventions responsive to the HIV prevention needs of MSM population by devising culturally sensitive strategies to reach out unreached MSM and designing appropriate policy to deliver HIV prevention services to female partners of MSM.

##### 5.1. Implications for Targeted Interventions

As many MSM are hidden and do not want to open up, mechanism must be developed to reach out unreached hidden MSM population. One feasible mechanism as emerged from the study was anonymous peer educators. These peer educators are from the hidden population or know few MSM who do not want to disclose their identities. However, this strategy is suggested to use as a entry point because it may become challenging in long run to address issues of accountability of outreach services to them, agenda to mainstream HIV prevention services and HIV prevention intervention as a whole. Counseling services need to be enhanced to address counseling needs of MSM population. All counselors should be trained to deliver mental health counseling and appropriate referrals. Peer counseling is another strategy can be introduced to immediately address issues of open as well as closeted MSM and their female partners at community level. There is an urgent need to provide HIV prevention services to female partners of MSM through existing targeted HIV prevention intervention framework. Female peer educator can be recruited to reach out female partners of MSM. Policy framework on the same need to be developed and should be incorporated in the National AIDS Control Program-IV (NACP-IV).

Communication strategy should be developed based on understanding of health risks within socio-cultural context. Communication strategies such as MSM (open and closeted MSM) as well as female partner centric IEC materials in local language to be developed urgently with appropriate graphics, short culturally sensitive messages, documentary film, case studies especially on condom use with wives, lovers and regular

partners; condom negotiation, living healthy life with HIV, regular HIV test and medical check-up needs. Also, other IEC strategies such as group educational sessions with MSM and female partners based on the analysis of their health risks, community events, community shows (awareness show by community members within community), public awareness shows by community members. Further, culturally tailored behavior change messages should be evolved through participatory approach actively involving MSM population in designing culturally tailored communication strategies. These communication strategies should be used during individual counseling, educational group sessions, and group counseling sessions to create awareness regarding healthy sexuality, sexual health, and mental health. Large-scale mixed-method research need to be conducted to build primary data on the topic, and validate concepts evolved in the study. Similar study with transgender population is also required.

### 5.2. Implications for advancement of counseling

Counseling is an important aspect in TI. However, programmatically counseling component is not viewed as strategic. Counseling, in targeted intervention merely reduced to activities of information sharing (about potential risks involved in risks activities, risk reduction alternatives, and available services). This study revealed that counseling does not address micro issues such as sexuality issues, for example, one's disclosure of sexual identities; non-use of condoms, power dynamics within homosexual relationships, mental health issues. These micro level issues need to be addressed carefully in TI. Counselors should gain deeper understanding of MSM population and their female partners, and their mental health needs and risk practices. Further, identifying potential community members to become community counselors and train them in counseling will be helpful strategy to reach out un-reached MSM population.

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### NOTES

National AIDS Control Organization (NACO) is an autonomous body established by the government of India, working on HIV prevention, control, and care and support.

Sexual orientation embraces physical, interpersonal, and intra-psychic factors. A person's sexual orientation can be assessed based on the sexual attraction, sexual behavior, sexual fantasies, and self-identification.

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**Table 1: Respondents profile**

Sub-groups of Respondents	Age Range					Marital Status				Education				Occupation					
	18 to 27	28 to 37	38 to 42	43 to 47	<b>Total</b>	Married	Unmarried	Cohabitation with same-sex partner	<b>Total</b>	Illiterate	Upto 10th	Graduation	<b>Total</b>	Daily labor	Service	Student	Small business	Unemployed	<b>Total</b>
Koti	3	5	3	2	<b>13</b>	9	2	2	<b>13</b>	2	10	1	<b>13</b>	8	1	2	0	2	<b>13</b>
Double Decker	4	3	2	0	<b>9</b>	5	4	0	<b>9</b>	1	8	0	<b>9</b>	1	1	3	2	2	<b>9</b>
Bisexual	2	1	2	2	<b>7</b>	6	1	0	<b>7</b>	0	6	1	<b>7</b>	2	4	0	1	0	<b>7</b>
Ghadiya	4	1	1	0	<b>6</b>	1	5	0	<b>6</b>	0	2	4	<b>6</b>	1	1	2	1	1	<b>6</b>
Gay	2	1	0	0	<b>3</b>	1	2	0	<b>3</b>	0	1	2	<b>3</b>	0	2	0	1	0	<b>3</b>
<b>Total</b>	<b>15</b>	<b>11</b>	<b>8</b>	<b>4</b>	<b>38</b>	<b>22</b>	<b>14</b>	<b>2</b>	<b>38</b>	<b>3</b>	<b>27</b>	<b>8</b>	<b>38</b>	<b>12</b>	<b>9</b>	<b>7</b>	<b>5</b>	<b>5</b>	<b>38</b>

# IDMA Technology and Comparison survey of Interleavers

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**ABSTRACT** : The recently proposed interleave-division multiple access (IDMA) system, a multiuser scheme where users are separated by unique interleaver sequences on the horizon of wireless communication world. The receiver involves a chip-by-chip iterative multi-user detection that uses low complexity turbo-like iterative receivers. Its complexity increases with the number of users, the number of iterations and the number of paths in the case of multipath channels. In IDMA the separation of the information of different users is achieved by interleaving. Criteria for design for a good interleaver IDMA include requirement low memory, low correlation among interleave, low complexity, low overhead synchronization between user and base station. In this paper, we propose a novel interleaver based on prime numbers for generation of user specific interleavers to remove the problem of high consumption of bandwidth. The simulation results demonstrate the optimal performance of prime interleaver (PI) apart from other merits in comparison to random and other interleavers.

**Index Terms**- IDMA scheme, Random Interleaver (RI), Master Random Interleaver (MRI), Prime interleaver (PI), TBI

## I. INTRODUCTION

In wireless communication, A new multiple access scheme called interleave-division multiple access (IDMA) was recently proposed. In IDMA scheme, the users are allotted with user-specific interleaver in place of PN-sequences as allotted. A multiple access scheme IDMA, in which interleaver are used as the only means for user separation. A low-cost iterative chip-by-chip multi-user detection algorithm is described with complexity independent of the user number and increasing linearly with the number of path. In IDMA, FEC encoding and spreading may be done jointly by a single low-rate encoder, subsequently denoted by ENC. The spreader has no special task. Due to interleaving, the code is nonlinear. Accordingly, with IDMA high bandwidth/power efficiency can be achieved. Without loss of generality, we assume a superposition of binary (pseudo-)random sequences in the following. IDMA offers a number of features: rate/power adaptation, MIMO According to Shannon, typical sequences are generated and superimposed, fast fading, frequency-selective fading, complexity is linear with respect to the number of layers, number of chips/number of users, number of receiver antennas, number of channel taps, and the number of iterations, delivers reliable Soft-output information, Resource allocation, Low delay.

If random interleaver is employed for the purpose of user separation, then lot of memory space is required at the transmitter and receiver ends. In addition to it, the base station (BS) has to use a considerable amount of memory to store user-specific interleaver, which may cause serious concern, in case of large user count.

Attractive features such as dynamic channel sharing, mitigation of cross-cell interference, asynchronous transmission, low receiver cost, de-centralized (i.e., asynchronous) control, simple treatment of ISI, cross-cell interference mitigation, diversity against fading, high power efficiency, high spectral efficiency, flexible rate adaptation.

In an interleaver known as power interleaver or master random interleaver (MRI), has been proposed which alleviates concerns of extra bandwidth consumption and memory requirement at transmitter and receiver ends. In this scheme, user specific interleaver are generated with the help of one randomly selected master interleaver known as master random interleaver (MRI), for available user count at the transmission and receiver ends. During the transmission, only MRI and the user count need to be transmitted.

The Prime Interleaver is basically aimed to minimize the bandwidth and memory requirement that occur in other available interleaver with BER performance comparable to random interleaver.

In this section, the performance of proposed tree based interleaver (TBI) will be examined in comparison to that of random interleaver (RI) and master random interleaver (MRI).

## II. IDMA SCHEME

At the IDMA transmitter, shown in upper part of the Figure 1, considering  $K$  simultaneous users, input data sequence are  $d_k = [d_k(1), d_k(2), d_k(3), \dots, d_k(i), d_k(i+1), \dots, d_k(N)]$  of user  $k$  is encoded into chips  $c_k = [c_k(1), c_k(2), c_k(3), \dots, c_k(j), (c_k+1), \dots, c_k(J)]$  based on low rate code  $C$ , where  $N$  is sequence length and  $J$  is the Chip length.

In transmitter, encoder-spreader block, the code  $C$  is constructed by forward error correction (FEC) code and repetition code of length- $sl$ . The FEC code used here is Memory-2 Rate-1/2 Convolution coder. We may call the elements in the chips  $c_k$ , are interleaved by a

chip level interleaver ' $\pi_k$ ', producing a transmitted chip sequence  $x_k = [x_k(1), x_k(2), x_k(3), \dots, x_k(j), \dots, x_k(J)]^T$ . After transmitting through the channel, the bits are seen at the receiver side as  $r = [r_k(1), \dots, r_k(j), \dots, r_k(J)]^T$ . The channel opted for the simulations, is additive white Gaussian noise (AWGN) channel.

The receiver consists of a signal estimator block (SEB) and a bank of  $K$  single user a *posteriori* probability (APP) decoders (DECs), operating in an iteratively. The modulation technique used for simulation is binary phase shift keying (BPSK) signaling. The outputs of the signal estimator block (SEB) and decoders (DECs) are extrinsic log-likelihood ratios (LLRs) about  $\{x_k\}$  defined as

$$e(x_k(j)) = \log\left(\frac{p(r/x_k(j) = +1)}{p(r/x_k(j) = -1)}\right), \forall k, j. \quad (1)$$

Where  $r$  denotes the received signal and  $p(r/x_k(j) = +1)$  characterized by conditional Gaussian probability density function. These LLRs are further distinguished by the subscripts i.e.  $e_{SEB}(x_k(j))$  and  $e_{DEC}(x_k(j))$ , depending upon whether they are generated by SEB or DECOD-DESPREADERS.

In receiver section, after chip matched filtering, the  $K$  users are first encoded by an encoder (ENC) based on a FEC code and then interleaved and transmitted over a Gaussian multiple access channel (MAC). The received signal can be written as

$$r(j) = \sum_{k=1}^K h_k x_k(j) + n(j), \quad (2)$$

$j = 1, 2 \dots j$

Where

$x_k(j) \in \{+1, -1\}$  is the  $j^{th}$  chip transmitted by user- $k$ ,  $h_k$  is the channel coefficient for  $k^{th}$  user,

$\{n(j)\}$  are the samples of an additive white Gaussian noise (AWGN) process with zero-mean and variance  $\sigma^2 = N_0/2$

Due to the use random interleavers  $\{\pi_k\}$ , the SEB operation can be carried out in a chip-by-chip manner, with only one sample  $r(j)$  used at a time. So, rewriting (2) as

$$r(j) = h_k x_k(j) + \zeta_k(j), \quad (3)$$

where  $\zeta_k(j) = r(j) - h_k x_k(j)$  (4)

and

$$\zeta_k(j) = \sum_{k' \neq k} h_{k'} x_{k'}(j) + n(j) \quad (5)$$

where  $\zeta_k(j)$  is the distortion (including interference-plus-noise) in  $r(j)$  with respect to user- $k$ . From the central limit theorem,  $\zeta_k(j)$  can be approximated as a Gaussian variable.

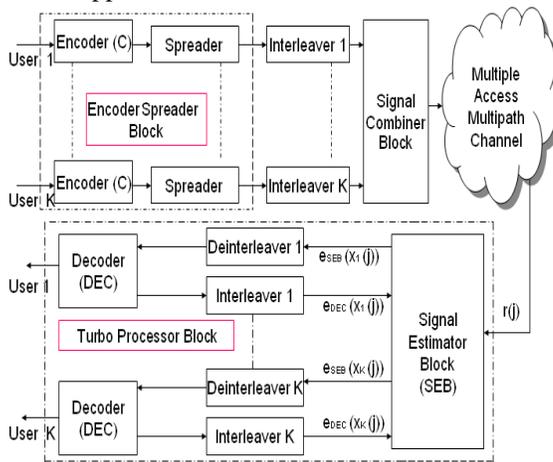


Figure 7. Transmitter and receiver structures for IDMA system

The CBC algorithm in single path detection

The brief description of CBC algorithm used in IDMA. The operations of ESEB and APP decoding are carried out user-by-user. The outputs of the ESEB as extrinsic log-likelihood ratios (LLRs) is given as,

$$e_{SEB}(x_k(j)) = 2h_k \cdot \frac{r(j) - E(r(j)) + h_k E(x_k(j))}{Var(r_j) - |h_k|^2 Var(x_k(j))} \quad (6)$$

The LLR output of SDEC, for  $S$  samples, is given as,

$$e_{SDES}(x_k(\pi(j))) = \sum_{j=1}^S e_{SEB}(x_k(\pi(j))) \quad (7)$$

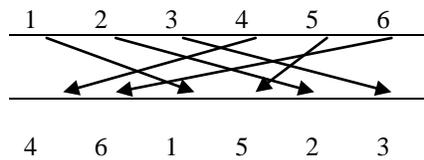
$j = 1, 2, \dots, S$

Now, these steps are repeated depending on no. of iterations and users.

### III. RANDOM INTERLEAVER (RI)

In random interleaver, the base station (BS) has to use a considerable amount of memory to store the random patterns of interleaver which may cause serious concern of storage when the number of users is large. Also, during the initial link of setting-up phase, there should be messages assign between the BS and mobile stations (MS) to inform each other about their respective interleaver. Random interleaver scrambles the data of different users with different pattern. Patterns of scrambling the data of users are generated arbitrarily. Because of the scrambling of data, burst error of the channel is randomized at the receiver side. The user specific Random Interleaver rearranges the elements of its input vector using a random permutation [Ping 2006]. The incoming data is rearranged using a series of generated permuter indices. A permuter is essentially a device that generates pseudo-random permutation of given memory addresses. The data is arranged according to the pseudo-random order of memory addresses. If random interleaver is employed for the purpose of user separation, then lot of memory space will be required at the transmitter and receiver ends for the purpose of their storage. Also, considerable amount of bandwidth will be consumed for transmission of all these interleaver as well as computational complexity will be increase at receiver ends. After randomization of the burst error which has rearranged the whole block of the data the latter can now be easily detected and corrected. Spreading is the important characteristic of random interleaver.

Input sequence



Output sequence

Figure 2. Random interleaver of data

Random Interleavers are generated independently and randomly. Random interleavers for IDMA need to satisfy two design criteria.

- 1) They are easy to specify and generate, i.e., the transmitter and receiver can send a small number of bits between each other in order to agree upon an interleaver, and then generate it.
- 2) The interleaver does not “collide”.

The collision among interleaver is interpreted in the form of the uncorrelation among the interleaver. If the interleaver is not randomly generated, the system performance degrades considerably and the MUD is unable to resolve MAI problem at the receiver resulting in higher values of Bit Error Ratio (BER). On the other hand if the interleaving patterns are generated more and more random, the MUD resolves the MAI problem more quickly and better values of BER are obtained for the same parameters.

### IV. MASTER RANDOM INTERLEAVER (MRI)

In master random interleaver or ‘power- interleaver’ method, a master interleaver pattern  $\varphi$  is assigned, each user has a user specific interleaver  $\{\pi_k\}$  having length equal to chip length ‘J’. Then  $K$  ( $K$  is an integer) interleavers can be generated using  $\pi_k = \varphi_k$ . Here,  $\varphi_k$  ( $c$ ) is,

$$\begin{aligned} \varphi_1(c) &= \varphi(c) \\ \varphi_2(c) &= \varphi(\varphi(c)) \\ \varphi_3(c) &= (\varphi(\varphi(\varphi(c)))) \end{aligned}$$

By this rule, every interleaver is a ‘power’ of  $\varphi$ .

The principle for this method is that if  $\varphi$  is an ‘ideal’ random permutation, so are all  $\{\varphi_k\}$ , and these permutations are also approximately independent from each other. Now BS assigns the power index  $k$  to each user  $k$ , and then  $\varphi_k$  will be generated at the MS for user  $k$  accordingly. This method of generating patterns increases the performance in the term information that has to be sending by the base station to the mobile station

This method not only reduces the amount of information exchange between Base Station (BS) and Mobile Stations (MS), but also greatly reduces the memory cost in comparison to random interleaver. If the intermediate variables are not stored, then for generating the interleaving sequence for the  $k^{\text{th}}$  user,  $(k-1)$  cycles are needed. Even if the intermediate values are stored, it is mentioned that a maximum of  $2(n-1)$  cycles are needed for generating the required interleaver, if  $2^{n-1} < k < 2^n$ , where  $n > 1$  is an integer.

V. TREE BASED INTERLEAVER (TBI)

The IDMA systems using power interleaver require high computational complexity for computation of interleavers at transmitter and receiver ends. In iterative IDMA systems, each user is assigned with its own user-specific random interleaver  $\{\pi_k\}$  having length equal to chip length 'J'. Hence, considerable amount of memory is required for storing the indices for these interleaver.. The tree based interleaver is basically aimed to minimize the computational complexity and memory requirement that occurs in power interleaver & random interleaver respectively

In case of generation mechanism of tree based interleaver, two master interleavers are chosen, randomly. Let  $\pi_1$  and  $\pi_2$  be the two randomly chosen interleavers. The combinations of these two interleavers in a particular fashion as shown in the figure (3.a) are used as interleaving masks for the users [8] the allocations of the interleaving masks follow the binary tree format. The interleaving masking diagram is shown in figure (3.a) for 14 users which may be enhanced for higher count of users. It is clearly shown through the figure (3.a) that, for obtaining the interleaving sequence related to 14<sup>th</sup> user, it needs only 2 cycles.

$$\pi_{14} = \pi_2(\pi_2(\pi_2)) \dots \dots \dots (8.a)$$

$$\pi_7 = \pi_1(\pi_1(\pi_1)) \dots \dots \dots (8.b)$$

$$\pi_{13} = \pi_1(\pi_2(\pi_2)) \dots \dots \dots (8.c)$$

The algorithm for generation of TBI tree is given below.

Step 1: Master interleaver  $\pi_1$  is randomly generated having the length of data block (data length  $\times$  spreader length).

Step 2: Master interleaver  $\pi_2$  is randomly generated having the length of data block (data length  $\times$  spreader length).

Step 3: According to user k, level (L) of Tree is determined. Hence, Number of users in that level =  $2^L$

Step 4: All the possible combinations ( $2^L$ ) of interleavers are generated as  $\pi_1(\pi_2), \pi_2(\pi_1) \dots$  and so on.

Step 5: According to the user k particular combination of Master interleaver i.e.  $\pi_1$  and  $\pi_2$ , is chosen and there after data is interleaved accordingly.

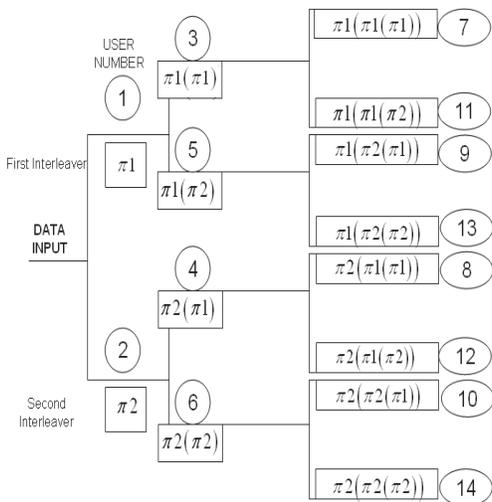


Figure 3. Interleaving mask allocation for the proposed Tree based interleaving scheme

VI. PRIME INTERLEAVER (PI)

The Prime Interleaver is basically aimed to minimize the bandwidth and memory requirement during transmission with lesser time, that occur in other available interleaver with BER performance comparable to random interleaver.

In generation of prime interleaver we have used the prime numbers as seed of interleaver. Here, user-specific seeds are assigned to different

users. For understanding the mechanism of prime interleaver, let us consider a case of interleaving

n bits with seed p. First, we consider a gallois field GF (n). Now, the bits are interleaved with a distance of seed over GF (n).

In case, if {1, 2, 3, 4, 5, 6, 7, 8..... n} are consecutive bits to be interleaved with seed p then location of bits after interleaving will be as follows:

- 1====> 1
- 2====> (1+p) mod n
- 3====> (1+2p) mod n
- 4====> (1+3p) mod n
- .
- .

$$n \rightarrow (1+(n-1)p) \bmod n$$

For Example if we have to interleave 8 bits such that {1, 2, 3, 4, 5, 6, 7, 8} and we wish to interleave these bits with seed 3 then the new location of bit will be as follows

- 1  $\rightarrow$  1
- 2  $\rightarrow (1+1*3) \bmod 8 \rightarrow 4$
- 3  $\rightarrow (1+2*3) \bmod 8 \rightarrow 7$
- 4  $\rightarrow (1+3*3) \bmod 8 \rightarrow 2$
- 5  $\rightarrow (1+4*3) \bmod 8 \rightarrow 5$
- 6  $\rightarrow (1+5*3) \bmod 8 \rightarrow 8$
- 7  $\rightarrow (1+6*3) \bmod 8 \rightarrow 3$
- 8  $\rightarrow (1+7*3) \bmod 8 \rightarrow 6$

Now, the new order of bits will be {1, 4, 7, 2, 5, 8, 3, and 6}.

The bandwidth required by the Prime Interleaver (PI) is smaller than other available interleaver as now only seed is to be transmitted, in addition to very small amount of memory required at the transmitter and receiver side.

For the simulation purpose, the data length is opted to be 512 bits while 16. The iteration at the receiver is chosen to be 15. The simulation has been performed for 100 users. The prime interleaving scheme reduces the computational complexity that occurs in master random interleaving scheme; however, it is higher to that of tree based interleaving scheme due computation involved for calculation of user specific interleaver.

### VII. COMPARISON ANALYSIS

In the simulation, we observe that the PI demonstrates superior performance in terms of memory requirement [Figure 9] with RI and in terms of computational complexity with MRI. In unequal power allocation technique, PI [figure7] and TBI [figure6] gives almost similar Bit Error Rate (BER) performance of all the interleavers that of the RI [figure4], MRI [figure5], based interleavers, MRI give in coded environment in IDMA system. Therefore, PI and TBI adopted replacing random interleaver in iterative IDMA systems. In master random interleaving scheme the computational complexity and transmitter and receiver end is quite high due to calculation of user-specific interleaving masks.

The memory required by TBI generation method is extremely less than that required for RI generation method and is independent of user count of TBI over RI. For the simulation purpose, the performance of RI, MRI, TBI, PI has been demonstrated in [8]. In figure 7, the performance of tree based interleaver is shown TBI with IDMA till 64 users receivers in rate 1/2 convolutionally code environment. The prime interleaving scheme reduces the computational complexity that occurs in master random interleaving scheme; however, it is higher to that of tree based interleaving scheme due computation involved for calculation of user specific interleavers

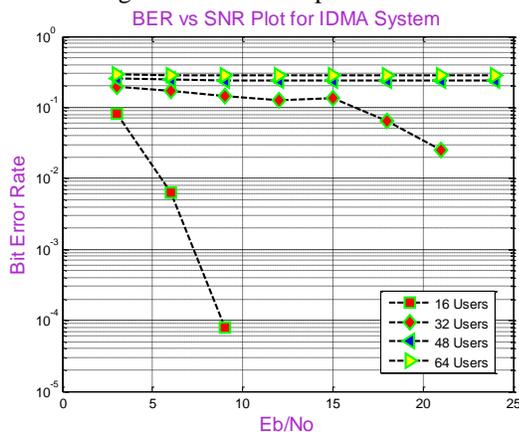


Figure 4. Random Interleaver

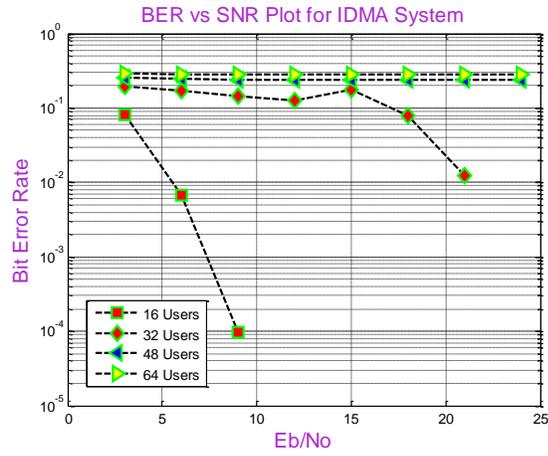
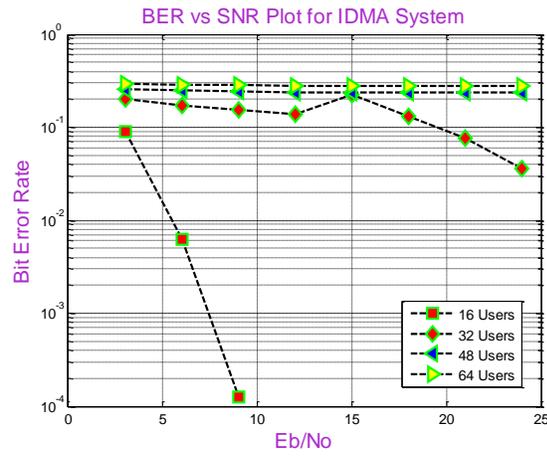


Figure 5. Master Random



Interleaver

Figure 6. Tree Based Interleaver

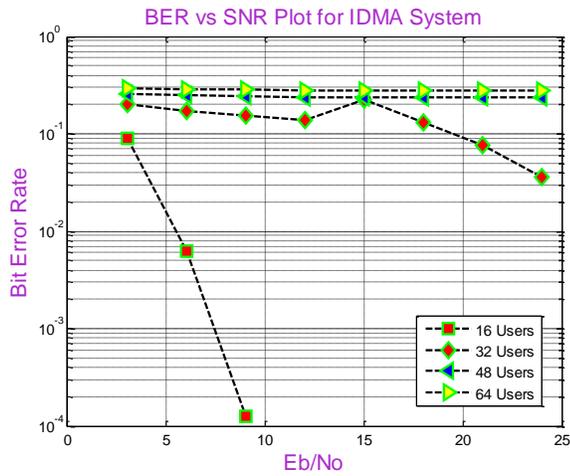


Figure 7. Prime Interleaver

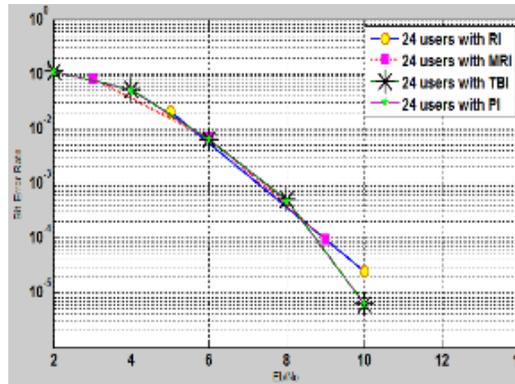


Figure 8. Comparison between RI, MRI, TBI and PI

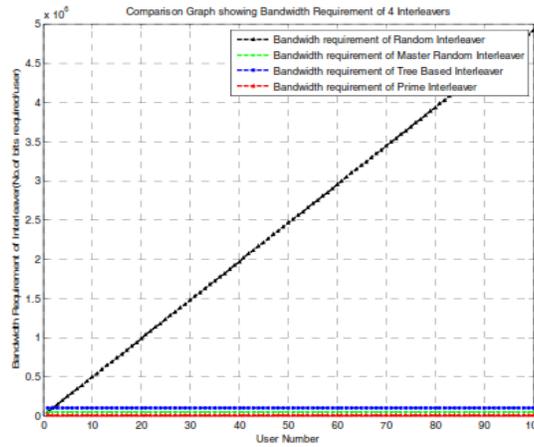


Figure 9: Comparison Graph of Bandwidth Requirement of various Interleavers

Table 1. Comparison Graph of Bandwidth Requirement for transmission of interleaving mask

User Count	RI Generation	TBI Generation	PI Generation
2	2	2	1
6	6	2	1
14	14	2	1
30	30	2	1
62	62	2	1
126	126	2	1

Table 2. Comparison on the Basis of Parameter

Parameter	RI	MRI	TBI	PI
Memory	High	Low	Low	Lowest

requirement				
Bandwidth requirement	$1.5 \times 10^6$	$0.01 \times 10^6$	$0.02 \times 10^6$	$0.0001 \times 10^6$
complexity	High	Very High	Low	Little high than TBI
BER for Eb/No=10(24 users)	$10^{-4}$	$10^{-4}$	$0.4 \times 10^{-4}$	$0.5 \times 10^{-4}$
BER(Coded) for Eb/No=10(24 users)	$0.6 \times 10^{-5}$	$0.6 \times 10^{-5}$	$0.4 \times 10^{-6}$	$0.4 \times 10^{-6}$
BER(UnCoded) for Eb/No=10(24 users)	$0.6 \times 10^{-4}$	$0.2 \times 10^{-4}$	$0.2 \times 10^{-5}$	$0.2 \times 10^{-5}$
Specific user cross correlation	Low	Low	High	High

### VIII. CONCLUSION

The computational complexity of PI and TBI is extremely less in comparison to MRI. The memory required by TBI generation method is extremely less than that required for RI generation method. The BER performance of all the interleaver including RI and TBI is almost similar. The bandwidth required by the PI is smaller than other available interleaver. The prime interleaving scheme reduces the computational complexity that occurs in master random interleaving scheme. Among all the comparisons discussed so far, the features of Tree Based Interleavers and Prime interleaver shows their suitability for the IDMA technology for fourth generation communication.

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# Environmental /Occupational Factors and Seasonality of Birth- Male Infertility

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**Abstract-** Reproductive failure or infertility may be due to several factors that are not limited to one sex. It remains a common problem causing significant psychological distress to those affected individuals and who are increasingly seeking medical advice. Male infertility means inability to induce conception in normal woman within a year. The etiological factors associated with male infertility are anatomical, developmental, seminal, hormonal, immunological and environmental factors. The paper was aimed to highlight the environmental factors and its association to male infertility and seasonality of birth and its influence. The data was collected from the 75 male patients referred with infertility for karyotyping and counseling. Their age ranged from 21 to 45 years. It is opined that certain occupations are preferentially associated with male infertility.

**Index Terms-** Environmental, occupational, Seasonal, male infertility

## I. INTRODUCTION

Infertility is defined as the failure of a couple to conceive after twelve months of regular intercourse without contraceptive [1]. Though a fairly high proportion of males suffer from impaired fertility the causes of this abnormality remains obscure in the vast majority. Many causes are attributed to male infertility that include genetic and environmental factors such as single gene, chromosomal, multifactorial, hormonal, infections, anatomical, environmental/occupational, immunological and idiopathic causes. In general, the environmental factors in male infertility are linked to occupational hazards and lifestyle. The suspected environmental factors are: infections (viruses, bacteria, toxins), exposure to radiation, food habits, seasonality, life style (working duration, stress/strain, smoking, alcohol), medications (ayurvedic, allopathy). There is association between infertility and occupational exposure to heat/ pesticides/ chemicals/ altered hormonal changes/ sedentary lifestyle/consumption of animal fats/ smoking/dietary changes has detrimental effect on sperm morphology and time to conception.[2,3]. Exogenous heat, pesticides/glycol ethers /printing/adhesives/ metals like lead, cadmium, mercury are known to have adverse effect on sperm production [4].

## II. MATERIAL AND METHODS

The study reports the gathered data from the consecutively referred 75 male patients with infertility to Division of Human

Genetics, St.John's Medical College, Bangalore, India for karyotyping and genetic counseling. The reasons for the referral were primary and secondary infertility, with seminal abnormalities like azoospermia, oligospermia, asthenospermia, varicocele and absence or poorly developed primary or secondary sexual characters. Their age ranged from 21 to 45 years. Clinical profile and other information regarding their occupation were gathered from the detailed proforma and the data was analyzed. It maybe noted that at the time of referral, patients consent was duly obtained.

## III. RESULTS

**Table I: Environmental/occupational factors/infertility**

Occupation	n-75	%
Business	12	16
Agriculture	13	17.3
Executive/employee/pvt company	11	14.6
Teachers/auditors/official	11	14.6
Doctors/health dept	05	6.6
Engineers/scientist	04	5.3
Workshop/turner/mechanic/technician	06	8
Goldsmith/laborer/garments/driver/police	08	10.6
Painter	01	1.3
Drugs: allopathy/ayurveda/homeopathy	04	5.3

Interpretation: Out of 75 probands, 12 were involved in business (16%). 13(17.3%) agriculturists, 11(14.6%) executives, 11 (14.6%) teachers/auditors/officials, 5(6.6%) doctors/health dept, 4(5.3%) engineers/scientists, 6(8%) in workshops as mechanics/technicians, 8(10.6%) goldsmith/laborers/garment factory and 1(1.3%) painter.

**Table:II Seasonality of birth/Infertility**

Season	Infertility(n-75)	%
Jan-Mar	12	16
Apr-June	17	22.6

July-Sep	6	8
Oct-Dec	6	8
Not known	34	45.3

Interpretation; out of 41 probands with infertility 17(22.6%) were born between April-June, 12(16%) during Jan-Mar, 6(8%) July-Sep and 6(8%) during Oct-Dec.

#### IV. DISCUSSION

In general the environmental factors in male infertility are linked to occupational factors and life style. The suspected environmental factors are : infections (viruses, bacteria, toxins), exposure to radiation, food habits, seasonality, life style (working duration, stress/strain, smoking, alcohol), medications (ayurvedic, allopathy etc). Exposure to radiation, heavy metals, occupational exposure to heat might cause damage to spermatogenesis. Chronic marijuana use, may cause endocrine abnormality with low levels of plasma testosterone. Agricultural chemicals /welding exposure have showed significant reduction in sperm motility and increased tail defects. It has also been reported welders had shown increased risk of seminal abnormalities. Drugs such as propranolol and guanethidine may affect sympathetic system by impairing erectile function. Pesticides/glycol ethers, printing/adhesives/ metals like lead, cadmium, mercury are also known to have adverse effect on sperm production. [2,3,5,6,7]. Sperms are normally produced at a temperature lower than the normal body temperature 37 °C. The testis is vulnerable to heat than any other organ of the body [8]. Precise thermoregulation of the testis is evidenced by the fact that even slight elevation in scrotal temperature is associated with infertility. Sedentary jobs sitting for longer durations and by virtue prolonged scrotal temperature may increase and cause infertility. Over the last decades the overall quality of semen has changed worldwide and one of the main causes for this may be presence of toxic agents in the environment. Environmental and occupational exposure to physical and chemical agents [2]. Exposure to metals like lead and cadmium, Nutritional deficiency and psychological stress were also reported to affect fertility in males. Life style factors as reported in literature play an important role in the causation of infertility.

In the present study, (Table -I) the incidence of infertility was observed in 16% businessmen and 14.6% executives. This may be because businessmen and executives have more psychological stress and strain. It is known that stress and strain cause infertility [9]. Agricultural workers especially those who are applying pesticides have a greater risk as they are directly exposed to the pesticides and other chemicals.

In the present study, 17.3% were agriculturists. Studies have reported the effects of pesticide exposure and chemicals on the reproductive performance of these workers and also studies have reported that occupational exposure to different chemical agents in the workers employed in various chemical plants, cement factory [3,8].

In the present study, 20% of cases included the mechanics and the technicians in workshops, goldsmiths/laborers/garment

factory workers/ painters, may have had exposure to toxic agents affecting normal spermatogenesis.

**Seasonality of Birth** (Table-II): seasonality has been defined as a consistent variation of rate with season over a period of some years. Many studies have been done about seasonal clustering of births. In Chromosomal abnormality only for Down and Klinefelter syndrome seasonal variation has been observed. But few studies have not observed seasonal clustering, may be due to low ascertainment of cases which obscure temporal change. Environmental factors as per season may influence the non-disjunction of chromosomes Harlap (1974) cited in [10]. In the present study most of the patient were born between April-June, summer season in India, probands may have been conceived in July/August/September, the border months between summer and autumn, since the sample size is less, further interpretation could not be done.

#### V. CONCLUSION

The data presented in the present article has shown the environmental factor as one of the aetiological factors in male infertility. Besides many other factors such as hormonal, anatomical/developmental, immunological factors might be involved in causation of infertility. Hence it is imperative to undertake extensive studies to delineate all the factors involved in infertility, so that necessary medical intervention programmes may be considered for the benefit of infertile couples particularly males.

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# Analysis of supply chain of Spices in India: A case study of Red chillies

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**Abstract-** India 'Land of spices' is the major producer and exporter of chillies. An efficient supply chain ensuring remunerative prices to the producers for their products and to deliver maximum satisfaction to the end consumers for the price they pay. Two major supply chains have been identified, Which reveals that supply chain II is more efficient than the supply chain I because more value goods are delivered to consumer from producer at low marketing costs. The study shows that farmers who bring good quality chillies to market prefer Supply chain-II to supply chain-I. But farmers who bring poor quality, discolored chillies, are preferring supply chain-I. Delay in payment after sale, problems in fare price evolution process, collection of excess commission and availability of loan through bank on produce important problems that farmers are facing in this market.

**Index Terms-** Supply Chain of Chillies, Marketing Spices, Price spread, Price discovery

## I. INTRODUCTION

India's Agro climatic conditions provide scope for cultivation of 63 different spices, making India the 'Land of spices'. India is the largest producer (76 lakh MT), consumer (73 lakh MT) and exporter (3.8 lakh MT) of spices in the world. India's share in world trade of spices is 3.8 lakhs MT i.e. 48%. The area under spices is 57 lakh hectares. In India the southern states grow spices like pepper, cloves and cardamom. Southern states of India together produce 30percent of cardamom and 25-30% pepper of the world. Gujarat and Rajasthan grow the spices like cumin, coriander, fennel and fenugreek. They alone produce 80 % and 90 % world production in respect of coriander and cumin. The states of Uttar Pradesh, Madhya Pradesh, Andhra Pradesh, Maharashtra, and West Bengal, are major producers of onion, garlic, mustard and chillies. Orissa, Tamil Nadu, Andhra Pradesh, Mehalaya, Assam and Himachal Pradesh grow turmeric and ginger. Kerala contributes 96 percent of the total black pepper production in the country. Karnataka and Kerala alone grow 90 percent of small cardamom.

Chillies are pungent fruits of *capsicum annum L* and *capsicum frutescence*. It is also known as red pepper or dry chillies. Majorly used as condiment or culinary. It is specially used for its pungency, spicy taste, besides the appealing colour it adds to the food. It is used in pickles, sauces, ketchup, essences, oleoresins and it is an inevitable ingredient in Indian dishes. An alkaloid capsaicin is extracted from chili. which has medicinal value, besides its richness in vitamin C. Average per capita consumption in India ranges from 50gms-60gms per day.

The major producers in the world are India, China, Pakistan, Morocco, Mexico, Turkey and Bangladesh. Chillies are grown in all regions of India. The major Producers are Andhra Pradesh, Maharashtra, Karnataka, Tamil Nadu, Orissa and Rajasthan contributing 2/3 rd of India's production. And Andhra Pradesh alone contributes 46% for production making it the largest producer in India.

Andhra Pradesh has a production of 5.58 lakh MT area from 1.74 lakh hectares, which accounts for 26 % percent of area and 54 % percent of production in the country. In Andhra Pradesh it is grown in all the districts namely Warangal, Khammam, Guntur, Karimnagar, Prakasham and some other districts.

About 65% of the total chillies produced in India are traded from six major markets, Guntur, Warangal, and Khammam in Andhra Pradesh, Raichur and Bellary in Karnataka, and Jalgoan in Maharastra and even exported to Srilanka, Bangladesh, Malaysia, USA, Nepal, Indonesia, UAE, Italy from these markets.

An efficient supply chain ensuring remunerative prices to the producers for their products and to deliver maximum satisfaction to the end consumers for the price they pay. This motivates the producers to increase the production and productivity on the one hand and can generate additional income and employment to their farm family. In this view an analytical study of supply chain of chillies, to know the problems associated with marketing of chillies and preferences of producers towards different supply chains.

## II. METHODOLOGY

Present study was carried out in three major production centers namely Khammam, Warangal, and Guntur districts of Andhra Pradesh with specific objectives of supply chain analysis of chillies. A combination of purposive stratified and random sampling techniques were used for market functionaries, district, market and farmer selection required for the purpose of study. Personal interviews were conducted with growers belonging to different strata and marketing intermediaries with specially designed questionnaire for all the stakeholders. Besides data relating to quantity purchased, price paid/received, costs incurred were collected from the market functionaries.

## III. FINDINGS AND DISCUSSIONS

The major functionaries involved in supply chain of chillies are:

#### REGULATED MARKET:

The market committee is the major institutional unit established under the APMC act of the state to establish regulated market, which also creates and develops infrastructural requirements for the market and see that there is no malpractices during the marketing process.

#### PRODUCER

Producers play a major role in marketing because important practices like drying, cleaning, grading and packing are done by them. which play major role in supply chain because these practices influence the price of produce, which is ultimate goal of any marketing process .

#### COMMISSION AGENT

Commission agents are licensed brokers in regulated market, who take 3% commission from farmers on sale the produce at good price, by treating a competitive environment between the (traders ,wholesale and processor) purchasers during the price evolution process. Commission agents are not directly involved in trade process but facilitated trade process by arranging weighing machines, hamalli, transport and credit to farmer.

#### TRADER/ EXPORTER

Traders/Exporters are the purchasers who participate in trade. They handle the produce for a short period on behalf of distantly located wholesalers, exporters and for processors. They play very important role in chillies trade then other crops because the quantity sold by the wholesale and exporter are in small quantities but throughout the year . But chillies require cold storage facilities to retain their quality (colour). These traders purchase in behalf off wholesalers and exporters by taking in hand order and store them in cold storages nearby market yard and facilitate year around supply.

#### WHOLESALEERS:

There are the functionaries who purchase large quantities and sell them in bulk to retailers. There are only very few wholesalers take part who belong to local areas. For distant wholesalers depend on traders for purchasing these products as storage is main constraint for them, because cold storage facilities are not available at their place of business as wholesalers are scattered unlike traders.

#### PROCESSORS:

Processors are the important functionaries in supply chain of chillies because they take up different value addition process like chilli powder ,making olieoresin extaction, pigment extraction, pickles etc. In Warangal most of the processors are small and main process is chilli powder making. Few branded companies like Priya foods Ltd, ITC, MTR are also located but they have direct tie ups with farmers. In case of shortage they also come for procurement through regulated market. The Processors located at distant places depend upon traders for procurement of chillies on behalf of them as these traders procure the specific quality as per the requirement of processor and arrange for cleaning, grading and transporting to the place of processors which is added

advantage to them. Some local processors who process chillies to powder and pack on behalf of some exporters.

#### RETAILER:

Retailer who finally deliver chillies and chilli powder from the wholesalers and processors and sell in small quantities required to the consumer. These retailers are scattered all over and are the ultimate contact points with consumers.

The chilli growing farmers bring the produce into the market after well drying, grading and packed in gunny bags. The quantity packed in gunny bags vary from 40kg to 70kg per gunny bag. The farmer bring their produce to the market by his own transport facilities as large farmer do, or through common transport arranged by a group of farmers of the village hired vehicle as in case of marginal and medium farmers do. This produce after arriving to the market is stacked to lots at shop of the authorized commission agent. The commission agent arranges for hamali (labour)who help the farmers in stacking their produce into different lots as per different grades, in weighing the produce and also show the produce by cutting the gunny bags to the traders who is willing to purchase.

The general method of sale process involved is open auction method. When few number of traders assemble at the commission agent shop the commission agent starts the auction by price by quoting a starting price which is decided by him. In negotiation with farmer, previous day closing price in market and considering the market arrivals then individual trader quotes the maximum price to pay to own the produce. After the auction process, if any quantity of chillies is not sold due to high prices or poor quality the commission agent negotiates with farmer for little lower price. If the farmer agrees, the commission agent keeps the produce for auction otherwise the farmer has an option to store the produce in the cold storage until he gets a good price and disposes the produce when he gets good price.

Two major supply chains are identified in trade of chillies in India:

#### SUPPLY CHAIN-1

In this supply chain the movement of produce from producer is through trader, wholesaler, retailer and finally to the consumer. The trader purchases the chillies through open auction at Regulated Market, in presents of commission agent. The trader avails a credit facility from the commission agent who in turn pay to the farmers after receiving payment from trader. Generally there is a period to 30 days for payment during which no interest is charged either to trader or commission agent due to which farmer are generally at loss. Here no major value addition takes place. The raw chillies are just sold from intermediary to other in variable quantities as per requirements. Only in few cases grading and cleaning takes place.

#### SUPPLY CHAIN-II

In this supply chain the produce is purchased from the producer by the processor in Regulated market through open auction method. Unlike supply chain I the processor pays

immediately for the produce purchased. So farmers at advantage when compared to supply chain-I The processor adds value to the raw chillies by different value addition processing and change the produce in to ready to use products like chilli powder and is attractively packed in small quantities as per the consumer choice then their value added products are distributed to retailers as per their orders and they are finally reach consumer through retailers.

#### PRICE SPREAD IN SUPPLY CHAIN I

The price spread in supply chain I revealed that the consumer's rupee was shared as Producer's share 49%, Trader's share 6%, Wholesaler's share 6%, Retailer's share 13% and marketing costs incurred at all levels was incurred to 26%. Out of the total marketing cost incurred in the supply chain 30% was incurred at Producer level, 25% at Trader level, 18% at Wholesaler level, and 27% at Retailer level.

#### PRICE SPREAD IN SUPPLY CHAIN II

The price spread in supply chain II revealed that the consumer's rupee was shared as Producer's share 40%, Processor's 17%, Retailer's share 20% and marketing costs incurred at all levels was incurred to 23%. Out of the total marketing cost incurred in the supply chain 28% was incurred at Producer and 28% at Processor's level.

#### COMPARISION OF SUPPLY CHAIN I TO SUPPLY CHAIN II

The study marketing costs and market margins in supply chain I and supply chain II reveal that marketing cost in supply chain I and supply chain II are 50% and 40% respectively and market margins are 50% and 60% respectively. Which reveals that supply chain II is more efficient than the supply chain I because more value goods are delivered to consumer from producer at low marketing costs.

#### PREFERENCE OF FARMERS TOWARDS DIFFERENT SUPPLY CHAINS:

The study shows that farmers who bring good quality chillies to market prefer Supply chain-II to supply chain-I. But farmers who bring poor quality, discolored chillies, are preferring supply chain-I. The procurers are willing to buy well graded, clean and well dried chillies with maximum of 8-12% moisture, packed in 40Kg gunny bags and rejecting those which are tightly packed that weigh more than 40Kgs of chillies. However, the traders are ready to buy any quality material because they get more bargaining power if the produce is poor in quality, there by more margins. They supply these materials to many small and unorganized far distance processors, and they also go for grading and repacking of this poor quality material in to 2 or 3 grades as possible and supply them to as per the grades required by their customers.

#### PROBLEMS ASSOCIATED WITH MARKETING OF CHILLIES

To identify the problems in the two supply chains, a pre-tested questionnaire was designed. Separately for identifying constraints producer level, trader level and processor level as

they were the important functionaries in two identified supply chains. The constraints faced by producers covered in the questionnaire were grouped under ten headings. The rank wise constraints identified were:

- (1) Poor transportation facilities.
- (2) Poor market information
- (3) Delay in sale of produce.
- (4) Poor weighing procedures.
- (5) Unfair practices during in open auction.
- (6) Delay in payments from agents.
- (7) Collection of excess commission.
- (8) Lack of storage facilities at market yard.
- (9) Poor finance for ware house receipts during lean market prices.
- (10) Lack of facilities for farmers at market yard.

#### IV. CONCLUSION

1. Poor understanding of Volatile Price fluctuations, which affect the benefit of farmers and middle men are being profited due to this.
2. The Traders take major share in chilli supply chain due to which Producers are not able to get there actual share in the consumer's rupee.
3. The present supply chain which is dominated by Supply chain-I is inefficient, because the farmer is getting a better price for the same quality of produce in Supply chain-II.
4. There is no value addition involved in supply chain-I which is the major supply chain at present.
5. Poor post harvest practices like drying, cleaning, grading, and packaging of farmers are rendering the quality of chillies and not attracting the processor during the open auction process causing loss in the actual price.
6. Delay in payment after sale, problems in fare price evolution process, collection of excess commission and availability of loan through bank on produce important problems that farmers are facing in this market.

#### V. POLICY IMPLICATIONS:

1. Flow of market information of both domestic and international market prices, taken through forward and back ward integration and best utilization ICT solutions, So that Producer will be benefited through proper price discovery.
2. Arrangements for training and education of post harvest handling so that producers would meet world food standards and packing standards.

3. Processing units should be encouraged to make the supply chain more organized.
4. Adequate finance facilities should be made available at producer level to reduce dependence on non institutional credit, so that producer would get time utility and more bargaining power at open auction process.

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# Computation of Neural Network using C# with Respect to Bioinformatics

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**Abstract-** Neural network is the emerging field in the era of globalization which is fully based on the concept of soft-computing technique and bioinformatics. In the competitive market of new development process, Bioinformatics play the vital role to give the process of integration aspect as multidisciplinary subject like- biological Science, medicine science, computer science, engineering, chemical science, physical science as well as mathematical science who gives the experiences of artificial activities of human behaviour in the form of software. Now a days neural Network and its multidimensional approach give the idea for solving bioinformatics problems to handle imprecision, uncertainty in large and complex search spaces. This paper gives the emphasis on multidimensional approaches of neural network with soft computing paradigm using C# in bioinformatics with integrative research methodology. The overall process of multidimensional approaches of bioinformatics neurons can also be understood with the help of flow chart and diagram is the major concerned.

**Index Terms-** Soft-computing technique of C#, Neural Network, bioinformatics, Bioinformatics tools, Genetic algorithms.

## I. INTRODUCTION

The paper tried to explore the exact relationship among neural network, genetic algorithm, and bioinformatics with the help of C# computational approach [1][2]. We all know the running world is fully depends of computer technique which play vital role in living style as well as working life from here and there. Now we are generating the idea of modelling and computational programming technique having multidimensional prospects who can behave like the human activities by artificial component. Hence we are fully concerned on the soft-computing process by introducing the application and utilization of neural network, genetic algorithm & bioinformatics [3][4].

Artificial neural networks as a major soft-computing technology has been extensively studied & applied during the last three decades. The Neural Network, especially the multilayer perceptions network with a back propagation training algorithm, have gained recognition in research and applications with various scientific and engineering areas. Soft computing techniques demonstrates the high standards of technology, algorithms, and tools in bioinformatics for dedicated purposes such as reliable and parallel genome sequencing, fast sequence comparison, search in databases, automated gene identification, efficient

modelling and storage of heterogeneous data, etc. On the other side the continuous development of high quality biotechnology, e.g. micro-array techniques and mass spectrometry, which provide complex patterns for the direct characterization of cell processes. With the advance of gene expression data in the bioinformatics field, the questions which frequently arise, for both computer and medical scientists, are which genes are significantly involved in discriminating cancer classes and which genes are significant with respect to specific cancer pathology. Numerous computational analysis models have been developed to identify informative genes from the microarray data; however, the integrity of the reported genes is still uncertain. The flow chart and diagrammatical approaches are also presented for easy understanding the concept of bioinformatics in neural.

The complete paper is divided into six section including introduction and conclusion. Section one contains the brief idea of computation of neural network with Bioinformatics & Genetic concept. Section two includes the concept of soft-computation technique and its component on bioinformatics & neural network in c#. Section three concentrated on bioinformatics with its objective, scope, application along with development of algorithms in updated version. Computation of neural network, its advantage, application and connection with bio information includes in section four. Relationship among Neural Network, Genetic Algorithm and Bioinformatics will be explain in section five with complete compilation among all of them. The modified version of General Mathematical Model of Neural Network for Bioinformatics impact of hidden layers as per input to be discussed with complete computation in C#. In each section research to be worked on diagrammatical presentation of bioinformatics in Neural, Genetics as well as computing is the major concerned. Total ten figure/diagram to be presented for better understanding in concise manner having multidimensional approaches of these thrice concept. Last section gives the future scope and conclusion of this paper.

## II. SOFT COMPUTING TECHNIQUE AND ITS PARADIGM

Soft computing techniques are often used in conjunction with rule-based expert systems where the knowledge is usually in the form of if-then rules. Every computational process purposely includes imprecision into the calculation on one or more levels and allow this imprecision either to change (decrease) the granularity of the problem, or "to soften" the goal

of optimization at some stages which is define as belonging to the field of soft computing. It is clear that this is a quite general definition including all those techniques and approaches that are considered as the components of soft computing according to the practice. If we further go in this approach, it is possible to say that soft computing encompasses two main conceptual components namely approximate reasoning and functional approximation with optimization. From the above point we are considering the soft computation with using C# as is an evolving concept to explore the theory. Its evolution can be easily interpreted in the term of integration of new topics/techniques that are in accordance with these properties and the corresponding conceptual components. The term soft computing was coined to refer a family of computational techniques particularly adapted to cope with a class of problems for with other techniques are not quite well suited. Basically soft computing is not a homogeneous body of concepts and techniques it is a partnership of distinct methods that in one way or another conform to its guiding principle. The principal constituents of soft computing are neurocomputing, and probabilistic reasoning, with the latter subsuming genetic algorithms, belief networks, chaotic systems, and parts of learning theory As the presence of genetic algorithms has gained importance in the field of more recent enumerations which have been included evolutionary computation (EC, a family including genetic algorithms) as an independent constituent of soft computing(C#). Soft computing techniques are meant to operate in an environment that is subject to uncertainty and imprecision. The guiding principle of soft computing (C#) is exploit the tolerance for imprecision, uncertainty, partial truth, and approximation to achieve tractability, robustness, low solution cost and better rapport with reality. Imprecision results from our limited capability to resolve detail and encompasses the notions of partial, vague, noisy and incomplete information about the real world. In other words it becomes not only difficult or even impossible but also inappropriate to apply hard computing techniques when dealing with situations in which the required information is not available. The behaviour of the considering the system is not completely known or the measures of the underlying variables are noisy. But we can go one step further and analyze those situations where imprecision is not a drawback of the information we are managing but an intrinsic characteristic of that information. In that sense it is quite important to distinguish in between measurements and perceptions, and to discriminate those situations where we work on the basis of imprecise measurements from those others where we compute with perceptions. Compute with perception is clearly an approach to approximate reasoning (again one of the constituents of soft computing(C#)).

In that sense of soft computing as a tool to cope with uncertainty and imprecision should clearly include computing with words and perceptions as one of its basic components. Computing with words is inspired by the remarkable human capability to perform a wide variety of physical and mental tasks without any measurements and any computations. As a methodology, computing with words provides a foundation for a computational theory of perceptions. One of the fundamental aims of science has been and continues to be that of progressing from perceptions to measurements of the potential achievements

of soft computing will be to return to perceptions in order to take profit of its qualities as a carrier for intrinsically imprecise information. The Centre focuses on Soft Computing(C#) following a well known principle of Genetic Algorithms that could be described as maintain an appropriate balance in between Exploitation and Exploration, i.e. "try to improve those useful techniques and fundamentals SC already exploit at the same time search for completely new options (explore) that will eventually outperform those already known.

### III. PROPERTIES OF SOFT COMPUTING AND ITS COMPONENT

The characterizations of Soft Computing gives the emphasis by the essential properties as a family of techniques, as a complement of hard computing, as a tool for coping with imprecision and uncertainty. However, none of them can be called the "correct" or "best" answer: depending on the context, the background of the person asking the question and other factors, Every computing process that purposely includes imprecision into the calculation on one or more levels and allows this imprecision either to change (decrease) the granularity of the problem, or to "soften" the goal of optimization at some stage, is defined as to belonging to the field of soft computing. It is clear that this is a quite general definition including all those techniques and approaches that, according to the practice, are considered as the components of soft computing. If we go further in this approach, it is possible to say that, in summary, soft computing encompasses two main conceptual components, namely approximate reasoning and function approximation and optimization. From that point, and considering that soft computing is an evolving concept, its evolution can be easily interpreted in terms of the integration of new topics/techniques that are in accordance with these properties and the corresponding conceptual components. Soft computing(C#) is the mixture of several pre-existing techniques. Basically, soft computing is not a homogeneous body of concepts and techniques. Rather, it is a partnership of distinct methods that in one way or another conform to its guiding principle. The major properties of soft computing neural are as follows.

- The Neural Networks (NNs) exhibit mapping capabilities, that is, they can map input patterns to their associated output patterns.
- The Neural Networks (NNs) possess the capability to generalize. Thus, they can predict new outcomes from past trends.
- The Neural Networks (NNs) are robust systems and are fault tolerant. They can, therefore, recall full patterns from incomplete, partial or noisy patterns.
- The Neural Networks (NNs) can process information in parallel, at high speed, and in a distributed manner.
- **The Neural Networks (NNs) learn by examples.** Thus, Neural Network architectures can be 'trained' with known examples of a problem before they are tested for their 'inference' capability on unknown instances of the problem. They can, therefore, identify new objects previously untrained.

## 2.2 SOFT COMPUTING vs HARD COMPUTING

The term soft computing distinguishes those previously enumerated techniques from hard computing (conventional approaches) considered as less flexible and more computationally demanding. The key aspect for moving from hard to soft computing is the observation that the computational “To clarify that it would be easier to talk in terms of optimization, and the situation is that, for many different applications a sub-optimal solution is enough, and having that in mind when designing the optimization process will provide the difference in between obtaining a solution that satisfies our needs or getting lost when searching for the optimal solution”.

Soft computing	Hard computing
Soft computing differs from conventional (hard) computing which tolerant of imprecision, uncertainty, partial truth, and approximation.	Hard computing is a conventional computing which requires a precisely stated analytical model and often a lot of computation time.
In effect, the role model for soft computing is the human mind.	Premises and guiding principles of Hard Computing are Precision, Certainty, and rigor.
The principal constituents, i.e., tools, techniques, of Soft Computing (SC) are Fuzzy Logic (FL), Neural Networks (NN), Support Vector Machines (SVM), Evolutionary Computation (EC), and Machine Learning (ML) and Probabilistic Reasoning (PR)	Many contemporary problems do not lend themselves to precise solutions such as Recognition problems (handwriting, speech, objects and images. Mobile robot coordination, forecasting, combinatorial problems etc.

Actually, the distinguishing feature of “soft computing” is straightforward however “Hard computing “uses an explicit model of the process under consideration while “Soft computing” does not do this. Instead, as an indispensable preliminary step, it infers an implicit model from the problem specification and the available data. Working out the analogy we can see that building the explicit model is a first step in the process of finding the optimal solution, while, in absence of such an explicit model, the use of an implicit model usually drives us to a (sub-optimal) solution satisfying our needs. Considering again the “view of soft computing” as blending approximate reasoning and function approximation/optimization, this view concentrates on the second part, the one usually assigned to neural networks and evolutionary computation. But if we consider optimization with a broader view, new components should be integrated in “soft computing(C#)”. The term soft computing distinguishes those previously enumerated techniques from hard computing (conventional approaches) considered as less flexible and more computationally demanding. The key aspect for moving from hard to soft computing is the observation that the computational effort required by conventional approaches which makes in many cases the problem almost infeasible, is a cost paid to gain a precision that in many applications is not really needed or, at least, can be relaxed without a significant effect on the solution.

In other words, we can assume that this imprecision is a small price to pay for obtaining more economical, less complex and more feasible solutions.

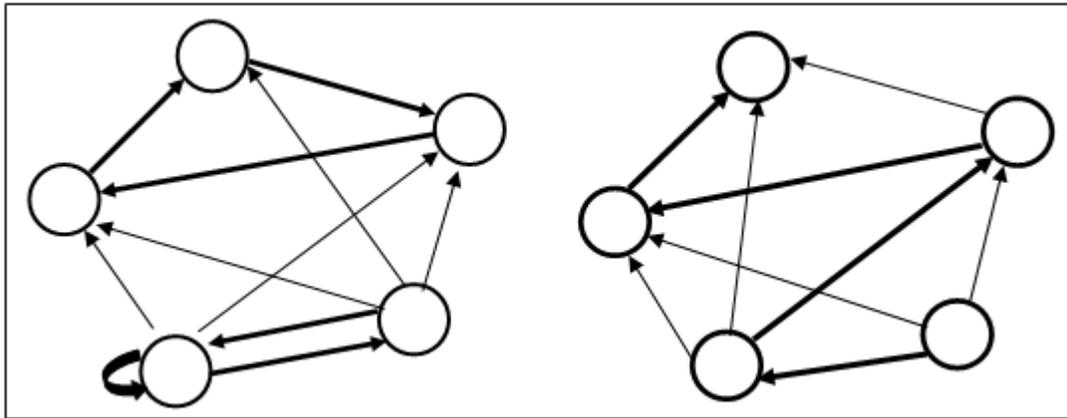
## 2.3 SOFT COMPUTING TECHNIQUES IN BIOINFORMATICS

Traditionally, a human being builds such an expert system by collecting knowledge from specific experts. The experts can always explain what factors they use to assess a situation however, it is often difficult for the experts to say what rules they use (for example, for disease analysis and control). This problem can be resolved by soft computing mechanisms. Soft computing(C#) mechanism can extract the description of the hidden situation in terms of those factors and then fire rules that match the expert’s behaviour. In molecular biology research, new data and concepts are generated every day, and those new data and concepts update or replace the old ones. Soft computing can be easily adapted to a changing environment. This benefits system designers, as they do not need to redesign systems whenever the environment changes. Missing and noisy data is one characteristic of biological data. The conventional computer techniques fail to handle this. Soft computing based techniques are able to deal with missing and noisy data. With advances in biotechnology, huge volumes of biological data are generated. In addition, it is possible that important hidden relationships and correlations exist in the data. Soft computing methods are designed to handle very large data sets, and can be used to extract such relationships.

## 2.4. TYPE OF NEURAL NETWORK

There are several types of neural network topology exit on the basis of its properties, structure, design and architecture. The most famous are like:

**Architectural Dynamics:** The architectural dynamics specifies the network topology and its possible change. The architecture update usually applies within the framework of an adaptive mode in such a way that the network is supplied with additional neurons and connections when it is needed. However, in most cases the architectural dynamics assumes a fixed neural network topology, which is not changed anymore. Two types of architectures are distinguished: cyclic (recurrent) and acyclic (feed-forward) network. In the cyclic topology, there exists a group of neurons in the network, which are connected into a ring cycle. This means that in this group of neurons the output of the first neuron represents the input of the second neuron whose output is again the input for the third neuron, etc. as far as the output of the last neuron in this group is the input of the first neuron. The simplest cycle is a feedback of the neuron whose output serves simultaneously as its input. The maximum number of cycles is contained in the complete topology in which the output of each neuron represents the input for all neurons. An example of a general cyclic neural network is depicted in Fig. where all the cycles are indicated. On the contrary, the feed-forward neural networks do not contain any cycle and all paths lead in one direction. An example of an acyclic neural network is in Figure 1(a)&( b) where the longest path is marked.



(a) (b)  
Figure1: Example of architectural dynamics: a. cyclic architecture, b. Acyclic architecture.

**Feed-forward Networks** :The neurons in the feed-forward networks can always be disjointly split into layers which are ordered (e.g. arranged one over another) so that the connections among neurons lead only from lower layers to upper ones and generally, they may skip one or more layers. Especially, in a multilayered neural network, the zero (lower), input layer consists of input neurons while the last (upper), output layer is composed of output neurons. The remaining, hidden (intermediate) layers contain hidden neurons. The layers are counted starting from zero that corresponds to the input layer, which is then not included in the number of network layers (e.g. a two-layered neural network consists of input, one hidden, and output layer). In the topology of a multilayered network, each

neuron in one layer is connected to all neurons in the next layer (possibly missing connections between two consecutive layers might be implicitly interpreted as connections with zero weights). Therefore, the multilayered architecture can be specified only by the numbers of neurons in particular layers, typically hyphenated in the order from input to output layer. In addition, any path in such a network leads from the input layer to the output one while containing exactly one neuron from each layer. An example of a three-layered neural network with an indicated path is in Figure 2 which, besides the input and output layers, is composed of two hidden layers

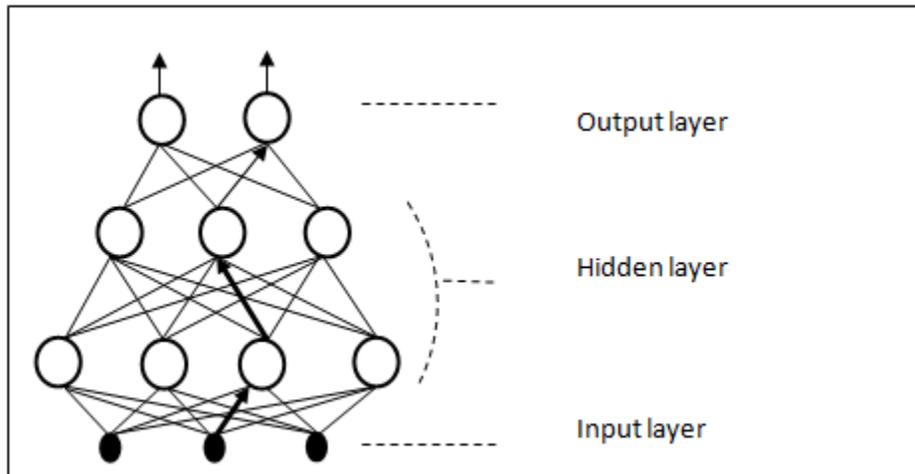
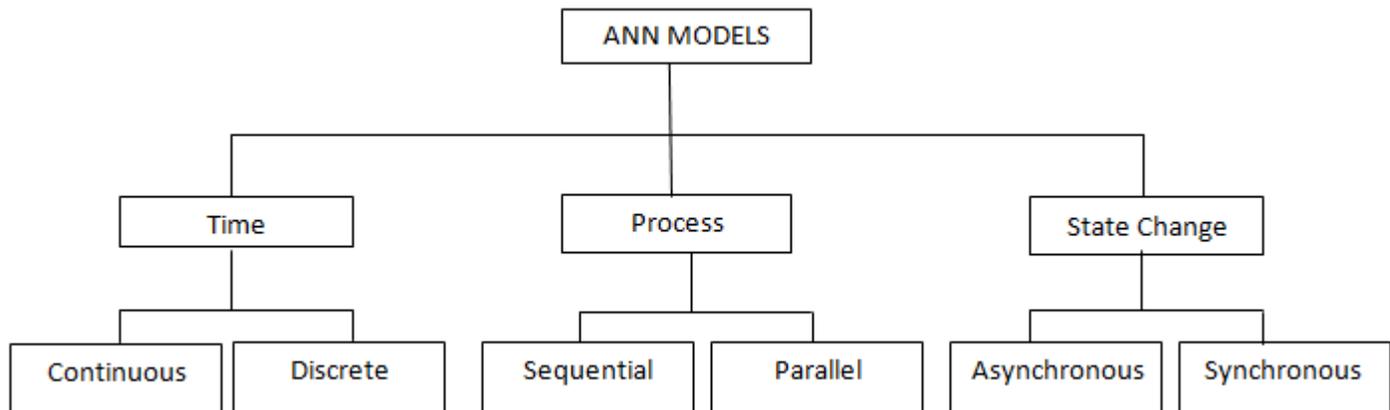


Figure2: Example of architecture of multilayered (three-layered) neural network.

**The computational dynamics** also determines the function of particular neurons whose formal form (mathematical formula) is usually the same for all (non-input) neurons in the network (homogeneous neural network) which has been inspired by a biological neuron operation. However, in neural network models, various neuron functions are in general use, which may not correspond to any neurophysiological pattern, but they are

designed only by mathematical invention or even motivated by other theories (e.g. physics). On the other hand, sometimes the excitation level corresponds formally to the distance between the input and respective weight vector, etc. In addition, the transfer function is often approximated by a continuous (or differentiable) activation function or replaced by a completely different

function. The classification of ANN on the basis of computational dynamics is presented in Figure3



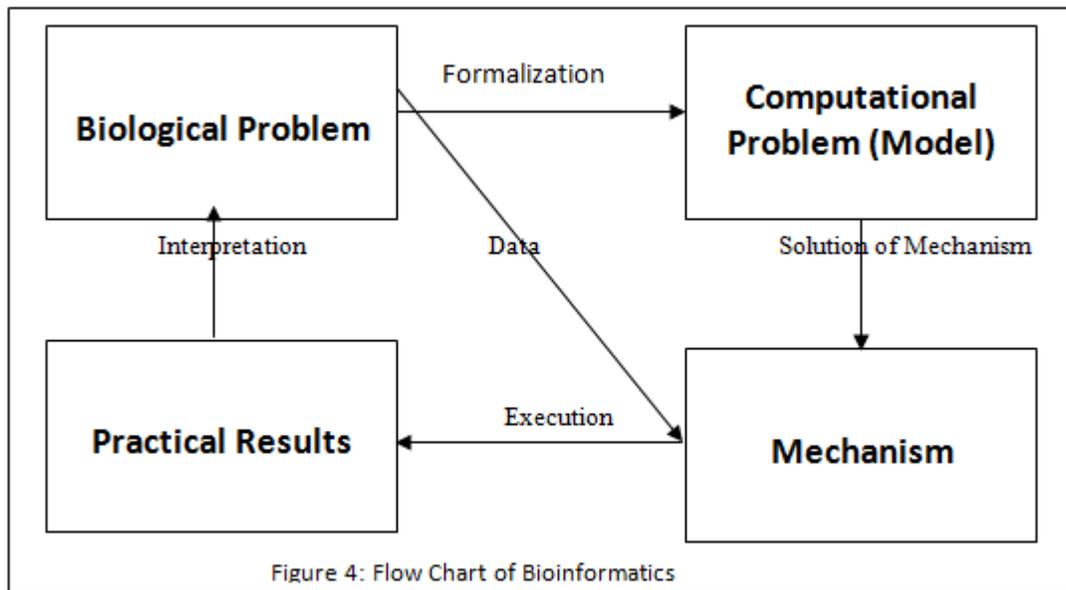
**Figure3: Classification of neural network models according to computational dynamics.**

#### IV. BIOINFORMATICS

We all know this is the field of statistics & computer science to explore Bioinformatics is a promising and innovative research field in 21st century. Despite of a high number of techniques specifically dedicated to bioinformatics problems as well as many successful applications, we are in the beginning of a process to massively integrate the aspects and experiences in the different core subjects such as biology, medicine, computer science, engineering, chemistry, physics, and mathematics. Recently the use of soft computing tools for solving bioinformatics problems have been gaining the attention of researchers because of their ability to handle imprecision, uncertainty in large and complex search spaces.

Advancement in soft computing techniques demonstrates the high standards of technology, algorithms, and tools in bioinformatics for dedicated purposes such as reliable and parallel genome sequencing, fast sequence comparison, search in databases, automated gene identification, efficient modelling and storage of heterogeneous data, etc. The basic problems in bioinformatics like protein structure prediction, multiple alignment, phylogenetic inference etc. are mostly NP-hard in

nature. For all these problems, soft computing offers on promising approach to achieve efficient and reliable heuristic solution. On the other side the continuous development of high quality biotechnology, e.g. micro-array techniques and mass spectrometry, which provide complex patterns for the direct characterization of cell processes, offers further promising opportunities for advanced research in bioinformatics. So bioinformatics must cross the border towards a massive integration of the aspects and experience in the different core subjects like computer science and statistics etc. for an integrated understanding of relevant processes in systems biology. This puts new challenges not only on appropriate data storage, visualization, and retrieval of heterogeneous information, but also on soft computing methods and tools used in this context, which must adequately process and integrate heterogeneous information into a global picture. The molecular operation of Bioinformatics for achievement of soft computational approach in Neural Network to be understood with the following chart in Figure 4 who explains the summary of complete process of bioinformatics in neural.



### 3.1 OBJECTIVE OF BIOINFORMATICS

The basic objective of Bioinformatics is varies on the basis of area where we move to use. The global objectives of bioinformatics are as follows:

- To organize data in a way that allows researchers to access existing information and to submit new entries when they are produced.
- To develop tools and resources that aid in the analysis and management of data.
- To use this data to analyze and interpret the results in a biologically meaningful manner.
- To help researchers in the pharmaceutical industry in understanding the protein structures
- To make the drug design easy and integrate the soft comp using appropriate to bioinformatics

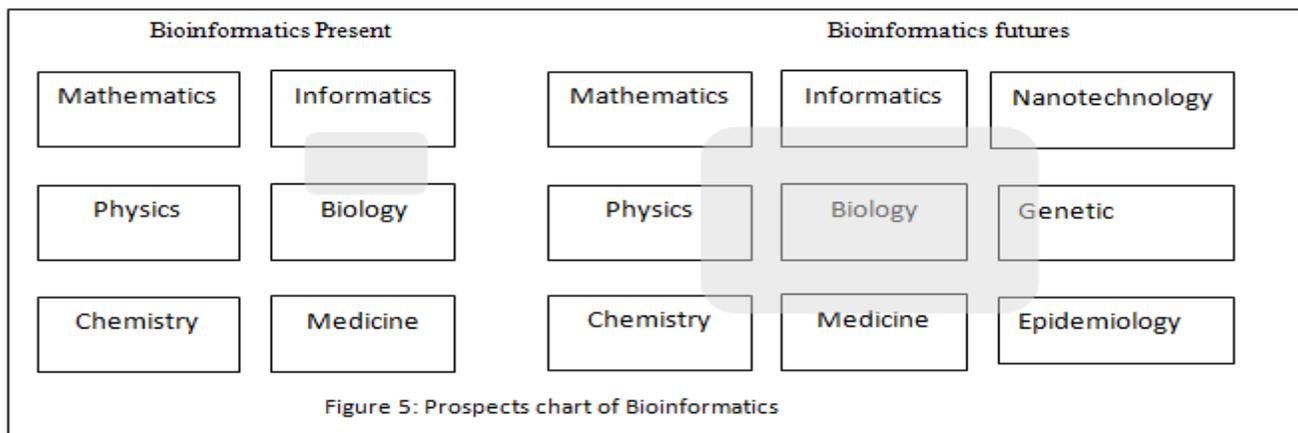
### 3.2 SCOPE OF BIOINFORMATICS

In this paper bioinformatics to be used for mathematical model is neural network for soft computing approach with the help of c#. Scope of bioinformatics involves the study of genes, proteins, nucleic acid structure prediction, and molecular design

with docking. A broad classification of the various bioinformatics tasks is given as follows. The same will be also view in flow chart.

- Alignment and comparison of DNA, RNA, and protein sequences.
- Gene mapping on chromosomes gene finds and promoter identification from DNA sequences.
- Interpretation of gene expression and micro-array data.
- Gene regulatory network identification & analysis.
- Construction of phylogenetic trees for studying evolutionary relationship.
- DNA & RNA structure prediction.
- Protein structure prediction and classification with Molecular design and molecular docking.

The complete scope at present and coming time of bioinformatics(shown in shadow part in Figure5) can be used as presented concrete diagram in multidimensional approaches.



So, Bioinformatics has found its applications in many areas. It helps in providing practical tools to explore proteins and DNA in number of other ways. Bio-computing is useful in recognition techniques to detect similarity between sequences and hence to interrelate structures and functions. Another important application of bioinformatics is the direct prediction of protein 3-Dimensional structure from the linear amino acid sequence. It also simplifies the problem of understanding complex genomes by analyzing simple organisms and then applying the same principles to more complicated ones. This would result in identifying potential drug targets by checking homologies of essential microbial proteins. Bioinformatics is useful in designing drugs.

### 3.3 ALGORITHMIC DEVELOPMENT OF BIOINFORMATICS

Basically algorithms give the basic idea to develop the computational programming & judge the situation of the Bioinformatics technique. Attempted to be explore “How bioinformatics can be used in modern era for development of new concept with the help of soft-computing C#” for well behaving human activities i.e. Neural network and genetic concept. Usually a biological problem can be transformed into a computational problem in a number of ways that feature different levels of accuracy and complexity. Highly accurate models often result in intractable computational problems while less accurate models may produce meaningless results. Goal of Bioinformatics Algorithm “to maintain an acceptable level of accuracy keeping the computational problem effectively solvable”

The following are some of the most important algorithmic trends in bioinformatics related to Biological Science:-

- Finding similarities among strings (such as proteins of different organisms).
- Detecting certain patterns within strings (such as genes,  $\alpha$ -helices).
- Finding similarities among parts of spatial structures (such as **motifs**).
- Constructing trees (called polygenetic trees expressing the evolution of organisms whose
- DNA or proteins are currently known.
- Classifying new data according to previously clustered sets of annotated data.
- Reasoning about microarray data and the corresponding behaviour of pathways.

The first three trends can be viewed as instances of pattern matching. However, pattern matching in biology differs from its counterpart in computer science. DNA strings contain millions of symbols, and small local differences may be tolerated. The pattern itself may not be exactly known, because it may involve inserted, deleted, or replacement symbols. Regular expressions are useful for specifying a multitude of patterns and are ubiquitous in bioinformatics. However, what biologists really need is to be able to infer these regular expressions from typical sequences and establish the likelihood of the patterns being detected in new sequences.

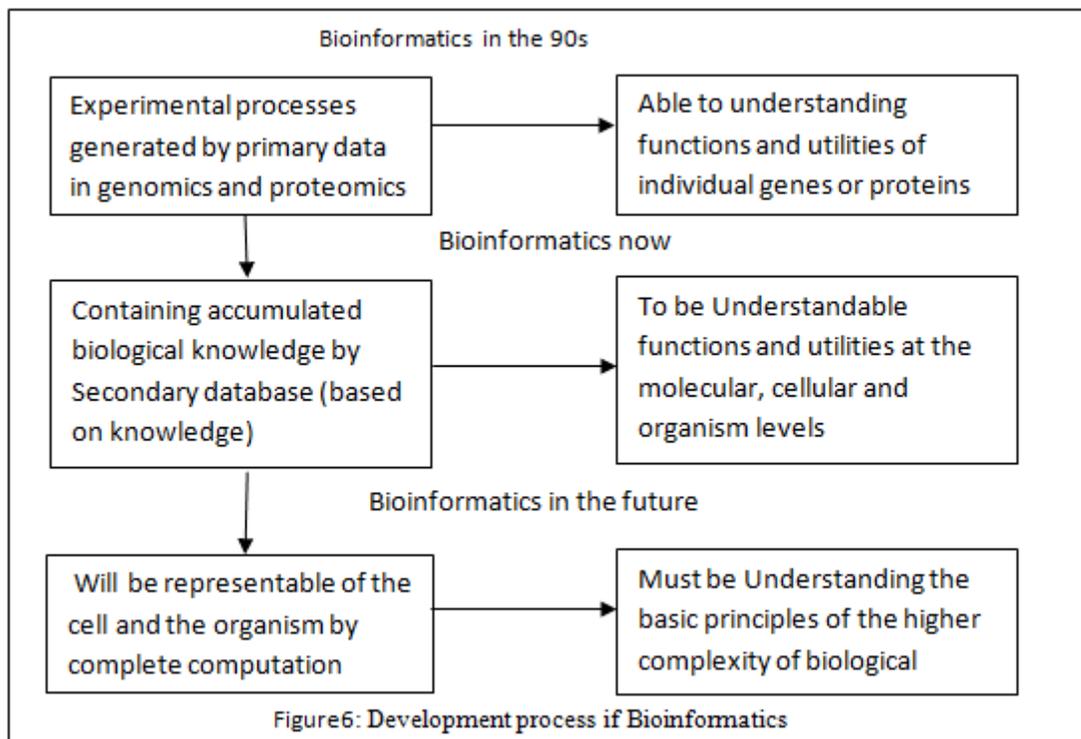
The discussion suggests that both optimization and probabilistic approaches are necessary for developing biology-

oriented pattern-matching algorithms. Which are like “Dynamic programming technique ,Patter matter approach, Multiple alignments, Approximate methods, Support vector machines(SVM).In the intermediate time of twentieth century a dynamic programming technique was devised to match two strings, taking into account the costs of insertions, deletions, and substitutions called global pair-wise alignment. This technique was subsequently extended to consider local alignments and today, both methods are often used in bioinformatics. However, dynamic programming is time consuming (it involves quadratic complexity) and therefore cannot be applied in a practical way to strings with hundreds of thousands of symbols. A remarkable bioinformatics development at the end of the twentieth century a pattern-matching approach called BLAST, or the Basic Local Alignment Search Tool, that mimics the behaviour of the dynamic programming approach and efficiently yields good results using heuristic based approach. It is fair to say that BLAST is the most frequently used tool for searching sequences in genomic databases. Another widely used and effective technique is multiple alignments, which helps align several sequences of symbols, so identical symbols are properly lined up vertically, with gaps allowed within symbols. The sequences may represent variants of the same proteins in various species. But the goal is to find conserved parts of the proteins that are unchanged during evolution. Finding conserved parts of proteins also provides hints about a protein’s possible function. Methods for multiple alignments are based on dynamic programming techniques developed for pair wise alignment. After aligning multiple genomic or protein sequences, biologists usually depict trees representing the degree of similarity among the sequences being studied. Depicting evolutionary trees is in itself a domain within bioinformatics called polygenetic trees. The problem of matching spatial structures can be viewed as a combination of computational geometry and computer graphics. Approximate methods are often required to find the longest linkage that is common in two 3D structures. Bioinformatics involves the pervasive use of searches in genomic databases that often yield very large sets of long sequences. Such searches are often performed automatically by scripting to download massive amounts of genomic data from a number of Web sites. An approach commonly used in bioinformatics is: Given a human-annotated list of strings with boundaries specifying meaningful substrings—the learning set— now establish the corresponding likely boundaries for a new string (examples in bioinformatics involve finding genes and identifying the components of proteins). Solutions to these problems are being explored through approaches from machine learning, neural networks, genetic algorithms, and clustering. In the same time clustering technique called support vector machines (SVM) has had considerable success in biology. Classification and machine learning have been studied extensively in artificial intelligence to sort out new data based on a human-annotated set of examples. Two other algorithmic trends relevant to this discussion are related to micro-arrays and biologists’ interest in computational linguistics. Recall that the main goal of analyzing micro-array data is to establish relationships among gene behaviour, possible protein interactions, and the effects of a cell’s environment. From a computer science perspective, that goal is amounted to the generation of parts of a program (flowchart) from data.

Information about the relationships among genes is often buried in countless articles describing the results of biological experiments. In the case of protein interaction, pharmaceutical companies have teams whose task is to search the available literature and “manually” detect phrases of interest. Efforts have been made to computerize these searches. Their implementation requires expertise in biology, computational linguistics and

heuristic based methodologies. Based on the above discussion, it is mandatory to have a machine learning/soft computing based approach for various tasks in bioinformatics.

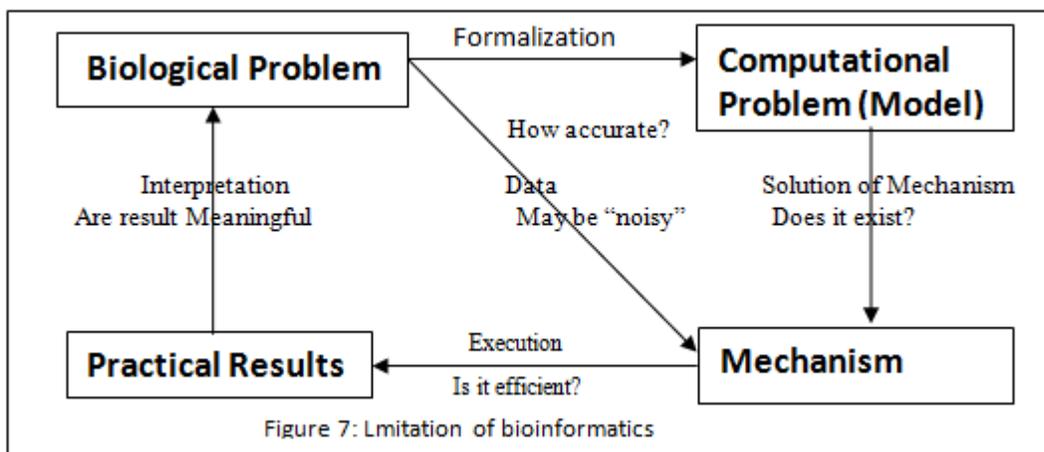
The overview can be seen as diagrammatical presentation (Figure 6) of time bounded manner of development of bioinformatics which are as :



### 3.4 BOTTLENECKS OF BIOINFORMATICS

The basic problems in bioinformatics like protein structure prediction, multiple alignment, polygenetic inference etc. are mostly NP-hard in nature. For all these problems, soft computing offers on promising approach to achieve efficient and reliable

heuristic solution. The basic limitation of bioinformatics in neural network can be understood with the help of following diagrammatic presentation in figure 7.



## V. COMPUTATION AND TYPE OF NEURAL NETWORK

The provision of embedding neural networks into software applications can enable variety of Artificial Intelligence systems for individual users as well as organizations. Previously, software implementation of neural networks remained limited to only simulations or application specific solutions & tightly coupled solutions end up in monolithic systems as well as non reusable programming efforts. We adapt component based software engineering approach to effortlessly integrate neural network models into AI systems in an application independent way. This paper presents componentization of three famous neural network models (1) Multi Layer Perceptions (2) Learning Vector Quantization and (3) Adaptive Resonance Theory family of networks. Main premise of this paper states that the integration and deployment of neural networks into production environments in an application independent way can be greatly facilitated by employing component based software engineering approach. The CompoNet (Componentized-neural-Networks) facilitates development of neural network based software systems by designing and implementing neural networks as software components. These components can be reused effortlessly across different application and, thus, shipping of trained models from simulation to production environment is possible with minimal programming effort. Essentially CompoNet functions as binary unit of composition into larger systems. It can encapsulate arbitrary size and structure of underlying neural network models and exposes programmatic interfaces in order to i) embed a neural network into external software application and ii) persist neural network on permanent storage and restore it later. For the sake of realization of the concept and in order to provide variety of choices to developer community, we componentized three famous neural network models.

1. **The Multi Layer Perceptions (MLP)** is presented in (Figure 2,8,9) general model of neural network analysis. This network has an input layer (on the left) with three neurons, one hidden layer (in the middle) with three

neurons and an output layer (on the right) with three neurons.

2. **Learning Vector Quantization (LVQ)** contains an input layer a kohonen layer(which leads and perform the classification) and an output layer. The input layer contains one node for each input feature. The kohonen layer contains equal number of nodes for each class, in the output layer each output node represent a particular class.
3. **Adaptive Resonance Theory (ART)** networks represent a family of neural networks which is based on resonance refers to resonant state of neural network in which a category prototype vector matches close enough to the current input vector.

These entire three models is on the basis of structural, development and working process of neural network having three basic part i.e. input, output and hidden layers is presented in general neural network(Figure 2,8,9) which is presented below.

### 4.1 ARTIFICIAL NEURAL NETWORK

The terminology of artificial neural networks has developed from a biological model of the brain. A neural network consists of a set of connected cells: the neurons. The neurons receive impulses from either input cells or other neurons and perform some kind of transformation off the input and transmit the outcome to other neurons or to output cells. The neural networks are built form layers of neurons connected so that one layer receives input from the preceding layer of neurons and pass the output on to the subsequent layer.

A neuron is a real function of the input vector  $(y_1, \dots, y_k)$ . The output is obtained as obtained as  $f(x_j) = f\left(a_j + \sum_{i=1}^k w_{ij} y_j\right)$ , where f is a function, typically the sigmoid (logistic or tangent hyperbolic) function. A graphical presentation of neuron is given in figure below. Mathematically a Multi-Layer Perceptions network is a function consisting of compositions of weighted sums of the functions corresponding to the neurons.

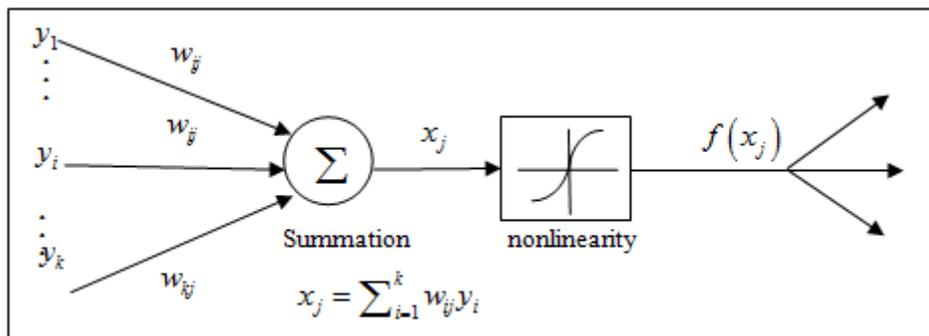


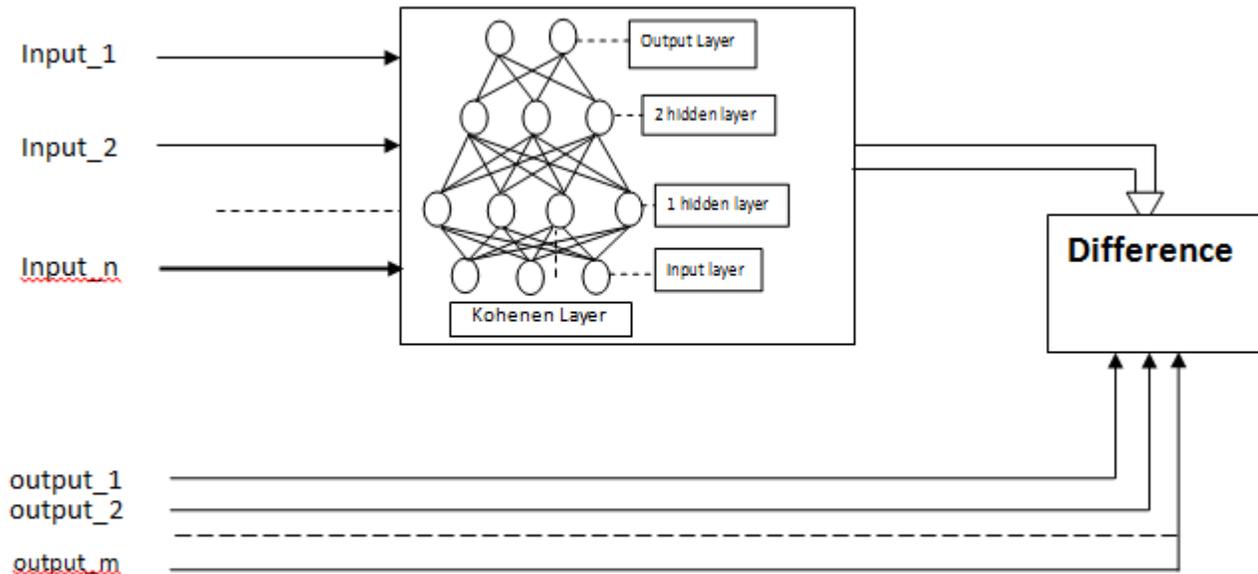
Figure 8: Flow chart of General Mathematical Function of ANN

That means Artificial Neural Networks are biologically inspired clusters of highly connected parallel processing nodes. Their remarkable ability to tolerate noise and adapt to unseen situations, wide scale application of neural networks has been

carried out in many areas such as manufacturing , intelligent control systems power engineering , pattern recognition ,speech recognition and Ubiquitous Computing Systems to name a few. Mostly, the practical implementation considerations for neural

network based AI systems are studied from hardware point of view. However, several software applications demand incorporation of neural networks as well. This requirement holds for building hybrid intelligent systems based on combination of neural networks and knowledge-based system. Moreover, AI researchers often need to verify and test their application of neural networks on novel problems in real life but software environment. Advanced software environments for neural network development and training are limited only to simulation of neural networks in restricted simulation environment e.g. C #, **MATLAB Neural Network Toolbox etc.** Therefore, In order to

train a model and verify the results, AI researchers have to bring training and test data from real life environment into a simulation environment. After the neural network model is optimized and trained, the integration of this model into real-life environment remains a secondary task and left to domain specific software programs which results in non-reusable effort. The basic architecture of ANN is presented below when a system with “n” inputs and “m” outputs. Each ANN Target- output corresponds to the one of m classes, and it is activated by the proper values of the corresponding inputs that are associated to its class.



**Figure 9: General Model of Neural Network**

#### 4.2 ADVANTAGE OF ARTIFICIAL NEURAL NETWORK

An artificial neural network (ANN) is the overcome of SVM (Support Vector Machines) which programmed the computational model having aims to replicate the neural structure and functioning of the human brain. It is made up of an interconnected structure of artificially produced neurons that function as pathways for data transfer. Artificial neural networks are flexible and adaptive, learning and adjusting with each different internal or external simultaneously. Artificial neural networks are used in sequence and pattern recognition systems, data processing, robotics and modelling. There are different types of neural networks, including feed-forward neural network, radial basis function (RBF).

**Flexibility:** Artificial neural networks have the ability to generalize and learn. They acquire knowledge from their surroundings by adapting to internal and external parameters. The network learns from examples and adapts to situations based on its findings. It generalizes knowledge to produce adequate responses to unknown situations. Artificial neural networks solve complex problems that are difficult to manage by approximation.

**Non-Linearity:** A computational neuron can produce a linear or a non-linear answer. A non-linear artificial network is made by the interconnection of non-linear neurons. Non-linear systems have inputs that are not proportional to the outputs. This

function allows the network to efficiently acquire knowledge through learning. This is a distinct advantage over a traditionally linear network that is inadequate when it comes to modeling non-linear data.

**Greater Fault Tolerance:** An artificial neuron network is capable of greater fault tolerance than a traditional network. The network is able to regenerate a fault in any of its components without the loss of stored data. It uses instances and examples from the past to reassemble the functioning of a damaged node or other network constituent.

**Adaptive Learning:** An artificial neuron network is based around the concept of abstract learning. Three learning paradigms function to equip the network for adaptive learning. These are reinforcement learning, unsupervised learning and supervised learning. Neuron networks can be trained via specialized algorithms including non-parametric methods, expectation maximization, simulated annealing and evolutionary methods. The neurons of an artificial neuron network are flexible enough to be attuned to various input signal patterns and acclimatize to a diverse array of unknown situations. They are constantly accepting and replacing previously learned information, keeping their repository of problem solving techniques updated. Partial destruction of a network leads to the corresponding degradation of performance. However, some

network capabilities may be retained even with major network damage.

**Adaptive learning:** An ability to learn how to do tasks based on the data given for training or initial experience.

**Self-Organisation:** An ANN can create its own organisation or representation of the information it receives during learning time.

**Real Time Operation:** ANN computations may be carried out in parallel, and special hardware devices are being designed and manufactured which take advantage of this capability.

**Massive parallelism:** Massively parallel systems is used in Artificial neural nets (ANNs) with large numbers of interconnected simple processors

### 4.3 APPLICATION OF ARTIFICIAL NEURAL NETWORK

Neural networks have been successfully applied across an extraordinary range of problem domains, in areas as diverse as finance, medicine, engineering, geology, physics and biology. The excitement stems from the fact that these networks are attempts to model the capabilities of the human brain. From a statistical perspective neural networks are interesting because of their potential use in prediction and classification problems. Artificial neural networks (ANNs) are non-linear data driven self adaptive approach as opposed to the traditional model based methods. They are powerful tools for modelling, especially when the underlying data is unknown. ANNs can identify and learn correlated patterns between input data sets and corresponding target values. After training, ANNs can be used to predict the outcome of new independent input data. ANNs imitate the learning process of the human brain and can process problems involving non-linear and complex data even if the data are imprecise and noisy. Thus they are ideally suited for the modelling of agricultural data which are known to be complex and often non-linear. A very important feature of these networks is their adaptive nature, where "learning by example" replaces "programming" in solving problems. This feature makes such computational models very appealing in application domains where one has little or incomplete understanding of the problem to be solved but where training data is readily available. These networks are "neural" in the sense that they may have been inspired by neuroscience but not necessarily because they are faithful models of biological neural or cognitive phenomena. In fact majority of the network are more closely related to traditional mathematical and/or statistical models such as non-parametric pattern classifiers, clustering algorithms, nonlinear filters, and statistical regression models than they are to neurobiology models. Neural Networks (NNs) have been used for a wide variety of applications where statistical methods are traditionally employed. They have been used in classification problems, such as identifying underwater sonar currents, recognizing speech, and predicting the secondary structure of globular proteins. In time-series applications, NNs have been used in predicating stock market performance. As statisticians or users of statistics, these problems are normally solved through classical statistical methods, such as discriminant analysis, logistic regression, logistic regression, Bayes analysis, multiple regression, and ARIMA time-series models. It is, therefore, time to recognize neural networks as a powerful tool for data analysis.

Here we have using *c#* for soft component in model of Neural Network. The application of artificial neural network which is commonly used in real world is as follows:-

- Predict the translation initiation sites in DNA sequences and Study human TAP transporter
- Explain the theory of neural networks using applications in biology
- Predict immunologically interesting peptides by combining an evolutionary algorithm
- Carry out pattern classification and signal processing successfully in bioinformatics; in fact, a large number of applications of neural network can be found in this area.
- Perform protein sequence classification; neural networks are applied to protein sequence classification by extracting features from protein data
- Protein secondary structure prediction and Analyze the gene expression patterns as an alternative to hierarchical clusters
- Gene expression can even be analyzed using a single layer neural network
- Protein fold recognition using ANN and SVM

### VI. RELATIONSHIPS AMONG NEURAL NETWORK, GENETIC ALGORITHM AND BIOINFORMATICS

The combined effort of Genetic programming-optimized NN (GPNN) in an attempt to improve upon the trial-and-error process of choosing an optimal architecture for a pure feed-forward Bioinformatics Programming NN (BPNN). The GPNN optimizes the inputs from a larger pool of variables, the weights, and the connectivity of the network including the number of hidden layers and the number of nodes in the hidden layer. The genetic algorithm is a population of strings (called chromosomes or the genotype of the genome), which encode individuals, creatures, or phenotypes solution to an optimization problem, evolves toward better solutions. Traditionally, solutions are represented in binary as strings of 0s and 1s, but other encodings are also possible. The evolution usually starts from a population of randomly generated individuals and happens in generations. In each generation, the fitness of every individual in the population is evaluated, multiple individuals are stochastically selected from the current population (based on their fitness), and modified (recombined and possibly randomly mutated) to form a new population. The new population is then used in the next iteration of the algorithm. Commonly, the algorithm terminates when either a maximum number of generations has been produced, or a satisfactory fitness level has been reached for the population. If the algorithm has terminated due to a maximum number of generations, a satisfactory solution may or may not have been reached. Genetic algorithms a biologically inspired technology, are randomized search and optimization techniques guided by the principles of evolution and natural genetics. They are efficient, adaptive, and robust search processes, producing near optimal solutions, and have a large degree of implicit parallelism. Therefore, the application of GAs for solving certain problems of bioinformatics, which need optimization of computation requirements, and robust, fast and close approximate solutions, appears to be appropriate and natural. Moreover, the errors

generated in experiments with bioinformatics data can be handled with the robust characteristics of GAs. To some extent, such errors may be regarded as contributing to genetic diversity, a desirable property. The problem of integrating GAs and bioinformatics constitutes a new research area. GAs is executed iteratively on a set of coded solutions, called population, with three basic operators: selection/reproduction, crossover, and mutation. They use only the payoff (objective function) information and probabilistic transition rules for moving to the next iteration. Of all the evolutionarily inspired approaches, Gas seem particularly suited to implementation using DNA, protein, and other bioinformatics tasks. This is because GAs is generally based on manipulating populations of bit-strings using both crossover and point-wise mutation.

### 5.1 SIGNIFICANCE AND APPLICATION OF GENETIC ALGORITHM IN BIOINFORMATICS

Genetic algorithms find application in bioinformatics, polygenetic, computational science, engineering, economics, chemistry, manufacturing, mathematics, physics and other fields. The most suitable applications of GAs in bioinformatics are:

- Alignment and comparison of DNA, RNA, and protein sequences.
- Gene mappings in chromosomes.
- Gene finding and promoter identification from DNA sequences.
- Interpretation of gene expression and micro array data.
- Gene regulatory network identification.
- Construction of polygenetic tree for studying evolutionary relationship
- DNA structure prediction and RNA structure prediction.
- Protein structure prediction and clustering.
- Molecular design and molecular docking.

A typical genetic algorithm requires: A genetic representation of the solution domain, and a fitness function to evaluate the solution domain. A standard representation of the solution is as an array of bits. Arrays of other types and structures can be used in essentially the same way. The main property that makes these genetic representations convenient is that their parts are easily aligned due to their fixed size, which facilitates simple crossover operations. Variable length representations may also be used, but crossover implementation is more complex in this case. Tree-like representations are explored in genetic programming and graph-form representations are explored in evolutionary programming; a mix of both linear chromosomes and trees is explored in gene expression programming.

**The fitness function** is defined over the genetic representation and measures the quality of the represented solution. The fitness function is always problem dependent. For instance, in the knapsack problem one wants to maximize the total value of objects that can be put in a knapsack of some fixed capacity. A representation of a solution might be an array of bits, where each bit represents a different object, and the value of the bit (0 or 1) represents whether or not the object is in the knapsack. Not every such representation is valid, as the size of objects may exceed the capacity of the knapsack. The fitness of the solution is the sum of values of all objects in the knapsack if

the representation is valid or 0 otherwise. In some problems, it is hard or even impossible to define the fitness expression; in these cases, interactive genetic algorithms are used. Once the genetic representation and the fitness function are defined, a GA proceeds to initialize a population of solutions (usually randomly) and then to improve it through repetitive application of the mutation, crossover, inversion and selection

### 5.2 ADVANTAGE OF GENETIC ALGORITHM IN BIOINFORMATICS

Several tasks in bioinformatics involve optimization of different criteria (such as energy, alignment score, and overlap strength), thereby making the application of Gas more natural and appropriate.

- Problems of bioinformatics seldom need the exact optimum solution; rather, they require robust, fast, and close approximate solutions, which GAs are known to provide efficiently.
- GAs can process, in parallel, populations billions times larger than is usual for conventional computation. The usual expectation is that larger populations can sustain larger ranges of genetic variation, and thus can generate high-fitness individuals in fewer generations.
- Laboratory operations on DNA inherently involve errors. These are more tolerable in executing evolutionary algorithms than in executing deterministic algorithms. (To some extent, errors may be regarded as contributing to genetic diversity—a desirable property.)

### 5.3 GENERAL NURAL MODEL FOR BIOINFORMATICS

An Artificial Neural Network (ANN) is an information processing model that is able to capture and represent complex input-output relationships. The motivation the development of the ANN technique came from a desire for an intelligent artificial system that could process information in the same way the human brain. These brains collect the information through connected neurons with the help of bioinformatics. The general concrete and basic model of bioinformatics can be presented here. This model may also be computed with the help of soft-computing programming of C#. Its novel structure is represented as multiple layers of simple processing elements, operating in parallel to solve specific problems. ANNs resemble human brain in two respects: learning process and storing experiential knowledge. An artificial neural network learns and classifies a problem through repeated adjustments of the connecting weights between the elements. In other words, an ANN learns from examples and generalizes the learning beyond the examples supplied. Artificial neural network applications have recently received considerable attention. The methodology of modelling, or estimation, is somewhat comparable to statistical modelling. Neural networks should not, however, be heralded as a substitute for statistical modelling, but rather as a complementary effort (without the restrictive assumption of a particular statistical model) or an alternative approach to fitting non-linear data. A typical neural network (shown in Figure) is composed of input units  $X = X_1, X_2, \dots, X_n$  corresponding to independent variables, a hidden layer known as the first layer, and an output layer (second layer) whose output units  $Y = Y_1, Y_2, \dots, Y_m$

corresponds to dependent variables (expected number of accidents per time period)

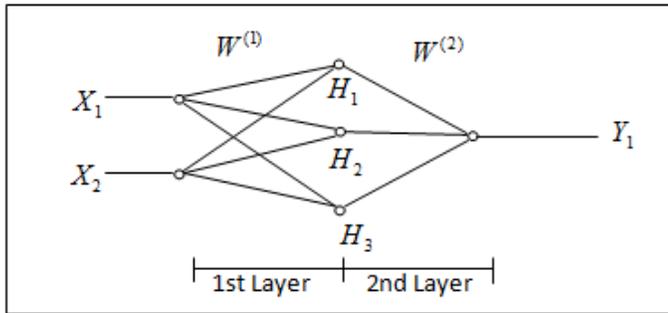


Figure 10: General ANN model with weight

In between are hidden units H1, H2 ... corresponding to intermediate variables. These interact by means of weight matrices W (1) and W (2) with adjustable weights. The all the hidden units(H<sub>k</sub>) corresponded with the weights and sharing the information with input(X<sub>i</sub>)(i=1,2,...n) and output(Y<sub>j</sub>)(j=1,2,...m). In this case no of hidden units depends on input as per informative flow of output. The values of the hidden units are obtained from the formulas:

$$H_j = f\left(\sum_k w_{jk}^{(1)} x_k\right) \dots\dots\dots(A)$$

$$Y_i = f\left(\sum_k w_{jk}^{(2)} H_j\right) \dots\dots\dots(B)$$

In One multiplies the first weight matrix by the input vector X = (X1, X2,...) and then applies an activation function f to each component of the result. Likewise the values of the output units are obtained by applying the second weight matrix to the vector H = (H1, H2,...,H<sub>k</sub>) of hidden unit values, and then applying the activation function f to each component of the result. In this way one obtains an output vector Y= (Y1, Y2,...).The activation function f is typically of sigmoid form and may be a logistic function, hyperbolic tangent, etc.:

$$f(u) = \frac{1}{1 + e^{-u}} \dots\dots\dots(C)$$

$$f(u) = \frac{e^x - e^{-u}}{e^x + e^{-u}}$$

Usually the activation function is taken to be the same for all components but it need not be. Values of W (1) and W (2) are assumed at the initial iteration. The accuracy of the estimated output is improved by an iterative learning process in which the outputs for various input vectors are compared with targets (observed frequency of accidents) and an average error term E is computed(see section 5.4):

$$E = \frac{\sum_{n=1}^N (y^{(k)} - T^{(n)})^2}{N}$$

Here -----(D)

N = Number of highway sites or observations

Y (n) = Estimated number of accidents at site n for n = 1, 2... N

T (n) = Observed number of accidents at site n for n = 1, 2... N.

After one pass through all observations (the training set), a gradient descent method may be used to calculate improved values of the weights W(1) and W(2), values that make E smaller. After reevaluation of the weights with the gradient descent method, successive passes can be made and the weights further adjusted until the error is reduced to a satisfactory level. The computation thus has two modes, the mapping mode, in which outputs are computed, and the learning mode, in which weights are adjusted to minimize E. Although the method may not necessarily converge to a global minimum, it generally gets quite close to one if an adequate number of hidden units are employed. The most delicate part of neural network modelling is generalization, the development of a model that is reliable in predicting future accidents. Over fitting (i.e., getting weights for which E is so small on the training set that even random variation is accounted for) can be minimized. The complete process can be summarised on the above mathematical model.

**5.4 Soft Computing Approaches of Neural Network by C#**

The above model can be computed with the help of programming in C# to easy understand of modified general neural network model for bioinformatics with hidden layers who can pass the information from input to output layers in easy manner. The above mathematical function and equation ( C ) &(D) to be computed by C#.

```
public Double observationInput(Int32 EstimatedNoAccidents, Int32 ObservedNoAccidents,
Int32 NohighwaySite)
{
    Double finalval = 0;
    Double finalvalallCal = 0;
    for (int i = 1; i == NohighwaySite; i++)
    {
        finalval += (EstimatedNoAccidents ^ i - ObservedNoAccidents ^ i) *
(EstimatedNoAccidents ^ i - ObservedNoAccidents ^ i);
    }

    return finalvalallCal = finalval / NohighwaySite;
}
public Double logisticMethod(double logisticInput)
{
    Double result = 1 / (1 + Math.Exp(logisticInput));
    return result;
}
public Double HyperbolicM(double hyperInput)
{
    Double result = (Math.Exp(hyperInput) - Math.Exp(-hyperInput)) /
(Math.Exp(hyperInput) + Math.Exp(-hyperInput));
    return result;
}
```

## VII. CONCLUSION AND FUTURE SCOPE

The demand of interdisciplinary subject has been increasing rapidly with its great significances and complete utilization in the sense of application point of view. The Bioinformatics is one of them, its involvement of other sciences like neural network, genetic for computation holds great promise; this century's major research and development efforts will likely be in the biological and health sciences. Computer science diversifies their offerings, which can gain through early entry into bioinformatics. Even using minimal resources and maximum utilization of bioinformatics in neural network with the computational process such efforts are wise and signified in recent time. Still unclear is whether bioinformatics will eventually become an integral part of computer science or will develop into an independent application. Regardless of the outcome, computer scientists are sure to benefit from being active and assertive partners with biologists. The tools like neural network and genetic algorithm gives the powerful emphasis on bioinformatics to computing the combined effect for development model and exploring it with development of soft impact by C#. The multidimensional mathematical model can be developed for together working process of neural, genetic with bioinformatics in futures. The computational programmings for same model to be also work out in coming time.

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# Proposal for the Development of a Device to Load Bagasse at Sugar Industry

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**Abstract-** In all sugar industries the cane after processing is left with the waste product called "Bagasse". The Bagasse produced in the mills is used as a fuel to boilers and the generation of steam. The steam thus produced is expanded in turbines and the power is generated. The excess bagasse is then stored in an open area. Lot of human health hazards is taking place due to loading of bagasse. Nowadays, the industries are using the crane systems to load the bagasse into the tippers, which is a very slow task and causing more dust. The bucket conveyors are used to move bulk materials in a vertical or inclined path. Buckets are attached to a cable, chain, or belt. Buckets are automatically unloaded at the end of the conveyor run. The belt conveyor is used for transporting light- and medium-weight loads between operations, departments, levels, and buildings, providing considerable control over the orientation and placement of the load. The belt is roller or slider bed supported; the slider bed is used for small and irregularly shaped items.

**Index Terms-** Bagasse, Sugar industry, Sugar

## I. INTRODUCTION

Indian sugar industry is the 2<sup>nd</sup> largest agro-industry with approximately 50 million sugarcane farmers and a large number of agricultural labourers (7.5% of the rural population) involved in sugarcane cultivation. In India, sugarcane is the key raw material, planted once a year during January to March. The production of sugar is spread across the country. Maharashtra, UttarPradesh, Karnataka, Tamil Nadu, Gujarat and Andhra Pradesh are the major sugar producing states in the country. Maharashtra and UP are the main cane producing states.

**Bagasse:** Bagasse is the material obtained after extraction of juice from sugarcane stalk. It is used as fuel in co-generation plant of sugar mills but is burnt directly in furnaces. Efficient burning of bagasse depends on its moisture content. Fresh bagasse normally contains 50% moisture.

Efficient burning of bagasse depends on its moisture content. Fresh bagasse normally contains 50% moisture and reduction of moisture improves upon its calorific value [1]. Calorific value of bagasse dried to half of its initial moisture content is about 10% higher [2]. Manohar [3] reported that wet mill bagasse has moisture 50%, fibre pith 47%, sugar 2.5% and mineral 0.5%. The composition of bagasse obtained from sugar mill is given in Table 1.

**Table 1 Composition of Bagasse of Sugar Mill**

Composition, %	Mill Bagasse
Fibre	43-52(Avg. 47.7)
Moisture	46-52(Avg. 50)
Soluble Solids	2-6 (Avg. 2.3)

A typical chemical analysis of bagasse might be (on a washed and dried basis) as mentioned below;

Bagasse is an extremely inhomogeneous material comprising around 30-40% of "pith" fiber, which is derived from the core of the plant and is mainly Parenchyma material, and "bast", "rind", or "stem" fiber, which comprises the balance and is largely derived from sclerenchyma material. These properties make bagasse particularly problematic for paper manufacture and have been the subject of a large body of literature.

**Table 2 Chemical analysis of Bagasse**

Cellulose	-	45-55 %
Hemi-cellulose	-	20-25 %
Lignin	-	18-24 %
Ash	-	01-04 %
Waxes	-	Less than 1 %

Bagasse can be used for various other forms, such as follows;

### a) Fuel

Bagasse is often used as a primary fuel source for sugar mills; when burned in quantity, it produces sufficient heat energy to supply all the needs of a typical sugar mill, with energy to spare. To this end, a secondary use for this waste product is in cogeneration, the use of a fuel source to provide both heat energy used in the mill, and electricity, which is typically sold on to the consumer electricity grid.

The resulting CO<sub>2</sub> emissions are equal to the amount of CO<sub>2</sub> that the sugarcane plant absorbed from the atmosphere during its growing phase, which makes the process of cogeneration greenhouse gas-neutral. In many countries (such as Australia), sugar factories significantly contribute 'green' power to the electricity supply. Florida Crystals Corporation is one of America's largest sugar companies, owns and operates the largest biomass power plant in North America. The 140 MW facilities use bagasse and urban wood waste as fuel to generate enough energy to power its large milling and refining operations.

**b) Paper**

Paper production is the second-largest revenue stream from bagasse; the largest is electricity cogeneration. Using the by-products of agricultural crops for paper production, rather than wood, does offset commercial forestry practices.

This is believed beneficial because the conversion of the rainforest to commercial tree stock and common forestry practices destroys a majority of the indigenous rainforest life forms. For example, the most common commercial tree stock for short fiber pulp for paper is eucalyptus, which is considered an invasive species due to compounds in the leaves that can be toxic in large quantities and because it is considered a fire hazard.

A secondary benefit of substituting agricultural by-products for commercial forestry practices is the reduction of the number of farmers following logging roads into the rainforest for the purpose of burning pristine rainforests to convert to farming. It is thought that bagasse has the added advantage over other forms of papermaking feedstock in that it requires fewer greenhouse gases to collect, compared to harvesting of wood chips, as the fibre has already been transported to the factory for extracting the sugar.

**c) Boards**

It can also be used for making boards resembling Plywood or Particle board, namely Bagasse board. It has wide usage for making partitions, furniture etc. It is an eco-friendly method as it does not involve any harm to the world's timber resources, unlike plywood. It is known as Bagasse Board and is considered a good substitute for plywood.

**d) Controls**

Mechanical collectors and wet scrubbers are commonly used to control particulate emissions from bagasse-fired boilers. Mechanical collectors may be installed in single cyclone, double cyclone, or multiple cyclone arrangements. The reported PM collection efficiency for mechanical collectors is 20 to 60 %. Due to the abrasive nature of bagasse fly ash, mechanical collector performance may deteriorate over time due to erosion if the system is not well maintained. Impingement scrubbers are in greater use due to their lower energy requirements and fewer operating and maintenance problems. Reported PM collection efficiencies for both scrubber types are 90% or greater.

**Moisture test of Bagasse**

Experimental procedure followed to determine the moisture content of the Bagasse in the laboratory;

1. Weighing out 100 gms of Bagasse material.
2. Dry it in oven at a temperature between 105 °C to 110 °C.
3. Cool it to room temperature.
4. Weight it again to find the loss.
5. The difference between the first and final weight of the sample will equal to the original moisture content.
6. Report the exact percentages of moisture determined.
7. Express moisture as percentage of moist sample.

**II. PROBLEM DEFINITION**

The sugar factories works in the season of October to march, during season lot of bagasse is collected and stored in an

open place. Loading of Bagasse to the trolley has become a very difficult task due to dust coming out of it and it creating a lot of health hazards to human beings. Hence labors are unable to work in that environment. Hence a mechanical system must be developed for the loading of Bagasse.

**III. PROPOSED WORK**

The loading of bagasse is a very difficult task in sugar industries as it causes more dust while doing to trolley. Hence it is required to develop a new mechanism for loading bagasse in sugar industry. Hence we proposed a mechanical system for loading a bagasse by using bucket conveyors. The bucket assembly starts rotating and starts collecting the bagasse from heap. When the bucket reaches to the topmost position, the bagasse gets dumped into the hopper which then guides the bagasse towards the conveyor. Once the bagasse is conveyed onto the conveyor, it is then transported to the trolley. Engine is attached to the whole assembly so that the movement of the assembly can be made easier and it can also be moved to the place from where the bagasse is to be loaded.

**Objectives**

1. To suggest the development of an economic new mechanism for sugar industries in India to load the Bagasse to the trolley.
2. To be economical, consume less labor and lesser time than conventional methods.
3. To create a human hazardous free mechanism covering under safety norms.
4. To create a flexible and multipurpose mechanism.

**Observations:**

Percentage of moisture content  
 $= (W1 - W2) / W1 \times 100 = 50 \%$

Where,  
 $W1 \text{ (gms)} = \text{Weight of Bagasse whose moisture is to be determined} = 100 \text{ g.}$

$W2 \text{ (gms)} = \text{Weight of Bagasse after drying} = 50 \text{ g.}$

After performing the experiment finally the average moisture content in bagasse is found out to be 50%. Composition of Bagasse is shown below

**Table 3 Composition of Bagasse**

ITEM	BAGASSE (%)
Moisture	49.0
Fiber	48.7
Soluble Solids	2.3

**IV. METHODOLOGY**

The prototype mechanism works on 12 V DC power supply. When the power is switched on, the bucket assembly starts

rotating and starts collecting the bagasse from the heap. When the bucket reaches to the topmost position, the bagasse gets dumped into the hopper which then guides the bagasse towards the conveyor. Once the bagasse is conveyed onto the conveyor, it is then transported to the tippers and trucks.

Some of the design considerations made are:

1. Minimum ground clearance must be provided for the ease of movement of the buckets.
2. The slope and position of the hopper should be set so that the whole amount of bagasse that is collected goes onto the conveyor. An enclosure is suggested for the hopper so that the bagasse is not carried away by the wind.
3. The height of conveyor frame should be in proper alignment with the hopper and at the same time the other end of the frame should confirm to the height of the tippers and trucks for easier transportation.
4. The bucket assembly and the conveyor should be attached together with a common weld in order to maintain the constant distance between bucket assembly, hopper and conveyor. For this setup a driving mechanism is suggested so as to make the whole mechanism flexible to move and collect the bagasse.
5. The conveyor used here is roller conveyor in which the rollers are arranged in such an inclined position that the belt forms a "U" position by idlers so that the bagasse does not get carried away by any external influences.
- 6.

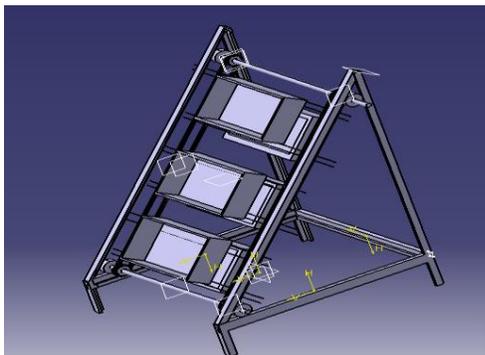


Fig 1 Isometric View after Final Assembly

## V. MANUFACTURING OF COMPONENTS

**Buckets:** Bucket is the component used for loading the Bagasse in the sugar industry as it offers less resistance during collection of material because of less area of contact Presence of teeth and the slope provided makes it easier to collect the bagasse. Bulk production of these buckets is cost effective hence after a long market survey we preferred the material of bucket as stainless steel 302 grade.

Stainless steels are corrosion resistant steels, which are protected by the formation of a self-repairing passive oxide film. The resilience of this layer increases with chromium content and also with the addition of molybdenum. The presence of nickel encourages the formation of a crystalline structure called austenite, which aids ductility and formability. The standard stainless steel alloys used in plumbing applications typically contain 17-18% chromium and 8-12% nickel.

The nominal width of bucket is 1.2m and length of bucket is 1.5m and depth is of 0.6m. the buckets are arranged with the teeth which helps to take the bagasse easily. The size of bucket helps to collect more bagasse and fill the trolley in a very faster rate.

## Stainless Steel 302, as Bucket Material

SS302 is an austenitic Chromium-Nickel stainless steel offering the optimum combination of corrosion resistance, strength and ductility. These attributes make it a favorite for many mechanical switch components.

## Advantages offered by Stainless Steel

### • Material Benefits

1. Stainless steel has a very low general corrosion rate in water and no corrosion allowance is required.
2. Combining corrosion resistance with high strength allows reduction in section diameter, wall thickness and weight, making it quick and easy to install.
3. It is ductile and using the appropriate tooling is not difficult to bend and cut.

### • Environmental Benefits

1. Stainless steel can be used in all types of water.
2. No heat is required to form a joint or groove, reducing fire hazards. Therefore hot work permits are not required.
3. Stainless steel is fully recyclable.

### • Economic Benefits

1. The expected life time of a stainless steel system is more than 50 years, longer than is typical for competing materials.
2. Stainless steel requires no additional coating.
3. No maintenance is required after installation, reducing system downtime, replacement and maintenance costs over the life-cycle of the installation.
4. Although initial costs may be higher than for competing materials, such as copper and plastic, the economic benefits of using stainless steel increase over time.
5. At the end of its useful life, stainless steel is fully recyclable and retains a higher residual scrap value than ordinary steel.

Table 4 Nominal Composition

Chromium	18.2%	Silicon	5%
Nickel	85%	Carbon	0.06%
Manganese	1.6%	Iron	Balance

Table 5 Physical Properties

Density	= 0.284 lbs.cu.in.
Melting Point (Approx.)	= 1400°C
Resistivity @ R.T.	= 72 Microhm-cm
Thermal Expansion	= 17.3x10 <sup>-6</sup> /°C

Coefficient (0° to 100° C)	
Thermal Conductivity @ 100°C	= 16.3W/m·K
Magnetic Attraction	= None / Slight
Annealed Cold Rolled	---
Magnetic Permeability (Annealed: H=200 oersteds)	= 1.02 Max.

**General Corrosion:** ATI 302 austenitic steels provide useful resistance to corrosion on a wide range of moderately oxidizing to moderately reducing environments. The alloys are used widely in equipment and utensils for processing and handling of food, beverages and dairy products.

In addition, a large variety of applications involve household and industrial chemicals. The 18 to 19 percent chromium which these alloys contain provides resistance to oxidizing environments such as dilute nitric acid, as illustrated by data for ATI 302 below

**Table 6 Data for ATI 302**

% Nitric Acid	Temperature °F (°C)	Corrosion Rate Mils/Yr (mm/a)
10	300 (149)	5.0 (0.13)
20	300 (149)	10.1 (0.25)
30	300 (149)	17.0 (0.43)

**Table 7 Typical Mechanical Properties**

Property	Annealed	Cold rolled
Ultimate Tensile Strength	100,000 PSI	210,000 PSI
Yield Strength (.2% Offset)	40,000 PSI	190,000 PSI
Elongation in 2''*	40 %	2 %
Modulus of Elasticity (Tension)	28x10 <sup>6</sup> PSI	-
Poisson's Ratio	0.29	-

\*The measured elongation will be less as thickness decreases to .002'' and less.

**Belt Conveyors:** A belt conveyor consists of two or more pulleys, with a continuous loop of material - the conveyor belt that rotates about them. One or both of the pulleys are powered, moving the belt and the material on the belt forward. The powered pulley is called the drive pulley while the unpowered pulley is called the idler. There are two main industrial classes of belt conveyors; those in general material handling such as those moving boxes along inside a factory and bulk material handling such as those used to transport industrial and agricultural materials, such as grain, coal, ores, etc. generally in outdoor locations.

The belt consists of one or more layers of material. They can be made out of rubber. Many belts in general material handling have two layers. An under layer of material to provide linear strength and shape called a carcass and an over layer called the cover. The carcass is often a woven fabric having a warp &

weft. The most common carcass materials are polyester, nylon and cotton.

It is considered a labour saving system that allows large volumes to move rapidly through a process, allowing companies to ship or receive higher volumes with smaller storage space and with less labour expense.

Rubber conveyor belts are commonly used to convey items with irregular bottom surfaces, small items that would fall in between rollers (e.g. a sushi conveyor bar), or bags of product that would sag between rollers. Belt conveyors are generally fairly similar in construction consisting of a metal frame with rollers at either end of a flat metal bed. The belt is looped around each of the rollers and when one of the rollers is powered the belting slides across the solid metal frame bed, moving the product.

In heavy use applications the beds which the belting is pulled over are replaced with rollers. The rollers allow weight to be conveyed as they reduce the amount of friction generated from the heavier loading on the belting. Belt conveyors can now be manufactured with curved sections which use tapered rollers and curved belting to convey products around a corner.



**Fig 2 Belt Conveyor**

In the Project, belt conveyor is used for the transportation of bagasse from the hopper to the trolley. The belt of conveyor is made up of top cover, end cover and carcass as explained earlier. Belt is also made of U-shape with the help of idlers as shown in above figure to prevent dropping of bagasse from belt.

**Chain Conveyors:** These conveyors generally have double or triple and sometimes multiple strands of roller chains running over fabricated frames and guides. They are used where positive transport of goods is required, and are often used in roller conveyors where a change of direction is required.

Chain conveyors utilize a powered continuous chain arrangement, carrying a series of single pendants. The chain arrangement is driven by an electric motor and the material suspended on the pendants is conveyed. Chain conveyors are used for moving products down an assembly line and/or around a manufacturing or warehousing facility.

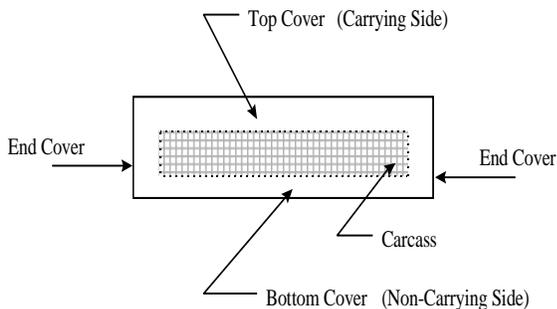


**Fig 3 Saltplus' Warlock Halflink' Chain**

Chain conveyor is arranged with series of buckets. The buckets are welded with two cast iron bars to conveyor. Conveyor is provided power by electric motor because as electric power is generated in industry. When conveyor rotates buckets collect bagasse and dump to hopper.

**Essential Properties Components**

1. Flexibility
2. Transverse rigidity
3. Low mass per unit length
4. High strength
5. Simplicity and inexpensive
6. Longer life
7. Should not stretch under normal working stresses, (i.e. low relative elongation)
8. Wear resistant
9. Fire resistant



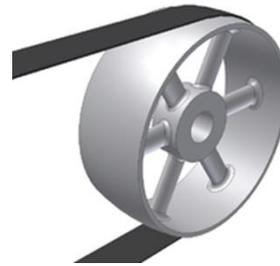
**Fig 4 Construction of conveyor belt**

**Pulley**

A pulley is a wheel on an axle that is designed to support movement of a cable or belt along its circumference. Pulleys are used in a variety of ways to lift loads, apply forces, and to transmit power. A belt and pulley system is characterized by two or more pulleys in common to a belt. This allows for mechanical power, torque, and speed to be transmitted across axles. If the pulleys are of differing diameters, a mechanical advantage is realized.

In the case of a drum-style pulley, without a groove or flanges, the pulley often is slightly convex to keep the flat belt centred. It is sometimes referred to as a crowned pulley. Though once widely used in factory line shafts, this type of pulley is still found driving the rotating brush in upright vacuum cleaners. Agricultural tractors built up to the early 1950s generally had a belt pulley. It had limited use as the tractor and equipment being

powered needed to be stationary. It has thus been replaced by other mechanisms, such as power take-off and hydraulics.



**Fig 5 Flat belt on a Belt Pulley**

**Cast Iron Angular Plates**

Angular plates are used to provide support to the whole assembly. Bucket conveyor systems supported by the cast iron angular plates.



**Fig 6 Cast Iron Angular Plates**

**VI. DISCUSSION AND CONCLUSION**

Considering all the design parameters, real-time calculations, safety norms, cost efficiency, material life time and labour availability, it can be concluded that the Mechanism that is suggested is the most appropriate for conduction and transportation of bagasse. The sugar plant is bounded by a limitation of utilizing an excavator for 10 hrs. Per day; henceforth the use of this mechanism which can be fabricated at a onetime investment can serve the plant when needed, eliminating the cost expenses.

The mechanism is flexible in terms of motion due to the presence of a driving mechanism which makes it to collect the bagasse covering the whole plant area over which the bagasse is spread. By varying the size of the buckets, the amount of bagasse that can be collected can also be increased correspondingly. The total number of links present in the mechanism is considerably less making the maintenance cost of the mechanism lesser. By this, above suggested real time application will be best to suit the company requirements and prevents human labours from hazardous environment.

**Real-time Calculations**

Total no. of buckets	=	10
Amount of bagasse collected in one bucket	=	10 Kg
Amount of bagasse conveyed/cycle	=	100 kg

Amount of bagasse = 6.67 tons  
conveyed/min  
Amount of bagasse = 40.02 tons  
conveyed/hour

The main advantage of the proposed machine is its flexibility. It can be used to lift and convey not only bagasse, but also the materials in other industries like Crusher industry, Grain industry. The whole system is attached to the driving mechanism where in the machine can be driven to the place where the produce is stored and ready to be conveyed/transported. The mechanism proposed serve as in ideal replacement of JCB's in Sugar Industries, in terms of economic parameters attached to it.

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# Definition of zachman framework cells based on service oriented architecture

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**Abstract-** One of the favorite frameworks which is increasingly introduced for solving the problems of complex information systems and improving their management is John Zachman Framework. This framework is currently used for understanding Enterprise Architecture and business. Service Oriented Architecture is a standard framework in which services are created, implemented, and settled. Its main objective is accelerating agility of information technology towards fast and effective reply to the changes in business environments. As the organizations and companies are increasingly moving to the Service Oriented Architecture, its complexities and dimensions are more highlighted. Therefore, it is needed to take into account the expansion of criteria and models used in designing architecture. Since Service Oriented Architecture is the newest generation of Information System Architecture and it can be used in different areas like Enterprise Architecture, in this article it is intended show different models of Service Oriented Architecture and also demonstrate the position of this service in Zachman Framework. On the other hand, it is attempted to introduce Zachman's Service Oriented Framework.

**Index Terms-** OASIS, Reference Model for SOA (SOA-RM), Service Oriented Architecture (SOA), Zachman Framework (ZF), Zachman's Service Oriented Framework (ZSOF).

## I. INTRODUCTION

An Enterprise Architecture (EA) is a plan of record, a blueprint of the permitted structure, arrangement, configuration, functional groupings / partitioning, interfaces, data, protocols, logical functionality, integration, technology, of IT resources needed to support a corporate or organizational business function or mission. The Zachman Framework for Enterprise Architecture is a widely used approach for developing or documenting an enterprise wide architecture. John Zachman based his framework on practices in traditional architecture and engineering. The framework is a logical structure for classifying and organizing those elements of an enterprise that are significant to both the management of the enterprise and the development of its information systems.

In 1987, John Zachman wrote, "To keep the business from disintegrating, the concept of information systems architecture is becoming less of an option and more of a necessity." From that assertion over 20 years ago, the Zachman Framework has evolved and become the model through which major organizations view and communicate their enterprise information

infrastructure. The Zachman Framework draws upon the discipline of classical architecture to establish a common vocabulary and set of perspectives, a framework, for defining and describing today's complex enterprise systems. Enterprise architecture provides the blueprint, or architecture, for the organization's information infrastructure.

Service Oriented Architecture techniques are applicable to the system layer (domain) of enterprise architecture as a system development methodology. SOA is an approach to building IT systems out of common software modules (parts), called services. The goal of SOA-based development is to enable organizations to assemble business systems out of simpler cataloged modules. SOA methods are now being explored by enterprises with the goal of achieving flexibility, agility, and productivity enhancements in IT development. Indeed, in allowing reuse, SOA lowers long-term integration costs and provides faster delivery of business applications. This approach to development may typically require more upfront effort in design and planning when the paradigm is first adopted and applied, but, in theory, it enables organizations to increasingly build systems more rapidly and cheaply as the inventory of reusable modules grows over time.

## II. THE PLAN OF WORK (PROCEDURE)

The Zachman Framework intends to provide an understanding of any particular aspect of a system at any point in its development. The tool can be useful in making decisions about changes or extensions. The framework contains six rows and six columns yielding 36 cells or aspects (Table 1).

**Table 1: Zachman Framework**

	What (Data)	How (Function)	Where (Locations)	Who (People)	When (Time)	Why (Motivation)
Scope (contextual) Planner	List of things important to the business	List of processes that the business performs	List of locations in which the business operates	List of organizations important to the business	List of events/cycles important to the business	List of business goals/strategies
Enterprise Model (conceptual) Business Owner	e.g. Semantic Model	e.g. Business Process Model	e.g. Business Logistics System	e.g. Workflow Model	e.g. Master Schedule	e.g. Business Plan
System Model (logical) Designer	e.g. Logical Data Model	e.g. Application Architecture	e.g. Distributed System Architecture	e.g. Human Interface Architecture	e.g. Process Structure	e.g. Business Rule Model
Technology Model (physical) Implementer	e.g. Physical Data Model	e.g. System Design	e.g. Technology Architecture	e.g. Presentation Architecture	e.g. Control Structure	e.g. Rule Design
Detailed Representation (out-of-context) Subcontractor	e.g. Data Definition	e.g. Program	e.g. Network Architecture	e.g. Security Architecture	e.g. Timing Definition	e.g. Rule Definition
Functioning System	e.g. Data	e.g. Function	e.g. Network	e.g. Organization	e.g. Schedule	e.g. Strategy

Nearly all of today’s modeling languages offer design capabilities that reflect a futuristic state of software architecture. These languages illustrate future scenarios; some even introduce a road map for implementation.

OASIS (Organization for the Advancement of Structured Information Standards) is a non-profit consortium that drives the development, convergence and adoption of open standards for the global information society. The OASIS Reference Model for SOA [SOA-RM] provides a common language for understanding the important features of SOA. The SOA-RAF (Reference Architecture follows) ,follows the recommended practice of describing architecture in terms of models, views, and viewpoints, as prescribed in the ANSI/IEEE 1471-2000.

In this article it is intended to take into account different dimensions of service oriented architecture (e.g., web services) and also apply OASIS Service Oriented Architecture Reference models in the cells of Zachman Framework show Zachman’s Service Oriented framework.

### III. MOVING TO THE ZACHMAN’S SERVICE ORIENTED FRAMEWORK (ZSOF)

In this part service oriented actions in each row of Zachman Framework is reviewed.

#### 3-1 Analysis First Row in ZSOF:

The first row of the framework identifies the field and theme of architecture without regard to the output. Since here there is a combination of Zachman Framework and Service Oriented, it is obvious that primary concepts that represents Zachman Framework change. Accordingly, after making service oriented, contents of first row are suggested as given in Table 2.

**Table 2: The Comparison of Concepts of the ZF and ZSOF**

Zachman Framework Concept	Data (“what”)	Function (“how”)	Location (“where”)	People (“who”)	Time ( “when”)	Motivation (“why”)
Zachman’s Service Oriented Framework	Data and Information Flowing	Services and Processes	Network and Valuable Resources	Consumer services, Service Provider, User interfaces ...	Events and Time	The need for service and Policies

#### 3-2 Analysis Second Row in ZSOF:

Second row (Owner’s perspective) in Zachman Framework, identifies descriptive representation from the enterprise owners’ perspectives. In this row, business is described in accordance

with what business stakeholders in the organization (managers, staffs, reporters) explain. Third row (designer’s perspective) in Zachman Framework identifies given data for saving and the relationship between these data. Since OASIS Service Oriented models to a high degree are the combination of both owner and planer’s perspectives in relation to the business, in this article the second row (Business Model) and third row (Information System Model) are composited and a new compound row ‘Business Model’ is suggested in Table 3. Therefore, in new composited row (Business Model) what is modeled includes people (participants and stakeholders) who are involved in business, and also consists of objectives, activities, interpersonal relationships, and instruments and actions influenced by these people. In Business Model row, Service Oriented Models (OASIS models) are located. In the following these models and their features for each cell will be explained.

#### 3-2-1 The Business row and First column in ZSOF:

All the components participated in Service Oriented Architecture are frequently in contact with business processes in order to offer exact and suitable services to the participants. In the development of Service Oriented, a collection of components are used which in relation and cooperation with each other expand the business of complex and developing workshops. In interface, transferring messages is an instrument by which service participants are interacting. Since in this cell we have transformation of information, ‘Semantics of Communication Model’ can be a suitable model for representing the concepts and dimensions of this cell. In the following, features and characteristics of ‘Semantics of Communication Model’ based on OASIS consortium will be explained (Figure 1). Location of this model is depicted in Table 3.

#### Semantics of Communication Model:

Interaction is a form of communication. In this Reference Architecture, we use messages as the medium of interaction between service participants. Messages are exchanged that represent actions, and messages are exchanged that represent the reporting of events. In this model, we outline one way that this can be modeled effectively – in terms of shared vocabularies, shared semantics and shared understanding of communicated intent. Since service consumers and providers are not directly acting against each other, they must do so indirectly – primarily by means of some form of communication. Speaking to someone is an action; if the speech conveys a request or a pronouncement of some kind, the former actions are used as vehicles to convey the true actions. Thus in Figure 1, we see Action appear twice – once in modeling the communicative actions needed to support interaction and once as the intended or conveyed action.

Message exchange is the means by which service participants (or their delegates) interact with each other. There are two primary modes of interaction: joint actions that cause real world effects and notification of events that report real world effects. The notion of “joint” in joint action implies that you have to have a speaker and a listener in order to interact. A message exchange is also used to communicate event notifications. An event is an occurrence that is of interest to some participant; in our case when some real world effect has occurred.

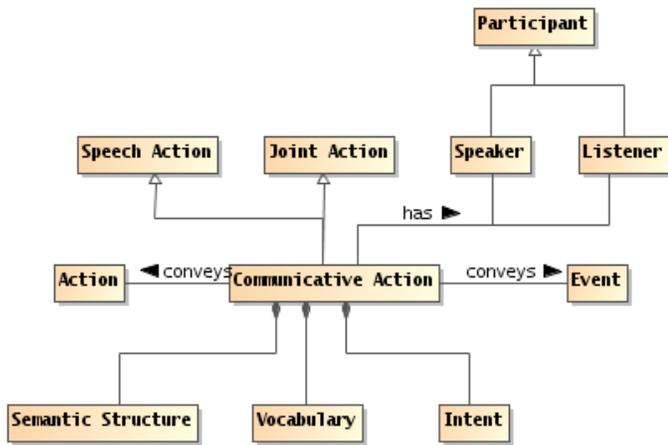


Figure 1: Semantics of Communication Model

**Communicative Action:** Communicative actions are joint actions where service participants communicate with each other. A Communicative Action has a speaker and a Listener; each of whom must perform their part for the communicative action to occur.

**Semantic Structure:** A communicative action has an aspect which conveys the meaning of the content being communicated. Typically, a semantic structure takes the form of a proposition which is either true, false or intended to be true or false. The concept of semantic structure is quite abstract. However, in many cases involving machines, the semantic structure will be conveyed as some form of highly regular tree structure, with a well defined method for interpreting the structure. For example, an invoice will often follow pre-established standards for communicating invoices.

**Intent:** The purpose of the communicative action is its intent. The intent, together with the semantic structure convey either an action – such as a request from a service consumer to the service – or an event – which typically reports on the results of previous communicative acts.

**Vocabulary:** In order for there to be any communication, there must be sufficient shared understanding of the elements of interaction and of terms used in communication. A shared vocabulary may range from a simple understanding of particular strings as commands to a sophisticated collection of terms which are formalized in shared ontologies.

**Action:** Participants’ principal mode of participation in a SOA ecosystem is action; typically action in the interest of achieving some desired real world effect. The application of intent by an actor to cause an effect.

**Event:** An event is made visible to interested consumers by means of an event notification message exchange that reports a real world effect; specifically, a change in shared state between service participants.

**Joint Action:** The coordinated set of actions involving the efforts of two or more actors to achieve an effect.

**3-2-2 The Business row and Second column in The ZSOF:**

This cell indicates a model of processes and services of Service oriented organizational systems in relation to the business. In previous approaches, data was used for communication; however, in this model message is used for request which shows that this model is based on process. Among the protocols and Service Oriented Standards BPEL, UDDI, WSDL, and SOAP can be mentioned. Though in this model protocols and standards are not explained in details, however, using the capacities of services and processes in direction of reaching the services confirms that ‘Service Reachability Model’ can suitably cover this cell.

**Service Reachability Model:**

Service reachability, as modeled in Figure 2 enables service participants to locate and interact with enables service participants to locate and interact with one another. To support service reachability, the service description should indicate the Endpoints, to which a service consumer can direct messages to invoke actions and the protocol to be used for message exchange using that Endpoint. As generally applied to an action, the endpoint is the conceptual location where one applies an action; with respect to service description, it is the actual address where a message is sent. Reachability involves knowing the endpoint, protocol, and presence of a service. At a minimum, reachability requires information about the location of the service and the protocol describing the means of communication. Location of this model is depicted in Table 3.

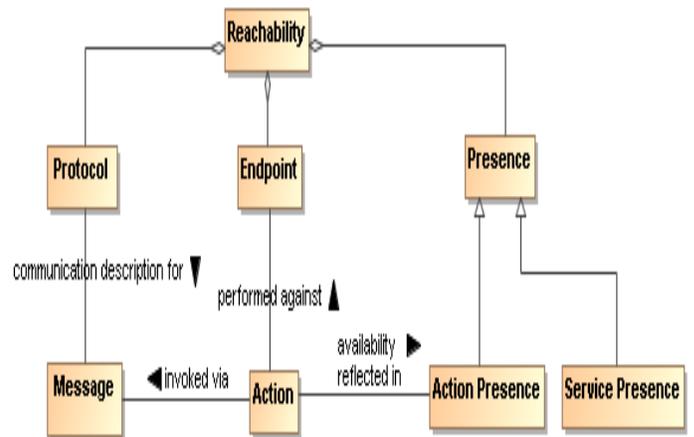


Figure 2: Service Reachability Model

**Endpoint:** A reference-able entity, processor or resource against which an action can be performed.

**Protocol:** A structured means by which details of a service interaction mechanism are defined.

**Presence:** The measurement of reachability of a service at a particular point in time.

A protocol defines a structured method of communication. Presence is determined by interaction through a communication protocol. Presence may not be known in many cases until the interaction begins. To overcome this problem, IT mechanisms may make use of presence protocols to provide the current

up/down status of a service. Each action may have its own endpoint and also its own protocols associated with the endpoint and whether there is presence for the action through that endpoint. Presence of a service is an aggregation of the presence of the service's actions, and the service level may aggregate to some degraded or restricted presence if some action presence is not confirmed. For example, if error processing actions are not available, the service can still provide required functionality if no error processing is needed. This implies reachability relates to each action as well as applying to the service/business as a whole.

**3-2-3 The Business row and Third column in ZSOF:**

In Zachman Framework, geographical distribution of physical resources of business, organizational functioning, and the way of relationship between locations were located in this cell; however, after combining Zachman Framework with Service Oriented Architecture, contents of this cell are being expanded and contains more than physical themes. The model located in this cell must represent properties, resources, and valuable stocks comprehensible for the Service Oriented Enterprise. Therefore, description of network and its valuable resources can be presented by the Service Oriented 'Resources'.

**Resource Model:**

A resource is generally understood as an asset: it has value to someone. Key to this concept in a SOA ecosystem is that a resource must be identifiable (Figure 3). Location of this model is depicted in Table 3.

**Resource:** An identifiable entity that has value to a stakeholder. A resource may be identifiable by different methods but within a SOA ecosystem a resource must have at least one well-formed identifier that may be unambiguously resolved to the intended resource. Codified (but not implied) contracts, policies, obligations, and permissions are all examples of resources, as are capabilities, services, service descriptions, and SOA-based systems. An implied policy, contract, obligation or permission would not be a resource, even though it may have value to a stakeholder, because it is not an identifiable entity.

**Identifier:** A sequence of characters that unambiguously indicates a particular resource. Identifiers are assigned by social structures according to context, policies and procedures considered sufficient for that structure's purposes.

**Service description:** The information needed in order to use, or consider using, a service. Reachability is an inherently pairwise relationship between service providers and service consumers. However, a service description should include sufficient data to enable a service consumer and service provider to interact with each other. This may include metadata such as the location of the service and what information protocols it supports and requires. It may also include dynamic information about the service, such as whether it is currently available.

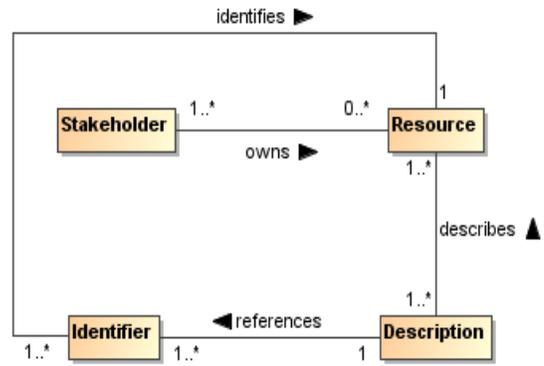


Figure 3: Resource Model

**3-2-4 The Business row and Fourth column in ZSOF:**

This cell identifies people and participated units in the service and shows the specification of their responsibilities and interrelations in the Service Oriented Enterprise. So, 'Stakeholders and Participants Model' can finely cover Zachman's Service Oriented Framework. A person or a system which interacts with system (uses the system or transfer some information with it) is called agent. In this model, Service Agents are not identified. So, it can be extended. This model can be seen as series of steps that start with customer's request and its purpose is satisfying shareholder, participant, and non-participant stakeholder in service.

**Stakeholders and Participants Model:**

A SOA-based system is deployed in the context of human and non-human entities capable of action. In this section we focus on the relationship between these ultimate actors and the services that they use and deploy (Figure 4). Location of this model is depicted in Table 3.

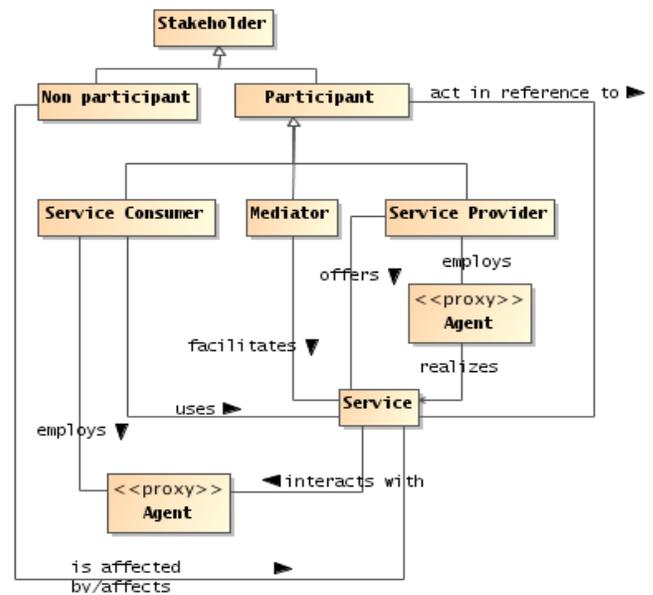


Figure 4: Stakeholders and Participants Model

**Stakeholder:** A stakeholder is an individual entity, human or non-human, or organization of entities that has an interest in the states of services and/or the outcomes of service interactions. Stakeholders do not necessarily participate in service interactions. For example, a government may have an interest in the outcomes of commercial services deployed in a SOA-based system without actively participating in the interactions (e.g., the government may collect tax from one or more participants without being part of the interaction itself).

**Participant:** A participant is a stakeholder that has the capability to act in the context of a SOA-based system. A participant is a stakeholder whose interests lie in the successful use of and fulfillment of services.

However, human participants always require representation in an electronic system – they require agents. Note that we admit non-human agents that have no identifiable representative as an extreme case: the normal situation is where participants are either human or organizations.

It is convenient to classify service participants into service providers and service consumers. The reason for this is twofold: an extremely common mode of interaction is where a provider participant offers some functionality as a service and a consumer participant uses that service to achieve one of his or her goals. Secondly, it helps to illustrate the dominant situation where the participants in an interaction are not truly symmetric: they each have different objectives and often have different capabilities. However, it should be noted that there are patterns of interactions where it is not clear that the distinction between service provider and consumer are valid.

**Service Provider:** A service provider is a participant that offers a service that permits some capability to be used by other participants. In normal parlance, the service provider commonly refers to either the ultimate owner of the capability that is offered or at least an agent acting as proxy for the owner. For example, an individual may own a business capability but will enter into an agreement with another individual (the proxy) to provide SOA access to that business so that the owner can focus on running the business itself.

Note that several kinds of stakeholders may be involved in provisioning a service. These include but are not limited to the provider of the capability, an enabler that exposes it as a service, a mediator that translates and/or manages the relationship between service consumers and the service, a host that offers support for the service, a government that permits the service and/or collects taxes based on service interactions.

**Service Consumer** A service consumer is a participant that interacts with a service in order to access a capability to address a need. It is a common understanding that service consumers typically initiate service interactions. Again, this is not necessarily true in all situations (for example, in publish-and-subscribe scenarios, a service consumer may initiate an initial subscription, but thereafter, the interactions are initiated by publishers). As with service providers, several stakeholders may be involved in a service interaction supporting the consumer.

**Service mediator:** A service mediator is a participant that facilitates the offering or use of services in some way.

There are many kinds of mediator, for example a registry is a kind of mediator that permits providers and consumers to find each other. Another example might be a filter service that enhances another service by encrypting and decrypting messages. Yet another example of a mediator is a proxy broker that actively stands for one or other party in an interaction.

**Agent:** An agent is any entity that is capable of acting on behalf of a person or organization.

In order for people to be able to offer, consume and otherwise participate in services, they require the use of an agent capable of directly interacting with electronic communications – a service agent. Common examples are software applications that make use of services, hardware devices that embody an agent with a particular mission, and enterprise systems that offer services.

**Non-participant stakeholder:** A non-participant is any stakeholder who may be affected by the use or provisioning of services or who has an interest in the outcome of service interactions but does not directly participate in and may not be aware of the interactions.

There are two main classes of such non-participatory stakeholders: third parties who are affected by someone's use or provisioning of a service, and regulatory agencies who wish to control the outcome of service interactions in some way (such as by taxation).

### 3-2-5 The Business row and Fifth column in ZSOF:

#### Timing Model:

This cell represents a model which includes occurring event and elapsed time in relation to the servicing. In other words, this cell describes events and cycles related by time which are covered by Timing Figure. Timing Model which is introduced in the second version of Unifies Modeling Language completely covers the requirements of this phase of Zachman's Service Oriented Framework. This model does not belong to the OASIS Service Oriented models but it is a good option for covering this cell. (Figure 5). Location of this model is depicted in Table 3.

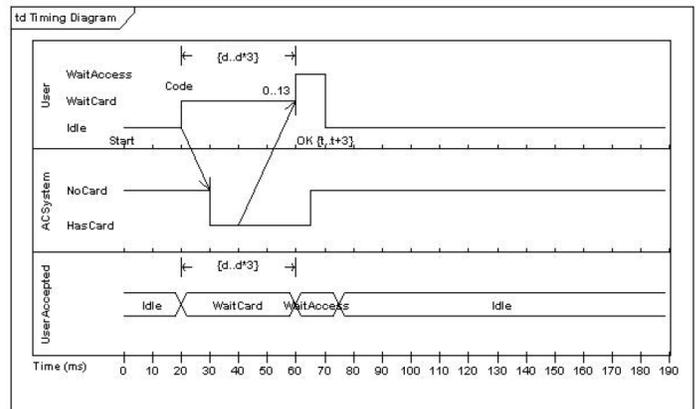


Figure 5: Timing Diagram (Model)

### 3-2-6 The Business row and Sixth column in The ZSOF

The cell represents aims, needs, capabilities, motivations, limits, and business rules in Service Oriented Enterprise. A model which represents these cases is introduced by OASIS Consortium. ‘Needs and Capabilities Model’ can finely put the mentioned cases in Zachman’s Service Oriented Framework. Nevertheless, the output of this cell is not a distinct model; rules and functioning limits of enterprise in the form of condition, feature, and explanation in other models of business row is also located. The location all six mentioned models can be observed in Table 3.

#### Needs and Capabilities Model:

The motivation for participants interacting is the satisfaction of needs. From a consumer perspective, the motivation for interacting with a service is to satisfy a business objective, which in turn, is often related to the role they represent in the social structure; for the provider, the need is to gain satisfaction, monetary or otherwise, for other participants’ use of the service.

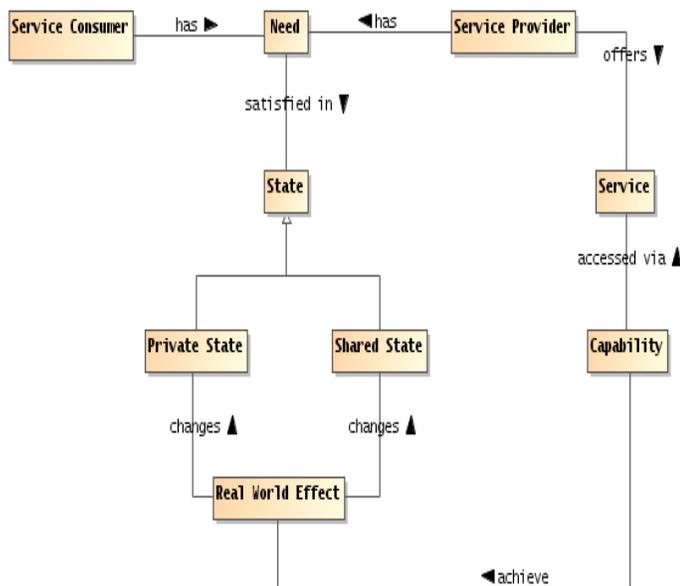


Figure 6: Needs and Capabilities Model

#### Capability:

A capability is a resource that may be used by a service provider to achieve a real world effect on behalf of a service consumer. The model in Figure 6 show that there is an inherent indirection between needs and having them satisfied. Both needs and the effects of using capabilities are expressed in terms of state: a need is expressed as a condition on the desired state and the Real World Effect of using capabilities is a change in the state of the world. As noted in the Reference Model, the Real World Effect is couched in terms of changes to the state that is shared by the participants in the service; in particular the public aspects of that state. By making a capability available for use, via the Service, the owners aim to address their needs as well as the needs of other participants who use the service. The extent to which a capability is exposed via a service (or via multiple services) is controlled by the owner of the capability.

#### Real World Effect:

A measurable change to the shared state of pertinent entities, relevant to and experienced by specific stakeholders of an ecosystem .

#### Need:

A need is a measurable requirement that a service participant is actively seeking to satisfy. A need may or may not be publicly measurable; the needs that this Reference Architecture finds in scope are those that are publicly measurable. However, the satisfaction of a participant’s need can only be determined by that participant. A need is characterized by a proposition. However, the extent to which a need is captured in a formal way is likely to be very different in each situation.

#### State:

The condition of an entity at a particular time.State is characterized by a set of facts that is true of the entity. In principle, the total state of an entity (or the world as a whole) is unbounded. In practice, we are concerned only with a subset of the state of an entity that is measurable and useful in a given context. For example, the total state of a light bulb includes the temperature of the filament of the bulb, the composition of the glass, the dirt that is on the bulb’s surface and so on. However, someone needing more light to read is only interested in whether the bulb is ‘on’ or ‘off’ and if it is working properly. That individual’s characterization of the state of the bulb reduces to the fact: “bulb is now on”. In a SOA ecosystem, there is a distinction between the set of facts about an entity that only that entity can access and the set of facts that may be accessible to others, notably actors in the SOA-based system.

#### Private State:

That part of an entity’s state that is knowable by, and accessible to, only that entity.

#### Shared State:

That part of an entity’s state that is knowable by, and may be accessible to, other actors. Note that shared state does not imply that the state is accessible to other actors. It simply refers to that subset of state that may be accessed by other actors. This will principally be the case when actors need to participate in joint actions. It is the aggregation of the shared states of pertinent entities that constitutes the desired effect of a joint action. Thus the change to this shared state is what is experienced in the wider ecosystem as a real world effect.

### 3-3 Analysis Third Row in ZSOF:

About fourth row of Zachman Framework (Builder’s view) which is currently located in the third row of Zachman’s Service Oriented Framework, it must be said that this row describes enterprise implementation based on the technologies of CGI, PHP, ASP, etc. it should be said that Independent Service Oriented Architecture is a type of Technology, Platform, and Operating System that uses a concept called Web Service. Therefore, it seems that separation of Web Service sections in one by one business cells is impossible. That’s why we resist presenting a model for each cell but all the focused row is covered by a layer of Web Service.

**3-4 Analysis Forth Row in ZSOF:**

Fourth row (Builder’s view) in Zachman’s Service oriented Framework (ZSOF) includes, implementation of Service oriented sections, of previous models. This process consists of programming actions, protocols, and service oriented rules.

**WEB SERVICE:**

A Web Service is a software system designed to support interoperable machine to machine interaction over a network. It has an interface described in a machine processable format (specifically WSDL). Other systems interact with the Web service in a manner prescribed by its description using SOAP messages, typically conveyed using HTTP with an XML serialization in conjunction with other Web related standards.

The key standards with Web services are XML, WSDL, and SOAP.

- XML (eXtensible Markup Language) is a special language that enables programmers to define data in a way that any program can understand. It can also be used to standardize the commands that programs send each other.
- WSDL (Web Services Description Language) is a special language that describes all the commands (and the data that must be associated with them) that a software component will accept from another software component.
- SOAP (Simple Object Access Protocol) is a standard language that enables software components to talk to each other.

It was no small achievement for the industry to find a way to standardize these three things: a common definition language (XML), a common format for defining interfaces (WSDL), and a common format for messages between software components (SOAP). The idea of publishing Web services is critical to SOA. You can only reuse services that are available for reuse.

**3-5 Analysis Fifth Row in ZSOF:**

Fifth row represents working Service Oriented Enterprise. This row does not include a model or an architecture product. This row can be seen as the picture of five higher rows that shows ‘working Service Oriented Enterprise’.

**TABLE 3: THE ULTIMATE ZACHMAN’S SERVICE ORIENTED FRAMEWORK (ZSOF)**

ZSOF	Data and Information Flowing	Services and Processes	Network and Valuable Resources	Consumer services, Service Provider, User interfaces	Events and Time	The need for service and Policies
Scope (contextual)	SOA Scope	SOA Scope	SOA Scope	SOA Scope	SOA Scope	SOA Scope
Business Model (OASIS Model)	Semantics of Communication Model	Service Reachability Model	Resource Model	Stakeholders and Participants Model	Timing diagram	Needs and Capabilities Model
Technology Model	Service Oriented Technology (Web Service)					
Detailed Representation	The implementation of Service Oriented Elements (Web services, protocols and standards, etc.)					
Functioning System	working Service Oriented Enterprise					

**IV. SUGGESTED FRAMEWORK AND ITS ANALYSIS**

In Table 3, final results of actions done by service orientation on Zachman Framework are depicted. A Questionnaire was used to analyze the suggested Service Oriented framework. People familiar with Enterprise Architecture and Service Oriented like professors and authorities of technology units which are involved in this field were asked to comment on the focused framework on the basis of clarity, relation to the business and service orientation, suitability of models for the cells, generalizability of models, etc. Analyzing their views and comments indicated that the suggested framework was acceptable.

**V. CONCLUSION**

In this article Zachman’s Service Oriented Framework (ZSOF) was analyzed. The discussed points in the article led to:

- ✓ Architects will gain a better understanding when planning and designing enterprise systems of the principles that underlie Service Oriented Architecture.
- ✓ Standards architects and analysts will be able to better position specific specifications in relation to each other in order to support the goals of SOA.

- ✓ Decision makers will be better informed as to the technology and resource implications of commissioning and living with a SOA-based system
- ✓ Users will gain a better understanding of what is involved in participating in a SOA-based system.

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# Effects of Service Orientation on Enterprise Business (A Case study in Education Department)

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**Abstract-** Service Oriented Architecture is a style of Information System Architecture which is constituted from a collection of services based on business and supports Loosely Coupled (independence of coding and service location) for flexibility and intersystem interactions. In this article, firstly Service Oriented Architecture and its related concepts will be elaborated on then a real enterprise, before and after making service orientation, will be studied in order to see the effects of service orientation on the business of that enterprise.

**Index Terms-** Achievements of Service Orientation in business, Service Oriented Architecture (SOA), Service Oriented Elements, Web Service

## I. INTRODUCTION

Service Oriented Architecture (SOA) is an approach to software design (“architecture”) in which applications are assembled from reusable components (called services). A service is a software building block that performs a distinct function for example, retrieving customer information from a database, producing an invoice, performing a credit check, etc. through a well-defined interface (basically, a description of how to call the service from other programs). According to proponents, SOA is emerging as the premier integration and architecture framework in today’s complex and heterogeneous computing environment. It can help organizations streamline processes so that they can do business more efficiently and adapt to changing needs, thus enabling the software-as-a service concept. It should be clear that a SOA must be able to relate the business processes of an organization to the technical processes of that organization and map the workflow relationships between the two.

SOA describes an IT systems architecture based on the principle of delivering reusable business services that are assembled from software subcomponents in such a way that the providers and The consumers of the business services are loosely coupled. Specifically, with SOA the providers and consumers do not need to have in-depth knowledge of the technology, platform, location, or environment choices of each other. SOA promotes loose coupling between software components so that they can be reused.

In other words, Service Oriented architecture enables different organizations to independently implement services that meet their immediate needs, yet can also be combined into higher-level business processes and enterprise solutions.

## II. OBJECTIVES OF THE PAPER

- 1) Introducing the Service Oriented Elements.
- 2) Solutions for the integration of Information Systems
- 3) A case study in an Enterprise before and after being service oriented
- 4) Comparison of a service oriented enterprise and non-service oriented one

## III. BASICS OF SERVICE ORIENTATION AND CASE STUDY

### 3-1 Service Oriented Architecture Elements

All of the elements of service-oriented architecture (SOA) are arranged to connect through business processes to deliver a precise level of service. SOA develops a basic arrangement of components that can collectively administer an intricate business service. To understand the layout of SOA, take a look at this flowchart of service-oriented architecture components (Figure 1):

**Enterprise Service Bus:** The enterprise service bus is the communications nerve center for services in a service oriented architecture. It tends to be a jack-of all-trades, connecting to various types of middleware, repositories of metadata definitions (such as how you define a customer number), registries (how to locate information), and interfaces of every kind (for just about any application).

**Adapter:** A software module added to an application or system that allows access to its capabilities via a standards-compliant services interface.

**Business Process Modeling:** A procedure for mapping out what the business process does both in terms of what various applications are expected to do and what the human participants in the business process are expected to do.

**Service Broker:** Software in a SOA framework that brings components together using the rules associated with each component.

**SOA Governance:** SOA governance is an element of overall IT governance and as such lays down the law when it comes to policy, process, and metadata management. (Metadata here simply means data that defines the source of the data, the owner of the data, and who can change the data.)

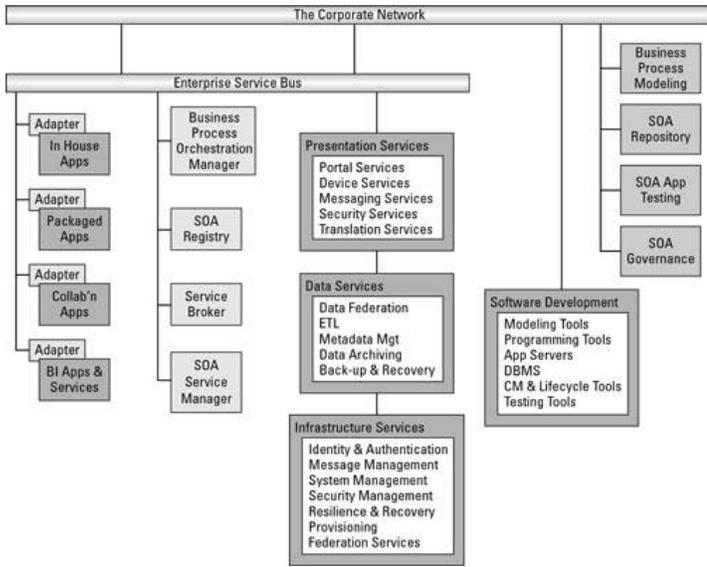


Figure 1 - layout of SOA

**SOA Repository:** A database for all SOA software and components, with an emphasis on revision control and configuration management, where they keep the good stuff, in other words.

**SOA Service Manager:** Software that orchestrates the SOA infrastructure, so that the business services can be supported and managed according to well-defined Service Level Agreements.

**SOA Registry:** A single source for all the metadata needed to utilize the Web service of a software component in a SOA environment.

**3-2 Solutions for the integration of Information Systems:**

Presenting solutions for integrating Information Systems: for integrating different Information Systems various solutions are offered among which the most well-known ones are

- 1- Peer to Peer connection
- 2- Central Translator
- 3- Web Service

**3-2-1 Peer to Peer connection**

In the Peer to Peer Connection, in order to make interaction between two Information Systems in an enterprise, it is necessary to define and provide the communication path. Naturally, such a procedure and approach was too expensive and cumbersome (Figure 2).

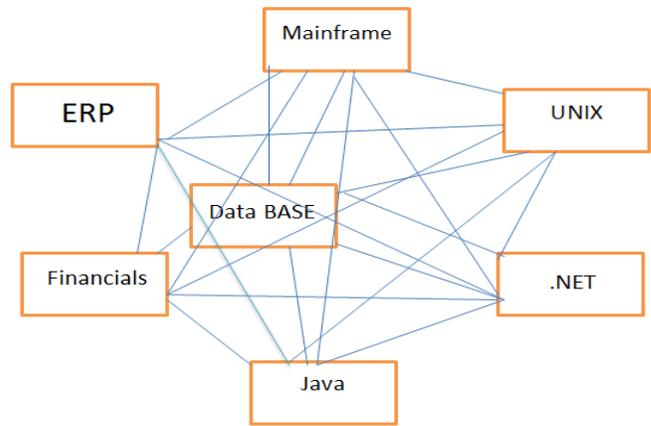


Figure 2 - Peer to Peer connection

**3-2-2 Central Translator**

In the case of Central Translator, middleware operates between all the Information Systems in a way that like a central hob all the sent messages are referred to this mediator and after translation, they are sent to the protocol of the targeted system. This option also has had its own problems that the most salient ones were heterogeneous protocols and its limits of generalizability (Figure 3).

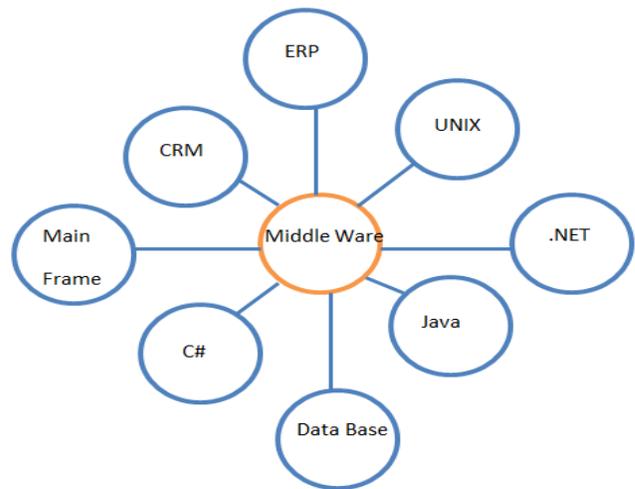


Figure 3 - Central Translator

**3-2-3 WEB SERVICE**

The most up-dated generation of Unified Communication is Web Service which is based on Service Orientation. In this model, all the Information Systems must interact with a standard and internationally permissible mediator called WEB SERVICE which is based on XML, possesses universal standard, and is acceptable by all Platforms, technologies, and producers.

**3-3 A CASE STUDY IN EDUCATION DEPARTMENT:**

Transfer is a process in which an administrative or teaching staff requests to change his/her place of employment from the source to the target office. Agreement of both offices is mandatory.

**3-3-1 Education before being Service Oriented:**

For transferring personnel in the past, the following steps should be followed: 1- first, the applicant entered the office and referred to the Personnel Unit. 2- The Personnel authority reviewed the records of each applicant to assure that they have the initial conditions of transferring. 3- Personnel authority gave each applicant a scoring form for filling out and determining his/her rank (transferring is done based on the final scores recorded in the form) 4- in some steps for the lack of some documents (one of the effective factors of ranking), the applicant was forced to leave the office and after preparing the documents come back. 5- Applicant, after completing all the requirements, should refer to the Secretariat Unit, register the request, and again deliver the request form to the Personnel Unit. 6- In each step, if one of the mentioned units was closed the applicant had no choice except patient. 7- Because of abundance of requests, the process was handled slowly. 8- It was at the expose of mistake or losing the documents. 9- Direct presence of the applicant in the process increased the plausibility of giving bribe and nepotism. 10- All the applicants' documents were organized based on their scores (points). 11- Documents were transferred from the original office to the State Office. 12- Documents of those whose office agreed with their transfer were sent to the target office for reviewing and commenting. 13- The target office, based on the conditions, commented on the requests. 14- Since the Offices were too far from each other, the comments were not delivered on time. All in all, to gain service, both source and target offices were busily involved, because transferring is just one of the duties that each office should do.

**3-3-2 Education after being Service Oriented:**

In recent years, the Transferring Unit of Education is service oriented and applicant only once refer to the Personnel Unit, receive 'transferring code' and enter their scores in the transferring system. The source and target offices make appropriate decisions based on the scores and the results are declared on time, easy as a pie! Features of Service Oriented Enterprise are completely clear: 1- Related offices can simply connect to this system by any technology or programming language since, as discussed above, integrating and unifying Information Systems based on 'Web Service' is independent of technology, platform, and operating system. 2- Instead of transferring bundles of files and documents between different offices, workflow is done by the management system. 3- The applicant just delivers the documents once and the results (transfer or not transfer) are announced on a specific time in the system. 4- Features and conditions of the service are clearly mentioned. 5- Overcrowding is avoided in offices.

**IV. ACHIEVEMENTS OF SERVICE ORIENTATION IN BUSINESS:**

Results and achievements of service orientation in the Personnel Transfer Unit of Education in a comparative form is depicted in Table 1.

**Table 1: Comparison of transferring condition before and after service orientation**

Comparison	Before SOA	After SOA
Following the steps and procedures of doing works	By applicant	Mechanized
All the procedures and steps of the works have the capability of being done by internet	Never	Somewhat
The time of being present in office	Excessive and unnecessary	Time-effective
Possibility of corruption and bribery	High	Low
Hiding the complexity and internal rules from the customer	Impossible	Possible
Document delivery	Frequently	Once
Possibility of mistake and missing the documents	High	Low
Customers' satisfaction from the Enterprise	Low	High
Enterprise condition	Weak and inflexible	Agile and service oriented
Recording the applicant's information for future use	Hard	Simple
Interaction between Departments	Excessive and unnecessary	Balanced and When required
Reliability	Low	High
Enterprise costs	High	Low

**V. CONCLUSION**

In an actual case study we showed that service orientation resulted in the flexibility, cost reduction, agility of enterprise, and satisfaction of applicants .

**ACKNOWLEDGMENT**

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# VOICE AND VIDEO OVER WIRELESS LAN

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**Abstract-** “Voice and Video over Wireless LAN” is concerned with establishing audio and video calls using wireless LAN. We are using client server model for achieving this purpose. A wireless router is used to establish the wireless LAN. Establishing wireless LAN is easier, cost effective and less time consuming than establishing wired LAN.

This system provides flexibility of operation. We are configuring one system having minimum of 1GB RAM as a server. Server is responsible for establishing and maintaining connection among clients. Any PC within the range of WLAN can be configured as client. Installation and maintenance of wired LAN is tedious and expensive. Comparatively installation of WLAN is simple and quicker. Maintenance required is also less. Comparatively it is easier to troubleshoot. Hence we propose a wireless system for audio and video calls within an organization.

**Index Terms**—WLAN, VOIP, SIP, RTP

## Introduction

Voice over IP (VoIP) has presented a unique opportunity for enterprises. Convergence the merging of data networks and voice networks over a common IP infrastructure – can offer a dramatic reduction in the capital and operational expense of maintaining separate voice and data infrastructures. Beyond these cost savings, the ability to host voice and data on the same network can lead to improvements whereby data applications can leverage unique multimedia capabilities, while voice and real-time multimedia applications are able to take advantage of rich enterprise data features that can enhance communications in a manner that can reduce the need for costly face-to-face meetings. Additionally, convergence can lead to a unique synergy resulting in the development of new real-time applications. An important element that is missing from this equation is mobility. The transition of VoIP to the wireless space is an inevitable extension of this trend, since Voice and Video over WLAN extends the reach of a company’s IP telephony and multimedia

communication systems, enterprise work forces from the confines of their offices, and opens the door to a new generation of wireless converged network applications.<sup>[1]</sup>

Given its rapid end-user acceptance, it is not surprising that wireless LANs have come to the fore as a growing part of the enterprise communications landscape. Early issues such as security have been addressed and companies are now systematically consolidating access points into wireless enterprise infrastructures.

Wireless networks were originally designed for the wireless transmission of data. Therefore, adding voice and video presents several challenges that must be resolved before voice over WLAN can supplant traditional wireless voice solutions: best-in-class voice quality, robust security embedded in the corporate security model, support for both on and off-site mobility, high availability, and low total cost of ownership (TCO).

## PROBLEM DEFINITION

Currently there are technologies existing for transmitting voice over long distance. However they are quiet expensive. There are systems like Skype, GTalk which are useful for low cost communication. Skype for example allows free call to first fifty pay tariff to Skype. If we wish to have more than fifty contacts on the same identity we need to pay tariff to Skype. In case we don’t wish to pay then we need to open new account with new identity. For companies second solution is not recommended. Also server of Skype, GTalk are not accessible to administrator. For using these services we need to have access to net connection. It could be a costly affair for small companies. Installation

and maintenance of wired LAN is tedious and expensive. Comparatively installation of WLAN is simple and quicker. Maintenance required is also less. [1] Comparatively it is easier to troubleshoot. Hence we propose a wireless system for audio and video calls within an organization.

## EXISTING SYSTEMS

Name	Private Chat	File Transfer	Video Call	Voice Call
iptux	No	Yes	No	No
iChat	Yes	Yes	No	No
Outlook LAN messenger	Yes	Yes	Yes	No
eBuddy	Yes	Partial	No	Yes
GTalk	Yes	Yes	Third party plug-in	Yes
Xfire	Yes	Yes	No	Yes

Table 1: List of existing systems

Currently there are technologies existing for transmitting voice over long distance. However they are quite expensive. There are systems like Skype, GTalk which are useful for low cost communication. Skype for example allows free call to first fifty pay tariff to Skype. If we wish to have more than fifty contacts on the same identity we need to pay tariff to Skype. In case we don't wish to pay then we need to open new account with new identity. For companies second solution is not recommended. Also server of Skype, GTalk are not accessible to administrator. For using these services we need to have access to net connection. It could be a costly affair for small companies. Installation and maintenance of wired LAN is tedious and expensive. [2]

## PROPOSED SYSTEM

There are five main modules in this system. They are:-

- Registration & authentication
- GUI module
- Audio call
- Video call

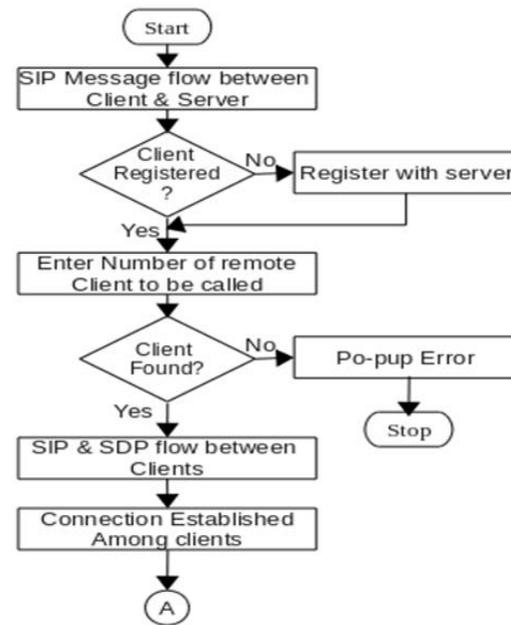


Figure 1: Registration and authentication

When we are running client for first time, we need to register client with server. Here we register our desired number with server. When a call is made to any client server it checks if referenced client is registered with it. If client is within range of wireless LAN then connection is established between both clients.

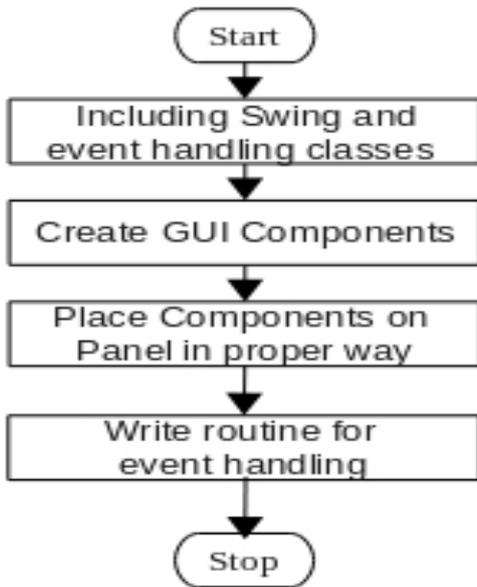


Figure 2: GUI Module

We need GUI for audio and video call. We made those GUI using swing. GUI includes GUI for registering with server, GUI for conferencing, GUI for call progress states. It also includes pop-up box for alerting user on arrival of call. The number of calling client and message is displayed using pop-up box.

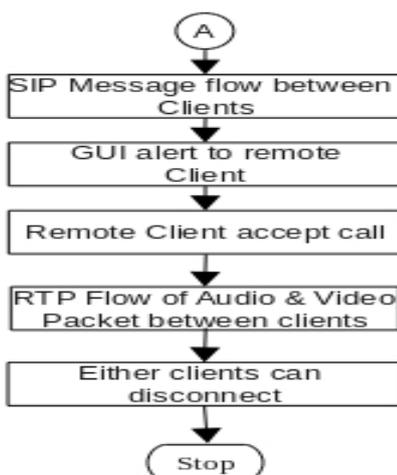


Figure 2: Audio and Video Call

We are using SIP for initiating and maintaining session. This module converts speech to bytes & then they are transmitted. DES encryption decryption algorithm for security of transferred data. Since audio, video call require various QOS parameters like delay & jitter within constraint we use RTP to transfer audio, video packets. For efficient transmission of video we need to compress it. Since bandwidth is important consideration in wireless network we are using MPEG compression for video transfer.

## IMPLEMENTATION

Entire project is mainly based on two modules i.e. server software and client software. Each user must have the client software. Admin will have the server software. To run the client software server software must be in running condition to serve the request of each of the client. These programs can communicate using socket programming. Whenever we run the client software socket connection is established with the IP address of the server and the port number which is open for the communication.

Synchronization between client and server has been achieved with the help of the request messages i.e. client sends the “form no” to the server to tell the server which code the client is currently executing. Whereas server sends the unique field “Data sent=MESSAGE” to tell the client that there is message for you and similarly for other features like file sharing and calling it uses these types of messages.

### Feature Implementation

#### CLIENT LOGIN

- Whenever client enters the user name and password on the home page and clicks on “sign in” button these fields are sent to the server side

- Server then checks whether the user is registered or not from the database and sends the reply accordingly
- As soon as the client gets logged in, server sends the profile information of the user and the list of online and offline users.

#### TEXT CHAT

- Whenever user enters a message it is stored on client side database (to maintain the history) and forwarded to the server
- Server also stores this message on the server database for offline users and forwards it to the receiver client
- On client side MS access is used and server uses 'rs2xml' API to take the data from the chat box and store it in the MS access file
- On the server side Oracle 10g is used as the database for which 'ojdbc6' API is used
- The receiver client again stores the message into the database and message is displayed on the screen
- On clicking on the particular user from the list chat history is loaded from the database in the chat box

#### OFFLINE MESSAGES

- User can also send the message to offline users, for this at the server side status of each message is maintained i.e. if the message is delivered then status is 'delivered' else status is 'pending'
- Whenever any user is logged in, server checks whether there is any pending message for that user
- If message is pending it simply delivers it to the client and updates the status of that message as 'delivered'

#### FILE SHARING

- Whenever client shares a file it is first sent to the server and then the server forwards it to the client
- The entire file is divided into the packets of size 1024 bytes and these packets are sent to the server in the form of a byte array

- In this way the entire file is transmitted to the server and in a similar way server transmits the file to the receiving client
- File is stored temporarily on the server so that if the client is offline it can be forwarded to him whenever he is available

#### VOICE CHAT

- To implement voice chat SIP protocol is used which uses special type of messages for establishing, maintaining and terminating the call
- In this system whenever client clicks on the call button the request is sent to the main server, server then forwards the request to the receiver
- Receiver then accepts/rejects the request, this reply is given back to the caller.
- For voice call we have used a special type of mechanism, in which audio data is first recorded and then forwarded to the receiver
- We have used two threads, one for listening to the caller and another for transmitting recorded voice
- To achieve this we use 'Multi chat 1.0' API

#### VIDEO CHAT

For establishing video call we are using classes in the JMF package.

Classes used in this Module:

##### *AVReceive2*

AVReceive2 performs the following tasks:

- Open one RTP session per session address given.
- Listen for the NewReceiveStreamEvent from the ReceiveStreamListener.
- Create a JMF Player for each stream received for playback.

##### *AVTransmit2*

This class is used to transmit audio and video on two different ports and the IP address of the receiver

*Player*

This class is used to start the web cam on both the sides

*CaptureDevice*

This class is used to detect audio and video capture device

*Capture*

This class is used to capture the video from web cam

## Graphical User Interface



Figure 3: Login Screen

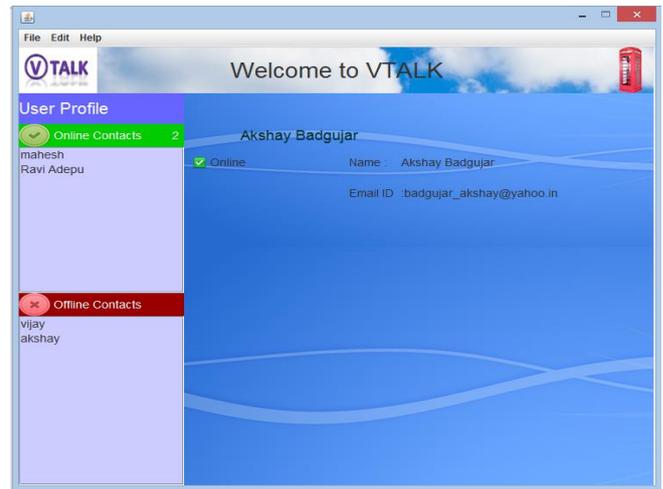


Figure 4: User Profile Screen

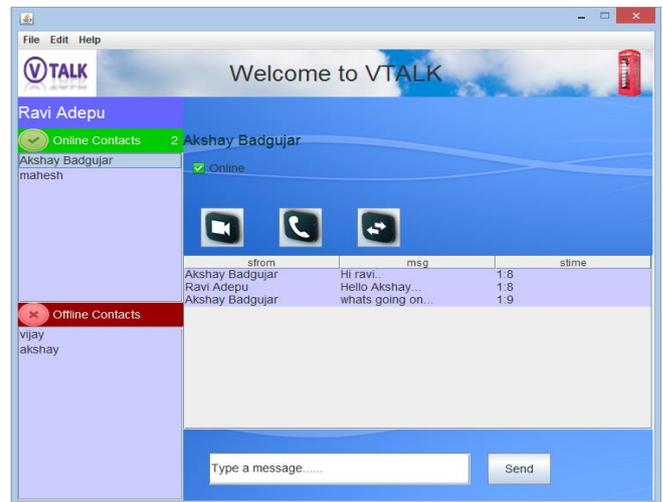


Figure 5: Conversation View

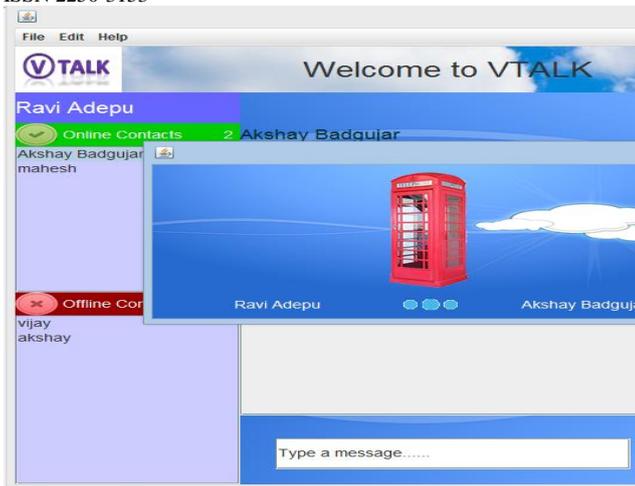


Figure 5: Call initiation screen

## CONCLUSION

Currently systems are available in market for inexpensive communication. However they have constraints like need for internet connection. In this project we attempt to introduce cheaper audio and video communication over wireless LAN. We achieve this using WLAN based system. As it requires only wireless router, personal computer & does not require internet connection, this system is very cost effective. It is easy to set up the system as no additional wiring is required in case of conventional system used for communication. This system will be of great use in small scale industries as well as educational institutions. It will be helpful as cost cutting means that facilitate audio video communication.

## FUTURE WORK

The motive of this paper was to propose a system for Simple Voice and Video transfer over WLAN.

This system establishes communication between only two participants. However, future developments may explore implementations for

mobile platforms, video conferencing as well as desktop sharing.

## ACKNOWLEDGEMENT

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# Seismicity in Jammu and Kashmir Region with Special Reference to Kishtwar

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**Abstract-** The present study involves study of more than 60 earthquake events that took place in the state of Jammu and Kashmir from which it was illustrated that most of the earthquakes were taken place in between and around the main boundary thrust and Main Central Thrust. Further it was seen that a Northwest and Southeast trending pattern will developed almost parallel to the Main Boundary Thrust and Main Central Thrust which indicates that further study is required in the concerned area to trace the faults and thrusts in this region. The epicentre of these earthquakes lies in between  $32^{\circ}\text{N}$ - $37^{\circ}\text{N}$ , and  $72^{\circ}\text{E}$ - $80^{\circ}\text{E}$  and the Richter scale magnitude of these Earthquake lies in between 2 to 6. The depth of these earthquakes varies from 5km to 100km. The former observations indicate that the entire region is tectonically active and continuous build up stress along these thrusts and faults has been released from time to time. It was further seemed that majority of earthquakes take place around Kupwara, district of Srinagar and Kishtwar and Doda district of Jammu.

**Index Terms-** Seismicity, Main Boundary Thrust, Main Central Thrust, Epicentre.

## I. INTRODUCTION

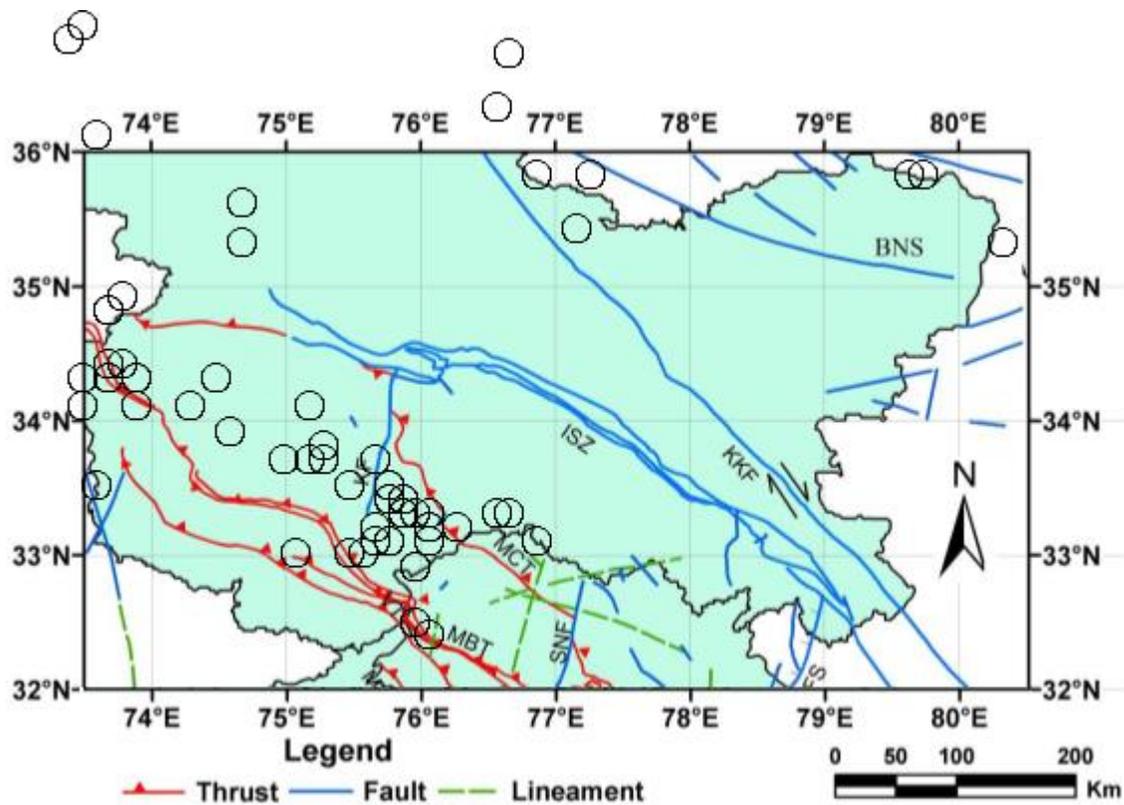
The Himalaya originated due to continental collision between the Indian and the Eurasian plates that took place during the Late Cretaceous to Early Eocene times (Searle *et al.*, 1987, Le Fort, 1989, Searle, 1991, Thakur, 1992). This orogenic process continues even in present times, as is indicated by significant small and moderate earthquakes and neotectonic movements along several thrusts and faults in the region (Valdiya 1998, 2001). The active tectonics along faults provides direct evidence of continued tectonic movements. The Indian and Asian continental plates collided some 50 Million years ago (Le Fort, 1975) resulting in lithosphere deformation and modification of the seismotectonic setup of the region. The Himalayan zone is

divided into three seismic gaps – Kashmir gap, Central gap and Assam gap. The Jammu and Kashmir, Himachal Pradesh and Uttarakhand falls under Kashmir gap which is the highest earthquake prone seismic zone.

Among the most notable are the Northwest Kashmir earthquake of 2005 (Mw 7.6); 2002 (Mw 6.4), Pattan earthquake of 1974 (Mw 7.4), Kangra earthquake of 1905 (Mw 7.8), 1885 Magnitude 7.5, 1842 Magnitude 7.5 Kashmir valley earthquake, 1505 Magnitude 7.6 earthquake of Kashmir, 1555 magnitude more than 8, etc. According to the seismic zonation map, the region under study falls in seismic zones IV and V. A recent seismic hazard analysis of Northwest Himalayan region has categorized Jammu region under high hazard zone (Mahajan *et al.*, 2007). The entire study area is flanked by a number of faults and thrusts some of them being considered very active (e. g., Main Boundary Thrust (MBT) and Muree thrust). Most of the earthquakes are generated by the fault movements (Bolt 1999) and in Jammu and Kashmir region there are parallel faults trending north west to south east.

## II. REGIONAL SETTING

The map of Jammu and Kashmir earthquake epicentres (Figure 1) shows earthquakes from January 2006 to August 2013 with magnitudes of 2.0 and more on the Richter scale (Table 1). Events of magnitude 4.0 or more are capable of causing damage to buildings. Jammu and Kashmir lies within a broad NW-SE trending belt of epicentres. The largest events recorded in this zone were of Richter magnitude 7.6, the epicentre of which was in North Kashmir. Small earthquakes occur at a continuous rate in this region as a result of which the entire region is marked as very high damage risk zone V (MSK IX or more) and high damage risk zone IV (MSK-VIII).



MCT	Main Central Thrust	KKF	Karakoram Fault
MBT	Main Boundary Thrust	KFS	Kauric Fault System
KF	Kishtwar Fault	ISZ	Indus Suture Zone
BNS	Bangong-Nujiang Suture	SNF	Sunder Nagar Fault

**Figure 1** Map showing earthquakes occurred in Jammu and Kashmir region from January 2006 to August 2013 (Figure modified after Patil, 2012).

### III. SEISMOTECTONIC SETUP OF THE REGION

Four major lithotectonic-physiographic belts of Himalaya have distinct tectonic, architecture, lithostratigraphic and evolution history, and episode of magmatism and metamorphism. The southern range of outer Himalaya (Siwalik belt) exhibits rugged youthful topography composed of molasses sediments. This belt is separated in the north from the Lesser Himalaya by Main Boundary Thrust (MBT) and from the plains to the south by Himalayan Frontal Fault (HFF). The lesser Himalayan domain is separated from the Great Himalaya by Main Central Thrust (MCT). To the north of Great Himalaya, stretches a vast sedimentary realm of Tethys Himalaya. The evolutionary model of Himalaya (Le Fort, 1975) reveals that Main Boundary Thrust (MBT) represents a younger tectonic activity as compared to Main Central Thrust (MCT), and is more active currently. However, both Main Boundary Thrust (MBT) and Main Central Thrust (MCT) have been considered as the contemporaneous features in the steady-state model of Seeber and Armbruster (1981) and these merge with each other at depth with a common

detachment surface. The majority of earthquakes in NW Himalaya are concentrated in the zone between Main Boundary Thrust (MBT) and Main Central Thrust (MCT) of shallow focal depth and great Himalayan earthquake originate at the surface of detachment, which represents the upper surface of the under thrusting Indian plate with apparent northward dip of about  $15^{\circ}$  (Ni and Barazangi, 1984). Many of these faults, e.g. Murree Thrust have produced (and are capable of producing) earthquakes of magnitude 8.0 or greater, which have been responsible for the initiation of neotectonic movements in the past.

The seismotectonic investigation has been carried out by many workers (Seeber and Armbruster 1981; Ni and Barazangi 1984; Thakur and Kumar 2002; Kayal 2007; Bollinger et al., 2007). To understand the ongoing pattern of Himalaya, Seeber and Armbruster (1981) proposed a steady state tectonic model while Ni and Barazangi (1984) formulated an evolutionary model. These models have highlighted the seismogenic discontinuities as Main Boundary Thrust (MBT), Main Central Thrust (MCT), a plane of detachment (Main Boundary Thrust (MBT) and Main Central Thrust (MCT) coincide with this plane at depth) and the basement thrust. Most of the seismicity of the

region lies between Main boundary Thrust (MBT) and Main Central Thrust (MCT) as shown in the map. The seismicity data has been taken from the IMD seismic network in India through IMD website and Department of Earthquake Engineering, Indian Institute of Technology Roorkee website [www.pesmos.in](http://www.pesmos.in) (Kumar et al. 2012).

**Table 1. List of Significant Earthquakes in J&K State\***

S.No.	UTC Time	Hr:mm:ss	Latitude	Longitude	Depth (Km)	Magnitude
1	20060111	05:48:40	34.4N	73.7E	33.0	5.0
2	20060201	13:52:33	34.4N	73.8E	33.0	5.0
3	20060202	21:49:00	34.8N	73.7E	33.0	5.1
4	20060211	05:32:49	34.9N	73.8E	96.0	5.0
5	20060310	07:50:10	33.5N	73.6E	33.0	5.2
6	20060320	17:40:54	34.3N	73.9E	35.0	5.5
7	20060422	08:31:14	34.3N	73.7E	33.0	3.7
8	20060426	00:41:42	32.9N	76.0E	33.0	4.7
9	20060522	08:31:14	34.3N	73.7E	33.0	3.7
10	20060526	00:41:42	32.9N	76.0E	33.0	4.7
11	20070224	09:06:14	33.5N	75.8E	8.8	3.3
12	20070801	04:53:40	33.9N	74.6E	39.1	3.1
13	20071004	05:14:15	32.5N	76.0E	10.0	3.8
14	20071026	06:49:59	35.8N	76.9E	8.5	5.1
15	20071211	15:56:37	35.4N	77.2E	35.0	5.3
16	20080225	07:25:01	34.1N	74.3E	33.0	3.9
17	20080301	08:36:07	35.6N	74.7E	20.0	4.1
18	20080311	16:44:06	33.3N	76.1E	33.0	3.5
19	20080316	05:44:44	33.7N	75.3E	100.0	3.5
20	20080510	06:35:52	33.3N	76.7E	96.0	3.8
21	20080914	22:11:30	32.4N	76.1E	10.0	3.4
22	20090126	07:25:20	33.7N	75.2E	10.0	2.1
23	20090208	14:33:17	34.3N	73.5E	08.0	4.0
24	20090220	03:48:48	34.3N	73.9E	10.0	5.5
25	20090519	19:29:46	33.2N	76.1E	10.0	4.9
26	20090612	04:03:15	35.8N	77.3E	60.0	5.3
27	20100314	19:09:01	35.3N	74.7E	10.0	4.9
28	20100323	09:59:55	33.8N	75.3E	10.0	3.9
29	20100911	03:10:38	33.7N	75.7E	13.0	4.6
30	20101107	03:40:21	34.1N	73.9E	35.0	4.2
31	20110209	04:36:38	36.1N	73.6E	15.0	5.0
32	20110323	05:55:53	36.3N	76.6E	57.0	5.2
33	20110428	09:53:07	33.3N	76.6E	10.0	3.8
34	20110728	18:42:34	33.3N	76.0E	21.0	4.4
35	20110823	01:23:00	33.1N	76.9E	40.0	4.8
36	20110924	15:21:35	34.1N	75.2E	42.0	4.3
37	20110927	11:02:59	36.7N	76.7E	84.0	4.9
38	20120104	16:31:24	33.7N	75.0E	10.0	4.0
39	20120220	13:59:24	35.8N	79.7E	10.0	4.9
40	20120220	14:18:05	35.8N	79.8E	10.0	5.0
41	20120312	06:06:44	36.8N	73.4E	33.0	5.8
42	20120509	18:05:58	34.3N	74.5E	08.0	3.4
43	20120603	23:19:04	35.3N	80.4E	10.0	3.1
44	20120726	05:31:36	33.2N	76.3E	05.0	3.8
45	20120813	20:32:59	34.8N	73.7E	30.0	5.2
46	20121011	23:54:27	34.1N	73.5E	10.0	4.5

47	20121109	05:49:34	36.9N	73.5E	10.0	4.3
48	20130430	09:41:52	33.1N	76.1E	10	4.1
49	20130501	06:57:12	33.1N	75.8E	15	5.8
50	20130501	08:42:43	33.1N	75.8E	10	3.7
51	20130501	09:19:49	33.1N	75.7E	10	4.6
52	20130503	01:38:15	33.4N	75.8E	5	3.7
53	20130505	04:39:38	33.0N	75.6E	12	3.5
54	20130514	19:58:24	33.2N	76.1E	10	4.4
55	20130514	20:00:07	33.4N	75.8E	10	4.8
56	20130514	21:01:42	33.3N	75.9E	10	3.8
57	20130515	12:05:41	33.3N	75.9E	15	3.8
58	20130711	19:39:49	33.2N	75.7E	10	3.9
59	20130722	09:07:19	33.0N	75.5E	10	3.7
60	20130730	18:09:13	33.0N	75.1E	5	3.8
61	20130802	02:32:50	33.5N	75.5E	28	5.4
62	20130802	21:37:40	33.4N	75.9E	20	5.2
63	20130802	22:42:05	33.4N	75.9E	10	3.7
64	20130803	09:31:04	33.5N	75.8E	10	3.3
65	20130805	13:57:47	33.3N	75.9E	27	4.4
66	20130814	07:37:34	33.4N	76.0E	15	3.3
66	20130818	23:53:27	33.3N	76.0E	18	4.6

\*Source IMD Earthquake website

#### IV. CONCLUSIONS

Based on the observed seismicity in Jammu and Kashmir region from January 2006 to August 2013, the following conclusions have been derived:

1. A review of the historical as well as recent earthquake activity in northern India indicates that different parts of the region are characterized by a moderate to very high level of seismic activity. It is observed that large and damaging earthquakes have occurred in the region. During the past few years many earthquakes of magnitude greater than 5 occurred. The Jammu and Kashmir has been a region of major seismic activity. Some of the largest earthquakes in India have occurred in this zone.
2. Several seismic zones have been tentatively identified on the seismicity map. Many of these are associated with known geological structures and fault zones. Others are related to unmapped subsurface structures.
3. Location of most of the earthquake epicentres lies north of Main Central Thrust and Main Boundary Thrust which shows that the movement is continued in this region and the build-up of stress was continuously reduced/released. From catalogue it is seen that most of the earthquakes occurs in Kupwara and Kishtwar district of Jammu and Kashmir which is looking more seismically prone areas. The earthquakes was continuously strike Kishtwar and Doda district of Jammu and Kashmir w.e.f. 31-04-2013 to 18-08-2013 around SNF (Sunder Nagar Fault) circumscribing Kishtwar window and it appears like that the earthquake in kishthwar is result of Sunder Nagar Fault which is getting active.

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# Study of Seasonal Variation in Lake Water Quality of Byadagi Taluka

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**Abstract-** Groundwater is one of the major resources of the drinking water in Byadagi taluk (India.). In this study 11 sampling station were selected for the investigations on 11 chemical parameters. The work was carried out during different months of the premonsoon, monsoon and post-monsoon seasons in June 2009 to June 2010. pH values recorded were alkaline in nature. Correlation between EC, TDS, Total hardness and related results clearly indicated the degree of acceptance of results documented. Water samples were found to be rich with phosphorus. High sodium content was noticed in all the stations. Results of principal component analysis evinced that all the parameters equally and significantly contribute to groundwater quality variations. Significant variation of physico-chemical parameters of surface water were observed; various physico-chemical parameters for the water samples were within highest desirable limit (HDL) prescribed by WHO for drinking purposes for all seasons except for pH in summer, total alkalinity and Fe contents in spring, autumn and winter; total dissolved solids in winter, turbidity in all seasons.

**Index Terms-** Physico-chemical, Chemical parameters, Byadagi taluka and seasonal variations etc

## I. INTRODUCTION

Good drinking water quality is essential for the well-being of all people which has affected the health and economic status of the populations. Groundwater is the major source of water for drinking, agricultural and industrial desires[1]. In this study, concentrations of chemical parameters such as pH, DO, BOD, COD, alkalinity, chloride, *o*-phosphate, nitrate, TDS, conductivity, TH, fluoride, ammonia and iron in groundwater samples were determined by using standard analytical methods[2]. Water is the principal need of life on earth, and is an essential component for all forms of lives, from micro-organism to man. The unplanned urbanization and industrialization [3] has resulted in over use of environment [4] in particular of water resource. A kind of crises situation has made getting clean water a serious problem. It is a known fact that when pure water is polluted its normal functioning and properties are affected. Ganges is a sacred river of India. The increased anthropogenic activities due to industrialization have contributed to decline in water quality of Ganges.

Groundwater is used for domestic and industrial water supply and irrigation all over the world. In the last few decades, there has been a tremendous increase in the demand for fresh water due to rapid growth of population and the accelerated pace

of industrialization. Human health is threatened by most of the agricultural development activities particularly in relation to excessive application of fertilizers and unsanitary conditions. Rapid urbanization, especially in developing countries like India, has affected the availability and quality of groundwater due to its overexploitation and improper waste disposal, especially in urban areas. According to WHO organization, about 80% of all the diseases in human beings are caused by water. Once the groundwater is contaminated, its quality cannot be restored by stopping the pollutants from the source. It therefore becomes imperative to regularly monitor the quality of groundwater and to device ways and means to protect it. Water quality index is one of the most effective tools [5-8] to communicate information on the quality of water to the concerned citizens and policy makers. It, thus, becomes an important parameter for the assessment and management of groundwater. WQI is defined as a rating reflecting the composite influence of different water quality parameters. WQI is calculated from the point of view of the suitability of groundwater for human consumption. The objective of the present work is to discuss the suitability of groundwater for human consumption based on computed water quality index values.

Water is an indispensable natural resource on earth. All life including human being depends on water. We have enormous resource on the earth amounting to about 13, 481, 96000 Km<sup>3</sup> of water. Due to its unique properties water is of multiple uses for living organisms. In India 77% of water is used in agricultural sector. Human being depends on water for almost every developmental activity. Water is used for drinking, irrigation, washing, and Industrial purposes. Although water is very abundant on this earth, yet it is very precious. Out of the total water reserves of the world, about 97% is salty water and only 3% is fresh water. Even this small fraction of fresh water is not available to us as most of it is locked up in polar ice caps and just 0.003% is readily available to us in the form of ground water and surface water. The fresh water resources now a day as consequences of population explosion coupled with industrialization, urbanization, and green revolution. In reservoirs, which are formed at the back of the relieved and accumulated structures on the running water, new organisms come into existence with the effects of different morphological structures. (Fair et al., 1971). In order to benefit from our reservoirs, lakes, ponds, dam lakes and rivers, we have to know the characteristics of these waters and the algae which are the first link of the food chain with regards to ecology and taxonomy. In comparison with natural lakes and marshes, reservoirs have the following features: (1) the water level varies irregularly, which physically destabilizes the lake shoreline, and

(2) the hydrogeological structure of dam lakes is complicated and could change easily because the water level is regulated artificially (Nakashima et al., 2007). In recent years, activities to preserve the water quality and ecosystem of reservoirs and lakes have been encouraged. For example, research on the classification of the water quality of reservoirs and lakes and the effects of its use on land have been carried out.

## II. STUDY AREA

**Byadagi** (Kannada: ಬ್ಯಾಡಗಿ) is a town in Haveri district in the state of Karnataka, India. Its around 18 km north west of the famous business center Ranebennur. The town is famous for the red Byadagi chilli. The surrounding areas of Byadagi produce chilli ( red in color & long ) which is dried in sunlight and sent to different markets. This spicy chilli is one of the common ingredients used in Udupi cuisine. Today the use of this chili is seen in abroad also.

Byadagi is located at 14.68°N 75.48°E. It has an average elevation of 601 metres (1971 feet). As of 2001 India census,<sup>[2]</sup> Byadagi had a population of 25,658. Males constitute 51% of the population and females 49%. Byadagi has an average literacy rate of 67%, higher than the national average of 59.5%; with male literacy of 74% and female literacy of 60%. 13% of the population is under 6 years of age.

## III. METHODOLOGY

Groundwater samples were collected from 11 locations during pre-monsoon, 1, 2 and post monsoon period. Each of the groundwater samples was analyzed for 11 parameters such as pH, electrical conductivity, TDS, total hardness, acidity, alkalinity, chloride, sodium, phosphorus, and potassium, using standard procedures recommended by APHA[9]. The water samples were collected from different sites in plastic bottles and transported to the laboratory in an icebox jars to avoid unpredictable changes in parameters of water samples and were compared with standard values recommended by World Health Organization[10], for drinking purposes.

## IV. RESULTS AND DISCUSSION

The values of various physico-chemical parameters in different seasons of Byadagi lake water are presented in Table.1, 2 and 3 respectively. The pH of water is important because many biological activities can occur only within a narrow range. Thus, any variations beyond an acceptable range could be fatal to a particular organism. pH values recorded exhibited alkaline nature of subsurface water. Further the water was found to be more alkaline during Pre monsoon - 2 followed by Pre monsoon - 1 and Post monsoon season. Acidity and alkalinity values recorded were found to have good correlation with pH hence inferred that the results of analysis are acceptable. pH of waters varied from 8.09 to 8.80 and 8.14 to 8.86 during Pre monsoon - 1 and Pre monsoon - 2 respectively. On the other hand the pH ranging from 7.16 to 7.95 was observed during Post monsoon season. In 2002

and 2003, Zafer and Sultana 2007 reported pH range of 7.6 and 7.55 respectively for monsoon season[11].

Again the correlation between EC, TDS, Total hardness and related salts clearly indicated the degree of acceptance of results documented. The highest TDS concentration of 645 mg / l during Pre monsoon - 2 was recorded in sample collected at Mattur village, Correspondingly TDS of this sample during Pre monsoon - 1 and Post monsoon was respectively 641 mg / l and 566 mg / l. The water sample collected from subsurface water source at Kerudi village exhibited lowest concentration of TDS, the values being 393 mg / l (Pre monsoon -1), 343 mg / l (Post monsoon ) and 395 mg / l (Pre monsoon -2). The highest and lowest concentrations of total hardness during Pre monsoon - 2 at Mattur and Kerudi villages were respectively 335 mg / l and 210 mg / l.

Hardness is an important parameter in decreasing the toxic effect of poisonous element. The total hardness is relatively high in some samples due to the presence of calcium, magnesium and chloride and sulphate ion. The hardness is greater than permissible limit (300 mg/l) in premonsoon-1 and 2 respectively. In Total hardness in premonsoon-1, postmonsoon and premonsoon-2 ranged from 209 to 333mg/l, 182 to 294mg/l and 210 to 335 mg/l respectively. Total hardness was recorded comparatively highest in premonsoon and lowest in postmonsoon is reported.[12]. Hardness more than permissible limit leads to heart diseases and kidney stone formation[13]. Acidity was detected in monsoon seasons in three locations only ( 20, 31 and 42mg/l), while in post monsoon acidity varied from 128mg/l to 222mg/l.

Nitrogen percolates easily into the groundwater through the soil along with rainwater recharge or irrigation water. As a result, the shallow aquifers are more likely than deeper ones to initially suffer from contamination problems [14–15]. Within practical limitations of analysis the nitrogen content in subsurface waters during all the seasons considered for study was found to be same and it ranged from 10 mg / l to 18 mg / l.

Sulphur dioxide (SO<sub>2</sub>) and oxides of nitrogen and ozone to some extent are the primary causes of acid rain. These pollutants originate from human activities such as combustion of burnable waste, fossil fuels in thermal power plants and automobiles. These constituents interact with reactants present in the atmosphere and result into acid deposition. The natural sources of sulphur pollutants are oceans and to much smaller extent from volcanic eruptions. The man-made sources of SO<sub>2</sub> emissions are the burning of coal and petroleum and various industrial processes (Cullis and Hirschler, 1980)[16].

Alkalinity of water samples ranged from 198 to 317, 182 to 222 and 200 to 319 mg/l in premonsoon-1, postmonsoon and premonsoon-2 respectively. The mild alkalinity may be due to more seepage of effluent, domestic sewage etc.

Phosphorous concentration ranging from 24 mg / l to 37 mg / l (Pre monsoon - 1), 21 to 33 mg / l (Post monsoon) and 25 to 40 mg / l (Pre monsoon - 2) were observed. Most critical single element in maintaining aquatic productivity is phosphorus, throughout is one of the most limiting factors of production in Indian reservoirs[17].

Maximum potassium concentration of 7.0 mg / l was observed at station SSB4 followed by SSB7 (6.2 mg / l ) , followed by SSB3 (4.1 mg / l ) , followed by SSB6 (3.9 mg / l),

followed by SSB2 ( 3.0 mg / l), followed by SSB8 (2.5 mg / l) ,followed by SSB5 (2.1 mg / l ) , followed by SSB1 (1.3 mg / l), followed by SSB10 (1.1 mg / l ) than by SSB9 (0.8 mg / l ) These values corresponds to Pre monsoon - 2. accordingly the concentrations in samples during Pre monsoon - 1 were respectively 6.8 mg / l , 6.0 mg / l , 4.0 mg / l ,3.8 mg / l , 3.3 mg / l , 2.9 mg / l , 2.4 mg / l , 2.0 mg / l , 1.7 mg / l , 1.3 mg / l and 0.8 mg / l . On the other hand potassium concentration ranged from 0.7 mg / l to 6.0 mg / l during Post monsoon. Thus, the excess amount of potassium present in the water sample may lead nervous and digestive disorder [18]. Very high sodium content in the water samples at all the three stations was noticed. Again higher sodium content in water sample during Pre monsoon - 2 followed by Pre monsoon - 1 and Post monsoon were recorded. The ranges were respectively 23.1 mg / l to 173.6 mg / l , 22.0 mg / l to 165.0 mg / l and 18.5 mg / l to 103.3 mg / l . Sodium and potassium if compression to chloride is high because of the present of salt in groundwater. The chloride and fluoride are correlated with each other.

Chlorides concentration ranging from 79 mg / l to 135 mg / l (Pre monsoon - 1), 69 mg / l to 119 mg / l (Post monsoon) and 81 mg / l to 136 mg / l (Pre monsoon - 2) were observed, indicating non-pollution status of water body. These values exceeded the permissible limit proposed by WHO. It is the indicator of contamination with animal and human waste. The high concentration of chloride gives an undesirable taste to water and beverages. Taste thresholds for the chloride anion depends on the associated cation and are in the range of 200–300 mg/l for sodium, potassium, and calcium chlorides [19]. No health-based guideline value is proposed for chloride in drinking water. However, chloride concentrations in excess of about 250mg/l can give rise to detectable taste in water [19].

## V. CONCLUSION

Analysis of Byadagi taluka lakes water in three seasons revealed that, some lake water samples are not suitable for purposes like irrigation and potable purposes.

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**Table: 1 Variations in Characteristics of Lake water Samples in Byadgi Taluk  
 in Pre monsoon - 1**

Variations in Quality of Lake water with respect to seasons ( Season : Pre Monsoon - 1 )													Taluk : Byadgi	
Station Code	Village	Monsoon Season	Concentrations of Parameters Stated											
			PH	EC $\mu$ s	TDS mg/l	Total Hardness mg/l	Acidity mg/l	Alkalinity mg/l	Nitrogen mg/l	Phosphorus mg/l	Sodium mg/l	Potassium mg/l	Chlorides mg/l	
LB1	Agasanahalli	Pre - 1	10.10	823	532	278	0	265	15	25	38.0	6.0	108	
LB2	Anur	Pre - 1	8.11	819	534	284	38	199	15	25	35.0	7.2	112	
LB3	Attikatti	Pre - 1	8.56	868	563	296	0	281	17	27	52.4	7.8	114	
LB4	Budapanalli	Pre - 1	9.48	876	570	296	0	282	17	27	46.0	15.2	115	
LB5	Chikkabasur	Pre - 1	9.20	935	601	320	0	304	17	28	53.0	8.3	126	
LB6	Chikkanajji	Pre - 1	8.44	1,069	692	368	0	350	19	33	73.0	2.5	140	
LB7	Galapuji	Pre - 1	8.35	647	422	219	0	208	12	20	44.0	6.3	89	
LB8	Kaginehalli	Pre - 1	8.69	879	570	300	0	285	17	27	27.1	5.8	115	
LB9	Kerudi	Pre - 1	9.07	648	419	223	0	212	12	20	49.3	16.3	85	
LB10	Kummur	Pre - 1	9.48	630	403	214	0	203	11	19	34.5	8.3	85	
LB11	Mattur	Pre - 1	8.78	1,245	810	421	0	400	23	38	80.5	51.0	164	

**Table : 2 Variations in Characteristics of Lake water Samples in Byadgi Taluk in Post monsoon**

Variations in Quality of Lake water with respect to seasons ( Season : Post Monsoon ) Taluk : Byadgi													
Station Code	Village	Monsoon Season	Concentrations of Parameters Stated										
			PH	EC $\mu$ s	TDS mg/l	Total Hardness mg/l	Acidity mg/l	Alkalinity mg/l	Nitrogen mg/l	Phosphorus mg/l	Sodium mg/l	Potassium mg/l	Chlorides mg/l
LB1	Agasanahalli	Post	8.50	732	474	248	0	235	14	22	45.0	8.7	96
LB2	Anur	Post	7.26	735	479	255	209	178	13	23	71.0	10.7	101
LB3	Attikatti	Post	8.48	768	500	260	0	247	14	24	134.5	48.5	101
LB4	Budapanalli	Post	7.66	782	508	267	128	187	15	24	86.0	15.9	103
LB5	Chikkabasur	Post	8.23	828	532	283	14	269	15	25	89.3	17.0	112
LB6	Chikkanajji	Post	7.55	884	572	304	150	213	15	27	95.0	16.0	116
LB7	Galapuji	Post	7.47	612	399	207	166	145	11	19	122.0	14.8	84
LB8	Kaginehalli	Post	7.77	802	520	273	105	191	15	25	82.3	14.2	105
LB9	Kerudi	Post	8.11	615	398	212	37	148	11	19	87.5	21.0	80
LB10	Kummur	Post	8.48	601	384	204	0	194	10	18	62.0	13.0	81
LB11	Mattur	Post	7.86	986	642	334	89	234	18	30	95.0	19.7	130

**Table : 3 Variations in Characteristics of Lake water Samples in Byadgi**

**Taluk in Pre monsoon - 2**

Variations in Quality of Lake water with respect to seasons ( Season : Pre Monsoon - 2 )													Taluk : Byadgi	
Station Code	Village	Monsoon Season	Concentrations of Parameters Stated											
			PH	EC $\mu$ s	TDS mg/l	Total Hardness mg/l	Acidity mg/l	Alkalinity mg/l	Nitrogen mg/l	Phosphorus mg/l	Sodium mg/l	Potassium mg/l	Chlorides mg/l	
LB1	Agasanahalli	Pre - 2	9.56	970	628	328	0	312	18	30	45.2	6.9	127	
LB2	Anur	Pre - 2	7.68	965	629	335	124	234	18	30	41.9	8.3	132	
LB3	Attikatti	Pre - 2	8.98	1,033	672	349	0	332	19	32	56.0	17.7	136	
LB4	Budapanalli	Pre - 2	8.10	1,023	664	349	39	244	20	31	63.2	9.1	134	
LB5	Chikkabasur	Pre - 2	8.71	1,090	701	373	0	354	20	33	65.4	9.5	147	
LB6	Chikkanajji	Pre - 2	7.99	1,124	727	387	62	271	20	35	87.8	3.2	147	
LB7	Galapuji	Pre - 2	7.91	763	497	258	79	181	14	24	55.1	7.5	105	
LB8	Kaginehalli	Pre - 2	8.23	1,036	672	353	14	336	19	32	34.5	7.0	136	
LB9	Kerudi	Pre - 2	8.59	764	494	263	0	250	14	24	61.2	18.7	100	
LB10	Kummur	Pre - 2	8.98	743	474	252	0	240	13	22	43.0	10.1	100	
LB11	Mattur	Pre - 2	8.31	1,404	914	475	0	451	26	43	98.2	62.3	185	

# The Significant of History Curriculum in the Development of Active Citizen: A Critical Analysis of the ICSS History, Malaysia

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**Abstract-** This study discusses the aim and objectives of teaching and learning of history, Integrated Curriculum for Secondary School (ICSS), Malaysia. The introduction of this subject should help to develop skills in pupils in communication, understanding concepts, to extend vocabulary and use of language in different contexts, to encourage discussion, and, problem-solving. The important thing is that the pupil's acquisition of historical skills and to the development of personality and self-confident should each be systematically assessed in order to identify both progress and any need for further remedial or enrichment work. This is important in the production of motivated and active citizen who can learn effectively and be competent in their future jobs career. Consequently, the pupils are expected to appreciate and practise in daily life Malaysian multi-culture, appreciate the efforts and contributions of the national figures who had liberated and developed the nation, and, have historical and consciousness with regard to the existing community in the country. It is clear that history curriculum is the only subject at school to directly foster and develop active citizen towards the realisation of the Vision 2020 and 1-Malaysia.

## I. INTRODUCTION

It is very exciting that history in the Integrated Curriculum for Secondary School (ICSS) has been included as one of the core subjects in the lower secondary and upper secondary levels of Malaysian schools. This subject is officially included in the time table of the ordinary, religious, science, vocational and technical schools in the country. Thus, it is necessary to study and analyse the ICSS history curriculum to see if it really could achieve the objectives of the syllabus, successfully producing the active Malaysian generations as stipulated in the Malaysian Education Philosophy, Malaysian development plans and meeting to a considerable extent the challenges of the Vision 2020 and 1-Malaysia vision.

The question is why history became considered as an important subject even after more than five decades of Independence of Malaysia on 31 August 1957?

## II. WHY HISTORY BECAME CONSIDERED AS AN IMPORTANT SUBJECT IN THE ICSS MALAYSIA?

The Ministry of Education's Curriculum Development Centre (CDC) Malaysia stresses that the inclusion of history as a core subject was due to its intended role, first, to fulfil the noble

aim of the national education reformation as stipulated in the National Education Philosophy, that is:

*To further develop the potential of the individual in a holistic, balanced and integrated manner encompassing the intellectual, spiritual, emotional and physical aspects in order to create a balanced and harmonious human being with high moral standards.*

(CDC, Ministry of Education, Malaysia, 1987, 2002)

The above statement has outlined clearly the type of pupil inspired by the Malaysian Education Philosophy.

Secondly, W.M Zahid (Ministry of Education, 1992) the ex-Director of Education, emphasises, since history directly deals with issues of nationality, politics and citizenship, it is very important for all pupils to learn this subject. Thus, history could be used as an effective instrument to create national identity, reinforce a sense of belonging and loyalty to the country and cultivate the spirit of patriotism. Consequently, through the acquisition of knowledge and appreciation of the country's history, it is hoped that pupils would be aware of the variety of social and national life and could this understanding foster national unity as stipulated in the Malaysian development plans.

Thirdly, the Ministry of Education (1987) stated that as a continuation from school level, beginning from 1991, the historical development of Malaysia should become one of the core subjects in the one-year In-service Teacher Training course. The aim is to raise consciousness among teachers concerning historical literacy and historical empathy, and sensitivity to the value of citizenship and patriotism.

Fourthly, most local universities offer the historical development of Malaysia as a subject in the first year, even in the non-arts courses such as Laws, Management, Medicine and Information Technology. In fact, the importance of history in the Malaysian schools curriculum, as well as at the university level, has been realised by Wang Gangwu who wrote History Teaching: Its Problem in Malaya 'We teach history because it is an essential part of the education of the young people of the most countries and all modern nations and will take for granted that is a subject which is taught in schools and universities and some educationists are agreed upon as a basic education for every body (Zainal Abidin Wahid 1965:1). Wang Gangwu (1968:1) admits that history is important as it will help to preserve the group identity and strengthen the group's capacity for service.

Fifthly, in order to assess the knowledge and understanding of the historical development of the country, all Government servants in Category B and above are required to sit an

examination, namely the '*Peperiksaan Am Kerajaan*' (Government Examination) to qualify them to a permanent post. The examination is mainly about the process of nation building and the historical development of the country. This would be a great advantage for those who have learned history at school. In the ICSS however, everyone has the same opportunity to score.

These are the main reasons for history was considered as an important subject especially in the ICSS. It is not only important at school level but also for beginning a career and beyond. This is in line with the aim of the national development plans implemented by the government. Moreover, since the 13 May 1969 incident there has always been a distinct conviction that history could be used as means to achieve national unity.

There is little wonder, therefore, that after more than fifty years of independence, the Ministry of Education insists on including history as one of the core subjects in the ICSS, even for those people busily propagating and actively involved in the development of sophisticated technology and Multimedia Super Corridor (MSC) projects. In this respect, the Ministry clarifies that the country does not aim to produce people of high literacy but illiterate in the history of their own nation.

As Omar (1992) says that history is now used as an instrument for unification or 'centripetal' and not for diversification or 'centrifugal' means as practised during the British administration.

### III. THE PRESSURE FOR THE CHANGE OF HISTORY CURRICULUM, MALAYSIA

The Ministry of Education (CDC 1980) admits that the May 1969 incident initiated more serious efforts to revise the new history curriculum. The Ministry realised that one of the reasons was the lack of historical knowledge which could raise consciousness about the reality of the multiethnic-based politics, economics, social and cultural practices of the country.

Vasil (1986) emphasised that the chauvinist sentiments of each ethnic groups for their ancestors' motherland were very strong. Their demands respecting development and policy making, especially concerning culture, education and language always referred to their ancestors' home countries. This situation raised dissatisfaction among the 'sons of the soil' and urged the government to review the development and education policies. The pressure was led by the Malay politicians, academicians, professionals and socio-cultural groups as discussed in the previous chapter.

At this stage, the concern for history as a centripetal instrument especially in providing the perspectives of the process of social evolution in the country in the previous centuries became prominent in the government's policy making agenda. Indeed, the Ministry of Education (CDC 1980) stated that the revision of the history syllabus for Malaysian schools in the 1970s illustrated the preponderance given to national aspirations as stipulated in the *Rukunegara* and the New Economic Policy, especially with regard to the making of the new society and the development of national unity. For example, in 1971, a Congress on Malaysian Culture was held with the aim of promoting the Malaysian identity and culture, as a multi-ethnic and multi-cultural society.

Ministry of Education (1992) stated that the history syllabus was revised mainly as a sequence of the recommendations of this Congress and the subsequent Malaysia History Seminars organised by the Malaysian Historical Society and the Historical Society of the Universiti Kebangsaan Malaysia (National University of Malaysia) in 1973 and 1974. It was recommended that the history syllabus: should emphasise more the endeavours of Malaysians and reflect the views of Malaysian historians rather than the perceptions of foreign historians. (Ministry of Education, CDC 1992).

The resultant revised history syllabus for Primary and Lower Secondary Schools undeniably echoed their view when it states, in organising the aims and content of the history syllabus of a nation, it is necessary to ensure that it is consistent with the policy and constitution and the educational objectives of the nation so that it helps to achieve the national aims. In selecting the content of History, it must be consistent with the national aspiration stated in *Rukunegara* and the aim of teaching History itself (Ministry of Education, CDC 1992).

In this respect, the Cabinet Committee Report 1979 emphasised that it was important for pupils to learn history, particularly the history of Malaysia, because it is intimately related to the development of nation building, citizenship and national integration and provides perspectives of the process of social evolution in the country for the previous centuries (Ministry of Education (1992). Consequently, the Cabinet Committee recommended that:

a. The history syllabus should place emphasis on the people of Malaysia and their contributions: the same format should also be followed when teaching about the Southeast Asian countries; and,

b. The time allocated for history lesson must be followed by all schools.

(The Cabinet Committee Report 1979, Item 40: para 137-139)

These recommendations are related to the earlier statement of the Cabinet Committee when the Government, through the Ministry of Education, decided to reform, improve and enhance the quality of education so that the requirements of present and future national development could be met. The Report's recommendations were geared towards the following objectives are to achieve national unity in a multi-ethnic society; produce skilled manpower for national development; further extend the policy of democratisation of education in order to strike a balance in all aspects of education between rural and urban areas; and, mould a disciplined and morally refined Malaysian society (Ministry of Education, EPRD 1994).

Consequently, in the early seventies the Ministry of Education launched a programme for the collection of data on Malaysian historiography. The programme was initiated particularly by the Department of History, University of Malaya and the University Kebangsaan Malaysia. The majority of the research was based on fieldwork undertaken by undergraduate students of the two universities in their own localities. The aim was to collect, collate and compile data as part of their history course requirements.

According to Ministry of Education (1992) the main themes in the study were education, immigration, racial conflicts, the Japanese Occupation, Malay historiography, biographies of

Malaysian personalities and politics at the grass-root level. The findings have made a significant contribution to the formulation of themes and content of history in the school curriculum.

In 1977, the Ministry of Education formulated a history syllabus for secondary schools. The objectives of the history curriculum 1977 were as follows to increase awareness of national identity through the learning of history; foster a sense of belonging within the community and country as a whole; develop an equal awareness of its historical heritage of all the major ethnic groups among Malaysians; foster international understanding; raise interest in history; and, create and develop critical thinking (CDC, Ministry of Education, Malaysia 1979). The above objectives were synchronised with the contemporary aims and development of the country. First, the formulation of 'National Culture', second, development of national identity, third, the restructuring of society and fourth, the role of Malaysia in the region and internationally, especially ASEAN (Association of South-East Asian Nations) with the ZOPFAN (Zone of Peace, Freedom and Neutrality) Policy and Third World organisation respectively. It is obvious that history was used by politicians and by government as an instrument to propagate national and international issues.

In 1983, the Malaysian Ministry of Education (CDC 1989) implemented the New Primary School Curriculum (NPSC) throughout the country beginning with Year One (pupils aged seven years). In the NPSC history was taught beginning with Year Four under the newly introduced subject 'Man and His Environment'.

In 1989, the Malaysian Ministry of Education (CDC 1989) implemented a new curriculum for secondary schools, known as the Integrated Curriculum for Secondary Schools (ICSS), throughout the country, beginning with Form One. In this curriculum history was included as one of the core subjects in the lower and upper secondary levels. The inclusion of history in the lower secondary level (Forms One, Two and Three) was merely a continuation of the 'Man and His Environment' subject of the NPSC and replaced the existing history syllabus. However, the inclusion of history in the upper secondary level (Forms Four and Five) in all type of schools was a new requirement. On one hand, it is a privilege but on the other, it is a great responsibility for history to achieve the aims and the aspirations envisioned in the National Education Philosophy and National Development Plans.

It can be seen that the decision to include history as one of the core subjects in the ICSS was not an overnight process. It involved the work and contributions of various individuals, professionals, academicians and historical associations. Consequently, the changes in the education policy and systems to suit the aspiration of building a Malaysian nation with a unified, multi-ethnic population able to produce the required quantity and quality of human resources, in accordance with the blue print of national development projects, have had a significant impact in the designation of the history curriculum of Malaysian schools, particularly in the ICSS.

#### IV. THE AIM AND OBJECTIVES OF HISTORY CURRICULUM IN THE ICSS, MALAYSIA

The Ministry of Education (CDC 1989) outlined thirteen objectives of school education in the ICSS. One of the objectives,

in line with the learning of history, was to enable pupils to understand, be aware of and appreciate the history as well as the socio-cultural milieu of the country.

In this respect, the Philosophy of History Education, Lower Secondary Schools, Malaysia, was formulated towards achieving these aims, to cultivate high standard moral values, the spirit of loyalty and pride in being a Malaysian. Through knowledge and appreciation of the country's history, it is hoped that the pupils would become aware of the variety of social and national order that is to be used as a main reference of fostering national unity and to reinforce the sense of belonging and the spirit of citizenship/patriotism (Curriculum Development Centre, Ministry of Education, Malaysia, 1987).

It is clear that there is a very close relation between the Malaysian Education Philosophy and the Philosophy of History in the ICSS. Consequently, the Ministry of Education (CDC 1987) decided to reformulate the aims and objectives of the old 1977 history curriculum in order to meet the aspiration of the Malaysian Education Philosophy.

The objectives, which were built into the History Syllabus ICSS (1988), were to enable pupils to:

- i. understand the political, economic and social development of the community and nation;
- ii. understand, appreciate and practise in daily life the Malaysian community values and culture;
- iii. appreciate the efforts and contributions of the national figures who have liberated and developed the nation;
- iv. have historical consciousness with regard to the existing community in the country;
- v. analyse, synthesise and evaluate the existing historical facts and evidence rationally;
- vi. upgrade thinking skills and develop maturity based on students' learning experiences in history;
- vii. be conscious of, sensitivity to and deeply responsible for law and order and the development of the nation.

The history curriculum in the ICSS 1988 was changed in accordance with the above objectives. The themes for lower secondary level are:

1. The Golden Era of the Malay Melaka Sultanate;
2. The kingdoms after the downfall of the Melaka Sultanate to the inauguration of the present Kingdoms;
3. The natural environment and wealth of the country which led western powers to colonise it;
4. The uprisings and movement to liberate the sovereignty of the nation;
5. The people's movements towards Independence;
6. The Formation of Malaysia;
7. The achievement of Independence.

The pupils of the Lower Secondary level should acquire knowledge and understanding of the above themes concerning the historical development of the country. At the same time, they are asked to identify the causes and effect of events which might affect their present situation. The pupils are also encouraged to use their own minds when examining the contents of textbooks in order to develop critical thinking.

It is clear that history within the ICSS was given a demanding task, namely to educate pupils to be 'good Malaysian

citizens' inspired by the national development plans and the National Education Philosophy (CDC 1987). The central feature in the process of education is the focus on pupils, whereby teachers actively involve pupils in the entire range of teaching-learning activities. The effectiveness of history in achieving the aims stipulated in the National Education Philosophy and National Development plans need further examination and discussion. The discussion on Malaysian ICSS history and local history in this study refers much to the learning and teaching approaches of this subject in English schools. The intimate political, economic, social and educational connections between Britain and Malaysia as mentioned above would lead one to expect some similarities in educational practice suitable and applicable to the Malaysian context.

This would not be to duplicate exactly the whole British schools system or copy the subject matter. The main point is to refer to the pedagogical aspects, particularly in the formulation of the curriculum, the implementation and the educational significance of both history and fieldwork history.

#### V. A CRITICAL ANALYSIS OF AIM AND OBJECTIVES OF THE ICSS HISTORY, MALAYSIA

It has been emphasised that the overriding concern of Malaysia is to achieve national integration and unity, and that history is seen as an important apparatus towards achieving that end.

In this respect, the Ministry of Education (CDC 1987) designed the ICSS history with the intention to achieve the aim stipulated in the education philosophy and national development, that is to produce the criteria of individual who is 'balanced and harmonious; spiritually, cognitively and physically skilful; and practising high moral values'.

In fact, these values of history curriculum are in line with the observation of Sir Keith Joseph as quoted by Grosvenor and Watts (1995:19-20) that:

*The knowledge, understanding and skills which the study of history can confer are of great value themselves. To acquire an interest in the past is itself a cultural acquisition which can enrich the whole of one's adult life...In addition history can...encourage young people to use their reason as well as their memories. It can develop skills of analysis and criticism...by encouraging pupils to evaluate primary source material...the skills acquired through the study of history can also enhance young people's use of language, numeracy, observation and communication with other people. History is indispensable to understanding the society we live...In short, properly taught, justifies its place in the curriculum by what it does to prepare all pupils for the responsibilities of citizenship (Keith Joseph 1984).*

From this statement, it is clear that, Joseph believed that, basically history has a considerable capacity to prepare pupils with the knowledge, understanding, skills and responsibilities necessary for the 'good citizen'. Thus, the reformulation and designation of the ICSS history would seem to be inspired by a similar philosophy.

In the ICSS, the elements of history were restructured through a variety of perspectives including political, economic,

social, cultural and aesthetic (researcher's acronym- PESCA). For the lower secondary level (Forms One, Two and Three), the themes were confined to Malaysia, from the period of the Stone Age pre-history until the formation of Malaysian State of the Malay Melaka Sultanate. The themes were presented in chronological order and a continuation of the NPSC 'Mans and His Environment' subject.

In the Form One (CDC 1987) textbook it is shown that Malaysia was developed in various stages and influenced by many internal and external factors. For example, the Malay Melaka Sultanate founded by Parameswara, initially was a small fishing village but later developed as a kingdom and international trader in the region. It is stated in the textbooks that the country faced a lot of challenges such as the attacks by the Siamese, the Portuguese, the Dutch and the British. In this respect, the contributions of local figures such as Sultan Mansor Shah, Sultan Alauddin Riayat Shah and Tun Perak were more clearly emphasised. The developments of the economic, social and cultural activities of the local people were also clearly highlighted (CDC 1987, 1988, 1989). There are a lot of differences here from the history curriculum during the British administration and before the implementation of the ICSS.

The content and presentation in the textbooks are in accordance with the aims of the ICSS history, that is to provide knowledge to the pupils and understand the process of nation building of the country over centuries (CDC 1987, 1989). The important thing in this aspect is that the history curriculum must be based on the Malaysian experience.

In fact, 'knowledge and understanding' of the development of the country is one of the fundamental element in the learning and teaching of history in England too. With regard to this, Sebba (1994) mentions that the requirements of historical thinking in the history curriculum should include three areas namely; first, knowledge and understanding of history; second, interpretations of history; and third the use of historical sources.

Within the 'knowledge and understanding' of history there were three strands namely; 'change and continuity', 'causes and consequences' and 'knowing about and understanding' key features of past situations. Change and continuity is concerned with the development of understanding of chronology (Sebba 1994). Bourdillon (1994) stresses that chronology provides a mental framework or map which gives significance and coherence to the study of history. We believe that a school history course should respect chronology and be broadly chronological in structure.

Sebba (1994) states that 'cause and consequence' is about identifying why things in the past happened, why particular individuals acted the way they did and what the consequences or results were of these events and actions. Knowing and understanding key features of past situations requires pupils to identify differences and similarities between a period in the past and the present or between two or more periods in the past.

'Interpretation of history' includes understanding the differences between fantasy and reality, looking at the different ways in which the past has been represented and investigating the differences between versions of the past. Sebba (1994:4) says that 'starting with the crudest of distinctions between facts and fiction this can develop into consideration of whether they are fictitious or not'. Bourdillon (1994:31) admits that the study of

history necessarily includes interpretations of history and its nature that has three distinct but related aspects:

- i. an acquaintance with the writings of historians and a knowledge of typical historical controversies, relating to the content of the course;
- ii. an understanding that history has been written, sung, spoken about, painted, and dramatised by all kinds of people for all kinds of reasons; and
- iii. an understanding that some histories have a high profile, others are hardly known, yet others (like the history of the differing roles of men and women) are now finding a place in the main arena of history.

Within 'the use of historical sources', pupils will be working on the skills of research in history such as developing powers of observation, listening, communicating, hypothesising, problem solving, library skills and interpretation. These skills may be enhanced by the use of various sources including portraits, photographs, objects, buildings, audio tapes, music and eyewitness accounts.

One of the principles of the ICSS history is the use of an integrated approach which entailed the integration of knowledge, skills and values; the integration of theory and practice; and the integration of curriculum, the co-curriculum and the school culture (CDC 1989). The intention is to promote to pupils the concept of 'history a-cross curriculum' meaning that the elements of history are acquired in other ICSS subjects.

This is in line with Black and M. MacRaild (1997) in Britain who stated that the links between history and the 'cross-curricular themes' of the history curriculum are extensive and include environmental education, citizenship, family life-cycles, economic and occupations of people in the locality. These were explained by Peter Burke in the *New Perspective on Historical Writing*, 1991. Sebba (1994:7) says that 'the importance of history as a vehicle for delivering this entitlement comes from a number of aspects of teaching of history which are intrinsic to the subject'. First, history deals with human motivation; and second, history has a very important part to play in pupils' cultural development. In fact, the fostering of spiritual, moral, social and cultural development of pupils has been given special attention in the ICSS history.

The value of motivation is included as one of the aims of the teaching and learning of ICSS history. It should help to develop skills in pupils in communication, understanding concepts, to extend vocabulary and use of language, especially Bahasa Malaysia in different contexts and to encourage discussion and problem-solving (CDC 1987). The important thing is that the pupil's acquisition of historical skills and to the development of personality and self-confidence should each be systematically assessed in order to identify both progress and any need for further remedial or enrichment work (CDC 1987). This is important in the production of motivated people who can learn effectively and be competent in their future jobs. The pupils are expected to appreciate and practise in daily life Malaysian culture, appreciate the efforts and contributions of the national figures who have liberated and developed the nation and have historical consciousness with regard to the existing community in the country (CDC 1989).

As an addition to the sixteen selected moral values of the ICSS, the Ministry (CDC 1992) reinforced the credibility of history subject in creating good citizens by introducing a specific value concerning citizenship and patriotism namely 'pride in being a Malaysian', 'patriotism', 'self belonging', 'discipline' and 'initiative and productiveness'. It might seem redundant as it duplicate other stated values, but it is specially designed for the history subject area. The more important thing is that it has to be clearly and truly implemented in the teaching, learning and examination of history and in textbooks. By this way pupils should realise the importance of the moral values inculcated in the subject whereas in the long term it is accordance with the aims of the national development plans especially the Vision 2020 as discussed in chapter one.

From the above, it is clear that history in the ICSS is viewed as an endeavour to enable the development of a balanced, integrated and well-rounded individual. The history curriculum at secondary school level was formulated to realise this aspiration, through a complete education which encompasses the acquisition of knowledge, skills, values and the effective use of historical experience.

In this respect, Grosvenor and Watts (1995) suggest that pupils are entitled to learning experiences, which allow them to demonstrate their progress in knowledge and understanding of history; ability to give historical explanation; ability to investigate and work with historical sources of different kinds; ability to provide interpretation of the past are consistent with the evidence; ability to locate, select and organise historical information; ability to present findings appropriately and effectively give historical explanations; sense of the past; awareness of how the past helped to fashion the present; enthusiasm for exploring the past; respect for evidence; toleration of a range of opinions; and. construction approach to collaborative working.

Furthermore, Grosvenor and Watts (1995:40) suggest that pupil should be given various opportunities to show that they can do; increase their understanding of historical terminology and concept especially by revising these within and across the Key Stages; study the different perspectives of history and the diversity of human experience within an increasingly deeper and wider framework knowledge; use more complex sources, both primary and secondary; recognise how and why people interpret history in different ways; have space and time to investigate at their own level with increase independence; ask questions, return to these in different contexts and learn gradually to formulate hypotheses; try different ways of communicating their findings and in an increasingly sophisticated way; be engaged in an active and challenging learning process which stimulates interest and enquiry and therefore naturally leads into the understanding and skills which are part of history; experience teaching which has clear objectives, a variety of both methods and classroom organisation and is well and imaginatively planned; and, have regular positive and informative feedback on how they are progressing and how to progress further.

Therefore, it is important to revise the history curriculum of ICSS Malaysia from merely focusing on the pupils' understanding the history of the nation and memorisation of historical facts for examination purposes. The pupils develop their understanding of people and events in history and learning

how 'historical facts' develop in accordance with the nature of history should itself involve understanding of 'objectivity', 'empathy' and 'causation'. It is good to remember the recipe of a cake, but it would be much better to know how to bake it.

The pupils should be given opportunity to use a range of historical sources including written evidence, artefacts, pictures, photographs, music, buildings, sites and computer-based materials. They should also be introduced to a range of perspectives such as political, economic, technological and scientific, social, religious, cultural and aesthetic. They should be actively involved in historical investigations which stem from their own interests, through asking questions, selecting and recording their own sources, organising the information they collect and presenting their findings in a variety of ways such as orally, in writing or through model-making, pictures, drama or information technology.

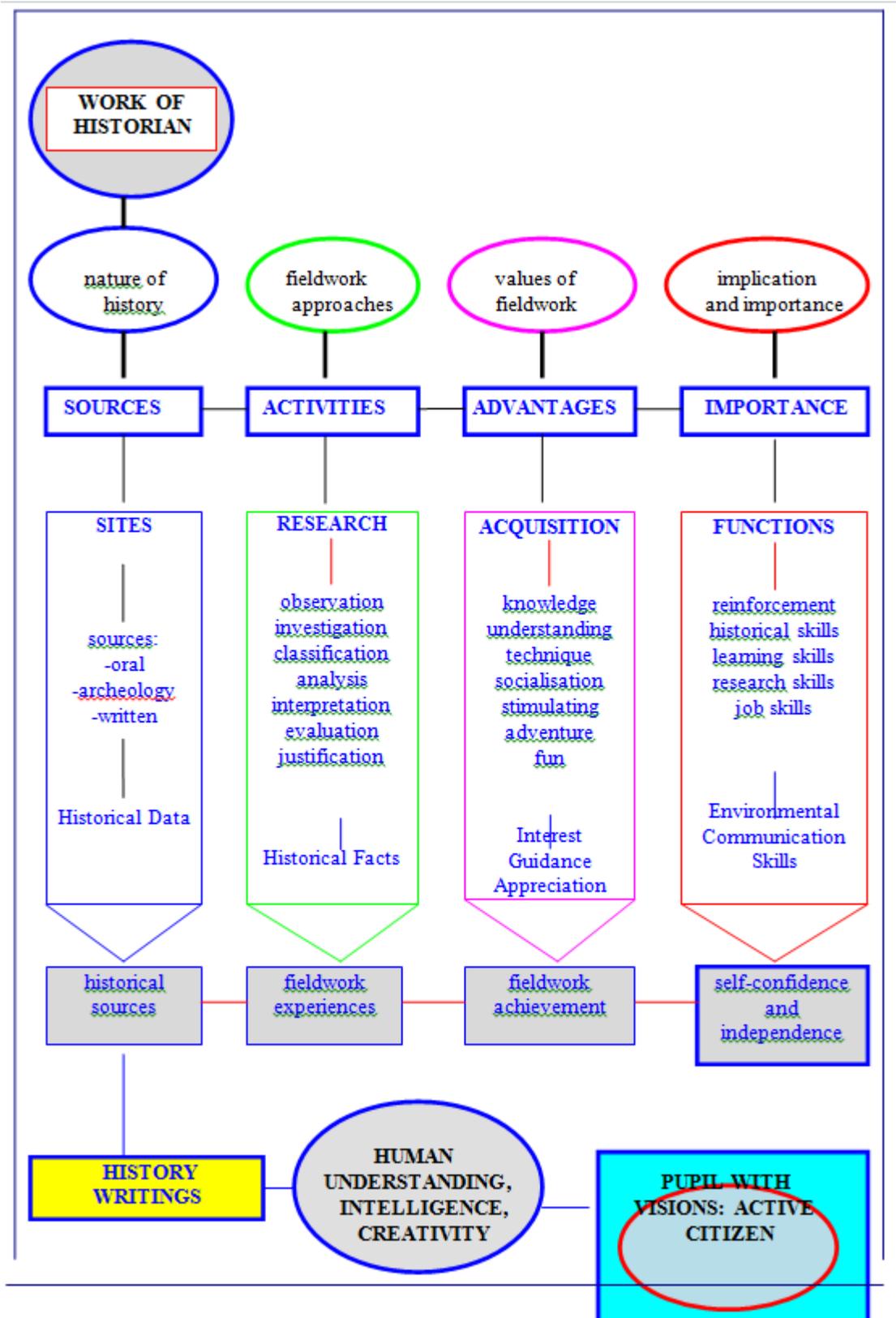
The Malaysian schools' history curriculum should recognise the essential interaction between content and process, the need for a balance of breadth and depth, and the importance of investigations stemming from pupils' own interests. The

pupils should be initiated, guided and shown how to investigate primary sources in order to find out about the relationship between past and present, or what it might be like to have lived at another time. Investigations should be recorded in a variety of artistic, creative and mathematical forms.

The planning might involve a sequence of stages such as an overview of resources, selection of focuses for investigations, selection of key concepts, consideration of possible activities related to each focus, long-term plans showing how activities relate to objectives and how they can be assessed. For the teaching and learning implementation more detailed, short-term plans required for each activity or activities in every lesson. The pupil should be exposed to the work of historian who works from scratch and patches of evidence, analyse and synthesise the facts until the writing of a historical book.

With regard to the work of historians it can be illustrated as shown in figure 1 below:

**Figure 1:**  
**Work of Historian: The Advantages and Functions of Fieldwork Approaches in History**



## VI. CONCLUSION

It is clear that the learning of history can enable pupils to develop potential abilities such as a better understanding of human beings and critical judgement, and can prepare the individual to face the problems of the contemporary world. In fact, since independence, the history curriculum has been changed in accordance with the availability of authentic and sufficient national history sources and to bring it into line with national aspirations which were closely related to the Malaysian development plans, the *Rukunegara* (Pillar of the Nation) and the New Economic Policy.

Hence, if lessons and activities are planned based on statement of attainment of 'comprehensive' global history objectives, it is possible to assess pupils' historical thinking as part of their on-going work in a variety of ways. Consequently, history in the ICSS would not only be seen as a core subject to be learned but furthermore it is relevant and central to the schools curriculum and to pupils' cognitive, emotional, spiritual, physical and social development in order to produce a 'balance and harmonious' generation as stated in the Malaysian Philosophy of Education and to considerably meet the challenges of the Vision 2020 in the development of the twenty-first millennium Malaysian nation.

This mean, the Ministry of Education has taken very appropriate steps to include history as one of the core subjects in the ICSS even though some people underestimate this subject, especially when Malaysia is busy in the development of sophisticated technology and Multimedia Super Corridor (MSC) projects in facing the challenges of the Vision 2020 and achieving the 1-Malaysia vision.

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# Probabilistic Load Flow Analysis of the 9 Bus WSCC System

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**Abstract-** Load flow analysis is one of the most important tools being used in analysing power systems. The significant uncertain parameters of the system planning and reliability are neglected in the deterministic method. In this study, the stochastic technique is proposed to examine the power flow issues in power systems. The main aim of this study is to provide a solid solution by considering the system uncertainties while keeping the system topology constant. The prospective values and the standard deviation of the power flow of each power line are estimated. The sensitivity coefficients which are quite significant for each power line are calculated as well. These coefficients tell us that how the changes occurring in the node data influence the power flow of each power line. This technique investigates the possibilities of all power flows taking place in the system. Additionally, by applying the stochastic approach to 9 bus WSCC system it is verified that the probabilistic analysis method gives more detailed information in power systems than that the deterministic analysis does.

**Index Terms-** Probabilistic load flow, Load distribution, Power systems, Probability

## I. INTRODUCTION

Load flow analysis is the most widely used tool for steady-state studies in power systems. Its application is based on the assumption that the system loading is precisely known. That is, the electric load and generation are deterministically known quantities. However, in many cases the load needs to be assumed stochastic in nature and therefore the power system operation has to be studied based on estimates of this demand and taking into consideration the probabilistic nature of the load. This is performed using the probabilistic power flow analysis. Probabilistic power flow is a term that refers to power flow analysis methods that directly treat the uncertainty of electric load and generation [1].

There are very well developed deterministic methods that are used in power flow studies that permit them to be made very quickly, accurately and efficiently [2]. In these deterministic methods the nodal loads, generation and topology of the network is kept constant. In practice however the data of the nodal loads and generation can only be known with limited accuracy. In this reason the PLF (Probabilistic Load Flow) was proposed by Borkowska for evaluation of the power flow considering uncertainties.

The uncertainties encountered may be due to; measurement error, forecast inaccuracy or outages of system elements [2].

The main purpose and reason of using probabilistic analysis instead of deterministic is to consider the uncertainties and model these statistical variations in the input data of the power system. A number of papers have been published that have modeled the load flow problem probabilistically [2]-[9]. In this paper the probabilistic method has been explained.

## II. LOAD FLOW EQUATIONS

Although well-known it is useful to explain the load-flow equations [10-14] :

$$P_i = V_i \sum_{k=1}^n V_k (G_{ij} \cos \delta_{ik} + B_{ik} \sin \delta_{ik}) \quad (1)$$

$$P_{ik} = -t_{ik} G_{ik} V_i^2 + V_i V_k (G_{ik} \cos \delta_{ik} + B_{ik} \sin \delta_{ik}) \quad (2)$$

$$Q_i = V_i \sum_{j=1}^n V_j (G_{ij} \sin \delta_{ij} - B_{ij} \cos \delta_{ij}) \quad (3)$$

$$Q_{ik} = t_{ik} B_{ik} V_i^2 - B_{ik} V_i^2 + V_i V_k (G_{ik} \sin \delta_{ik} - B_{ik} \cos \delta_{ik}) \quad (4)$$

$$Q_{i(sh)} = V_i^2 B_{i(sh)} \quad (5)$$

where  $B_{ik}$  is the imaginary part of element  $ik$  of admittance matrix,  $G_{ik}$  is the real part of element  $ik$  of the admittance matrix,  $n$  is the number of nodes,  $P_i$  is the injected active power at node  $i$ ,  $P_{ik}$  is the active power flow in line  $i-k$ ,  $t_{ik}$  is the transformer tap ratio,  $V_i$  is the voltage magnitude at node  $i$ ,  $\delta_i$  is the angle at node  $i$  referred to slack node and  $\delta_{ik}$  is the difference in angles between nodes  $i$  and  $k$ .

## III. THE PROBABILISTIC APPROACH

The loads in an electrical power system vary continuously, so the system operation must adapt to this kind of variation at any time. Therefore, to build an appropriate load model is very important for system security assessment. According to the requirement of security assessment, the load model can be divided into time instance load model and time-period load model [15].

The nodal data for the system are considered as random variables. The nodal loads and generation are defined as random variables because of factors like the change in the load demand and the generator outages. The traditional deterministic load flow only finds line flows under a specified operating condition. On

the other hand, the probabilistic load flow takes the uncertainties into considerations, such as the probability of a line flow being greater than its thermal rating under load uncertainties and random contingencies.

The nodal data are specified in terms of probability density functions. In this study of the 9 bus WSCC system, these are normal distributions for representing nodal-load estimate, binomial distributions for representing a set of identical generator units, discrete variables when neither of the previous distributions are suitable and one point values when a power has a unity probability of occurrence [3].

All the input data are first converted to the expected values ( $\mu$ ) and their variance ( $\sigma^2$ ) by their distributions. Then the active load flows and bus angles are calculated by using the DC load flow assumptions. Consider Eq. 1 assuming  $V_i=V_k=1p.u.$ ,  $G_{ik}=0$  (zero line resistance) and  $\sin\delta_{ik} \approx \delta_{ik}$ , we obtain [3],

$$P_i = \frac{1}{X_{ik}} \delta_{ik} \tag{6}$$

where  $X_{ik}$  is the reactance of the line joining buses  $i$  and  $k$ . The above equation in matrix form and inverting gives;

$$\delta = Y^{-1}P \tag{7}$$

where  $Y_{ik} = -1/X_{ik}$  and  $Y_{ii} = \sum_{i \neq k} 1/X_{ik}$ , in which the slack bus row and column are deleted. This equation is known as a dc form of the load flow problem. Under these circumstances Eq. 2 becomes,

$$P_{ik} = \frac{\delta_i - \delta_k}{X_{ik}} = \sum_j H_{(ik)j} P_j \tag{8}$$

The H matrix contains network distribution factors. It is called the sensitivity coefficients and the notation “(ik)j” represents the amount of real power flowing in line  $l$  (line between buses  $i$  and  $k$ ) as a result of injection of 1MW at bus  $j$ . If node  $j$  is slack,  $H_{(ik)j}=0$  [16].

To obtain the voltages and reactive load flows, equation 3 was linearized by assuming the voltage  $V_i=1p.u.$  Equation 3 becomes,

$$Q_i = \sum_{k=1}^n A_{ik} V_k \tag{9}$$

where;  $A_{ik} = G_{ik}\sin\delta_{ik} - B_{ik}\cos\delta_{ik}$  and  $A_{ii} = -B_{ii}$ .

Writing in matrix form  $Q=AV$  and partitioning into the load and generation quantities gives [6],

$$\begin{bmatrix} Q_l \\ Q_g \end{bmatrix} = \begin{bmatrix} M & L \\ N & J \end{bmatrix} \begin{bmatrix} V_l \\ V_g \end{bmatrix} \tag{10}$$

where  $Q_l$  has  $n_l$  elements and  $Q_g$  has  $n_g$  elements. From eqn. 10;

$$Q_l = MV_l + LV_g \tag{11}$$

$$V_l = \hat{M}Q_l + \hat{M}H \tag{12}$$

where;  $H = -LV_g$ . From eqn. 10 and 12 the reactive power of the generation bus,

$$Q_g = NV_l + JV_g \tag{13}$$

To obtain the reactive load flows in the lines, equation 4 was linearized by assuming  $V_i^2 = V_i$  and  $V_i V_k = V_k$  after the assumptions the reactive load flows,

$$Q_{ik} = \alpha_{ik} V_i + A_{ik} V_k \tag{14}$$

$$Q_{i(sh)} = V_i B_{i(sh)} \tag{15}$$

where  $\alpha_{ik} = t_{ik} B_{ik} - B_{ik}'$ .

#### IV. TEST SYSTEM

To exemplify the probabilistic approach, the 9 bus WSCC test system is used and shown in Figure 1. This system has 8 nodes that are independent, one reference node (node 1) and 9 lines. The nodal data used are shown in Table I and the network data are shown in Table II. The nodal data contains binomial and discrete distributions.

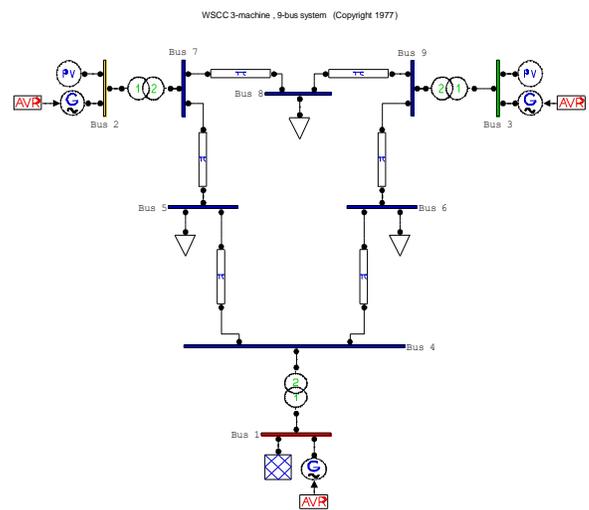


Fig. 1 9 bus WSCC test system

Table I. Nodal data used for the system

Node	Probability Function	Number of Units	Active Power (MW)	Reactive Power (MVAR)	Outage Coefficient
					Probability of Occurrence
2	Binomial	10	17,1589		0,05
3	Binomial	10	10		0,15
4	-	-	0	0	1
5	Discrete		-123	-45	0,2
			-124	-47	0,2
			-125	-50	0,2
			-126	-53	0,2
			-127	-55	0,2
6	Discrete		-88	-22	0,2
			-89	-26	0,2
			-90	-30	0,2
			-91	-34	0,2
			-92	-38	0,2
7	-	-	0	0	1
8	-	-	-100	-35	1
9	-	-	0	0	1

Table II. Network data for system shown in Fig. I

Node	To Node	R (p.u.)	X (p.u.)	Y (p.u.)	Transformer Tap
2	7	0.0000	0.0625	0.0000	1.00
7	8	0.0085	0.0720	0.0745*2	1.00
7	5	0.0320	0.1610	0.1530*2	1.00
5	4	0.0100	0.0850	0.0880*2	1.00
4	1	0.0000	0.0576	0.0000	1.00
4	6	0.0170	0.0920	0.0790*2	1.00
6	9	0.0390	0.1700	0.1790*2	1.00
9	3	0.0000	0.0586	0.0000	1.00
9	8	0.0119	0.1008	0.1045*2	1.00

Table III. Active power flow results

Line	Expected Value $\mu$ (MW)	Standard Deviations $\sigma$ (%)	Deterministic Solution (MW)
2-7	163	7.2552	163
7-8	76.036	8.0234	76.4
7-5	86.9656	10.0237	86.6
4-5	38.0318	23.1482	40.9
1-4	67.7053	24.5863	71.6
4-6	28.9706	28.4699	30.7
9-6	61.0344	13.3688	60.8
3-9	85	13.2842	85
8-9	-23.9721	25.4448	-24.1

V. RESULTS

The expected values and standard deviation of the power flow results in each line is shown in Table III. The deterministic values were assumed to be expected values. In the deterministic solution only the expected flows were obtained and the solution includes no information about the standard deviation.

The density functions of the line between nodes 4-6 is shown in Fig. 2. The density functions show that the change in the input data affects the power flows in each line. It is seen from the figure that the probability of expected value is not always the greatest. This fact should be known when a power system is being planned and operated. This kind of information is in great importance in situations where security and reliability is very important.

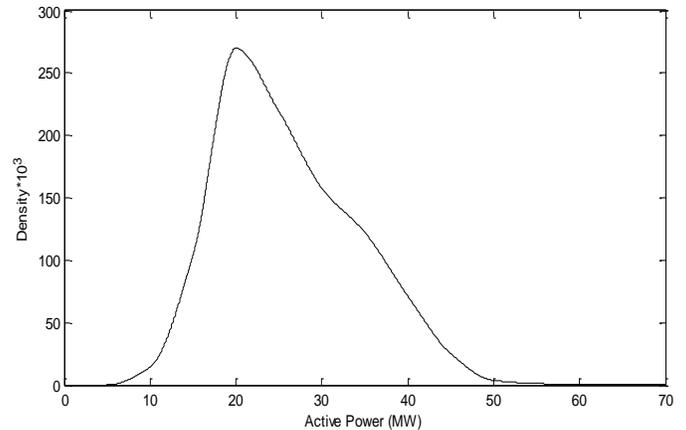


Fig. 2 Active power flow between nodes 4 and 6

Table IV. Voltages of the load buses and their standard deviation

Load Bus	Expected Value $\mu$ (p.u.)	Standard Deviations $\sigma$ (p.u.)	Deterministic Solution (p.u.)
4	1.0255	$2.5136 \times 10^{-4}$	1.0258
5	0.9982	$2.9155 \times 10^{-4}$	0.99563
6	1.0092	$3.784 \times 10^{-4}$	1.0127
7	1.0337	$1.595 \times 10^{-4}$	1.0258
8	0.9905	$1.745 \times 10^{-4}$	1.0159
9	1.0238	$1.8464 \times 10^{-4}$	1.0324

Table V. Reactive power injected at the generation bus

Generation Bus	Expected Value $\mu$ (MVAR)	Standard Deviations $\sigma$ (MVAR)	Deterministic Solution (MVAR)
1	26.48	4.9	27.046
2	6.14	2.9	6.654
3	4.03	3.5	-10.8

Table VI. Reactive power flow results

Line	Expected Value $\mu$ (MVAR)	Standard Deviations $\sigma$ (MVAR)	Deterministic Solution (MVAR)
2-7	6.434	2.98623	6.7
7-5	-5.165	3.825	-8.3
5-4	-38.868	6.1318	-38.6
4-1	-23.31	2.9124	-23.7
4-6	0.9663	6.9105	0.9
7-8	-24.94	2.7075	-0.8
6-9	-13.421	4.595	-13.5
9-3	14.565	3.5775	14.9
9-8	3.232	3.7193	3.1

The voltages of the load buses and their standard deviations is shown in Table IV, the reactive power and the reactive load flows are shown in Table V and Table VI.

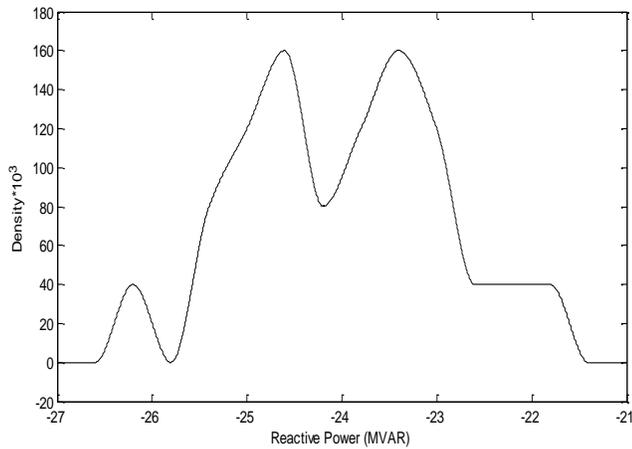


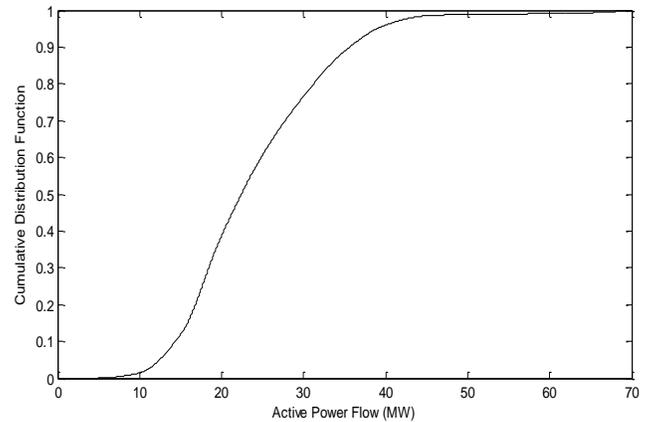
Fig. 1 Reactive power flow between nodes 4 and 1

### VI. CONCLUSIONS

Although the expected value of the power flows calculated in probabilistic method is not exact as the deterministic method, several advantages appear. The error is solved by shifting the density curve until its expected coincides with the value obtained from the deterministic analysis. The previous sections have shown the wide information that can be gained by the PLF. The probable power flows were calculated with their probability. Even though many of the input data have normal distribution, the binomial and discrete variables that exists in the system takes the results away from being normal distributed.

The active power cumulative distribution function of the line between nodes 4 and 6 is shown in Fig. 4. Applying this cumulative distribution function to the active power flow in line 4-6 can give the probabilities for exceeding various limits shown in Table VII.

This method objectively solves the uncertainties problem in the load flow problem and considers all the possibilities like generator outages and load changes. It helps to think about the worst conditions that can happen with the wider information the density functions give. Applying probabilistic studies in power systems allow gaining information for the future conditions.



[1] Fig. 4 Cumulative distribution function of the active power flow between nodes 4 and 6.

Table VII. Probability of power flow exceeding stated limits in line 4-6

Limit (MW)	Probability of Exceeding Limit
20	0.5713
25	0.3520
30	0.1941
35	0.1022
40	0.0307
45	0.0052
50	0.0015
55	0.0003
60	0

### ACKNOWLEDGMENT

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# Effective and Enhanced method for Template Extraction from Heterogeneous Web Pages

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**Abstract-** To achieve high productivity publishing the web pages are automatically evaluated using common templates with contents. The templates provide readers easy access to the contents guided by consistent structures. Cluster the web documents based on the similarity of underlying template structures in the documents so that the template for each cluster is extracted simultaneously. This process proposes to represent the document and a template as a set of paths in a DOM (Data Object Model) tree. As validated by the most popular XML query language XPATH, paths are sufficient to express tree structures and useful to be queried. Our experimental results with real-life data sets confirm the effectiveness and robustness of our algorithm compared to the state of the art for template detection algorithms.

**Index Terms-** Template extraction; clustering; minimum description length.

## I. INTRODUCTION

The World Wide Web (WWW) is widely used to publish and access information on the Internet. In this paper, we extract template from these heterogeneous templates using text clustering. In order to achieve high productivity of publishing, the web pages in many websites are automatically populated by using common templates with contents. For human beings, the templates provide readers easy access to the contents guided by consistent structures even though the templates are not explicitly announced. However, for machines, the unknown templates are considered harmful because they degrade the accuracy and performance due to the irrelevant terms in templates. Thus, template detection and extraction techniques have received a lot of attention recently to improve the performance of web applications, such as data integration, search engines, classification of web documents.

## II. ALGORITHM

In this paper, in order to relieve the limitations of the state-of-the-art technologies, this process investigates the problem of detecting the templates from heterogeneous web pages. This process proposes to represent the document and a template as a set of paths in a DOM tree. As validated by the most popular XML query language XPATH, paths are sufficient to express tree structures and useful to be queried. By considering only paths, the overhead to measure the similarity between these documents becomes small without significant loss

## III. RELATED WORK

Template extraction from heterogeneous web pages is categorized into two areas; the first area is the site-level template detection where the template is decided based on several pages from the same site. Crescenzi et al. studied initially the data extraction problem in which the roadrunner extracts data template by comparing web page pairs. One page is considered as initial template, and the other page is compared with the template, which is updated when there are mismatches. Rajagopalan introduced the template detection problem. Previously, only tags were considered to find templates but Arasu and Garcia-Molina observed that any word can be a part of the template or contents. Vieira et al suggested an algorithm considering documents as trees but the operations on trees are usually too expensive to be applied to a large number of documents. Zhao et al. concentrated on the problem of extracting result records from search engines. For XML documents, Garofalakis et al. solved the problem of DTD (Document Type Descriptors) extraction from multiple XML documents. While HTML documents are semi structured, XML documents are well structured, and all the tags are always a part of a template.

The other area is the page-level template detection where the template is computed within a single document. Lerman et al. proposed systems to identify data records in a document and extract data items from them. Zhai and Liu proposed an algorithm to extract a template using not only structural information, but also visual layout information.

## IV. METHODOLOGY

Algorithm Required

Algorithm: Min-Hash

Input: Web Pages

1) GetBestPair(Clusters, Documents )

1.1) initial C={cluster1,cluster2...documentN}

1.2) for each pair clusterI,clusterJ of Clusters in C

1.3) min MDLCost=0

1.4) MDLCost=calculate MDLCost(clusterI, clusterJ )

If (min MDLCost> MDLCost)

min MDLCost==MDLCost;

Store pair(clusterI , clusterJ );

1.5) cluster pages which having less MDLCost than other pair

1.6) update Cluster Set C by merging best pair in one cluster.

Parsing these web documents into an xml document using DOM model. This saves the time to find out best templates from large no of web document and also save the memory.

## V. ADVANTAGES

It is scalable to a huge number of sites due to the automatic process. In this paper, it is presented by algorithms for extracting templates from a large number of web documents which are produced from heterogeneous templates. This algorithm provides better performance compared to previous algorithms in terms of space and time. Our technique consists of two steps: Identifying data records without extracting each data field in the data records; Aligning corresponding data fields from multiple data records to extract data from data records, to put in a database table. This process proposed an enhanced method based on visual information for step (1), which significantly improves the accuracy of our previous algorithm. For step (2), this process proposed a novel partial tree alignment technique to align corresponding data fields of multiple data records. Empirical results using a large number of this process pages show that the new two-step technique can segment data records and extract data from them very accurately.

## VI. CONCLUSION

To represent the heterogeneous information, a new approach used for template detection. This process employed the MDL (Minimum Description Length) principle to manage the unknown number of clusters and to select good partitioning from all possible partitions of documents, and then, introduced our extended MinHash technique to speed up the clustering process. This process proposed a new approach to extract structured data from this process pages. Our method only requires page contains, which is almost always true for pages with data records.

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# MEASUREMENT AND EVALUATION OF RELIABILITY, AVAILABILITY AND MAINTAINABILITY OF A DIESEL LOCOMOTIVE ENGINE

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**Abstract-** The growing complexity of equipments and systems often lead to failures and as a consequence the aspects of reliability, maintainability and availability have come into forefront. The failure of machineries and equipments causes disruption in production resulting from a loss of availability of the system and also increases the cost of maintenance. The present study deals with the determination of reliability and availability aspects of one of the significant constituent in a Railway Diesel Locomotive Engine. In order to assess the availability performance of these components, a broad set of studies has been carried out to gather accurate information at the level of detail considered suitable to meet the availability analysis target. The Reliability analysis is performed using the Weibull Distribution and the various data plots as well as failure rate information help in achieving results that may be utilized in the near future by the Railway Locomotive Engines for reducing the unexpected breakdowns and will enhance the reliability and availability of the Engine. In this work, ABC analysis has been used for the maintenance of spare parts inventory. Here, compressor and vehicle and structures are used to focus on the reliability, maintainability and availability aspects.

**Index Terms-** Availability, ABC analysis, compressor, maintainability, reliability, vehicle and structures, Weibull Distribution.

## I. INTRODUCTION

The Reliability of an item is the probability that the item will perform a specific function under specified operational and environmental conditions at end throughout a specified time [1]. Reliability must have certain criteria. It depends on numerous factors, most of which are random. It is difficult to measure reliability since there is no instrument by means of which this may be done for particular equipment. The respective reliabilities of the various components of complex equipment depend on the technology of their production, the quality of materials used in their manufacture, the conditions or environment in which they operate and so on. In view of these considerations, the reliability of equipment is closely related to several uncertainty factors. The Quantitative study of uncertainty, therefore, forms the starting point for a quantitative analysis of reliability. The theory which deals with the study of uncertainty is the probability theory. The maintenance policy will cover issues regarding general repairs, repair or discard policies, emergency recorder policies, inventory control, provisioning of spares, etc. It is possible to define some of the maintenance policies in advance and take design decision accordingly. The process of designing involves decision regarding module size, test procedures, built-in-redundancies, and degree of automation, inspection intervals, special test equipment, and safety requirements and so on. Availability is a performance criterion for repairable systems that accounts for both the reliability and maintainability properties of a component or system. ABC analysis helps segregating the item from one another and tells how much valued the item is and controlling if to what extent is in the interest of the organization [2].

## II. RAILWAY DIESEL LOCOMOTIVE ENGINE AND ITS COMPONENTS

The following fig 1 shows a Railway Diesel Locomotive Engine. The engine is of 'V' design, and is manufactured in 16 cylinders. The cylinders are arranged into pairs of cylinders, each pair using a common throw on the crankshaft. The cylinders are divided into two banks, left and right.



Figure1: Railway Diesel Locomotive Engine.

A Railway Diesel Locomotive Engine has the following main sub-systems.

1. Compressor
2. Vehicle and structures

### III. FAILURE

Failure is any event that impacts a system in a way that adversely affects the system criteria. For example, the criteria could include output in a sold-out condition, or maintenance cost or capital resources in a constrained budget cycle, environmental excursions or safety, etc. A failure definition should contain specific criteria and not be ambiguous. Failure definition can change on a given system over time.

Field failures do not generally occur at a uniform rate, but follow a distribution in time commonly describe as a "bathtub curve." The life of a device can be divided into three regions: Infant Mortality Period, where the failure rate progressively improves; Useful Life Period, where the failure rate remains constant; and Wear out Period, where failure rates begin to increase. Within a population of units is a small sub-group of units with latent defects that will fail when exposed to a stress that would otherwise be benign to a good unit. With the failure of the weak units, the remaining population is more reliable, and the failure rate is known to decrease. Units that pass the Infant Mortality Period have a high probability of surviving the conditions provided by the system and its environment. Failures that occur during the Useful Life Period are residual defects surviving Infant Mortality, unpredictable system or environmental conditions, or premature wear out.

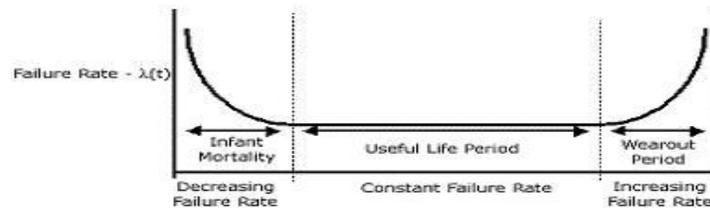


Figure 2: Bath-tub curve describing failure rates at different periods of life

### 3.1 Reliability Prediction

A reliability prediction is simply the analysis of parts and components which effort to predict and calculate the rate at which an item will fail. A reliability prediction is one of the most common forms of reliability analyses for calculating failure rate and MTBF, MTTR, Availability etc [3].

**3.1.1 Mean Time to Failure (MTTF)**

It is the expected value of time t or the mean of the TTF (Time to Failure) distribution when one item is put into operation [4]

When and only when failure rate is a constant or  $\lambda = \lambda(t)$  then

$$MTTF = \int_0^{\infty} R(t) dt = \int_0^{\infty} e^{-\lambda t} dt = \frac{1}{\lambda} \quad \text{--- (3.1)}$$

**3.1.2 Mean Time between Failures (MTBF)**

It is the expected average time between failure events that cause the item to go down. Therefore MTBF can be defined as the average time (generally expressed in hours) that a component works without failure If and only if the item has constant failure rate then,

$$MTBF = \int_0^{\infty} R(t) dt = \frac{1}{\lambda} \quad \text{--- (3.2)}$$

**3.2 Failure Distribution**

The goal of system modeling is to provide quantitative forecasts of various system performance measures such as downtime, availability, and number of failures, capacity, and cost. Evaluation of these measures is important to make optimal decisions when designing a system to either minimize overall cost or maximize a system performance measure within the allowable budget and other performance-based constraints.

Two important factors taken into account in the analysis of a system are the failure and repair behaviors of the system components. The failure and repair rates of components are often defined in terms of distributions, or how the failures and repairs occur during the time period the system is operational. Therefore, selecting the appropriate distributions for these failure and repair times is critical to analyze system metrics accurately.

A useful way to easily visualize the characteristics of a failure or repair distribution is through the use of Probability Density Functions (PDF) [5]. In general, the shape or type of failure distribution depends upon the component's failure mechanisms. Similarly, the shape or type of repair distribution depends upon several factors associated with component repairs. Several methods are used to determine the distribution that best fits a given failure or repair pattern. Or, if failures or repairs are known to follow a particular distribution, the specific parameters that define this pattern can be determined by using the known failure and repair times.

If the type of distribution is not known in advance, then the distribution that best fits the failure or repair times can be found using statistical methods. To find the best distribution manually, probability plot papers are used. Alternatively, engineering software products can also be used to generate probability plots and determine best-fit distributions. In general, it is better to use available software tools because best-fit distributions are determined using scientific analysis rather than human judgment, which must be used when manually creating probability plots. Such engineering software products are commonly referred to as "Weibull" analysis tools, simply because Weibull is a widely accepted, commonly used distribution for describing failure and repair rates.

Determining the failure and repair distributions of a system and its components is a significant part of evaluating the reliability of the design. Distributions may be referred to as single-parameter or two-parameter distributions. For single-parameter distributions, only one variable is used to define the shape of the curve. Two-parameter distributions require two variables to accurately model the distribution.

**3.3 Collection of Data**

The most essential precondition for reliability and failure analysis or maintenance planning is the availability of relevant data. For the present analysis, data related to Railway Diesel Locomotive Engine, its Mechanical system and Electrical system failures during last five years [2007 January to 2011 December] are collected. The database includes no. of breakdowns related to different types of systems or components failures of Diesel Locomotive Engine and their monthly or year wise available No. of failure of a component or system, cause of failure and corrective action taken previously.

The documentation of failure data (table 1 and fig.3) on Diesel Locomotive Engine, daily breakdown record has been collected from the daily maintenance statistics lab in the DEISEL SHED.

Table 1:No. of Failures of different components

Sl. No.	Name of Different Components	No. of Failures
1	Compressor	04
2	Vehicle and structures	05

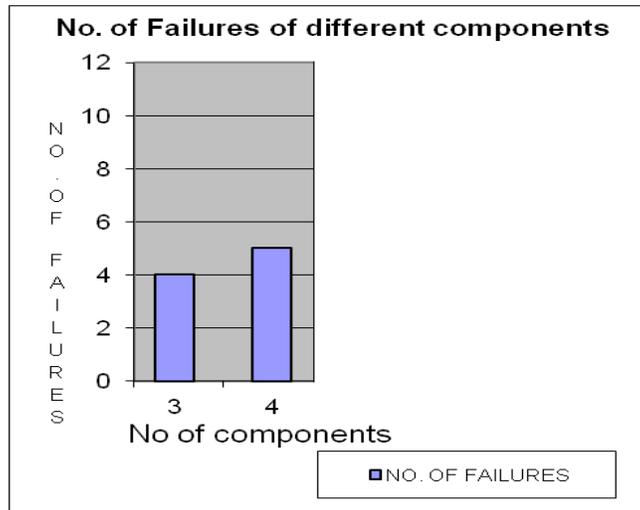
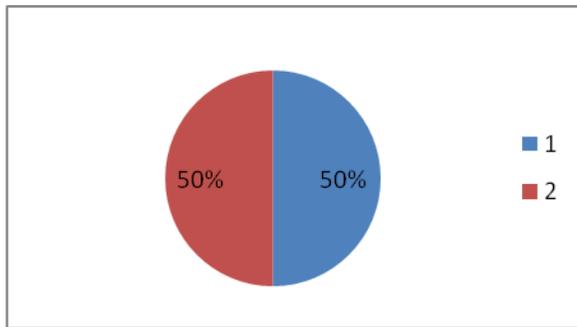


Figure 3:No. of Failures of different components

### 3.4 Failures of Compressor/Exhauster/ Brake system

In analyzing the various causes of failure in Compressor/Exhauster and Brake system it has been noticed in Fig.4 that the expresser 1<sup>st</sup> coupling gasket damaged as well as air leakage from expresser side cover gasket each comprises the 50% of the total failure.

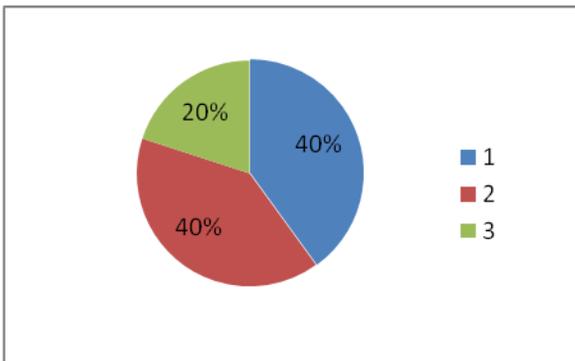


1. Expresser 1<sup>st</sup> coupling gasket damaged
2. Air leakage from Expresser side cover

Figure 4: Failures of Compressor

### 3.5 Failures of vehicle and structures

The various failure components of vehicle and structures are illustrated in figure3 wherein trolley side bearer rubber loading pad displaced damage and Brake rigging damage equally contribute.



1. 1Fro 01 NT trolley side bearer rubber loading pad displaced damage
2. Brake rigging damage.
3. Gear box problem

Figure 5: Failures of vehicle and structures

IV. RELIABILITY ANALYSIS

The Locomotive Engine under investigation is composed three components. The components are compressor, vehicle and structures.

**4.1 Hazard Model & Probability Distribution**

The initial stage of reliability analysis is to predict the hazard model of the failures and to choose a distribution among various probability distributions like Normal distribution, Exponential distribution, Poison distribution, Weibull distribution etc. The probability distributions are grouped as follows:

- Hazard model with constant failure rate can be followed by normal, exponential distributions.
- Hazard model with increasing or decreasing failure rates can be followed by Weibull distribution.

**4.2 Graphical Evaluation for Reliability Prediction**

There are generally two ways for graphical evaluation visualizes -Exponential plot and Weibull Plot. When the failure rate is constant, the distribution follows exponential probability law and when failure rate is not constant i.e. non-linear hazard model follows Weibull distribution.

**4.3 Linear Regression Analysis: Selection of Distribution**

The observed data regarding the failures of different components of the Railway Diesel Locomotive Engine shows that the failure rates of the components are not constant. So the Weibull distribution model can be adopted. Moreover the technique of linear regression analysis confirms the suitability to use Weibull distribution for the different components of the Railway Diesel Locomotive Engine. The analysis determines the best-fit line in the least square sense. The least square test has been performed to obtain the increasing/decreasing rate of failures [6].

Linear regression analysis has been carried out by using the Probability equation.

$$R_{x, f(x)} = \frac{\sum[x f(x)] - \frac{(\sum x)(\sum f(x))}{N}}{\sqrt{[\sum (x^2) - \frac{(\sum x)^2}{N}] [\sum f(x)^2 - \frac{\sum f(x)^2}{N}]}} \quad (4.1)$$

Where,

x = Breakdown hours

Y = f(x) = Cumulative % failures

N = number of trials

R<sub>x, f(x)</sub> = Correlation coefficient

Failure data of the different components of the Diesel Locomotive Engine is used for determining the correlation co-efficient (Table 2). From the concept of probability, we know that the correlation coefficient must be in between -1.0 to +1.0. If the correlation coefficient is positive, then the failure rate is increasing, otherwise the rate is decreasing. The correlation coefficients of the different components of the Railway Diesel Locomotive Engine under study shows increasing rate of failures. Weibull distribution can be applied for the estimation of reliability of the different components of the Railway Diesel Locomotive Engine.

Table 2: Correlation Coefficient

Name of Components	Correlation Coefficient
Compressor	0.783
Vehicle and Structures	0.741

**4.4 Weibull Distribution**

About all the distributions available for reliability calculations, the Weibull distribution [7] is the only unique to the field. Allodia Weibull (1887-1979) pointed out that normal distributions are not applicable for characterizing initial metallurgical strengths during his study on metallurgical failures. He then introduced a function that could embrace a great variety of distributions and used seven different case studies to demonstrate how this function allowed the data to select the most appropriate distribution from a broad family of Weibull distributions. Probably the most widely used distribution in reliability engineering, the Weibull distribution can model failures caused by fatigue, corrosion, mechanical abrasion, diffusion and other degradation processes.

The two parameter Weibull distribution requires characteristic life ( $\eta$ ) and shape factor ( $\beta$ ) values. Beta ( $\beta$ ) determines the shape of the distribution. If  $\beta$  is greater than 1, the failure rate is increasing. If  $\beta$  is less than 1, the failure rate is decreasing. If  $\beta$  is equal to 1, the failure rate is constant. There are several ways to check whether data follows a Weibull distribution, the best choice is to use a Weibull analysis software product. If such a tool is not available, data can be manually plotted on a Weibull probability plot to determine if it follows a straight line. A straight line on the probability plot indicates that the data is following a Weibull distribution.

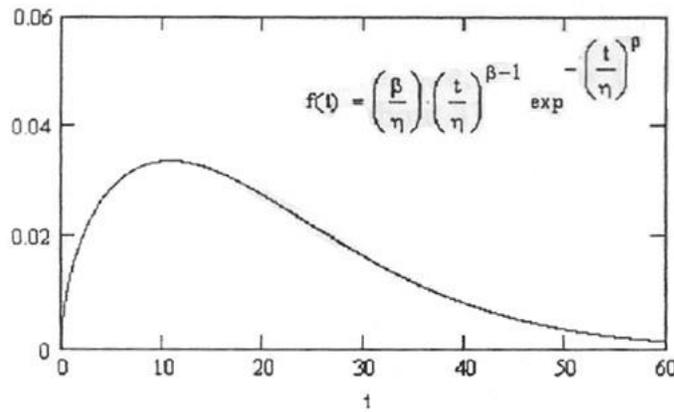


Figure 6: Weibull Distribution

Reliability analysis of the selected components of the Railway Locomotive Engine has been carried out with due consideration of failure as an indication of the underlying cause of failure has been summarized in term of Weibull shape parameter. Weibull shape parameter  $\beta$  also indicates whether the failure rate is constant or increasing or decreasing if  $\beta = 1.0$ ,  $\beta > 1.0$ ,  $\beta < 1.0$  respectively. The cumulative % failures versus operating time data are plotted on Weibull graph [Fig.12 & 13] and the values of the parameters are obtained using the statistical software ‘MINITAB15’.

Table 3: Weibull plot for Compressor

Sl. No	Month	Monthly Operating Time(Hours)	No of Failures	Percentage Failures	Cumulative % Failures
1	January'07	720	0	0	0
2		620	0	0	0
3		576	0	0	0
4		600	0	0	0
5		708	0	0	0
6		700	1	25	25
7		734	0	0	25
8		734	0	0	25
9		648	0	0	25
10		734	0	0	25

11		672	0	0	25
12		670	1	25	50
13	January'08	724	0	0	50
14		686	0	0	50
15		732	0	0	50
16		638	0	0	50
17		734	0	0	50
18		710	0	0	50
19		660	0	0	50
20		710	0	0	50
21		708	0	0	50
22		744	0	0	50
23		624	0	0	50
24		734	0	0	50
25	January'09	696	0	0	50
26		600	0	0	50
27		733	0	0	50
28		708	0	0	50
29		720	0	0	50
30		696	0	0	50
31		734	0	0	50
32		718	0	0	50
33		710	0	0	50
34		672	0	0	50
35		710	1	25	75
36		744	0	0	75
37	January'10	600	0	0	75
38		600	0	0	75
39		720	0	0	75
40		576	0	0	75
41		744	0	0	75
42		696	0	0	75
43		600	0	0	75
44		720	0	0	75
45		720	0	0	75
46		696	0	0	75
47		672	0	0	75
48		734	0	0	75
49	January'11	732	0	0	75
50		576	0	0	75
51		144	0	0	75
52		552	1	25	100
53		504	0	0	100
54		648	0	0	100
55		720	0	0	100
56		696	0	0	100
57		600	0	0	100

58		600	0	0	100
59		648	0	0	100
60		732	0	0	100

Table 4: Weibull plot for Vehicle and structures

SL. NO	Month	Monthly Operating Time(Hours)	No of Failures	Percentage Failures	Cumulative % Failures
1	January'07	720	0	0	0
2		620	0	0	0
3		576	0	0	0
4		600	0	0	0
5		708	0	0	0
6		700	1	20	20
7		734	0	0	20
8		734	0	0	20
9		648	0	0	20
10		734	0	0	20
11		672	0	0	20
12		670	0	0	20
13	January'08	724	0	0	20
14		686	0	0	20
15		732	0	0	20
16		638	0	0	20
17		734	1	20	40
18		710	1	20	60
19		660	0	0	60
20		710	0	0	60
21		708	0	0	60
22		744	0	0	60
23		624	0	0	60
24		734	0	0	60
25	January'09	696	0	0	60
26		600	0	0	60
27		733	0	0	60
28		708	0	0	60
29		720	0	0	60
30		696	0	0	60
31		734	0	0	60
32		718	0	0	60
33		710	0	0	60
34		672	1	20	80
35		710	0	0	80
36		744	0	0	80
37	January'10	600	0	0	80
38		600	0	0	80
39		720	0	0	80
40		576	0	0	80

41		744	0	0	80
42		696	0	0	80
43		600	0	0	80
44		720	0	0	80
45		720	0	0	80
46		696	0	0	80
47		672	0	0	80
48		734	0	0	80
49	January'11	732	0	0	80
50		576	0	0	80
51		144	0	0	80
52		552	1	20	100
53		504	0	0	100
54		648	0	0	100
55		720	0	0	100
56		696	0	0	100
57		600	0	0	100
58		600	0	0	100
59		648	0	0	100
60		732	0	0	100

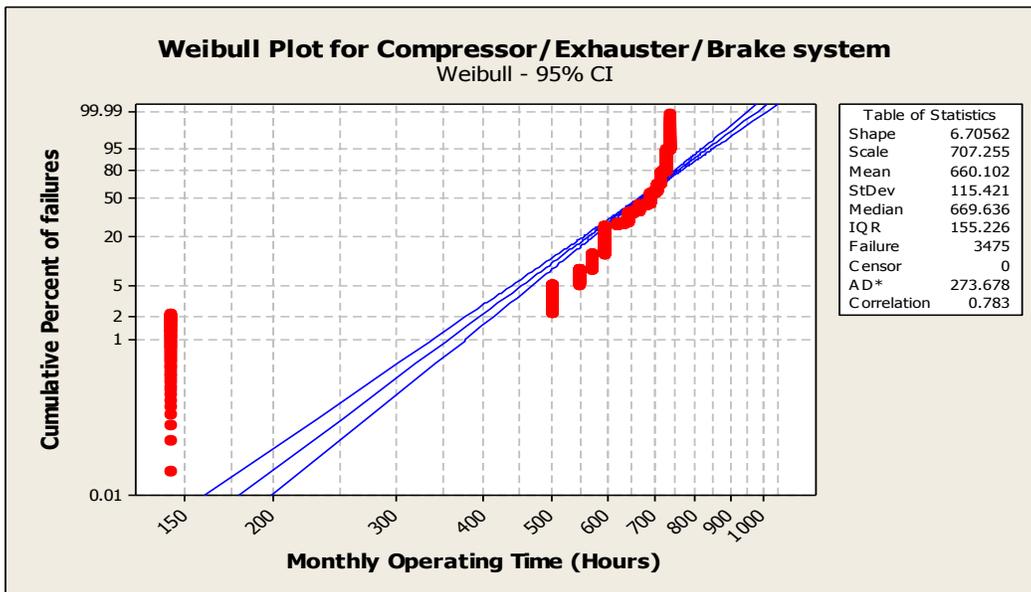


Figure7: Weibull plot for compressor

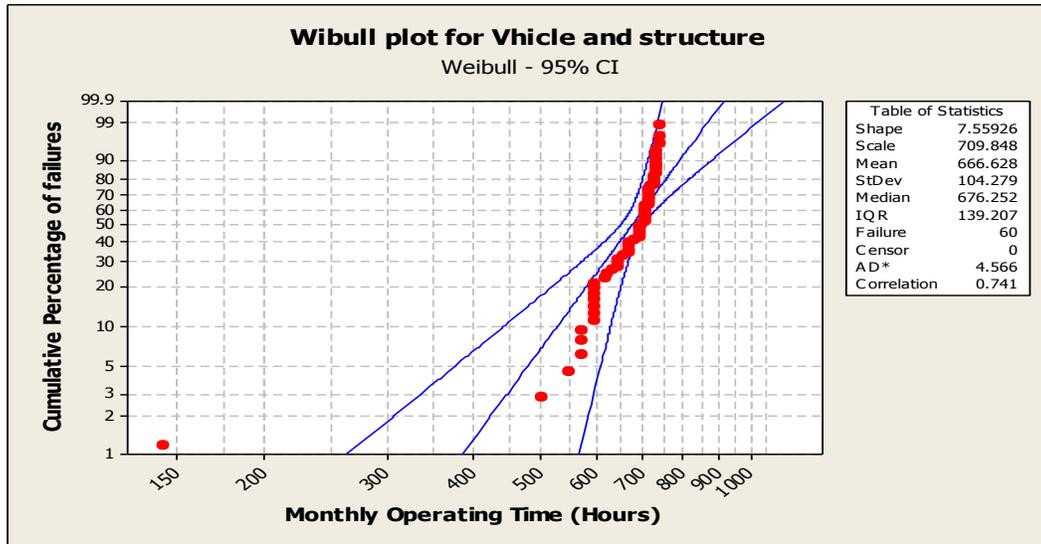


Figure 8: Weibull plot for vehicle and structure

V. AVAILABILITY ANALYSIS

Availability is a performance criterion for repairable system or any normal system that accounts for both the reliability and maintainability properties of a component of a system is operating properly when it is required to use. As a matter of fact availability is the probability that a system is not failed or undergoing a repair action / maintenance job when it needs to be used. So the estimation of availability plays vital role of both reliability and maintainability aspects are considered for a system or components under investigation.

5.1 Availability

Availability is a performance criterion for repairable systems that accounts for both the reliability and maintainability properties of a component or system. It is defined as the probability that the system is operating properly when it is requested for use. That is availability is the probability that a system is not failed or undergoing repair action when it needs to be used [2].

$$A_{IN} = MTBF / (MTBF+MTTR) \quad \text{--- (5.1)}$$

It is possible to define three types of availability depending on the time elements we consider.

5.1.1 Inherent Availability

This is a probability that a system or equipment shall operate satisfactorily when used under stated conditions in an ideal support environment, without consideration for any scheduled or preventive maintenance at any given time. Mathematically it is expressed [2] as

$$A_{IN} = MTBF / (MTBF+MTTR) \quad \text{--- (5.2)}$$

5.1.2 Achieved Availability

This is a probability that a system or equipment shall operate satisfactorily when used under stated conditions in an ideal support environment at any given time. It may be expressed as [2]

$$A_a = MTBM / (MTBM+MDT) \quad \text{--- (5.3)}$$

Where, MTBM is the mean active-maintenance down time resulting from both preventive and corrective maintenance.

5.1.3 Operational Availability

In any real operation, we cannot reduce administrative down time and supply downtime to zero. A certain amount of delay will always be caused by time elements such as these and if they are taken into account then we obtain the operational availability. It may be defined as the probability that a system or equipment shall operate satisfactorily when used under stated conditions and in an actual supply environment at any given time. It may be expressed [2] as

$$A_{OP} = MTBF / (MTBF+MDT) \quad \text{--- (5.4)}$$

In general the availability of a system is a complex function of reliability maintainability and supply effectiveness. This can be expressed as

$$A_s = f (R_s, M_s, S_s) \quad \text{--- (5.5)}$$

Where,  $A_s$  = System Availability,  $S_s$  = Supply Effectiveness,  $R_s$ = System Reliability,

Ms= System Maintainability.

Table 5: Estimation of availability of Compressor

Sl. No	Month	Uptime (hours)	Downtime (hours)	No. of failures	MTBF (hour)	Hazard rate	MDT (hours)	A <sub>OP</sub>	MTTR (hours)	A <sub>IN</sub>
1	January'07	720	24	0	***	0	***	1	0	1
2		620	12	0	***	0	***	1	0	1
3		576	144	0	***	0	***	1	0	1
4		600	120	0	***	0	***	1	0	1
5		708	36	0	***	0	***	1	0	1
6		700	20	1	700	0.0011	26	0.964	7.8	0.988
7		734	10	0	0	0	***	1	0	1
8		734	10	0	0	0	***	1	0	1
9		648	72	0	0	0	***	1	0	1
10		734	10	0	0	0	***	1	0	1
11		672	48	0	0	0	***	1	0	1
12		670	24	1	0		744	1	223.2	1
13	January'08	724	10	0	0	0	***	1	0	1
14		686	10	0	0	0	***	1	0	1
15		732	12	0	0	0	***	1	0	1
16		638	82	0	0	0	***	1	0	1
17		734	10	0	0	0	***	1	0	1
18		710	10	0	0	0	***	1	0	1
19		660	84	0	0	0	***	1	0	1
20		710	10	0	0	0	***	1	0	1
21		708	12	0	0	0	***	1	0	1
22		744	0	0	0	0	***	1	0	1
23		624	72	0	0	0		1	0	1
24		734	10	0	0	0		1	0	1
25	January'09	696	48	0	0	0		1	0	1
26		600	72	0	0	0		1	0	1
27		733	10	0	0	0		1	0	1
28		708	12	0	0	0		1	0	1
29		720	0	0	0	0		1	0	1
30		696	24	0	0	0		1	0	1
31		734	10	0	0	0		1	0	1
32		718	26	0	0	0		1	0	1
33		710	10	0	0	0		1	0	1
34		672	72	0	0	0		1	0	1
35		710	10	1	710	0.0014	10	0.986	3	0.995
36		744	0	0	0	0	***	1	0	1
37	January'10	600	120	0	0	0		1	0	1
38		600	48	0	0	0		1	0	1
39		720	24	0	0	0		1	0	1
40		576	144	0	0	0		1	0	1
41		744	0	0	0	0		1	0	1

42		696	24	0	0	0		1	0	1
43		600	120	0	0	0		1	0	1
44		720	24	0	0	0		1	0	1
45		720	24	0	0	0		1	0	1
46		696	0	0	0	0		1	0	1
47		672	24	0	0	0		1	0	1
48		734	48	0	0	0		1	0	1
49	January'11	732	12	0	0	0		1	0	1
50		576	120	0	0	0		1	0	1
51		144	192	0	0	0		1	1	1
52		552	168	1	552	0.0018	168	0.767	50.4	0.916
53		504	216	0	0	0		1	1	1
54		648	72	0	0	0		1	1	1
55		720	24	0	0	0		1	0	1
56		696	48	0	0	0		1	0	1
57		600	120	0	0	0		1	0	1
58		600	120	0	0	0		1	0	1
59		648	72	0	0	0		1	0	1
60		732	12	0	0	0		1	0	1

Table 6: Estimation of availability of Vehicle and structures

Sl. No.	Month	Uptime (hours)	Down time (hours)	No. of failures	MTBF (hours)	Hazard rate	MDT (hours)	A <sub>OP</sub>	MTTR (hours)	A <sub>IN</sub>
1	January'07	720	24	0	***	0	***	1	****	1
2		620	12	0	***	0	***	1		1
3		576	144	0	***	0	*	1		1
4		600	120	0	***	0		1		1
5		708	36	0	***	0		1		1
6		700	20	1	700	0.0014	20	0.972	6	0.999
7		734	10	0	***	0		1		1
8		734	10	0	***	0		1	***	1
9		648	72	0	****	0		1		1
10		734	10	0	****	0		1		1
11		672	48	0	***	0		1		1
12		670	24	0	***	0		1	***	1
13	January'08	724	10	0	***	0		1		1
14		686	10	0		0		1		1
15		732	12	0		0		1		1
16		638	82	0		0		1	***	1
17		734	10	1	734	0.0013	10	0.986	3	0.995
18		710	10	1	710	0.0014	10	0.986	3	0.995
19		660	84	0	***	0		1		1
20		710	10	0	****	0		1		1
21		708	12	0	***	0		1	***	1
22		744	0	0		0		1		1

23		624	72	0		0		1		1
24		734	10	0		0		1		1
25	January'09	696	48	0		0		1		1
26		600	72	0		0		1		1
27		733	10	0		0		1		1
28		708	12	0		0		1		1
29		720	0	0		0		1		1
30		696	24	0		0		1		1
31		734	10	0		0		1		1
32		718	26	0	***	0		1		1
33		710	10	0		0		1		1
34		672	72	1	672	0.0014	72	0.903	21.6	0.968
35		710	10	0	***	0		1		1
36		744	0	0		0		1		1
37	January'1	600	120	0		0		1		1
38		600	48	0		0		1	***	1
39		720	24	0		0		1		1
40		576	144	0		0		1		1
41		744	0	0		0		1		1
42		696	24	0		0	****	1		1
43		600	120	0		0		1		1
44		720	24	0		0		1		1
45		720	24	0		0		1		1
46		696	0	0		0		1		1
47		672	24	0		0		1		1
48		734	48	0		0		1		1
49	January'1	732	12	0		0		1		1
50		576	120	0		0	***	1		1
51		144	192	0	***	0		1		1
52		552	168	1	552	0.0018	168	0.767	50.04	0.916
53		504	216	0	***	0		1		1
54		648	72	0		0		1		1
55		720	24	0		0		1		1
56		696	48	0		0		1		1
57		600	120	0		0	****	1		1
58		600	120	0		0	***	1		1
59		648	72	0		0		1		1
60		732	12	0		0		1		1

Table 7: Availability of different components of the Railway Diesel Locomotive Engine

Sl. No.	Name of the Different Components	Availability
1	Compressor	0.998
2	Vehicle and structures	0.997

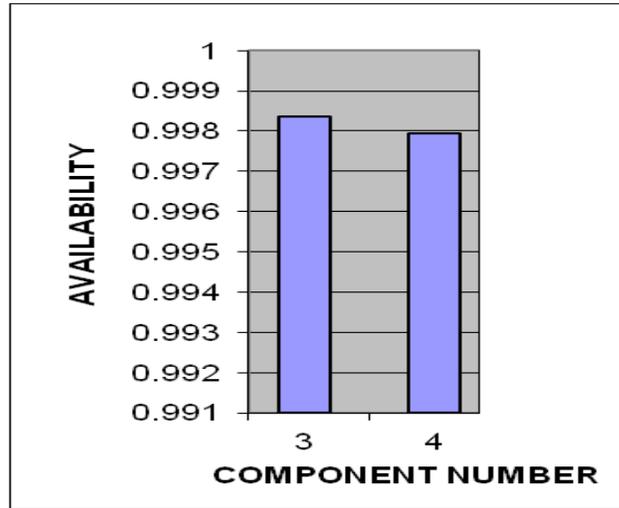


Figure 9: Availability graph for different components

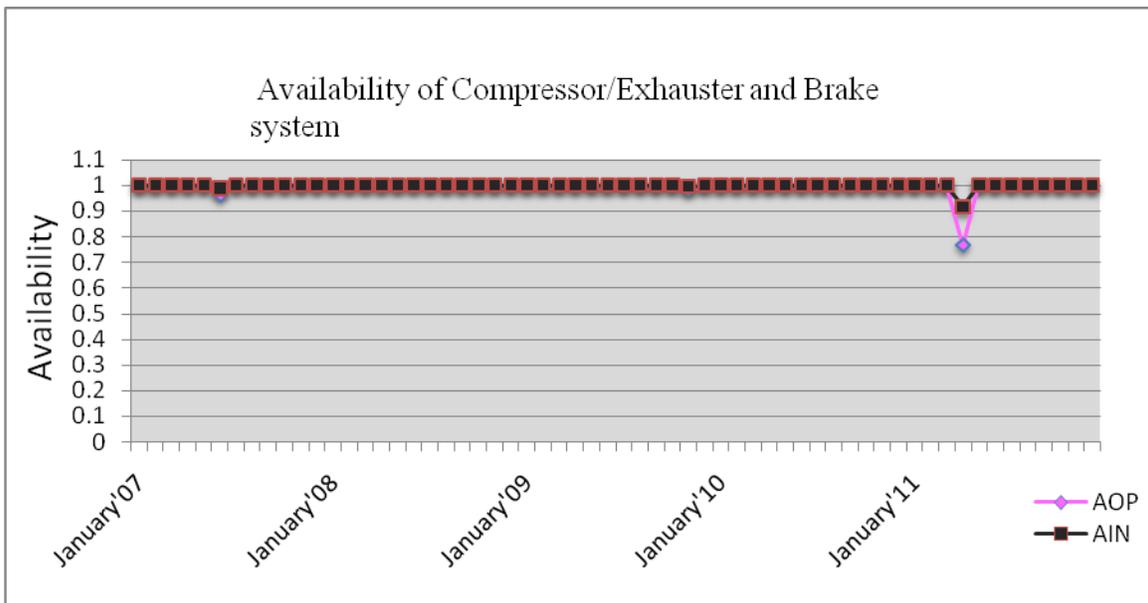


Figure 10: Availability of compressor

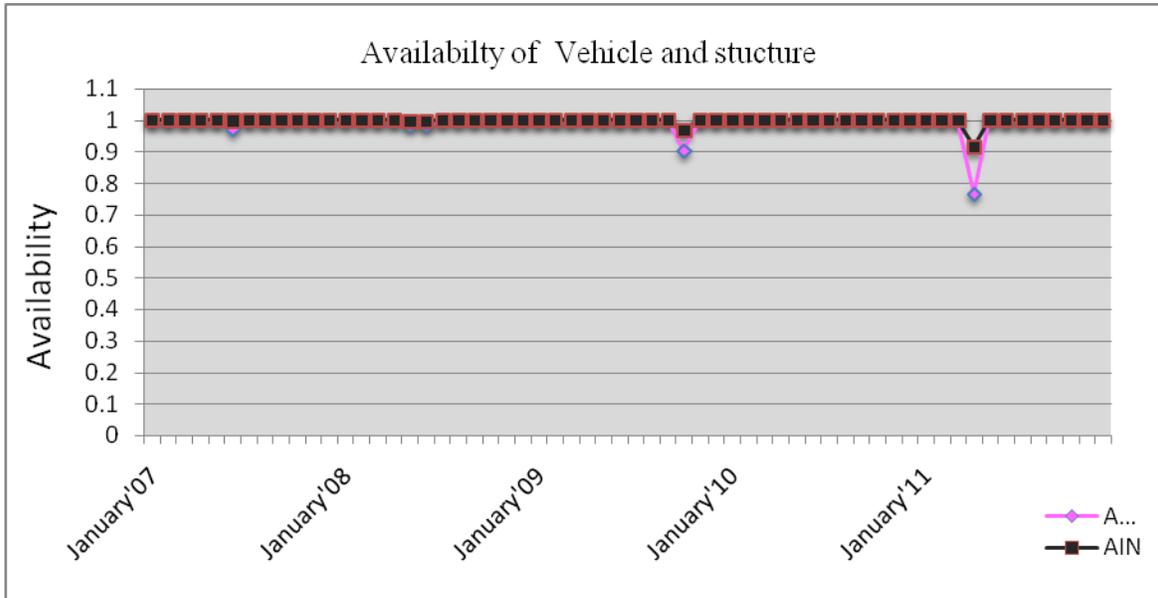


Figure 11: Availability of vehicle and structure

VI. DEVELOPMENT OF SPARES PLANNING AND CONTROL SYSTEM

**6.1 Maintenance**

The definition often stated maintenance as an activity carried out for any equipment to ensure its reliability to perform its functions [8]. Maintenance to most people is any activity carried out on an asset in order to ensure that the asset continues to perform its intended functions or to repair any equipment that has failed or to keep the equipment running or to restore to its favorable operating condition. Over the years, many new strategies have been implemented as maintenance strategies which are intended to overcome the problems which are related to equipment breakdown. Some of the common maintenance strategies [9] are as follows:-

Table 8: Maintenance Strategy

MAINTENANCE STRATEGY	MAINTENANCE APPROACH	SIGNIFICATION
Corrective Maintenance	Fix it when broke	Large maintenance budget.
Preventive Maintenance	Scheduled Maintenance	Periodic component replacement.
Predictive Maintenance	Condition based Monitoring	Maintenance decision based on equipment condition.
Proactive Maintenance	Detection of sources of failures.	Monitoring and correcting root causes of failure.

**6.2 Classification for selective control of spare parts inventory- ABC Analysis**

The objective of carrying out ABC analysis is to develop policy guidelines for selective controls of spare parts. The ABC classification of the spare parts of Railway Diesel Engine has been performed on the basis of their annual consumption in rupees. The entire procedure for making ABC analysis is summarized in the following steps:

- i) Annual consumptions in rupees have been calculated for each spare part.
- ii) The sorting of spare parts has been performed on the basis of annual consumptions in rupees in descending order.
- iii) Cumulative annual usage and cumulative % usage are estimated which are shown in Table 9. The parts are categorized considering the cumulative % usage.

iv) The Pareto chart figure 12 is obtained for the spare parts by plotting cumulative percentage usage against the ranks of the parts in descending order to visualize the ABC categories.

Table 9: ABC Analysis of the spare parts

Rank	Spare Part	Annual Usage [In Rupees.]	Cumulative Annual Usage	Cumulative % Usage	Category
1	Compressor	104,17,910.00	104,17,910.00	27.211	A
2	Vehicle and structures	11,97,653.00	38193075.32	99.760	C

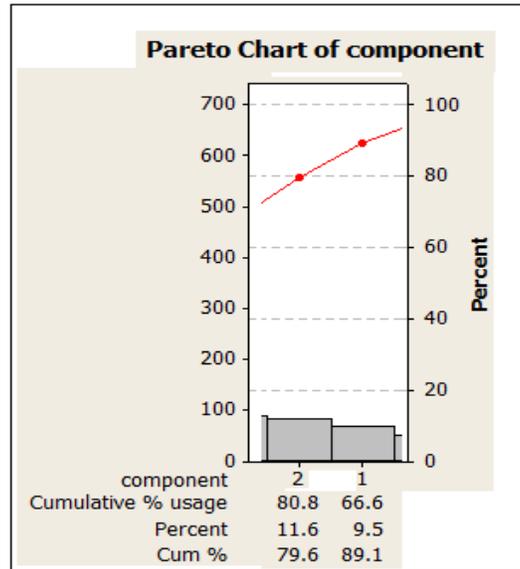


Figure 12: Paratoo chart

VII. RESULTS & DISCUSSIONS

7.1 Reliability Estimation

Reliability estimation of the different components of the Locomotive Engine of Railways provides the values of shape parameters as well as reliability (Table 10) which focuses on the performance of the components of the Locomotive Engine during the period of January, 2007 to December, 2011.

Table 10: Reliability of the Railway Locomotive Engine components

Sl. No.	Name Of The Different Components	Shape Parameter (B) (From Weibull Plot)	Mean Operating Hour (In Hours)	Reliability	Failure Probability
1	Compressor	6.705	660.102	64.621	35.378
2	Vehicle and structure	7.559	666.628	59.998	40.001

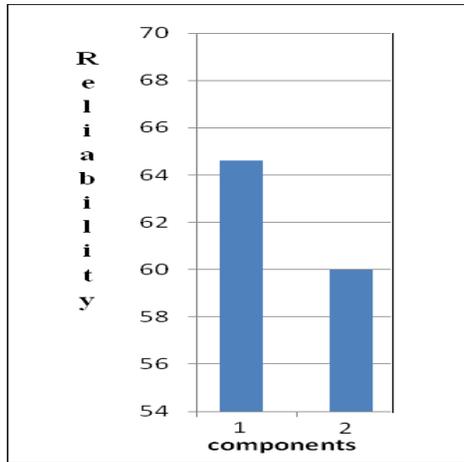


Figure 13: Reliability of different components for Locomotive Engine

From Fig.13, it is found that the estimated Reliability of the different components of the “Railway Diesel Locomotive Engine” is in the range of 59% to 68%. The minimum (59.9987%) reliability is for the vehicle and structure.

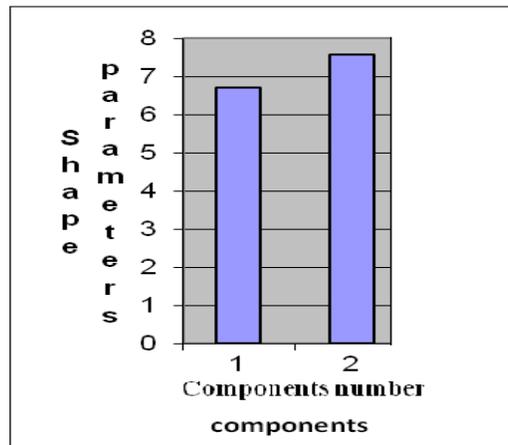


Figure 14: Shape parameter of different components

Weibull shape parameter is the indicative of the possible failure mechanism and the causes of failures of any component. Table 11 shows the classification of shape parameters according to their values indicating possible failure mechanism and cause of failure.

Table 11: Classification of shape parameter

Shape Parameter Value	Possible Failure Mechanism	Causes Of Failure
$\beta > 2$	Age related pattern	Accelerated wear and tear of components.
$\beta \approx 1$	Time independent pattern	Process error, design fault, mal operation
$\beta < 1$	Early failure	Manufacturing failure, and reconditioning fault.

The values of the shape parameters of the different components of the Railway Diesel Locomotive engine are given in Table 10 & Fig.13. It is evident that the possible failure mechanism of various components falls into the category of age related pattern and failures occur due to accelerated wear and tear of components (Table 11).

## 7.2 Availability of Different Components of the Railway Locomotive Engine

As per the definition of operational availability, the availability of different components of the Railway Diesel Locomotive Engine is calculated for a particular month starting from January, 2007 to December, 2011. After that the average operational availability of each component is calculated. A detailed average operational availability of different components of the Railway Diesel Locomotive Engine is given Table 12 and Fig.15.

Table 12: Estimated Operational Availability of the Railway Diesel Locomotive Engine components

Sl. No.	Name of the Different Components	Average Operational
1	Compressor	0.995
2	Vehicle And Structures	0.993

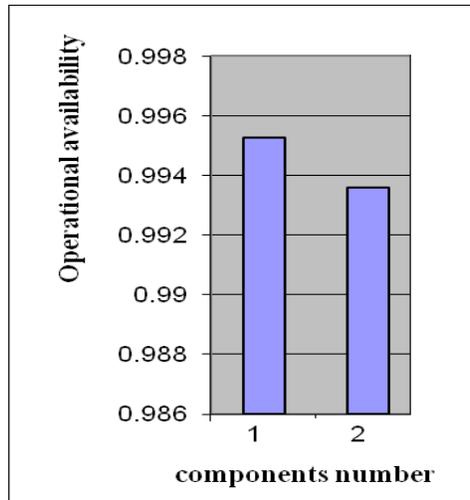


Figure 15: Operational availability of different components

Considering operational availability and inherent availability vs. time period for different components of the Railway Diesel Locomotive Engine (Fig.10 to11) show the availability patterns of Railway Diesel Engine during the period under study (January, 2007 to December, 2011).

**Figure.10:** shows that for, Compressor/Exhauster/Brake system both inherent and operational availability are closer to each other for very short periods.

**Figure.11:** shows that the Vehicle and structures undergoes preventive maintenance and overhauling for shorter period during the months of April 11 to May, 11, as both the inherent and operational availability are coinciding with each other.

**7.3 Analyses of the Major Causes of Failures and Recommendations for Their Remedies**

After analyzing the failures of the Railway Diesel Locomotive Engine components, the major causes of failures include careless and inexperienced handling, improper and excessive loading, environmental, careless operation, degradation etc

**7.4 Proposed Maintenance Schedule**

It is true that the failures of the engine parts cannot be fully prevented i.e. 100% availability cannot be achieved, but the probability of failure and frequency of failures, and thus risk can be checked or lowered through proper condition monitoring of the Railway Diesel Locomotive Engine components.

Following are the causes and the recommended preventive measures to be taken for the major components of the engine.

Table 13: Compressor/ exhauster/ brake system

Causes	Corrective actions
Expresser 1 <sup>st</sup> coupling gasket damaged	Extra care should be taken during major schedule for fitment of 1 <sup>st</sup> coupling gasket.
Air leakage from expresser side cover gasket due to three nos. over size bolt fitted, caused cover was not tightened properly.	Fitment of standard size bolt should be ensured.

Table 14: Vehicle and structure

Causes	Corrective actions
Fro 01 NT trolley side bearer rubber loading pad displaced damage	Replace
Brake rigging damage.	Replace
Gear box problem	Replace

#### VIII. CONCLUSION

This study has focused mainly on the estimation of the reliability and availability of a specific Railway Locomotive Engine along with maintainability aspects.

The collection of the past data is the most vital precondition to carry out such analysis. The initial stage of the present study has revolved around the collection of well defined data regarding the breakdowns and maintenance of the Engine.

It has been found that worker inefficiency, overloading, degradation of the system components with time are mainly the contributing factors for the failures of Railway Diesel Locomotive Engine.

From the Reliability prediction of the engine components it was found that the reliability of the components ranging from 59% to 68% where maximum reliability found in case of transmission cable (67.998%) and minimum reliability found in case of vehicle and structure (59%). As the maximum systems of the Engine are found to be moderate Reliability and to upgrade its maintenance process of the Locomotive Engine.

The availability patterns describe the performance of the Engine. The plant is having no such correct spare parts provisioning system for a cost effective and timely managed maintenance practice. Whenever any breakdown occurs, the maintenance department places an indent on the requirements for a particular spare part to the store, if the spare is available in the store they supply it to maintenance department and if not, then order is placed to the purchase department as a result maintenance process gets delayed. A spare parts provisioning model has been introduced to estimate the safety stock. In-depth and continuous study it is required to analyzing the effects of the preventive maintenance action for the Railway Locomotive Engine components, controlling and monitoring of spare parts on reliability aspects.

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# Impact of Political Participation in Building the Capacity of Dalit Women: A Case Study in BKT Block

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**Abstract-** Capacity building often refers to assistance that is provided to entities usually in developing countries, which have a need to develop a certain skill or competences, or for general upgrading of performance ability of women. It involves activities which strengthens the abilities, skills, and behavior of women and improve them so that they can meet its mission and goals in a sustainable way. Women's political participation has been considered a major measure in women's capacity building. The conceptualization of political participation has been undergoing drastic changes. Such changes will have direct impact upon different modes of political participation. There is positive relationship between urban residence and higher level of political participation. To increase political participation of women yield positive result, government at both center and state should not delay any further to complete de centralization of power that is power should be shared equally between men & women. This paper deals with the issue of capacity building and scale of need is enormous. There is a need for change in society building in dealing with women. The objective of this paper is to support and encourage in political and legal framework. It is a small exploratory study designed to analyze and interpret the Dalit women in Ambedkar & non-Ambedkar gram of Lucknow district. The sample size will be 500 dalit women from which 250 dalit women from Ambedkar gram are being selected. The result is being discussed in the full length paper.

**Index Terms-** performance, ability, sustainable way, exploratory, de centralization

## I. INTRODUCTION

Capacity building often refers to assistance that is provided to entities, usually societies in developing countries, which have a need to develop a certain skill or competence, or for general upgrading of performance ability of women. It involves activities which strengthens the abilities, skills and behavior of women and improve them so that they can meet its mission and goals in a sustainable way. It is a creation of an enabling environment with appropriate policy and legal framework, institutional development including community participation (especially women). It is a long term, continuous process of developing Skill and competence. Capacity building includes Human Resource Development that means equipping individuals with the understanding, skills and training to perform effectively. In the present scenario, it is very popular term as it deals with Individual Specific decision making skill and it relates to the overall quality of life. The impact of capacity building is studied and analyzed through four different parameters that is:

**Capacity Building:** Often refers to assistance that is provide to entities usually societies in countries, which have a need to develop a certain skills or competence or for the general upgrading of performance ability of women's.

In 1991 the term had evolved and become capacity building UNDP defines capacity building as the creation of an enabling environment with appropriate and legal frame work , institutional development, including community participation (of women's in particular).

WCO capacity building as activities which strengthen the knowledge, abilities skills and behavior of individual and improved institutional structures and process such that the organization can efficiently meet its mission and goals in a sustainable way.

Also referred to as capacity development is a conceptual approach to development that focuses on understanding the obstacles that inhibit people, governments, international organizations and non-governmental organizations from realizing their developmental goals while enhancing the abilities that will allow them to achieve measurable and sustainable results. Organizational capacity building is used by NGOs to guide their internal development and activities.

The United Nations Development Programme (UNDP) was one of the forerunners in developing an understanding of capacity building or development. Since the early 70's the UNDP offered guidance for its staff and governments on what was considered "institution building." In 1991, the term evolved to be "capacity building." The UNDP defines capacity building as a long-term continual process of development that involves all stakeholders; including ministries, local authorities, non-governmental organizations, professionals, community members, academics and more. Capacity building uses a country's human, scientific, technological, organizational, and institutional and resource capabilities. The goal of capacity building is to tackle problems related to policy and methods of development, while considering the potential, limits and needs of the people of the country concerned. The UNDP outlines that capacity building takes place on an individual level, an institutional level and the societal level.

**Institutional level-** Capacity building on an institutional level should involve aiding pre-existing institutions in developing countries. It should not involve creating new institutions, rather modernizing existing institutions and supporting them in forming sound policies, organizational structures, and effective methods of management and revenue control.

**Societal level-** Capacity building at the societal level should support the establishment of a more "interactive public administration that learns equally from its actions and from feedback it receives from the population at large." Capacity

building must be used to develop public administrators that are responsive and accountable.

**The World Customs Organization**-an intergovernmental organization (IO) that develops standards for governing the movement of people and commodities,<sup>[2]</sup> defines capacity building as "activities which strengthen the knowledge, abilities, skills and behavior of individuals and improve institutional structures and processes such that the organization can efficiently meet its mission and goals in a sustainable way." It is, however, important to put into consideration the principles that govern community capacity building.

## II. CONCEPT OF POLITICAL PARTICIPATION

Women's political participation has been considered a major measure in women's capacity building. To increase political participation of women yielded positive result. Government at both center and state should not delay any further to complete de centralization of power that is power should be shared equally between men & women. Allocation of funds for time series evaluation policy can promote women's political participation. The programmes that create greater political leadership for women to measures women's capacity building participation. Women in political activities are evaluated through women in parliament judiciary and in local bodies. It is also now often pointed out that several programme like Mahila Samakhya Swarnjayanti gram Swanoygar yogana (SGSY) Indira Awas Yogana (IAY) are being enforced for the upliftment of women and their active participation. Initially excluded women, but due to demands from women nationalists he later realized the power of women organizers at the local level. His inclusion of women, however, was not located within a gender equality framework, but was a means to achieving a stronger and unified Indian state. The inclusion of women in the nationalist movement was also to debunk the British colonial assertion of "needing to save the poor, vulnerable women" of preindependence India.

As in many nationalist movements, women in India took part in the struggle, in turn propelling a women's rights movement. And, as seen historically in many post-colonial countries, the nationalist women's movement in India was confronted by the rebuilding of a patriarchal nationalist state. Women revolutionaries gave way to their male counterparts who (as a result of Partition politics) created a strong, male, and Hindu "New India". The first post-independence Lok Sabha (the People's Council or the Parliament) had 4.4% women. The period between the early 1940's and late 1970's saw an emergence of the Indian women's movement, but it was not until the 1980s that the women's movement gained real momentum.

In the last two decades since the reservation for women in elected Panchayats was passed, many studies have been conducted to look at the impact of this policy. A survey conducted in 2008 yielded that women made up close to 50% of all the village councils across the India. The number of women representatives has certainly increased at the grassroots level; however, questions still remain regarding their decision-making power within the councils. A study in West Bengal and Rajasthan by the Institute of Management Studies (Calcutta) and the

## III. OBJECTIVES

The objective of study is to contribute to the process of organizational change & development or the institutionalization of gender perspective in organization & society by supporting women by following:

- (1) Training & developing the women through education system.
- (2) Supporting women through confidence building
- (3) They should be encouraged & participated in political in political & legal framework.
- (4) They should be provided a supportive institutional mechanisms for their advancement
- (5) To analyze transform programmes & organization by strengthening the position of women in community.
- (6) To create an environment through positive economic and social political for full development of women to enable them to utilize their full potential.
- (7) These would be significant relationship between the parameter used and their influences.

## IV. REVIEW OF LITERATURE

Research and Development in the Subject: Research have significantly added to the concept of capability building and the influence has been defined very clear. Various studies has been conducted on this area and organization focuses on promoting well being encouraging empowerment and participation and seeks to address the core factors resulting in poverty and distress . Saloman etal (2003) states that capacity building is defined by the organization and it can meet the needs of community.

Sector development policy team (2004) defines that voluntary and community sector is the heart of building strong, sustainable, connected and empowered communizes.

De vita & Fleming (2001) contributed at the risk of social exclusion and spend a considerable amount of time pursuing short term grants to provide services to tackle problem that an complex and takes years to address .Existing research & anecdotal evidences suggests that many voluntary & community sector organization work for the upliftment of Dalit woman .

MC Rhee and bare (2001) specifically states capacity building is an empowering activity that strengthens the ability of community to building their structure system people and skill so that they are better able to define & achieve their objective engage in consultation & planning, manage projects & take part in partnership and service delivery.

Saloman etal (2003) states that organizations with in the voluntary & communing score provide services that meet fundamental needs of communities. They also play a essential role with in society by identifying & advocating on behalf of unaddressed problem.

Baris (2001) states that in recent years pressure to improve and demonstrate effectiveness of capacity building.

Sector Development policy team (2004) summarized the common area of capacity building like employing & developing work force, improving performance, evaluation, monitoring, & quality assurance. Existing research and commentary supports

the conclusion that capacity building for Dalit sector is largely & sporadic & uncoordinated.

This result continues to struggle fundamentals needs of communities with minimal resourcing & support . A coordinated & well managed capacity building approach responds to the case need of sector over a long period with a sustained improvement in operation of sector. It will guarantee better use of the funding provided to the sector and more effective outcome in terms of the communities being served.

Review of literature is a vital part of any research. It helps the researcher to know the areas where earlier studies had focused on and certain aspects untouched by them. There have been numerous thought-provoking studies on human rights violation against women and dalits. A look at the studies shows that violations against women and dalits are increasing day by day in the local and global context.

Women have always been treated differently, whereas men have claimed all rights they have denied them to women. Religion has also helped in perpetuating the denial of equal rights to women. They have also been subject to socio-economic and cultural deprivations. They have been vulnerable to violence and exploitation such as harassment, taunts, abuses, battering, molestation, rape, dowry deaths, sati, mental and physical torture. In many countries, women are dehumanized, forcibly married, sold off and subject to all kinds of humiliation. Caste system is peculiar to India. Here people are branded as untouchables, denying them the right to live as human beings. They are oppressed, suppressed and marginalised by the so-called upper caste people. A dalit is denied all human rights while alive. The caste people do not spare a dalit even after his death. The dalits in India, who are the most disadvantaged and stagnated group, are serving mostly under caste Hindus. As the dalits don't have a strong national political party of their own to influence the ruling party, there is none to fight for their rights. Religion seems to sanction and sanctify both the caste system and untouchability. Violence, discrimination and abuse against women and dalits should be eliminated. Governments, private organisations and individuals have been fighting against these evils, but not with much success. Education and enlightenment can go a long way to break the social, economic and cultural shackles that have bound women and dalits. Not a day passes without papers reporting violation of human rights. Human rights violation has become a worldwide phenomenon and is increasing day by day, i.e. developing countries like India, which boasts of „unity in diversity“ witnesses such violations almost everyday. Women, children, dalits, adivasis, minorities and other marginalised groups are discriminated for no fault of their own. It is true that many countries, including India have enacted legislations with the sole aim of putting an end to such violations. But quite sadly one does not find any decreasing tendency in the occurrence of human rights violation. Mander (2008) argues that employing manual scavengers to clear human excreta is punishable under the law. Yet, many institutions, private and public, continue to do so. Manual scavengers themselves do not speak out because of shame and fear of losing even this frequently insecure source of livelihood. Instead they remain trapped in a vicious cycle of intense stigma, segregation, poor health and education, destructive coping strategies like alcohol and drugs. Rajkumar (2006) also asserts that this was the first

time, the National Human Rights Commission examined the issue of corruption from a human right standpoint. The gravity of human rights violation resulting from corrupt practices is no less than that of custodial violence or any other form of violation of civil, political, economic, social and cultural rights. Kaarthikeyan (2005) discusses a variety of issues including poverty, gender justice and child rights. Role of police as protectors of human rights is highlighted by him. He shows terrorism as the gravest violation of human rights. To him custodial justice and role of law enforcement agencies in protecting human rights, without committing excesses, are necessary for a good social set up. Chaudhary (2005) states that human rights and poverty are inter-related. Of course, there is organic interface between the two in the negative sense because poverty and violation of human rights go hand in hand but poverty is not the only manifestation of violation of human rights. The causative factors contributing to the gross violation of human rights are both historical and contextual as well as global and local in nature. Malhotra et al., (2005) point out that in a country, in spite of various constitutional safeguards, violation of human rights takes place every day in a variety of forms. These violations include breach of civil, and political rights, discrimination against minorities, women and weaker sections of society like scheduled caste and scheduled tribes, arbitrary arrest, torture and death of suspected culprits in the police custody, female infanticide, killing of suspected militants in police custody, religious violence, child labour, ethnic killings and kidnapping for ransom. Moreover degraded or polluted environment itself is a human rights violation. It is time to recognize that those who pollute or destroy the natural environment are not just committing a crime against nature but are violating human rights as well.

Shankarjha (1998) explains that even today, various forms of violence against women are manifested themselves directly in foeticide, female child killing, bride-burning dowry-murder, wife battering, abduction, eve-teasing, verbal abuses or verbal rebukes. Women on many occasions are victimised by all sorts of discriminations, deprivations and obstructions. It is upheld by Bhambri (1997). Banerjee (1993) states that molestation and rape, sexual harassment and wife abuse; bias against the girl child are a global phenomenon, and India is being no exception. Male characteristic milieu has reduced her status to a plaything of men's whims and fancies. Gang rapes and custodial rapes, molestation, eve-teasing, bride burning, child and sexual abuse, prostitution, dowry, wife battering, domestic bias and social injustice take a heavy toll on Indian women. Sexual harassment outside the house is of the major atrocities. When she complains of harassment, no one believes her, and then the second thing she encounters is the doubt cast on her moral character. Sahay (1991) highlights that as young girls they are loaded with the albatross of guilt about being female. Much of our folk music and dance and Hindi films perpetuate the theme that a girl child is a burden to be got rid of.

Bindel (2008) states an incident that happened in South Africa wherein four women wearing miniskirts were sexually assaulted at a taxi stand in Johannesburg by a group of men. They were forcibly stripped and paraded naked. Such a type of public assaults on women is a cause for concern of everybody. Reddy (2008) explains that eve-teasing has become a perennial problem for women. They are not able to stand at public places

like bus stops, but even inside the bus, at cinema halls and markets peacefully, because the eve-teasers who pass comments at them.

Veer (2004) explains that eve-teasing which involves the verbal and physical harassment of women is the scourge of the urban society. A woman can not go out in the street without fear of being harassed. In crowded places, very often women are subject to physical harassments. The miscreants hurl indecent remarks. There is no woman who has not suffered this menace of society. In daily life if not all men are potential eve-teasers, all women are potential victims. All women suffer from the fear of being teased, irrespective of her age, health, appearance and mental state. Also he explains that eve-teasers are everywhere, on the campus, in the markets, in parks and in buses. In educational institutions, eve-teasing hinders healthy academic atmosphere and damages the career of girl students. Eve-teasing is a group activity and often it leads to severe complications. On several occasions eve-teasing led to communal disturbances. Some recent news report that eve-teasing is also committed by professionals. They play with their subordinates, working women in 44 lighter form and watch the response of the opposite sex in this regard. Kahol (2003) who expresses the same view. Shankarjha et al., (1998) explain that women, on many occasions, are victimized by all sorts of discriminations and deprivations. These incidents may occur in all places including her home, offices, industries and even public places. Men are always considered a stronger and superior sex. They have been led to believe that dominance over the „weaker sex“ is their birthright. Maladjustments between husband and wife result in violence against women. Bahl (2008) argues that patriarchy is the main reason for violations against women. The social structure and cultural system that are keeping Indian women subordinated are perpetuating violence against women, not only during their lifetime, but even before they (girls) are born. Arora (2008) observes that women were affected by violence because of their silence and compromise. Women from comparatively conservative backgrounds gradually learn to adjust to every kind of environment. It has been deeply ingrained in her that a woman must learn to compromise. Bindel (2008) asserts that the way in which woman dress is one of the causes for women right violations. Tight jeans, miniskirts, bell bottoms, projection of breasts, high heels, birghtly coloured lipstick are seen as objects of provocation that stimulate men to commit rape. He argued that women make themselves vulnerable to assault and rape because of their provocative dress code.

Worth (2008) points out that the young girls below the age of 10 are sexually abused and beaten. Also they are motivated for child marriage. All these are due to poverty, their parents also accepted it against their will. Ghatnekar (1997) says that the contemporary Indian films have failed to project a correct image of women. Current cinema has corrupted the minds of the youth to participate in anti-social activity, sexual violence and crime in the society. Neeraja (1997) and Virk (1996) have also expressed the same view. Seshagin (1997) tells that we are also finding an increasing amount of violence shown on T.V and cinema. Visual media only reflect what is already taking place in society. A criminal is not necessarily inspired by films. Wife beating and domestic violence on women is nothing new in India. A wife is considered her husband“s property and outsiders cannot interfere,

no matter what tortures are inflicted by the husband. Violence is becoming the means for gaining power and wealth. So the media cannot be wholly blamed for contributing to violence against women. But, she concludes that there is a lot of scope for the visual media to contribute in building a society where a woman is honoured and respected.

Regunathan (2008) says that dalit Christians of about 150 families complained that they were discriminated against in offering worship at the Annai Sahaya Mary Church at Eraiyur, a village in Tamil Nadu. Since Vanniyar Christians constituted a majority, numbering about 2000 families, they got preference in all Church functions and dalit Christians were relegated to the background. Wankhede (2008) points out that the underprivileged sections, especially, the “bahujans” and the “dalits” have had a history of struggle in challenging given identities and furthermore constructing their own alternative identities and political concepts to fulfil the requirements of contemporary times. In this discourse, dignity of the self became the outcry for targeting the nature of the existing social control. According to Venkatesan (2008) it is very clear from the report given by Justice Lakshmanan that in India about 13 lakh of people carry human excreta on head for disposal. It is rampant in Delhi, Madhya Pradesh, Uttarpradesh, Maharashtra, Rajasthan and Bihar. He further says that carrying of human excreta on head is the most inhuman. One can easily understand how dalits are treated in India from the incident narrated by Menon (2008). She points out that the school at Krishnagiri in Tamil Nadu, students and answer sheets were purified by sprinkling cow urin as a dalit person occupied the headmaster post for a very short period. The high caste people did this purification after the transfer of the headmaster to another school.

Gunasekaran (2008) illustrates the violence against Dalits at Salarapatty in Coimbatore. A mob of caste Hindus ransacked more than 10 tiled houses and two motorcycles were smashed. Fifty dalit students were not able to attend classes. The violence is due to the opposition shown by certain dalits for the two tumbler system practised in this village. Karthikeyan (2008) points out that in Uthapuram in Madurai district where Caste Hindus of the village have electrified a 600 metre long wall which passes through the area of common use by people of all castes. The wall is intended to block common entry points, thereby preventing the dalits from mingling with caste Hindus. Access to common property resources is also being denied to dalits in that area. Kumar, S.V., (2008) states that a dalit official is not free from caste based violence by referring an incident in Kanyakumari district. Kanungo (2007) explains that in Vaso village, Gujarat, the upper caste Hindus did not allow the lower caste people for performing the last rites of a dead dalit man at the panchayat crematorium. A notice at the site pronounces “members of lower castes should take their dead to other locations. This speaks how caste Hindus do not spare a dalit even after his death. His article tries to make a bold attempt in unfolding the contradictions and collaborations between dalits and hindutva, from the vantage points of theory as well as practice. Menon (2007) explains that in Nagpur, dalits were attacked and assaulted by the caste Hindus, eight of the 11 accused were arrested and released on bail soon after. They roam freely in the village and threaten the dalit families. It makes dalit families more worrisome.

The political participation or the political behavior of human beings just like any other aspects of human behavior take place in a given socio-cultural setting. It implies that the political participation is affected by social structure, economic development and historical factors joining together. The political behavior of Muslim women should be understood in the Islamic perspective. It is observed that Islamic has given equal status in matters of religion and religious observations to men and women but politically they are unequal ones<sup>2</sup> Marcia Lee believes that, lack of female participation in politics stems from three factors, namely, children at home, fear of sex discrimination and perceptions of women that certain things are not proper to do."

The generally accepted sex - role socialization process is considered to be advantageous to males in the field of political participation although women may be interested in politics. The Indian society is full of paradoxes. On the one hand, foreigners come in hordes to our country in search of spiritual solace but on the other hand, Indians rank among the most corrupt project the world. Again, on the one hand, India is spending millions, nay, billions to send satellites to space to prove its scientific prowess but on the other the state can not provide almost half the population with the basic necessities of food, education, health and shelter. The same paradox exists in the case of women too. On the one hand, the scriptures put them on a high pedestal. An old Sanskrit proverb is that, where the women are held in reverence there do the gods reside. The traditional belief in the Indian society is that, a society grows if the women grow, if they partake of the spirit of progress, for they are proverbial domestic legislators, they are the matrix of social life.<sup>4</sup> In the Indian mythology, even God is regarded as half man, half woman - 'ardh-narishwara'. On the other hand, according to the UNICEF's recent international report, "The Progress of Nations 1997", more than 5000 dowry deaths occur every year in India. "Women's lives in India and the world over are circumscribed by what can be termed as five 'Ps' Patriarchy, Productive resources access inadequacy, Poverty, Promotion advancement the world's work. In exchange they receive only 10 percent of all the income and own a mere one percent of all the world's means of production. It is a fact that the real social status and the real level of political participation of women cannot be analyzed in isolation. On the contrary it is interlinked with the socio-economic conditions, political climate and inequalities inherent in the traditional social structure, its norms and values, customs and rituals. All these factors together determine the actual social status of women. Not only that, women's status differs according to region, caste, class and religion and also on considerations of tribal, rural and urban areas." The status of a person is a great force in participating wholeheartedly in the developmental process. In the case of women, their inferior status relegated to them due to fundamentalism of tradition and religious beliefs blocked them from active participation in developmental process. Historically women are supposed to carry forward the traditions, norms and the values of society. The process of socialisation that they undergo in their families does not prepare them for non-traditional roles. Now, it is reasonable to enquire about what the mainstream Indian culture expects a woman to be. In order to get a satisfactory answer to such a question, one will have to go through the corridors of the history of India. The political participation and behavior of human beings just like any other

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The generally accepted sex - role socialization process is considered to be advantageous to males in the field of political participation although women may be interested in politics. . On the one hand, foreigners come in hordes to our country in search of spiritual solace but on the other hand, Indians rank among the most corrupt project the world. Again, on the one hand, India is spending millions, nay, billions to send satellites to space to prove its scientific prowess but on the other the state can not provide almost half the population with the basic necessities of food, education, health and shelter.

## V. SIGNIFICANCE OF THE STUDY

The study of capacity building has its own importance in the following area

- (1) Organizational change and development
- (2) Involvement of women in community growth & development
- (3) Providing financial assistance to women so that they can control over resources
- (4) Human resource development relates with enhancing the knowledge, skill and abilities of woman.
- (5) Providing a supportive environment to carry out duties & responsibilities very efficiently & effectively.

- International Status
- National Status
- Significance of the study

## VI. SAMPLING METHOD

It is a small exploratory study designed to analyze & interpret the Dalit woman in Ambedkar & non Ambedkar gram of Lucknow district. The sample size will be 500 Dalit woman, and of which 250 dalit woman from Ambedkar gram and 250 dalit woman from non Ambedkar gram are being selected. The total methodology in the following step

- Step 1. Selection of five Nayay Panchayat by random sampling
- Step 2. Selection of the village is a two tier system
- Ambedkar Grams of five Naya Panchayat by random among the Ambedkar villages.
- Five non-Ambedkar grams of the same Nayay Panchayat by random methods.
- Step 3. Selection of target group.
- Step 4. Preparation of questionnaires separately the following
  - i. Target group

- Step 5. Preparation of Interview schedule for the following:
  - Govt. officials
  - Magistrate
  - Block development officer
  - Panchayat secretary
  - Peoples Man/Men from society
  - i. Members of parliament/assembly
  - Block Pramukh
  - Gram Pradhan

**Techniques Used:**

- Descriptive Statistics
- Kolmogrov- Smirnov Test
- Mann-Whitney U-test
- Large Sample test to compare proportions

Lastly after the completion of questionnaires an interview scheduled related will be prepared for analysis and interpretation

of the fact. All the statistical method, technique will be applied as per requirement.

**Analysis and Interpretation**

**Objective 1: To analyze equal access in decision making**

This objective is analyze by considering two points in mind. These are:

- Independency to make decision for voting
- Independency to decide children treatment
- **On the basis of Independency to make decision for voting**

**Chart 1: Distribution of Voting Independence in Ambedkar & Non-Ambedkar Grams**

Above chart represents that women of Ambedkar gram are more independent to cash their vote(100%), as compare to NonAmbedkar gram( 70%).

**Table 1: Comparison of Voting Independence in Ambedkar & Non-Ambedkar Grams**

	Voting Independence		Significance	Result
	Yes	No		
Ambedkar Grams	240 (.96)	10	<.0001	Significant
Non-Ambedkar Grams	175 (.70)	75		

This table shows that there is a significant difference in voting independence of Ambedkar & Non Ambedkargram. And women of Ambedkar Gram are more free to cash their votes according to their willingness.

**On the basis of awareness about laws**  
**Chart 1: Distribution of awareness about laws in Ambedkar & Non-Ambedkar Grams**

Above chart represents that there is a very huge difference related to awareness about laws. At the same time we can see from above that women of Ambedkar gram are much more awared regarding this (240/250) as compare to NonAmbedkar gram (5/250).

**Table 2: Comparison of Awareness about laws in Ambedkar & Non-Ambedkar Grams**

	Awareness about laws run by govt.		Significance	Result
	Yes	No		
Ambedkar Grams	240 (.96)	10	<.0001	Significant
Non-Ambedkar Grams	5 (.02)	245		

This table shows that there is a significant difference in awareness about laws of Ambedkar & Non Ambedkargram. And women of Ambedkar Gram more knowledge of laws as compare to Non- Ambedkar.

**Objective To analyse equal access on political basis**

This objective is analyze by considering the following points:

- Voting criteria( means do you vote or not)
- Presence of Voter ID
- Reason for Voting
- Enrollment of women’s in political parties
- Knowledge about past political leader’s
- **On the basis of Voting criteria( means do you vote or not)**

**Chart 2: Distribution of women’s vote in Ambedkar & Non-Ambedkar Grams**

Above chart represents that women of Ambedkar gram do more vote (99.6%), as compare to NonAmbedkar gram ( 62.8%).**Table 8: Comparison of proportion of women’s vote in Ambedkar & Non-Ambedkar Grams**

	Voting		Significance	Result
	Yes	No		
Ambedkar Grams	249 (.996)	1	<.0001	Significant
Non-Ambedkar Grams	157 (.628)	93		

This table shows that there is a significant difference in proportion of women’s vote in Ambedkar & Non Ambedkar gram. And women of Ambedkar Gram are voted more.

• **On the basis of Presence of Voter ID**

Above chart represents that approximately all of the women’s of Ambedkar & NonAmbedkar have voter ID.

**Chart 3: Number of women’s have voter ID in Ambedkar & Non-Ambedkar Grams**

**Table 3: Comparison of proportion of women’s having voter ID in Ambedkar & Non-Ambedkar Grams**

	Voter ID		Significance	Result
	Yes	No		
Ambedkar Grams	249 (.996)	1	0.1527	Non-Significant
Non-Ambedkar Grams	250 (1.00)	0		

This table shows that there is no significant difference in proportion of women’s having voter ID of Ambedkar & Non Ambedkar gram.

• **On the basis of Reason for Voting**

Above chart shows the figures that represents reason to vote in both the grams. From above chart it is clear that most of the women’s of Non-Ambedkar gram either vote for caste or govt, while of Ambedkar gram are vote for govt.

**Chart 3: Reason for voting of dalit women’s of Ambedkar & Non-Ambedkar Grams**

**Table 3: Comparison of proportion of women’s vote for govt. in Ambedkar & Non-Ambedkar Grams**

	Reason for voting		Significance	Result
	Govt.	Others		
Ambedkar Grams	247 (.988)	3	<.0001	Significant
Non-Ambedkar Grams	132 (.532)	116		

This table shows that there is a significant difference in proportion of women’s vote for govt. in Ambedkar gram as compare to Non Ambedkar gram. And women of Ambedkar Gram are voting more for govt(98.8%) as compare to Non Ambedkar gram (53.2%).

**On the basis of Enrollment of women’s in political parties**

of of Ambedkar gram & 44% of women’s are of Non-Ambedkar gram.

**Chart 4: Distribution of Enrollment of women in political parties in Ambedkar & Non-Ambedkar Grams**

Above chart represents that out of total women’s who thinks that women should be enrolled in political parties 56% women’s are

**Table 4: Comparison of proportion of women’s think that women’s should be enrolled in political parities**

	Enrollment of women in political parties		Significance	Result
	Yes	No		
Ambedkar Grams	236 (.94)	14	<.0001	Significant
Non-Ambedkar Grams	185 (.74)	65		

This table shows that there is a significant difference in proportion of women’s think that women’s should be enrolled in political parities of Ambedkar & Non Ambedkargram. And women of Ambedkar Gram thinks more about this.

• **On the basis of knowledge of past political leaders**

**Chart 5: Distribution of awareness about past political leaders in Ambedkar & Non-Ambedkar Grams**

Above chart represents that out of total women’s who have knowledge of past political leaders 64% women’s are of Ambedkar gram & 36% Of women’s are of Non-Ambedkar gram.

**Table 5: Comparison of proportion of women’s having knowledge about past political leaders in Ambedkar & Non-Ambedkar Grams**

	Knowledge about past political leaders		Significance	Result
	Yes	No		
Ambedkar Grams	242 (.968)	8	<.0001	Significant
Non-Ambedkar Grams	138 (.552)	112		

This table shows that there is a significant difference in proportion of women’s having knowledge about past political leaders in Ambedkar & Non-Ambedkar Grams & is more in women’s of Ambedkar grams.

**Chart 6 : Distribution of Employment type in Non-Ambedkar Grams**

Above chart represents that only 8% of women of Ambedkar gram are regular employed.

**Table 6: Comparison of Voting Independence in Ambedkar & Non-Ambedkar Grams**

	Type of Employment		Significance	Result
	Regular	Other		
Ambedkar Grams	199 (.796)	51	<.0001	Significant
Non-Ambedkar Grams	19 (.076)	231		

This table shows that there is a significant difference in proportion of women’s regularly employed. In Ambedkar & Non-Ambedkar Gram & is more in Ambedkar grams.

**On the basis of Mode of Communication**

**Chart 7: Distribution of Mode of Communication in Ambedkar & NoAmbedkar Grams**

Above chart represents the mode of communication in both the grams. We can see that mobiles are frequently used in both the grams.

**Table 7: Comparison of Land Line users in Ambedkar & Non-Ambedkar Grams**

	Landline		Significance	Result
	Yes	No		
Ambedkar Grams	44 (.176)	206	0.298	Non- Significant
Non-Ambedkar Grams	48 (.192)	202		

This table shows that there is no significant difference in landline users of Ambedkar & Non Ambedkargram.

**Table 8: Comparison of Mobile users in Ambedkar & Non-Ambedkar Grams**

	Mobile		Significance	Result
	Yes	No		
Ambedkar Grams	83 (.33)	167	0.105	Non- Significant
Non-Ambedkar Grams	71 (.28)	179		

This table shows that there is no significant difference in mobile users of Ambedkar & Non Ambedkar gram.

**Table 9: Comparison of Internet users in Ambedkar & Non-Ambedkar Grams**

	Internet		Significance	Result
	Yes	No		
Ambedkar Grams	69 (.138)	181	.2483	Non- Significant
Non-Ambedkar Grams	56 (.112)	194		

This table shows that there is no significant difference in Internet users of Ambedkar & Non Ambedkar gram.

**Table 10: Comparison of Voting Independence in Ambedkar & Non-Ambedkar Grams**

	Can Write		Significance	Result
	Yes	No		
Ambedkar Grams	232 (.928)	18	<.0001	Significant
Non-Ambedkar Grams	73 (.292)	177		

This table shows that there is a significant difference in proportion of women's that can write in Ambedkar & Non-Ambedkar Grams & is more in Ambedkar gram.

**VII. RESULT & DISCUSSION**

The result of the study have been presented in the previous chapter In this chapter an attempt will be made to discuss an interpret the findings of the present investigation. The research plan was to study the Capacity Building of dalit women in Lucknow district: A case study in BKT block. Data was subjected to suitable statistical analysis and the findings are discussed on the basis of hypothesis formulated for the research study. The result supported the henotheist relationship the study was based on comparative analysis between Ambedkar gram and non Ambedkar gram. Firstly the analysis was done on the basis of basic characteristics of dalit women and it was found

**Comparison of Ambedkar & Non-Ambedkar Gram**

- **On the basis of social, educational, economical, decision making, healthcare etc.**

On the basis of collected data an analysis had performed. At 5 % level of significance the following conclusions are drawn:

- There is a significant difference in voting independence of Ambedkar & Non Ambedkar grams. And women of Ambedkar Gram are more free to cash their votes according to their willingness.

- There is no significant difference in Independency related to make decision about Children treatment's of Ambedkar & Non Ambedkar gram.
- There is no significant difference regarding awareness about benefits of BPL families in Ambedkar & Non Ambedkargram.
- There is a significant difference in awareness level for schemes framed to socially disadvantageous families in Ambedkar & Non Ambedkargram. And women of Ambedkar Gram are more aware.
- There is a significant difference related to healthcare awareness of Ambedkar & Non Ambedkargram. And women of Ambedkar Gram are more aware about healthcare as compare to women of Non-Ambedkar Gram
- There is a significant difference in proportion of women believed that women education is more important in Ambedkar & Non Ambedkargram. And women of Ambedkar Gram are more aware about women's education.
- There is a significant difference in awareness about laws of Ambedkar & Non Ambedkargram. And women of Ambedkar Gram more knowledge of laws as compare to Non- Ambedkar.
- There is a significant difference in proportion of women's vote in Ambedkar & Non Ambedkar gram. And women of Ambedkar Gram are voted more.
- There is no significant difference in proportion of women's having voter ID of Ambedkar & Non Ambedkar gram.
- There is a significant difference in proportion of women's vote for govt. in Ambedkar gram as compare to Non Ambedkar gram. And women of Ambedkar Gram are voting more for govt. (98.8%) as compare to Non Ambedkar gram (53.2%).
- There is a significant difference in proportion of women's think that women's should be enrolled in political parties of Ambedkar & Non Ambedkargram. And women of Ambedkar Gram think more about this.
- There is a significant difference in proportion of women's having knowledge about past political leaders in Ambedkar & Non-Ambedkar Grams & is more in women's of Ambedkar grams.
- There is a significant difference in Average number of earning members of women's in Ambedkar gram & Non-Ambedkar Grams & is more in women's of Ambedkar grams.
- There is a significant difference in Average number of days women's employed in Ambedkar gram & Non-Ambedkar Grams & it's found that women's of Ambedkar grams are employed for more days.
- There is a significant difference in proportion of women's having Agricultural land in Ambedkar & Non-Ambedkar Grams & Is more in Ambedkar grams.
- There is a significant difference in proportion of women's having Agricultural land in Ambedkar & Non-Ambedkar Grams & Is more in Ambedkar grams.
- There is no significant difference in proportion of computer users of Ambedkar & Non Ambedkar grams.
- There is a significant difference in proportion of women's having income level more than 4000 Rs. in Ambedkar & Non-Ambedkar Gram & is more in Ambedkar grams.
- There is a significant difference in proportion of women's regularly employed. In Ambedkar & Non-Ambedkar Gram & is more in Ambedkar grams.

- There is no significant difference in landline users of Ambedkar & Non Ambedkargram.
- There is no significant difference in mobile users of Ambedkar & Non Ambedkar gram.
- There is no significant difference in Internet users of Ambedkar & Non Ambedkar gram.
- There is a significant difference in Healthcare awareness of Ambedkar & Non Ambedkar gram and is more in women of Ambedkar Gram.
- There is a significant difference in proportion of women's having vaccination card in Ambedkar & Non-Ambedkar Grams and is more in Ambedkar grams. It can also see that still there is a need to increase this ratio.
- There is no significant difference in **Awareness about Pulse polio drop** of women's of Ambedkar & Non Ambedkargram.
- There is a significant difference in proportion of women's aware about National Health Policies in Ambedkar & Non-Ambedkar Grams & is more in Ambedkar grams..
- There is no significant difference in proportion of women's thinks health awareness is must in Ambedkar & Non-Ambedkar Grams.
- There is a significant difference in proportion of women's ever attendant school in Ambedkar & Non-Ambedkar Grams & is more in Ambedkar gram.
- There is a significant difference in Availability of school in Ambedkar & Non Ambedkar gram & is more in Ambedkar Gram.
- There is a significant difference in distance of school from residence in Ambedkar & Non-Ambedkar Grams & in Ambedkar gram all the schools are within range of <2Km.
- There is a significant difference in proportion of people thinks that Education is more important for women in Ambedkargram & Non-Ambedkar Grams & is more in Ambedkar gram.
- There is no significant difference in proportion of people thinks that Education is necessary for women in Ambedkar gram & Non-Ambedkar Grams.

On the basis of above results we can clearly see that either Dalit women's of Ambedkar & Non-Ambedkar grams have equal rights, facilities & awareness level related to healthcare, children's future, education, income etc. or Dalit Women's of Ambedkar gram have more facilities & awareness. Thus Condition of Ambedkar grams are said to be more improved as compare to Non-Ambedkar grams on the basis of health, income, education, decision making & political rights.

Apart from the sign of rise in living conditions of Ambedkar grams, there is still a need to pay more attention on several issues like:

- Voting Independence is still low in Non-Ambedkar grams
- Awareness related to benefits for Below Poverty Line Families
- To aware women's related to importance of women's education
- Awareness level about laws is very low in Non-Ambedkar gram

### VIII. LIMITATION AND SUGGESTIONS

Like several other studies in other sciences the present study has also certain constraints the data is restricted BKT block of Lucknow region. The study could have being done on different levels of dalits women in Ambedkar and Non Ambedkar gram. The Psychographic variable where not study which may have affected the result. It is believed that lake of attention to moderate variable constitute a major limitation of earlier research in this area.

In a move that will lead to empowerment of Dalit women in Uttar Pradesh, the Mulayam Singh government has decided to enroll Dalit women in the Prantia Rakshak Dal. The Prantiya Rakshak Dal (PRD) is a statelevel protection force that is usually deployed to maintain law and order in villages, in large congregations like the Kumbh Mela and during elections. The strength of the PRD force in UP is 24,000 and PRD jawans are sent for refresher training every three years. This will be the first time that women will get a chance to be a part of the PRD which, till now, is an all male force. The state government has now cleared the way for enrolment of more than 500 Dalit women in the PRD and recruitment will begin shortly from the district to the block level. Talking to this newspaper on Saturday, a senior official of the PRD department said, "This is being done for the first time to empower Dalit women in the age group of 20 to 30. Under the gender budgeting programme, nearly 30 per cent of the PRD force will comprise of women. In the coming assembly elections, people will see Dalit women dressed in khaki PRD uniforms deployed at polling booths". The state government believes that this decision will not only instill confidence in Dalit women but will also take them away from traditional menial jobs.

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# Effect of Marital Adjustment in Middle-Aged Adults

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**Abstract-** The purpose of the present investigation is to analyze marital & emotional adjustment in middle aged couples. The sample consisted of 124 respondents, out of which 62 were males and 62 females (mean age= 50 to 65), who were financially independent from their offspring. To measure adjustment Old-age Adjustment Inventory (SJOAI) created by Dr. Shamshad Hussain and Dr. Jasbir Kaur was used. The inventory measures problems of marital & emotional adjustment faced by middle aged couples. The data were analyzed using descriptive statistics, t-test analysis. There were found significant differences between two genders (male and female) in the marital & emotional adjustment. The result of the study revealed that there is a significant impact on males' as well as females' adjustment level.

**Keywords:** Marital adjustment, emotional adjustment, middle aged couples.

## I. INTRODUCTION

Middle life is generally a time period of higher fulfillment, better health, more authority and greater financial stability than any other stage of life. Adults in middle life may care and support responsibilities for both younger generations (children who are not quite on their own) and older generations (parents who are starting to decline). There are physical and psychosocial changes associated with this time period that is different for women and for men. However, a primary change in thinking that defines middle life for both women and men is the real belief in mortality (ushered in by body sensations, major illnesses, or death of parent) coupled with an acceptance of the shrinkage of possibilities for the future. Individuals who feel stress associated with this process may go through "mid-life crisis".

Mid-life crisis is a controversial issue; some people believe in it and others think it is a myth. It is generally considered as the result from recognition that future possibilities have diminished and all goals and dreams set earlier in life will not be met. For some people this does not cause stress and results in a sense of relief and no crisis. Others focus on mortality, become attached to the idea that more time has gone by than remains, see the beginnings of physical decline, and feel stress at the fact that they are not where they want to be in life. This stress may lead to actual grief and depression. These people make seemingly dramatic changes, searching for youth, new relationships, and/or new careers in an attempt to get to where they want to be in life. People who argue against the concept of mid-life crisis believe that this generally takes place with people who are more restless to begin with, that these changes are consistent with the person's tendencies upon self-reflection, and there is no change in personality.

When people come in the age group of 40-65 years, most of them are financially secure. They have children who are almost independent. People during this period of their life are at the best of their health physiologically, happy, content and peaceful. It is hard to deny the fact that during this phase of life people get more stressed. It is a transition period. There are changes in physical appearance along with emotional and physiological changes in the body. The exterior look of an individual changes slowly. At this stage of life children get settled elsewhere and the house gets vacated. Many couples consider this to be a difficult period of their life. Though for some it is different, it is a time when success speaks. At this phase of life the middle aged couples rise up in their career, enjoying authority and prestige. For many this may be a period of financial as well as social success and well-being.

Comprehensive study of husbands and wives investigated some of the factors that contributed to marital satisfaction. Some of their findings revealed existing social, cultural, educational level the greater satisfaction. Occupation and income, which are often thought to be associated with levels of satisfaction, have no relationship with it. The number of children too affects marital satisfaction. There is evidence that the pressures of managing multiple roles in women are the greatest, and the psychological benefits of employment are the least, under conditions of heavy family responsibilities that is, when young children are at home. But beyond specific factors such as these, what is important to marital satisfaction over the course of marriage is the ability of partner to adjust to a variety of changes and to cope with a number of stresses. Marital role can be defined as set of attitudes and behaviors a spouse is expected to demonstrate in the content of the marriage relationship. A marital role comprises cultural expectations associated with the husband or with a wife. A husband is considered as head of family while wife is expected to make home and companion, or the wife may be expected to be the strong one, upon whom the husband can rely.

Perhaps half of the adults suffering from severe stress blame the deteriorating relationships on their spouse. Looking at the growing rate of divorces, court cases for alimony, physical abuses and single parents; it does seem as if handling a relationship can be a tricky and often taxing issue. The possible causes can be endless. More often than not, stress arising from marital relationships is manifested in chronic disorders such as depression, insomnia and hypertension. Since a relationship depends on the nature of the persons involved, it helps to seek the middle path when the inherent individual differences surface. It often helps to change one's attitude, go for counseling or talk openly with your spouse about problems facing your relationship.

Depression in a spouse is an issue that most couples will face at some point in their marriage. Depression is a normal and

natural response to loss or grief, whether a death, separation from a loved one, job loss, loss of physical health, or relocation. Marital distress and relationship conflict also contribute to depression. Symptoms of depression include feelings of sadness, hopelessness, helplessness, anxiety, irritability, agitation, fatigue, low energy, and a reduced activity level are common, and there is also withdrawal from social contact and loss of interest in previously enjoyed activities, including sex. There may be changes in appetite, weight or sleep patterns, memory problems or difficulty concentrating. Often there are feelings of worthlessness or inadequacy and a lowered sense of self-esteem. In more serious cases there may be suicidal thoughts or a feeling that "life is not worth living" (Comer, 1996). Married women have higher rates of depression than unmarried women, but the reverse is true for men. Marriage seems to confer a greater protective advantage on men than on women. Marital adjustment and depression are strongly related. In a research, collected data on 695 women and 530 men and then re-interviewed them up to 1 year later. During this a number of participants separated from or divorced their spouses though the majority reported stable marriages. Approximately 21% of the women who reported marital split during the study experienced severe depression, a rate three times higher than that from women.

Married couples with vital relationships are most likely to experience continued, positive interactions within marriage. Those who enjoy spending time together and can confide in each other usually maintain a close and giving relationship as they age. However, those couples who are unsatisfied in the earlier years of their marriage tend to have a negative experience in later life. Their relationships are difficult, their communication conflictual and unrewarding.

There is often a shift in roles between women and men in middle life called the midlife cross-over that strongly affects marriage. At middle adulthood, there is a direct reversal as women come into their own with greater importance placed on work/career and personal goals and men become more aware or more needful of intimacy. While divorces are most common during the first 4-7yrs of a marriage, the second most frequent period is at midlife. Divorce is often linked to infidelity with 60-70% of men and 20-30% of women engaging in infidelity at some point in life. There is a high rate of remarriage in midlife, especially among men.

The two-career partners are more challenged and are required to make greater efforts and adjustments while attempting to strike a balance between the simultaneous demands and pressures of two important areas, viz. their careers and their family. The study by Elloy & Smith (2003) shows that dual career couples experience higher levels of stress, family conflict, overload, role ambiguity and role conflict than single career couples. The risk for conflict between the two roles becomes all the more serious because individuals in such relationships have to face simultaneous and conflicting demands and pressures of two careers with that of family (Adams, King, & King, 1996, Frone, Russell & Cooper, 1992).

Moss and Schwebel (1993) found 61 unique definitions of intimacy. Definitions have ranged from being simple and one-dimensional to complex and multidimensional. Early research often defined intimacy as self-disclosure, or simply being married. More recent research has conceptualized intimacy as

consisting of many dimensions, for example love, sexuality, and emotional disclosure. It has also been acknowledged that intimacy may exist in friendships and other non-romantic relationships.

Prager (1995) proposed a multi-component definition of intimacy which incorporates aspects of many of the existing conceptualizations. Prager believes that intimacy has both a behavioural and emotional component. The behavioural component consists of activities which people engage in together, such as touching and talking, whereas the emotional component inches feelings of love and togetherness. The relationship of intimacy to marital satisfaction and sexuality has not been clearly identified. Generally, however, researchers agreed that intimacy is related to these concepts. It also appears that the emotional component of intimacy is the most important in the prediction of marital satisfaction (Schaefer & Olson, 1981; Tolstedt & Stokes, 1983). Feeling understood by and loved by one's partner seems to be an integral part of satisfactory marriages for both men and women. The relationship of intimacy to sexuality is even less clear than that of intimacy to marital satisfaction. Research has shown that intimacy is related to sexual satisfaction, however the extent of the relationship, and how specific intimacy dimensions affect sexuality has rarely been studied (Patton & Waring, 1985; Fortin & Theriault, 1995).

## II. MID-AGE ADJUSTMENTS

It is important to adjust naturally with the transitions that occur both physically and mentally. There are challenges which should be met and coped with successfully. At this age it is good to look at the world with new prospective and changed interests. Some may find this adjustment stage really difficult and hard to cope with. Following are some of these important changes and adjustments which are faced in middle age.

### A. Marital Adjustment

It can be seen that the phenomenon of marital adjustment is given a priority in all cultures, as marriage is one of the most important commitment of an individual makes in his or her life. A good marriage not only produces a satisfied life but it also generates a sense of well-being. In west, marriage is often considered as the centerpiece in ideological claims about the 'decline of family values'. Marital adjustment has been related to personality, job & home stresses, mental illness, depression, education, sex role attitude, happiness and success in life.

Sinha and Mukerjee (1990), defines marital adjustment as, "the state in which there is an overall feeling between husband and wife, of happiness and satisfaction with their marriage and with each other."

All the marriages are aimed at happiness in one or another way. Most couples marry filled up with expectations. Some of the expectations will be realistic while others unrealistic. Marital adjustment calls for maturity that accepts and understands growth and development in the spouse. If this growth is not experienced and realized fully, death in marital relationship is inevitable. A relationship between couples is not instantaneous rather a slow progress.

There is a list of six areas of marital adjustment, which is defined by the psychologist, such as, religion, social life, mutual friends, in laws, money and sex. Another psychologist defines

ten areas of marital adjustment, i.e. values, couple growth, communication, conflict resolution, affection, roles, cooperation, sex, money and parenthood. A study on marriage and marital adjustment in USA presents social activities and recreation, training and disciplining of children, religion, in law relationship, financial matters, sexual relationship, communication, mutual trust and companionship as the areas of marital adjustment.

### *B. Emotional Adjustment*

Emotional behaviors expressed by couples differed as a function of age, gender, and marital satisfaction. The intensity of the middle-age intimacy crisis depends on the need-satisfaction of the relationship and particularly on the success achieved in the previous stages of intimacy. Older adults are biased toward the positive aspects of close relationships (Story, Nathan T. et. al 2007), emotionally positive and responsive listening one of the key to successful conflict resolution in marriage (Pasupathi, Monisha et. al. 1999).

Carl Jung described the developmental task of the second half of life as the need to develop neglected inner resources and enrich the inner life which may result in the impoverishment of the inner life - the world of feelings, values and inner creativity. Failure to accept the changes may lead to grievously traumatic situations like mental illness, use of drugs, addiction problems, alcoholism and at times suicide or homicide.

In older couples, the resolution of conflict was less emotionally negative and more affectionate than in middle-aged marriages. Differences between husbands and wives and between happy and unhappy marriages were also found. Wives were more affectively negative than husbands, whereas husbands were more defensive than wives, and unhappy marriages involved greater exchange of negative affect than happy marriages.

Couples engage in naturalistic discussions about important topics related to their relationship. These interactions are studied to determine if there are signs in emotional experience, behavior, language, and physiology that can be used to discriminate between the interactions of couples who are satisfied and dissatisfied with their relationships, to discriminate between couples at different stages of the life span, and to predict what will happen to the level of couples' relationship satisfaction over time. What kinds of couples fare well as they cope with these transitions and what kinds of couples fare poorly.

Unlike many other aspects of human functioning which show pronounced declines with age (e.g., memory, psychomotor skills), many aspects of emotional functioning appear to be relatively spared as we age, and some even show signs of continuing improvement and positive development in late life.

Adams, Gary et al. (1996) data came from 163 workers who were living with at least 1 family member. Results suggested that relationships between work and family can have an important effect on job and life satisfaction and that the level of involvement the worker assigns to work and family roles is associated with this relationship. The results also suggested that the relationship between work and family can be simultaneously characterized by conflict and support. Higher levels of work interfering with family predicted lower levels of family emotional and instrumental support. Higher levels of family

emotional and instrumental support were associated with lower levels of family interfering with work.

Daniel Shek (1999) perceived health status in 378 Chinese married couples over 2 years was examined. Results showed that marital adjustment and marital satisfaction were concurrently related to midlife crisis symptoms, life satisfaction, and perceived health suggest that the relationships between marital quality and health measures are bidirectional in nature. While marital quality predicted changes in midlife crisis symptoms in husbands, but not in wives, marital quality predicted changes in perceived health status in wives, but not in husbands. Results also showed that mental health influenced the marital adjustment of the wives, but not the husbands, over time.

Skowron and Elizabeth (2000) this American study based on couples' levels of differentiation explained substantial variance in marital adjustment: 74% of variance in husband marital adjustment scores and 61 % of variance in wife marital adjustment scores were accounted for by couple differentiation of self-scores. Greater husband emotional cutoff uniquely accounted for husband and wife marital discord. Contrary to family systems theory, actual couples were no more similar on differentiation than were randomly matched couples. Finally, greater complementarity among couples along the specific dimensions of emotional cutoff and emotional reactivity predicted greater marital distress.

Isaac and Shah (2004) in a study based on 20 distressed and 20 non-distressed couples from a marital and family therapy center in the city of Bangalore, India, revealed that: (a) the group as a whole showed greater femininity than masculinity; (b) more non-distressed individuals show high androgyny; (c) androgynous dyads show better marital adjustment; and (d) qualitative analysis suggests a trend for couples to move towards more gender-neutral constructions of marriage, indicating a link between androgyny and marital adjustment and type of match between dyads.

Story, Nathan et al (2007) this American study based on 270 middle-aged (40-50 years old) and older (60-70 years old) couples who discussed a marital disagreement and completed an errand task. The results are consistent with theories of emotion regulation, such as socio emotional selectivity theory, that suggest that older adults are biased toward the positive aspects of close relationships.

Hashmi, Khurshid & Hassan (2007) the study is exploring the relationship between marital adjustment, stress and depression. Sample of the study consisted of 150 working and non-working married women (working married women = 75, non-working married women = 75). Their age ranged between 18 to 50 years. Results indicated highly significant relationship between marital adjustment, depression and stress. The findings of the results also show that working married women have to face more problems in their married life as compared to non-working married women. The results further show that highly educated working and non-working married women can perform well in their married life and they are free from depression as compared to educated working and non-working married women.

Seider, Herschel (2011) this study examined middle-aged (N = 82) and older (N = 74) couples, in California, engaged in a 15-minute conflict conversation to determine how discrete emotion sequences between spouses were related to marital satisfaction. It

further examined whether age and gender moderated the relationships between discrete emotion sequences and marital satisfaction. The study focused on discrete emotion sequences initiated by three antecedent emotions (anger, contempt and sadness) previously associated with distressed marriages. Results revealed significant associations between discrete emotion sequences and marital satisfaction for 11 of the 39 discrete emotion sequences examined. The findings indicated that the relationships between discrete emotion sequences and marital satisfaction did not consistently differ as a function of age, but when they did, they tended to be stronger for older couples. This study revealed important differences in how discrete emotion sequences relate to marital satisfaction.

Dr. Goel and Dr. Narang (2012) this research studied marital adjustment, mental health and frustration reactions in males and females of middle age, from Delhi, India. The sample comprised of 150 males and 150 females (n=300) which are bank employees, doctors and lecturers, within the age range of 40-55 years from Delhi, India. It was seen that Females showed high level of recreational adjustment as compared to males but males were having better group oriented attitude than females.

### III. METHODOLOGY

#### Objectives

1. To study Marital & emotional adjustment in middle aged couples,
2. To study the adjustment pattern in middle aged couples.

#### Delimitations

- Samples are collected from Banastali University campus, this research is area specific.
- The research is focused upon low income group population, which includes mess workers, watchman, shopkeeper, mechanic, library workers, horse barn workers and gardeners.

#### Sample

The sample consisted of randomly selected 124 respondents, (62 males and 62 females mean age range= 50 to 65) which are mess workers, watchman, shopkeeper, mechanic, library workers, horse barn workers and gardeners; who are financially independent from their offspring. Subjects from only low socio-economic status were selected. Individuals in this sample were only married couples.

#### Measures

Old age adjustment inventory, developed by Shamshad Hussain and Jashbir Kaur was used in this study. This inventory was developed for male and female ranging between 50 to 65 years of age belonging to different professions. This 125 items inventory measures the adjustment of old aged people into two areas-marital and emotional. Percentile norms are available sex wise and professional status wise.

#### Reliability of the Test

The obtained indices of different type of sampling schemes are as follows:

Validity	Item Analysis	Norm Construction	Reliability
N=100	N=375	N=100	N=100

### IV. RESULTS

Table 1: Means, Standard Deviations and t-value of Scores of males and females marital adjustment on SJOAI (Shamshad-Jasbir Old-age Adjustment Inventory) (N=124)

	Gender	Mean	SD	Significance
Marital	Males	11.93548387	2.455311858	0.001***
	Females	9.258064516	4.427690379	

Table 2: Means, Standard Deviations and t-value of Scores of males and females emotional adjustment on SJOAI (Shamshad-Jasbir Old-age Adjustment Inventory) (N=124)

	Gender	Mean	SD	Significance
Emotional	Males	13.87096774	3.091415247	0.001***
	Females	11.87096774	3.471116752	

(n=100) health, home, social, marital, emotional and financial  
\*\*\*Highly Significant at 0.001level

The table depicts that significant relation of parameters were found in marital and emotional adjustment of males and females in middle aged. Marital and emotional parameters have highly significant relation on marital adjustment in middle aged. As the mean value of marital adjustment in men (11.93) and in female (9.25) and the mean value of emotional adjustment in men (13.87) and in female (11.87) which is higher significant value the indicating that males make high level of adjustment than females.

The mean marital adjustment scores of these two genders were then compared. The Table-1 reveals that there is a significant difference between male and female i.e. high level of marital adjustment in males (Mean value = 11.93 and S.D. = 2.45) and low level of marital adjustment in females (Mean value = 9.25, S.D. =4.42) in comparison to high companionship of spouse group.

The result of the present study shows the significant at 0.001level. The investigation therefore concludes that there is a positive significant effect of marital adjustment between males and females.

### V. DISCUSSION AND CONCLUSION

Working females have to play dual roles as they are employed outside house. They shoulder more responsibilities than males, adjust their time and energy for children, spouse, and household activities, religious and social activities. They seek contentment and recreation out of all these activities performed and makes adjustment accordingly. This can be supported by Powers, Myers and Tingle (2004) studied 83 individuals (42 couples) living in medical marriage. Results revealed that resident spouses scored higher than the general married population on wellness, mattering, and satisfaction with shared marriage values and scored lower on work satisfaction and realistic beliefs. Barling

(1986) in a study on "inter role conflict and marital functioning" found that conflict regarding work and family roles was associated with lower levels of marital adjustment among dual earner couples.

In contrast, males are more mentally healthy than females. A balance of psychic forces in the males shows sound mental health. Ability to understand and to share other people's emotions, the ability to concentrate at work and interest in several activities in middle aged males results in good adjustment with spouse and with the family members. They always have an inner feeling to spend quality time with their spouse, take care of and satisfy sexual needs of the partner. They have concern and feel responsible for needs of the family members and for smooth functioning of the family, they are able to make equal role distribution among the family members. They try to maintain balance between family and society. During middle age the males have less family responsibilities (as the children are grown up or settled down) and would also desire to spend some time for social work or welfare activities. It leads to their overall life satisfaction.

Hill (2005) conducted a study on 1,314 individuals and found that work to family facilitation was positively related to job satisfaction and life satisfaction, and negatively related to individual stress. Family to work facilitation was positively related to marital satisfaction, family satisfaction and life satisfaction, and negatively related to organizational commitment. Working fathers reported long work hours (49 hours / week), major involvement in household responsibilities (46 hours / week), and a work culture less supportive of their family life than working mothers reported. However, working fathers reported less individual stress, and greater family satisfaction, and life satisfaction than working mothers.

#### *Principal Implications of the Study*

This study has very deep social implications to strength the marital bonds between the working couples. This can help / suggest the following points:

1. The middle aged couples to develop patience and tolerance and understanding for each other.
2. The importance of recreation, role distribution for smooth functioning marriage life.
3. Working couples to owe respect and equality rights to each other regarding financial and family matters with special reference to females.

#### *Suggestions*

1. This study was conducted to see the middle age crisis in adulthood regarding effect of marital adjustment. Further investigation may be undertaken to find out other factors affecting marital adjustment in middle adulthood.
2. Sample of present investigation was drawn only from Banasthali University, Rajasthan State of India.
3. Further revitalization programs could be undertaken for the identified martially maladjusted couples.
4. Similar research study can be undertaken on a sample belonging to different communities and cultures like Hindu, Muslim etc.

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# Gender gaps and Women's Empowerment in India – Issues and Strategies

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**Abstract-** Gender equality is considered a critical element in achieving social and institutional change that leads to sustainable development with equity and growth. Inequalities between men and women manifest themselves in all areas of development. Inequalities are most obvious in: health and education, economic development, violence against women, participation in public life and policymaking and social attitudes and gender stereotyping. Health discrimination against women in India starts early and is evident in the skewed sex ratio of 933 women to 1,000 men (world average: 990:1,000). Maternal mortality in India is the second highest in the world and close to 125,000 women die due to pregnancy and pregnancy-related illnesses every year. In rural areas, 60% of girls are married before the age of 18, and 60% of married girls bear children before they are 19. Almost one-third of babies are born with low birth weight because of poverty, early marriage, malnutrition and lack of healthcare during pregnancy. In the education sector, the inequalities observed are: Around 245 million Indian women cannot read or write and they form the world's largest number of unlettered women. Female literacy is 54.16, and there are wide disparities within states. Enrolment and retention of girls in education is poor and the average years of schooling for girls is only 1.2 years as against 3.5 years for boys. Girls miss school because they have to look after siblings. A look at the economic development sector indicates that, official data does not reflect the amount of work that women actually do to enable their families to survive, collecting fuel, fodder or water, keeping poultry, working as unpaid labour on family farms. Women also work in home-based industries, bidi and agarbatti-rolling, bangle-making, weaving, etc. without social security benefits and are lowly paid for

this informal work which forms an important part of the family's income. One-third of agricultural workers are women and many crops depend on extensive labour provided by agricultural labour, yet when it comes to wages, on an average, their wages are 30% lower than men's wages. The present study analyses the gender gaps and lists out the strategies in the Twelfth Five Year Plan of Government of India for women's empowerment. The Twelfth Plan endeavours to increase women's employability in the formal sector as well as their asset base. It aims to improve the conditions of self employed women with a focus on women's workforce participation particularly in secondary and tertiary sectors, reaching out to women in agriculture and manufacturing, financial inclusion, and extending land and property rights to women. One of the major impediments affecting women's participation in the workforce is the lack of skills. The Twelfth Plan envisages a major scaling up of skill development to promote skill development of women from traditional skills to emerging skills, which help women break the gender stereotypes and move into employment requiring higher skill sets.

**Key Words:** gender gaps, empowerment, gender gap index

## Introduction

Rural women and girls have many roles and many responsibilities. They are farmers, care-givers, wage labourers and micro-entrepreneurs and they often spend many hours fetching water and collecting firewood. The empowerment of women is fundamental to reduce poverty, hunger and malnutrition. Gender equality and women's empowerment are important factors for the social and economic development of a nation. The promotion of gender equality and empowering of women is one of

the eight Millennium Development Goals (MDG) to which India is a signatory.

### Gender gap

The differences between women and men, especially as reflected in social, political, intellectual, cultural, or economic attainments or attitudes. The Global Gender Gap measure was introduced by the [World Economic Forum](#) to examine four critical areas of inequality between men and women:

1. **Economic participation and opportunity** – outcomes on salaries, participation levels and access to high-skilled employment
2. **Educational attainment** – outcomes on access to basic and higher level education
3. **Political empowerment** – outcomes on representation in decision-making structures
4. **Health and survival** – outcomes on life expectancy and sex ratio

The Gender Gap Index assesses countries on how well they are dividing their resources and opportunities among their male and female populations, regardless of the overall levels of these resources and opportunities. India ranks 123 in terms of economic participation, 121 in educational attainment, 134 in health and survival and 17 in political empowerment.

India, with 1.3 million elected women representatives, has the largest number of women participating in local governance among the Asian countries, exceeding its own 33% reservation. A study of Indian local governments by Munshi and Rozenweig (2008) said that women in local government roles came out with better outcomes for communities in budgetary decisions and were more competent in procuring resources despite significantly lower education and labour market experience, so politically empowering women is a good thing.

### Examples of gender indicators

#### International indicators

##### 1. The Millennium Development Goals (MDGs)

A framework for incorporating gender equality across the MDGs: Many practitioners and policymakers agree that gender equality and women's empowerment are central to the achievement of each of the MDGs, and the achievement of Goal 3 in turn

depends upon the extent to which the other goals address gender-based constraints.

##### Goal 3. Promote gender equality and empower women

This central goal dedicated to gender equality and women's empowerment depends on the achievement of all other goals for its success.

##### 2. The Gender-related Development Index and Gender Empowerment Measure

The **Gender-related Development Index (GDI)** adjusts the Human Development Index (HDI) for gender inequalities in the three dimensions covered by the Human Development Index (HDI), i.e. life expectancy, education, and income. It is important to note that the GDI is not specifically a measure of gender inequality.

The **Gender Empowerment Measure (GEM)** seeks to measure relative female representation in economic and political power. It considers gender gaps in political representation, in professional and management positions in the economy, as well as gender gaps in incomes.

The GDI and GEM need to be used with **caution**: they are useful in their capacity to identify gender gaps in developing countries, rather than an overall picture of growth or education.

##### Composite Indices

International composite indices to measure gender equality have been developed, partly to complement and expand on the GDI and GEM. For example, Social Watch's **Gender Equity Index (GEI)** combines indicators from both the GDI and GEM, with a separate gender equality rating estimated for three dimensions (Social Watch 2005):

- **Education**: measured by the literacy gap between men and women and by male and female enrolment rates in primary, secondary and tertiary education.
- **Participation in the economy**: measured by the percentage of women and men in paid jobs, excluding agriculture, and by the income ratio of men to women.
- **Empowerment**: measured by the percentage of women in professional, technical, managerial and administrative jobs, and by the number of seats women

have in parliament and in decision-making ministerial posts.

### **Gender Gaps in selected sectors in India**

The gender gaps with respect to education, health and economic sector have been discussed as follows.

#### **Educational Sector:**

There is a wide gender disparity in the literacy rate in India: effective literacy rates (age 7 and above) in 2011 were 82.14% for men and 65.46% for women. The census provided a positive indication that growth in female literacy rates (11.8%) was substantially faster than in male literacy rates (6.9%) in the 2001–2011 decadal period, which means the gender gap appears to be narrowing table 1.

#### **Children's school attendance**

- Only two-thirds of girls and three-fourths of boys' age 6-17 years are attending school. The sex ratio of children attending school is 889 girls per 1,000 boys.
- There is gender equality in school attendance in urban areas; but, in rural areas, the female disadvantage in education is marked and increases with age.
- Age-appropriate school attendance is lower than any school attendance for both boys and girls. However, boys and girls who are in school are about equally likely to be in an age-inappropriate class.
- School dropout beyond primary school is a major problem for both girls and boys.

#### **Literacy and educational attainment among adults**

- Gender disparity in literacy is much greater in rural than in urban areas and declines sharply with household wealth.
- Forty-one percent of women and 18% of men age 15-49 have never been to school.
- Educational attainment remains very low: even among the 20-29 age group, only 27% of women and 39% of men have 10 or more years of education.

#### **Health Sector:**

Discrimination against women in India starts early and is evident in the skewed sex ratio of 943 women to 1,000 men (Census 2011) has been presented in table 2. This is attributed to the cultural bias in favour of male children, which results in the [abortion of female foetuses](#). Other causes are the social neglect of women and girls, manifested in less access to nutrition and healthcare, and in high maternal mortality. Maternal mortality in India is the second highest in the world, at 385-487 per 100,000 live births. Close to 125,000 women die due to pregnancy and pregnancy-related illnesses every year. In rural areas, 60% of girls are married before the age of 18, and 60% of married girls bear children before they are 19. Almost one-third of babies are born with low birth weight because of poverty, early marriage, malnutrition and lack of healthcare during pregnancy.

#### **Key Findings**

- The sex ratio (females per 1,000 males) of the population age 0-6 and in the sex ratio at birth for births in the five years preceding each survey.
- Females are under-represented among births and over-represented among births that die.
- Sex ratios at birth decline with wealth, suggesting that sex selection of births is more common among wealthier than poorer households.
- Ultrasound tests are being widely used for sex selection, with sex selection being more evident for the wealthiest women than for women in the other wealth quintiles.
- Sex ratios of all last births and last births of sterilized women show clearly that couples typically stop having children once they have the desired number of sons.
- The child mortality rate, defined as the number of deaths to children age 1-4 years per 1,000 children reaching age 1 year, is 61% higher for girls than for boys.

#### **Economic Sector:**

Women, as half of the human capital of India, will need to be more efficiently integrated into the

economy in order to boost India's long term competitive potential. The census does not accurately identify many activities as work that women actually do to enable their families to survive collecting fuel, fodder or water, keeping poultry, working on family land etc. Women also work in home-based industries, bidi and agarbatti-rolling, bangle-making, weaving, etc. They do not get social security benefits and are paid very low wages for this informal work. One-third of agricultural workers are women. On an average, their wages are 30% lower than men's wages. Women find it difficult to get credit from banking institutions because they are often unable to provide collateral. They get much smaller loan amounts even though their repayment record is much better than that of men. Women's right to land and other assets is weak. Though legislation has been introduced to ensure that women share equally in ancestral property, enforcing such rights in a patriarchal society requires resources that poor women may not have. The work participation rate and gender gaps have been presented in table3 and 4.

## Employment

### Key Findings

- Women age 15-49 are about half as likely as men in the same age group to be employed: 43% vs. 87%.
- Women in rural areas are more likely than women in urban areas to be employed; but the reverse is true for men.
- The relationship of employment and wealth for women suggests that, for many women, employment is largely a result of economic necessity.
- Marriage is negatively associated with a woman's likelihood of being employed and is positively associated with a man's likelihood of being employed.
- Most employed women work for someone else, away from home, and continuously throughout the year; about one in three women do not receive monetary compensation for

their work or receive at least part of their payment in kind.

- Most employed women work in agriculture; only 7% work in professional, technical, or managerial occupations.

## Gender Pay Gap in India

Various Articles of the Constitution of India attempt to ensure that there is no prevalence of gender pay gap. Specific legislations also address gender pay gap. These articles of the Constitution are as follows:

- **Article 14:** Men & women to have equal rights & opportunities in the political, economic & social spheres.
- **Article 15(1):** Prohibits discrimination against any citizen on the grounds of religion, race, caste, sex etc.
- **Article 15(3):** Special provision enabling the State to make affirmative discriminations in favour of women.
- **Article 16:** Equality of opportunities in matter of public appointments for all citizens.
- **Article 39(a):** The State shall direct its policy towards securing all citizens men and women, equally, the right to means of livelihood.
- **Article 39(d):** Equal pay for equal work for both men and women
- **Article 42:** The State to make provision for ensuring just and humane conditions of work and maternity relief.

The analysis of gender pay gap in India based on a voluntary online Salary Survey conducted by Paycheck India with 16,500 online observations (13,729 males and 2771 females) indicated that a wide gender pay gap exists in India. The average gender pay gap is approximately 54% for years 2006 to 2011. The data also revealed that gender pay gap has narrowed over the years. It was above 70% before 2008 and has come down to almost 40% in 2011. Gender pay gap changes with increase in wages, for wages below Rs1 Lakh and above Rs 50 Lakhs, the gender pay gap is negligible. However, for the wage group between Rs 1 Lakh to Rs 50 Lakhs the gender pay gap is above 40%. The pay gap increases with age,

the gender pay gap is highest for the age group 50-60 years at 157% and lowest for the age group 20-30 years at 38.

It was observed that as the education level increases, the gender pay gap increases in most of the cases. The gender pay gap is lowest for Plus 2 or equivalent education level at 11.54% and is highest for Post Doctoral Education level at an alarming 180. Data reveals that men and women with same work experience are not paid equally. Gender pay gap is low at junior level and high at senior levels. The extent of gender pay gap also depends on the occupation data shows that the gender pay gap is highest for health professionals at more than 65%. It is lowest for cleaners and helpers under elementary occupations at just a little above 1%. It is also worthy to note that the gender pay gap is remarkably low for information and communication technicians at only 4.37%.

Marital status is also one of the factors for gender pay gap. For women who were single, the gender pay gap is the lowest at 27%. It increases for married women and divorced women at a little above 40%. It is highest for widowed women at more than 60. The gender wages gap varies across Indian States. The gender wage gap is highest in the state of Assam and Rajasthan at 64% and 59% respectively. The gap is relatively low in the southern part of India. The gender wage gap is lowest for New Delhi at 20%.

### **Programs, Mission and Strategies for Empowerment of Women**

A few of the Programs, Missions and special provision for women's empowerment being adopted by the Government of India have been discussed below.

### **National Mission for Empowerment of Women India**

The National Mission for Empowerment of Women (NMEW) was launched by the Government of India (GOI) on International Women's Day in 2010 with a view to empower women socially, economically and educationally. The Mission aims to achieve empowerment of women on all these fronts by securing convergence of schemes/programmes of different Ministries/Departments of Government of India as well as State Governments. The Mission utilises existing structural arrangements of

participating Ministries wherever available and partners with Panchayati Raj Institution (PRIs) in implementation of activities. In light with its mandate, the Mission has been named Mission Purna Shakti, implying a vision for holistic empowerment of women.

### **Focus areas of the Mission**

- Access to health, drinking water, sanitation and hygiene facilities for women
- Coverage of all girls especially those belonging to vulnerable groups in schools from primary to class 12
- Higher and Professional education for girls/women
- Skill development, Micro credit, Vocational Training, Entrepreneurship, SHG development
- Gender sensitization and dissemination of information
- Taking steps to prevent crime against women and taking steps for a safe environment for women

### **National Policy for the Empowerment of Women of India (2001)**

#### **Goal and Objectives**

The goal of this Policy is to bring about the advancement, development and empowerment of women. The Policy will be widely disseminated so as to encourage active participation of all stakeholders for achieving its goals. Specifically, the objectives of this Policy include

- (i) Creating an environment through positive economic and social policies for full development of women to enable them to realize their full potential
- (ii) The *de-jure* and *de-facto* enjoyment of all human rights and fundamental freedom by women on equal basis with men in all spheres – political, economic, social, cultural and civil

(iii) Equal access to participation and decision making of women in social, political and economic life of the nation

(iv) Equal access to women to health care, quality education at all levels, career and vocational guidance, employment, equal remuneration, occupational health and safety, social security and public office etc.

(v) Strengthening legal systems aimed at elimination of all forms of discrimination against women

(vi) Changing societal attitudes and community practices by active participation and involvement of both men and women.

(vii) Mainstreaming a gender perspective in the development process.

(viii) Elimination of discrimination and all forms of violence against women and the girl child; and

(ix) Building and strengthening partnerships with civil society, particularly women's organizations.

## **Provisions under twelfth Five Year Plan of India**

### **Economic empowerment**

The Twelfth Plan endeavours to increase women's employability in the formal sector as well as their asset base. It will improve the conditions of self employed women. Focus will be on women's workforce participation particularly in secondary and tertiary sectors, ensuring decent work for them, reaching out to women in agriculture and manufacturing, financial inclusion, and extending land and property rights to women.

### **Skill development**

One of the major impediments affecting women's participation in the workforce, particularly in secondary and tertiary sectors, is the lack of skills. The Twelfth Plan envisages a major scaling up of skill development from traditional skills to emerging skills, which help women break the gender stereotypes and move into employment requiring higher skill sets. Training of women as BPO employees, electronic technicians, electricians, plumbers, sales persons, auto drivers, taxi drivers, masons, and so on will be

incorporated in the skill development programmes. Skill development would be seen as a vehicle to improve lives and not just livelihoods of women.

### **Strategies: A three-pronged approach**

Women can be powerful change agents. Empowering poor rural women involves three critical and interrelated dimensions: expanding access to assets such as capital, land, knowledge and technologies; strengthening decision-making and their representation in community affairs; and improving women's well-being and lessening their workloads.

The lack of basic amenities affects women more than men, as women are often responsible for a larger share of time-consuming household activities. Better electricity and access to water and sanitation may reduce the burden of women in providing essential household inputs for their families, and allow for more time to be directed toward entrepreneurial activities.

According to National Statistical Commission Chairman Pronab Sen, rural women are shifting towards self-help groups and self-employment, which is clear from the percentage of women taking up self-employment rising to 59 per cent in 2011-12 from 56 per cent in 2009-10. Also, it could also be that a large segment of rural women are not being categorised in the employable workforce in the WPR, as their activity may be designated as family household chores (Ashok Gupta 2013).

**John Coonrod (2013)** has suggested the following ways in which programs need to be designed to help and empower women.

**1. Gender analysis.** Too often, gender is an afterthought in project design. Often, mid-project it is discovered that women are not participating and then steps are taken to empower women to participate in a program that simply does not work for them, only adding further burden and anxiety.

**2. Reducing drudgery.** Working on an average twice the hours of men, women don't have time for development. They are the first to rise and the last to go to bed, often with the most backbreaking work:

hauling water and firewood, pounding grain, weeding farms using short-handed hoes and with children on their back, head-carrying produce to market and working as labourers.

**3. Rights awareness.** Many of the women are confined to their households and lack mobility and freedom of association and have no opportunity to learn their rights and take action to improve their lives and those of their family members. Even if they are aware they are not culturally tuned to assert themselves.

**4. Equal leadership.** Women are denied a voice in the decisions that affect their lives. Leadership among women can be greatly accelerated by mentoring, building an organized constituency among the women of the community, leadership training and building federations with other women leaders.

**5. Organize.** Investments in building strong grassroots women's organizations, federations and cooperatives provide women sustainable platforms for advocacy and mutual empowerment.

**6. Functional Literacy.** Eliminating gender differences in access to education and educational attainment are key elements on the path to attaining gender equality and reducing the disempowerment of women. Around 245 million Indian women cannot read or write the world's largest number of unlettered women. Female literacy is 54.16, and there are wide disparities within states.

**7. Financial services.** Women need credit not only for starting or supporting small enterprises, but also for coping with great seasonal fluctuations in family income. Several studies have shown that women spend money, on the health, nutrition and education of children than when men control the money.

**8. Health services.** Access to affordable health services is a fundamental human right for women and their children.

**Table: 1 Literacy rate and Gender gap in India-1951 to 2011**

Census year	Males	Females	Male-female gap in literacy rate
1951	27.16	8.86	18.30
1961	40.40	15.35	25.05
1971	45.96	21.97	23.98
1981	56.38	29.76	26.62
1991	64.13	39.29	24.84
2001	75.26	53.67	21.59
2011	82.14	65.46	16.68

Source: Census of India 2011

**Table: 2 Sex Ratio of Population in India: 2001, 2011**

Residence	2001	2011	Change
Total	933	943	+10
Rural	946	949	+3
Urban	900	929	+29

**Table: 3 Work Participation Rate and Gender Gap India: 2001, 2011**

Residence	Sex	2001 (%)	Gender gap	2011 (%)	Gender gap	Change
Total	Persons	39.1	26.1	39.8	27.8	+0.7
	Males	51.7		53.3		+1.6
	Females	25.6		25.5		-0.1

Source: worked out based on Census Data

**Table: 4 Type of Workers and Gender Gap India: 2001, 2011**

Residence	Sex	2001	Gender gap	2011	Gender gap	Change
Main Workers	Persons	77.8	30.0	75.2	22.7	-2.6
	Males	87.3		82.3		-5.0
	Females	57.3		59.6		2.3
Marginal Workers	Persons	22.2	-30.0	24.8	-22.7	2.6
	Males	12.7		17.7		5.0
	Females	42.7		40.4		-2.3

Source: worked out based on Census Data

[gender-gap-in-rural-development/#sthash.F2p63fz1.dpuf](http://www.intracen.org/gender-gap-in-rural-development/#sthash.F2p63fz1.dpuf)

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# Comparison of Bully Election Algorithms in Distributed System

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**Abstract-** Many distributed algorithms require one process or node to act as leader node in distributed systems. Election algorithms are meant for electing such process or node that acts as leader node also called as coordinator from among currently alive processes in such a way that at any instance of time there will be single coordinator for all the processes in the system. Therefore, election algorithms are very important in any distributed system. Bully algorithm is one of the standard approaches for electing the coordinator in distributed systems. In this paper, we have compared base and efficient version of bully algorithm to minimize the number of messages when electing the coordinator and when a process recovers from a crashed state in distributed systems.

**Index Terms-** Bully Election algorithm, Coordinator message, Election message, OK message, and Process Status table

## I. INTRODUCTION

A distributed system is a collection of processors interconnected by a communication network in which each processor has its own local memory and other peripherals and the communication between them is held by message passing over the communication network [1]. Several distributed algorithms require that there be a coordinator node in the entire system that performs some type of coordination activity needed for the smooth functioning of other nodes in the system. As the nodes in the system need to interact with the coordinator node, they all must unanimously agree on who the coordinator is. In addition, if the coordinator node fails due to some reason (e.g. link failure) then there is a need for electing a new coordinator.

### 1.1 Election Algorithm:

An algorithm for choosing a coordinator to play a distinct role is called an election algorithm. Leader election is a fundamental problem in the distributed systems, [8]. Election algorithms are meant for electing a coordinator process from among the currently running processes in such a manner that at any instance

of time there is single coordinator for all processes in the system.

Election algorithms are based on the following assumptions:

1. Each process in the system has a unique priority number.
2. Whenever an election is held, the process having the highest priority number among the currently active processes is elected as the coordinator.
3. On recovery, a failed process can take appropriate actions to rejoin the set of active processes.

Therefore, whenever initiated, an election algorithm finds out which of the currently active processes has highest priority number and then informs this to all other active processes. Leader election is the process of determining a process as the manager of some task distributed among several processes [7]. Every leader election algorithm must be satisfied by the safety and liveness condition for an execution to be admissible. The liveness condition states that every node will eventually enter an elected state or a non-elected state. The safety condition for leader election requires that only a single node can enter the elected state and eventually, become the leader of the distributed system. Information is exchanged between nodes by transmitting messages to one another until an agreement is reached. Once a decision is made, a node is elected as the leader and all the other nodes will acknowledge the role of that node as the leader.

As we are considering distributed systems, hence, some assumptions also need to make about the communications network. This is very important because nodes communicate only by exchanging messages with each other. The following aspects about the reliability of the distributed communications network should be considered, [3].

1. Messages are not lost or altered and are correctly

delivered to their destination in a finite amount of time; i.e., no communication failure occurs.

2. Messages reach their destination in a finite amount of time, but the time of arrival is variable.
3. Nodes know the physical layout of all nodes in the system and know the path to reach each other.
4. A node never pauses and always responds to incoming messages with no delay.

### 1.2 Bully Election Algorithm:

This algorithm was proposed by Garcia-Molina. In this algorithm, it is assumed that every process knows the priority number of every other process in the system. The algorithm works as follows:

- When a process (say  $P_i$ ) sends a request message to the coordinator and does not receive a reply within a fixed timeout period; it assumes that the coordinator has failed.
- It then initiates an election by sending an election message to every process with a higher priority number than itself. If  $P_i$  does not receive any response to its election message within a fixed timeout period, it assumes that among the currently active processes it has the highest priority number. Therefore it takes up the job of the coordinator and sends a coordinator message to all the processes having lower priority numbers than itself, informing that from now, it is the new coordinator.
- On the other hand, if  $P_i$  receives a response for its election message, this means that some other process having higher priority number is alive. Therefore,  $P_i$  does not take any further action and just wait to receive the final result of the election it initiated.
- When a process (say  $P_j$ ) receives an election message, it sends response message to sender informing that it is alive and will take over the election activity. Now  $P_j$  initiates an election if it is not already holding one. In this way, election activity gradually moves on to the process that has the highest priority number among the currently active processes, eventually wins the election, and

becomes the coordinator.

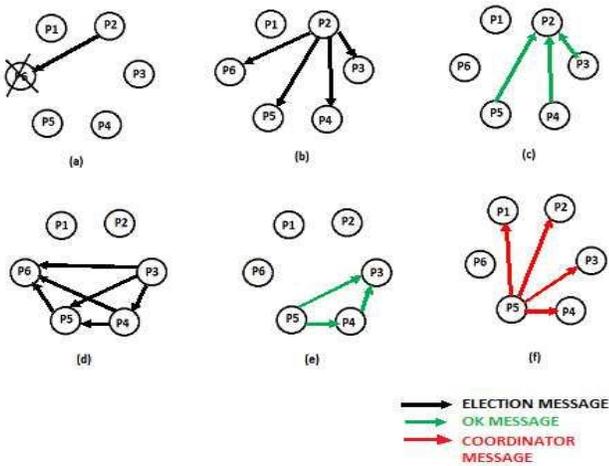
- As a part of recovery action, this method requires that a failed process (say  $P_k$ ) must initiate an election on recovery. If the current coordinator's priority number is higher than that of  $P_k$ , then current coordinator will win the election initiated by  $P_k$  and will continue to be the coordinator.
- On the other hand, if priority number of  $P_k$  is higher than that of current coordinator, it will not receive any response for its election message. Therefore, it wins the election and takes over coordinator's job from currently active coordinator. Therefore, the active process having the highest priority number always wins the election. Hence, the algorithm is termed as **bully algorithm** [1].

The Bully Algorithm proposed by Garcia Molina is based on assumptions that are as follows [1, 7]:

1. It is a synchronous system and it uses timeout mechanism to keep track of coordinator failure detection.
2. Each process has unique number to distinguish them.
3. Every process knows the process number of all other processes.
4. Processes do not know which processes are currently up and which processes are currently down.
5. In election a process with highest process number is elected as coordinator which is agreed by all other live processes.
6. A failed process can rejoin in the system after recovery.
7. The communication subsystem does not fail.

Consider the example in figure 1.1, suppose there are six processes  $P_1$ ,  $P_2$ ,  $P_3$ ,  $P_4$ ,  $P_5$  and  $P_6$  respectively. Among these six processes let  $P_1$  is down and  $P_6$  is the coordinator as it has highest process number. Suppose  $P_2$  wants some service from coordinator and  $P_6$  is crashed. So  $P_2$  comes to know that coordinator is failed due to some reason so it initiates an election. Process  $P_2$  sends election messages to all the processes with higher process number than itself. The live processes with high process number reply with OK message to process  $P_2$ . Now  $P_2$  stops and waits to receive coordinator message. Now processes  $P_3$ ,  $P_4$  and  $P_5$  make elections and among them  $P_5$  wins the election. Now  $P_5$  is the new

coordinator so P5 sends coordinator message to all processes having lower priority.



**Figure 1.1 Election of Coordinator by Garcia**

(a) P2 request service from P6 (b) P2 sends election message to P3, P4, P5 and P6 (c) P3, P4 and P5 send OK message to P2 (d) P3, P4 and P5 initiate election (e) P4 sends OK message to P3, P5 sends OK message to P3 and P4 (f) P5 sends coordinator messages to P1, P2, P3 and P4.

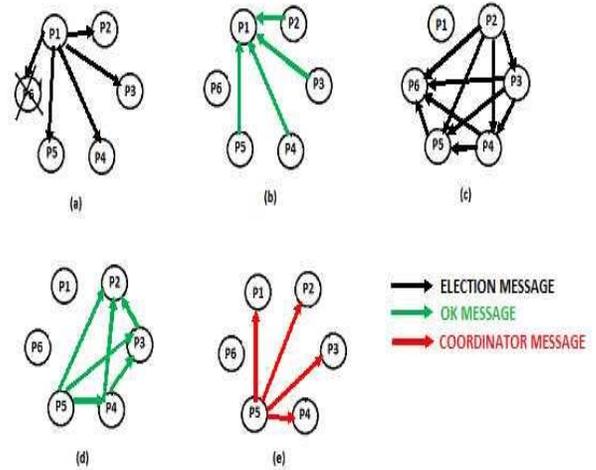
Now suppose process P1 recovers from its failed state and is now unaware about who is the coordinator. As shown in figure 1.2, P1 holds the election by same procedure of algorithm above and P5 wins the election again as shown in figure below. Now if process P6 recovers then P6 knows that it is the process with highest process number so it will simply bully every one and send coordinator messages to all the processes in the system.

The algorithm we discussed above is the base algorithm in which new modifications are made by some authors. The various modifications made to these algorithms are described in section II and in section III, we will be comparing all the methods.

**II. LITERATURE REVIEW**

As the basic well-known bully election algorithm proposed by Garcia Molina large numbers of messages are exchanged due to which traffic in network is increased. So to decrease this number of messages various authors have suggested modifications in this bully algorithm to reduce

number of messages.



**Figure 1.2 Recovery Process by Garcia**

(a) P1 sends election message to P2, P3, P4, P5 and P6 (b) P2, P3, P4 and P5 send OK message to P1 (c) P2, P3, P4 and P5 initiate election (d) P3 sends OK message to P2, P4 sends OK message to P2 and P3, and P5 sends OK message to P2, P3 and P5 (e) P4 sends OK message to P3, P5 sends OK message to P3 and P4.

In paper [2], M. S. Kordafshari, M. Gholipour, M. Jahanshahi, A.T. Haghigat, have proposed optimized method by modifying the Bully algorithm that intensively decreases the number of messages that must be exchanged between processes. Furthermore, the number of stages is decreased from five stages to four stages.

The algorithm works as follows:

- When the process P finds out that coordinator is crashed, sends ELECTION message to all other processes with higher priority number.
- Each process that receives ELECTION messages (with higher process than P) sends OK message with its unique priority number to process P.
- If no process responds to process P, it will broadcast one COORDINATOR message to all processes, declaring itself as a coordinator.
- If some process response to process P by comparing the priority numbers, the process P will select the process with

the highest priority, number as coordinator and then sends to it the GRANT message.

- At this stage, the coordinator process will broadcast a message to all other processes and informs itself as a coordinator.
- Now suppose process P1 recovers from its failed state and is now unaware about who is the coordinator. So P1 holds the election by same procedure mentioned above. it will send election message to all the processes and by comparing their priority numbers it will send GRANT message to higher process number i.e. to process P5 in this case.
- Now if process P6 recovers from its crashed state it will also follow the same procedure. So if we look at traditional bully algorithm then number of stages and number messages being passed is reduced to some extent.

In paper [3], Sandipan Basu has proposed an election algorithm that can be used in distributed systems to elect a coordinator. This is a betterment of an already existing Election algorithm (also known as **Bully Algorithm**) proposed by Hector Garcia-Monila.

The algorithm works as follows:

- When a process (say)  $P_i$  sends a message (any request) to the coordinator and does not receive a response within a fixed timeout period; it assumes that the coordinator has somehow failed. Process  $P_i$  refers to its process status table, to see who is process having the second highest priority number.
- It then initiates an election, by sending an ELECTION message to the process (say)  $P_j$ , having priority just below the failed coordinator; i.e. process with the second highest priority number.

Here two cases may appear:

#### Case 1:

When  $P_j$  receives an election message (from  $P_i$ ), in reply,  $P_j$  sends a response message OK to the sender, informing that it is alive and ready to be the new coordinator. Therefore,  $P_j$  will send a message COORDINATOR to all other live

processes (having priority less than  $P_j$ ) in the system. Hence,  $P_i$  starts its execution from the point where it was stopped.

#### Case 2:

If  $P_i$  does not receive any response to its election message, within a fixed timeout period; it assumes that process  $P_j$  also has somehow failed. Therefore, process  $P_i$  sends the election message to the process (say,  $P_k$ ) having the priority just below the process  $P_j$ . This process continues, until  $P_i$  receives any confirmation message OK from any of the process having higher priority than  $P_i$ . It may be the case that, eventually  $P_i$  has to take the charge of the coordinator. In that case,  $P_i$  will send the COORDINATOR message to all other processes having lower priority than  $P_i$ .

In paper [4], Pawan Kumar Thakur, Ram Kumar, Ruhi Ali and Rajendra kumar Malviya have presented a modified version of existing bully algorithm. It is based on assumptions made bully algorithm.

The algorithm works as follows:

- When a process  $P$  comes to know that coordinator has crashed it sends election messages to all the processes with higher process numbers.
- If process  $P$  doesnot receive any response then  $P$  wins the election but if process  $P$  receives the response (i.e. ok message along with process number of the responder) then process  $P$  will compare process numbers of all message and select highest process number as coordinator. Then process  $P$  will send coordinator messages to all the processes informing who is the new coordinator.
- Now suppose process P1 recovers from its failed state and is now unaware about who is the coordinator. So instead of holding an election process P1 will send query message to process P2 and process P3.
- Now P2 and P3 will give response by sending answer message to process P1. Now P1 will come to know that current coordinator is process P5.
- Now suppose process P6 recovers from its crashed state and process P6 knows that it is the process with highest

process number so it will directly send coordinator messages to all the processes in the system.

In paper [5], S. Mahdi Jameii, Loghman Kiani Shahvandi, Fatemeh Najafi and Payam Kiani Shahvandi have presented a method, which is an enhanced version of bully algorithm. In this, how coordinator can be elected is proposed but on recovery, how the process would rejoin is not specified.

This algorithm works as follows:

Whenever a process finds the coordinator is dead, it sends an election message to a process, which has the biggest number. Considering that the biggest process will be new coordinator, so it's not necessary that other processes to be busy for this problem.

Whenever a process receives the election message, it should introduce itself as a new coordinator. The receiver of message process may be dead such as the coordinator. So if the sender doesn't receive the response, initiator process sends the election message to the next biggest process.

This procedure maybe repeated for several times. If  $P_i$  finds the coordinator is dead, it begins the election algorithm by sending an election message to  $P_j$  that  $P_j$  has biggest number. (If  $P_i=P_j$ :  $P_i$  becomes coordinator). If  $P_i$  receives the response message from  $P_j$ , then  $P_j$  becomes new coordinator and if  $P_j$  doesn't reply to the message ( $P_j$  is dead) then election message is send to process having highest number below  $P_j$  and so on.

In paper [6], Rachna Gajre and Dr. Leena Ragma have presented a method, which is an enhanced version of bully algorithm. This paper tries to reduce network traffic present in distributed systems during leader election and process recovery.

The algorithm works as follows:

➤ suppose Process  $P_i$  wants some service from coordinator, therefore it sends a request to the coordinator  $P_k$ .

➤ Now if process  $P_i$  does not receive a response within a fixed period of time, then process  $P_i$  assumes that the coordinator has somehow crashed. Having a look at the current process table, process  $P_i$  will send an ELECTION message to the process having priority just below the failed coordinator's priority(i.e below  $P_k$ ).

➤ On receiving election message from  $P_i$  process  $P_j$  (let  $P_j$  be the process having second highest priority i.e. below  $P_k$ ) sends coordinator messages to all live processes. After receiving coordinator message from  $P_j$ , each live process would update its process status table.

Now suppose process  $P_m$  recovers from failure so there can be two cases:

**Case1:**

If the current coordinator's priority is higher than  $P_m$ 's priority, in that case,  $P_m$  will send its priority number and an UPDATE messages to all other live processes in the system, to tell them to update  $P_m$ 's status (from CRASHED to NORMAL) in their own process status table.

**Case 2:**

If  $P_m$ 's priority is higher than the current coordinator's priority; then  $P_m$  will be the new coordinator and update the process status table and sends the COORDIANTOR message to all other live processes in the system, and takes over the coordinator's job form the currently active coordinator.

III. COMPARISON

The comparison of workdone by various authors is as shown in table I.

Table I: Comparison of workdone by various authors

Authors	Complexity		No. stages required	Maintains status table	Types of messages
	Best Case	Worst Case			
Garcia Molina	$O(n)$	$O(n^2)$	5	No	Election, Ok and Coordinator

<b>M. S. Kordafshari</b>	O (n)	O (n)	4	No	Election, (Ok+ Priority), Grant and Coordinator
<b>Sandipan Basu</b>	O (n)	2(constant)	3	Yes	Election, Ok, Coordinator, Request and (Priority + Update)
<b>Pawan Kumar Thakur</b>	O(n)	O(n)	3	No	Election, Ok, Coordinator, Query and Answer
<b>S. Mahdi Jameii</b>	O(constant)	O(constant)	2	No	Election and Coordinator
<b>Rachna G.</b>	O(constant)	O(constant)	2	Yes	Election, Coordinator, Request, Reply and Update

From above comparison, as we can see the traditional bully algorithm has been improved to greater extent. We can say that a method proposed by S. Mahdi Jameii and Rachna G. has less complexity and require less number of stages. The method proposed by Sandipan Basu and Rachna G. both maintain status table due to which we are able to keep track of live and dead(failed) processes.

#### IV. CONCLUSION

Among several election algorithms, we have studied bully election algorithm in detail. In original bully algorithm, the numbers of messages exchanged are very high. To overcome this drawback, various authors have proposed modified algorithms. All methods measure performance of election algorithm by number of messages sent in system.

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# Infant attrition in Indian IT Sector: An Indication

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**Abstract-** This research aims at understanding the cause and effect relationship between infant attrition and employee satisfaction. It also evaluates relationship and impact of Job description discrepancies, organization leadership style, stress and employee discrimination on infant attrition. The sample consists of employees from IT sector all over India. A structured questionnaire and informal interviews are used to collect primary information from the respondents. Correlation was used to establish relationship between various variables and infant attrition using SPSS version 21. It was found that attrition is higher among the entry level management which is below the age group of 40 years. To check infant attrition some measures like profile mapping tools, strong retention policies etc.

**Index Terms-** Infant attrition, IT Sector, job description discrepancy, Lower level management.

## I. INTRODUCTION

Infant attrition talks about the attrition of employees within first six months of their joining or within the probation period of newly joined employees in an organization.

Due to various reasons employees use to leave the organization within the six months of their joining or within the probation period of employees. Employee satisfaction is most important for an organization, if the employees are not satisfied then the productivity of the employees hence the organization will go down and dissatisfaction will lead to employee attrition in an organization.

Human Resources Management (HRM) has lots of challenges in the modern competitive corporate world especially in case of IT sector. Infant attrition is a major issue for an organization which affects the flow of organization, it affects the company's brand name also.

Infant attrition leads to rise in cost which is 3 to 8 times of salary promised to pay during the period of training or during first six months of joining. If the employees quit the job within the probation period the cost incurred for those employees during recruitment and selection, training and development will become idle cost for the organization from which there will be no return to the organization. For which again the organization need to spend additional money to search for the recruitment of employees to fulfill those vacancies occurred because of infant attrition and for their training and development in the organization.

There are many factors which lead infant attrition in an organization such as-

- Job description discrepancy
- Organization culture
- Stress
- Employee discrimination, etc

### **Job description discrepancy**

Job Descriptions are written records of job duties and responsibilities and they provide factual basis for job evaluation.

A Job Description will generally describe the work performed, the responsibilities involved, the skill or training required, conditions under which the job is done, relationships with other jobs, and personal requirements on the job.

Objectives of job description are as follows-

- Efficient organization of jobs
- Proper recruitment and staffing in the organization
- Setting job standards
- Assigning jobs and communicating to people
- Performance appraisal of people
- Helps in employee reward system

Job description discrepancy is a major reason for attrition especially infant attrition in the lower level of management in the age group of 20-40. Due to the job description discrepancy newly joined employees use to leave the organization.

### **Organization culture**

It is also one of the factors which raise the infant attrition in an organization. If the organization culture is not suitable for the employees, then employees will not be comfortable in the organization. Organization environment should be good to retain the employees.

### **Stress**

Due to the stress employees use to quit their job. Over burden of works, rules and regulation leads to employees' stress which compel them to quit the job.

### **Employee discrimination**

In an organization there should not be any discrimination among the employees regarding religion, caste, race, gender. Every employee should be equally treated in the organization to create a good environment in the organization which is good for the organization and it helps to retain the employees.

Due to the employee discrimination in the organization attrition take place which is not a good signal for the organization.

Information Technology (IT) sector is emerging sector in the modern age of corporate world. The revolution in information technologies has facilitated the globalization of the economy, business, finance and culture. The shape of the Indian Information Technology (IT) industry has changed dramatically in the recent decade.

Use of information technology is increasing day by day. India especially in Bangalore there are so many IT companies available like Infosys, Wipro, Tata Consultancy Services, Oracle, Dell, IBM, Microsoft, Accenture, Cognizant and many more.

Bangalore is the 4<sup>th</sup> largest technology cluster in the world after Silicon Valley, Boston, and London. The employees of the Information Technology sector are very responsible for their services they need to be very keen in their works.

Human resource management should be very active in an organization to control the infant attrition. Infant attrition affects a lot to the organization which leads to-

- a. Rise in cost of the organization because the company loses on the amount it spent to recruit and select these employees and to train them for their respective jobs without any return.
- b. It affects the flow of the organization.
- c. It affects the productivity of the organization.
- d. It wastes the time of the organization for recruitment and selection.

To control infant attrition it is important to know the reason why the employees quitting their job in the probation period. It may be because of job description discrepancy, organization culture, stress, or employee discrimination.

The organization needs to provide such environment and facilities which can make employees feel good in the organization. It will help to reduce the infant attrition in the organization.

If there is no employee discrimination in the organization every employee is treated equally then the employees will feel comfortable in the organization. If the organization culture is suitable for the employees and the working environment is good then the employees will be comfortable in the organization.

Employer employee relationship should be good; there should be motivational entertaining programs in the organization to make employees feeling good and to make them more productive.

If the employees are satisfied then the organization will grow up because if employees are dissatisfied in the organization then they will not concentrate on their job which affect the productivity of the employees hence the organization.

Dissatisfaction of employees leads to attrition in the organization which will again lead to rise in cost of the organization for recruitment, training and development etc.

## **II. REVIEW OF LITERATURE AND RESEARCH DESIGN**

The literature review is conducted to provide a conceptual framework from which to plan and organize the research and interpret results. The literature review is entail obtaining recent and relevant literature and the presentation of this material in a qualitative manner.

There are many reasons why literature review is rendered as a significant part of any research or dissertation paper. Literature review is the part of the paper where the researcher will be given the opportunity to strengthen the research paper by citing what other reliable authors have said about the topic.

Research is made in order to inform people with new knowledge or discovery. Research can be made more credible with the support of other works which have spoken about the same topic.

Cascio, (1998) and Bowin & Harvey (2000) stressed the significance of job analysis as a strategic HRM practice linked with the organizational performance. Anthey *et al*;(2002) and Desslar, (2003) recommended that with the recognition of the Human Resource-Performance linkage, organizations vigorously adopting job analysis as a human resource strategy were likely to grow more and put on aggressive benefits. Gatewood & Feild, (1994) illustrated that extent to which tasks and employee attributes for an assigned job was termed as job analysis hence, job analysis techniques can also be termed as worker-oriented or work oriented. They further discussed that work oriented methods engaged clear description of a variety of jobs or tasks to be performed, while, worker-oriented methods examined human behaviours concerned with the work activities. Work or worker-oriented technique what so ever be, job analysis methods allow the assumption of employee's knowledge, skills and abilities (KSAs) characteristics. Davis (1995), Gatewood & Feild, (1994) studied the KSAs characteristics included in job-related information and the necessary human abilities to perform certain job activities. The significance of applicable KSAs could not be overstated, as these have an association with job performance. According to Gatewood & Feild, (1994) job analysis was an instrument to analytically gather data on tasks and behaviours leading to KSAs about virtually and any kind of work activity.

Prien, (1977) emphasized on the importance of carrying out job analyses to recognize valid predictors and criteria for job success which has also been acknowledged by the other researchers and human resource professional, fully engaged in recruitment and selection process. Dunnette, (1976) and Wernimont & Campbell, (1968) linked job analysis information with recruitment process

which was originated in the literature. Some of these researchers pointed job analysis as the base of the entire recruitment and selection process. The divergence was in a through consideration of the job performance realm which could lead to the development of the system in which the personal attributes ( KSA ) required to acceptably perform the jobs, identified and empirically linked with corresponding job performance. In 1991, Harvey acknowledged the job analysis in relation with work behaviours and associated tasks those were required for successful job performance.

Leap (1993, p11) asserts that job description is a written statement that explains the duties, working condition and other aspects of a specified job. In job description the job identification section may include a job code. These codes are useful for comparing jobs.

Sahl (1994. p.3) states 'well written job descriptions define the work of the organization and its reasons for existence as an employer of human resources. More, they define and help quantify the relative importance of work, what each position contributes to a process and the organization as a whole.' This definition illustrates an important point regarding job descriptions, used in today's work environment, by emphasizing that they describe not only what the job is about but how the job contributes to the work of the organization.

A job description must be accurate but not a minutely detailed list of an employee's tasks and duties (DeLon, 1994). As Behn (1997, p. 60) states: 'it is impossible to list, in anything smaller than an encyclopedia, the multitude of tasks ... that combine to produce the results desired from a particular job.' Job descriptions are meant to be a guide only 'staff must not interpret them rigidly or job descriptions become a barrier to success' (Degner, 1995, p. 17). Grant (1989) describes them as a 'map' that show direction. Job descriptions are not a description of how a job is to be done (Grant, 1989), a contract (DeLon, 1994) or set of rules, regulations or proper practices (Grant, 1989). They describe the nature of the work to be done by stating the purpose and main responsibilities. They may also include information on the type of person who is best suited to perform the job.

Grant (1988) describes job descriptions as a valuable resource. They have the potential to be a useful organizational tool, however, to realise their potential they must be properly prepared. Grant (1988, p. 53) believes many job descriptions do not reach their potential because they 'are too simplistic, they lack detail, they are out of date, they neglect many key structural elements of the job and they are unclearly written'.

Ray and Hawthorne (1993, p i) state 'an accurate and detailed job description is an increasingly crucial component of the effective use of valuable human resources in libraries and other organizations.' The primary function of a job description is as a communication tool. They effectively communicate a great deal of information about a job, especially between the manager and employee (Giles, 1995; Grant, 1989). 'When employees have a road map to success they often perform much better - and that translates into continued business growth for you and your firm' (Consulting Task Force, 1991). Information may include reporting relationships; skill requirements; major responsibilities; where the job fits into the organization and what is required of the position. This information is presented in a completely objective and impersonal way (How to write job descriptions the easy way, 1993) which allows the job description to be used in relation to many human resource functions such as recruitment, induction, training and performance management

### III. STATEMENT OF THE PROBLEM

Infant attrition and its affecting factors in IT sector.

Job profile and job specification should be matched if not then there will be the probability of infant attrition.

In the competitive corporate world for an organization it is most important to retain their employees and to maintain employer-employee relationship. Employee satisfaction is most important for an organization, if the employees are not satisfied then the productivity of the employees hence the organization will go down and dissatisfaction will lead to employee attrition in an organization.

Human Resources Management (HRM) has lots of challenges in the modern competitive corporate world especially in case of IT sector. Infant attrition is a major issue for an organization which affects the flow of organization, it affects the company's brand name also, and it leads to rise in cost which is 3 to 8 times of salary promised to pay during the period of training or during first six months of joining.

### IV. SCOPE OF THE STUDY

The survey is concentrated only on the people working in the IT sector in Bangalore. But this study can be extended to any other city in India.

### V. OBJECTIVE OF THE STUDY

- To study infant attrition and its affecting factors in IT sector.
- To ascertain the cause and effect relationship between infant attrition and employee satisfaction.
- To evaluate of relationship and effect of job description discrepancy on infant attrition.
- To study of impact of organizational culture style on infant attrition.
- To determine the impact of stress and its effect on infant attrition.
- To study of employee discrimination practices and effect on infant attrition.

### HYPOTHESES

#### Hypothesis 1:

The positive organizational culture and environment and infant attrition are negatively correlated.  
 H<sub>0</sub>: The positive organizational leadership style and environment and infant attrition are negatively correlated.  
 H<sub>1</sub>: The positive organizational leadership style and environment and infant attrition are positively correlated.

**Hypothesis 2:**

There is a positive correlation between the job description discrepancy and infant attrition:  
 H<sub>0</sub>: There is a negative correlation between the job description discrepancy and infant attrition.  
 H<sub>1</sub>: There is a positive correlation between the job description discrepancy and infant attrition.

**Hypothesis 3:**

The work related stress and infant attrition are positively correlated.  
 H<sub>0</sub>: The work related stress and infant attrition are negatively correlated.  
 H<sub>1</sub>: The work related stress and infant attrition are positively correlated.

**Hypothesis 4:**

The discriminatory practices and discriminatory treatment of employees results in more infant attrition.  
 H<sub>0</sub>: There is a negative correlation between the employee discrimination and infant attrition.  
 H<sub>1</sub>: There is a positive correlation between the employee discrimination and infant attrition.

VI. METHODOLOGY

**Descriptive and Analytical type of research methodology:**

**Descriptive method:**

It is a fact – finding investigation with adequate interpretation. It is the simplest type of research. It is more specific than an exploratory research. It aims at identifying the various characteristics of a community or institution or problem under study. It can highlight important methodological aspects of data collection and interpretation. The information obtained may be useful for prediction about areas of social life outside the boundaries of the research. They are valuable in providing facts needed for planning social action program.

**Analytical study:**

It is a system of procedures and techniques of analysis applied to quantitative data. It may consist of a system of mathematical models or statistical techniques applicable to numerical data. Hence it is also known as Statistical Method. It aims at testing hypothesis and specifying and interpreting the relationships.

The descriptive method would be suitable to find out the various characteristics of gender discrimination and also these results can analyze the social life outside the boundaries of the organization. This study can be helpful for the banking sector to know why does gender discrimination occurs and how it can be prevented.

The analytical study would have a strong basis with the use of statistical tools and techniques. It helps in optimization of the study and also helps in finding out the relationship between gender discrimination and delegation of task by managers.

**Hypothesis Testing**

**Hypothesis 1:**

The positive organizational culture and environment and infant attrition are negatively correlated.  
 H<sub>0</sub>: The positive organizational leadership style and environment and infant attrition are negatively correlated.  
 H<sub>1</sub>: The positive organizational leadership style and environment and infant attrition are positively correlated.

**Symmetric Measures**

		Value	Asymp. Std. Error <sup>a</sup>	Approx. T <sup>b</sup>	Approx. Sig.
Nominal by Nominal	Phi	.296			.067
	Cramer's V	.209			.067
Interval by Interval	Pearson's R	.243	.041	2.484	.015 <sup>c</sup>
Ordinal by Ordinal	Spearman Correlation	.279	.062	2.877	.005 <sup>c</sup>

N of Valid Cases	100			
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**Data Analysis**

From the above table Pearson’s correlation value is 0.243. Since the Pearson’s correlation value is belongs to the range of 0.10 – 0.29 so it is moderate association. And the Phi value is 0.296 and Cramer’s value is 0.209. Since both Phi value and Cramer’s V value are less than 0.5 so the relationship between the variables are a weak relationship.

**Data Interpretation**

Based on the analysis it has been found that the leadership style and infant attrition is not strongly related. Leadership style is define by the nature of the work, workforce, organizational policy, founder of the organization so it is pervasive in the organization and determines the nature of leadership across organization. So Leadership style is not a major factor for the infant attrition in the IT sector, it can be an influencing factor for infant attrition.

**Hypothesis 2:**

There is a positive correlation between the job description discrepancy and infant attrition:

H<sub>0</sub>: There is a negative correlation between the job description discrepancy and infant attrition.

H<sub>1</sub>: There is a positive correlation between the job description discrepancy and infant attrition.

**Symmetric Measures**

	Value	Asymp. Std. Error <sup>a</sup>	Approx. T <sup>b</sup>	Approx. Sig.
Nominal by Nominal      Phi	1.000			.000
Cramer's V	1.000			.000
Interval by Interval      Pearson's R	.961	.024	-34.298	.000 <sup>c</sup>
Ordinal by Ordinal      Spearman Correlation	.891	.061	-19.377	.000 <sup>c</sup>
N of Valid Cases	100			

**Data Analysis:**

From the above table Pearson’s correlation value is 0.961. Since the Pearson’s correlation value is belongs to the range of 0.30 – 0.99 so it is Evident of strong association. And the Phi value is 1.000 and Cramer’s value is 1.000. Since both Phi value and Cramer’s V value are more than 0.5 so the relationship between the variables are a strong relationship.

**Data Interpretation:**

Based on the analysis it has been found that the job description discrepancy and infant attrition is strongly related. Job Descriptions are written records of job duties and responsibilities and they provide factual basis for job evaluation. A Job Description will generally describe the work performed, the responsibilities involved, the skill or training required, conditions under which the job is done, relationships with other jobs, and personal requirements on the job. So job description discrepancy is a major factor for the infant attrition in the IT sector.

**Hypothesis 3:**

The work related stress and infant attrition are positively correlated.

H<sub>0</sub>: The work related stress and infant attrition are negatively correlated.

H<sub>1</sub>: The work related stress and infant attrition are positively correlated.

**Symmetric Measures**

	Value	Asymp. Std. Error <sup>a</sup>	Approx. T <sup>b</sup>	Approx. Sig.
Nominal by Nominal      Phi	.213			.033
Cramer's V	.213			.033
Interval by Interval      Pearson's R	.213	.038	2.158	.033 <sup>c</sup>
Ordinal by Ordinal      Spearman Correlation	.213	.038	2.158	.033 <sup>c</sup>
N of Valid Cases	100			

**Data Analysis:**

From the above table Pearson's correlation value is 0.213. Since the Pearson's correlation value is belongs to the range of 0.10 – 0.29 so it is moderate association. And the Phi value is 0.213 and Cramer's value is 0.213. Since both Phi value and Cramer's V value are less than 0.5 so the relationship between the variables are a weak relationship.

**Data Interpretation:**

Based on the analysis it has been found that the work related stress and infant attrition is not strongly related. Because along with the work stress will be there but it does not mean that employee will quit the job only because of stress. It is not a major factor for the infant attrition in the IT sector, it can be an influencing factor for infant attrition.

**Hypothesis 4:**

1. The discriminatory practices and discriminatory treatment of employees results in more infant attrition.

H<sub>0</sub>: There is a negative correlation between the employee discrimination and infant attrition.

H<sub>1</sub>: There is a positive correlation between the employee discrimination and infant attrition.

	Value	Asymp. Std. Error <sup>a</sup>	Approx. T <sup>b</sup>	Approx. Sig.
Nominal by Nominal      Phi	.140			.161
Cramer's V	.140			.161
Interval by Interval      Pearson's R	.140	.028	1.400	.165 <sup>c</sup>
Ordinal by Ordinal      Spearman Correlation	.140	.028	1.400	.165 <sup>c</sup>
N of Valid Cases	100			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

**Data Analysis:**

From the above table Pearson's correlation value is 0.140. Since the Pearson's correlation value is belongs to the range of 0.10 – 0.29 so it is moderate association. And the Phi value is 0.140 and Cramer's value is 0.140. Since both Phi value and Cramer's V value are less than 0.5 so the relationship between the variables are a weak relationship.

#### **Data Interpretation:**

Based on the analysis it has been found that the employee discrimination and infant attrition is not strongly related. Because now a days organization uses to treat all the employees equally, so there are very less probability of employee discrimination. So employee discrimination is not a major factor for infant attrition in the IT sector but it can be an influencing factor for infant attrition.

### VII. SUMMARY OF FINDINGS

1. A high attrition rate means that the costs are going to rise for the organization.
2. Infant attrition is high at the lower level of management and middle level of management compared to higher level of management.
3. Infant attrition rate is high in the age group of below 40 years old compared to more that that of 40 years old age of employees.
4. Infant attrition is high in the lower income group of employees compared to higher income group of employees.
5. Employees work target is also an influencing factor for infant attrition but not at a great extent.
6. Satisfaction level of employees is also having influence on infant attrition.
7. Job specification and job profile is most important because job description discrepancy is one of the major influencing factors for infant attrition.
8. Leadership style of the organization is one of the influencing factors for infant attrition but it is not a major influencing factor.
9. Organization culture is also one of the influencing factors for infant attrition.
10. Work stress is one of the influencing factors of infant attrition.
11. Employee discrimination is also a one of the influencing factors for infant attrition.
12. Job description discrepancy is having major influence in infant attrition.

### VIII. SUGGESTIONS

1. To remove the job description discrepancy recruitment and selection should be proper. Right person for the right job should be selected to avoid the job description discrepancy because if the employees are comfortable with the job profile then there is less chance of infant attrition.
2. Employee satisfaction is most important for an organization. If the employees are satisfied with the organization the there is less chance of infant attrition. The organization should celebrate festivals and should arrange some entertaining programs.
3. Leadership style of the organization should be comfortable with the employees so that the employees can feel comfortable in the organization.
4. Organization culture is also one of the influencing factors for infant attrition so if the organization culture is comfortable for the employees it can be a good measure to reduce infant attrition.
5. There should not be any employee discrimination in the organization regarding gender, religion, race etc.
6. Employees' work target is also an influencing factor for infant attrition so at the probation period of employees target should less so that they can reach easily.
7. Attrition level is highest in the age group of below 40. Therefore company should focus on retaining the young talent as it would affect the productivity of the company and also will be beneficial in terms of resources spent on training.
8. Since most of the respondents feel that their job profile and job specification did not match, they should use a profile mapping tool where in such possibilities can be avoided.
9. To tackle the problem of infant attrition and job discrepancy stress, competency mapping, job rotation can be used.
10. Organization should have strong retention policy for infant attrition.
11. Recruitment and selection process should be perfect to reduce job description discrepancy.

### IX. CONCLUSION

A sample size of 100 was taken. It was a descriptive and analytical study. The plan of analysis was designed in such a way that the questionnaires were given to the employees working in the IT sector. Interview method was also adopted. The questions were framed in such a way that the employees can understand the questions and answer the questions accordingly. Most of the questions were objective questions. Few of the questions were framed in such a way that they were given options. Few other questions were framed using likert scaling.

The data was collected and it was analyzed and interpreted. From the analysis it was found that infant attrition does exist in the IT industry and there are so many influencing factors like job description discrepancy, stress, employee discrimination, organization culture etc. Among those job description discrepancy is having major influence in infant attrition.

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QUESTIONNAIRE

The information furnished by the respondents will be kept confidential and will be strictly used for research purpose.

Name:

Gender: a) Male b) Female

Level of Management: a) Higher level  
b) Middle level  
c) Lower level

Company:

Age: a) Below 20  
b) 20 – 30  
c) 30 – 40  
d) 40 – 50  
e) Above 50

Income: a) Below 1.5 lakhs  
b) 1.5 – 3.0 lakhs  
c) 3.0 – 4.5 lakhs  
d) 4.5 – 6.0 lakhs  
e) Above 6 lakhs

1. Did you ever leave the job in your probation period?

a) Yes b) No

2. In your organization how many employees left the job within their probation period?

- a) 0 - 10
  - b) 11 - 20
  - c) 21 - 30
  - d) 31 - 40
  - e) Above 40
3. Were they able to reach the goal?
- a) Yes
  - b) No
4. Are you satisfied in your organization?
- a) Highly satisfied
  - b) Satisfied
  - c) Neutral
  - d) Not very satisfied
  - e) Not at all satisfied
5. Do you think job specification and job profile match with you?
- a) Yes
  - b) No
- 5.6 If yes how much percentage?
- a) 0 - 20
  - b) 20 - 40
  - c) 40 - 60
  - d) 60 - 80
  - e) 80 - 100
7. Which type of leadership style is there in your organization?
- a) Autocratic
  - b) Democratic
  - c) Transactional
  - d) Transformational
  - e) Laissez-Faire
8. Rate the style of leadership of your organization on the scale of 1 to 5
- a) 1
  - b) 2
  - c) 3
  - d) 4
  - e) 5
9. Did you ever leave the organization because of the leadership style?
- a) Yes
  - b) No
10. Do you face stress because of the stress of work?
- a) Yes
  - b) No
11. Are your stress too much rate on scale of 1 to 5
- a) 1
  - b) 2
  - c) 3
  - d) 4
  - e) 5
12. Did you ever leave the organization because of stress level in the probation?
- a) Yes
  - b) No
13. Are all the employees treated equally in the organization?
- a) Yes
  - b) No
14. Were there any instances of gender discrimination in your organization?
- a) Yes
  - b) No
15. Did you leave the organization because of employee discrimination?
- a) Yes
  - b) No

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# Impact of Motivation on Employee Performance with Effect of Training: Specific to Education Sector of Pakistan

Masood Asim

**Abstract-** The study explain the impact of the motivation level among the employee performance with the mediating of the training needed in the Pakistani universities. Respondents from the universities of about 118 suggest the impact of the HR need like promotion, motivation level of the employee, training and employee performance. In the model we taking motivation as a independent variable and training taking as mediating variable and employee performance as dependent variable. Alpha is about 0.684 which shows that dependent variable is mediating reliable on the independent variables. The variables are maximum reliable on each other. On the other hand descriptive statistics is calculated correlation as well as regression test is applied. And Pakistani universities must needed to take revise he salary and reward benefits to evaluate the performance of the universities employees. Future research as well as limitation also discuss in the paper.

**Index Terms-** Motivation, Training , Employee performance

## I. INTRODUCTION

Some theory needed to explain how the motivation factor works. In the term of the management scenario most popular explanation is based on the need of the individual. The basic model theory is the content theory of motivation. some employees interested basic needs but some are more interested psychological needs these are fulfill through experiences. Some other theorist explain motivation in different ways like most important is the Abraham maslow,david,maclellard,Frederick haerzberg,etc.these are the source of the motivation. In the modern world of today some and every organization wants to successful through continuous process. Every organization compete with each other to handle the customer among the organization size is considered more with the proper constant format. Human resource is the creating and maintaining positive relationship among the organization. They face different challenges' to achieve the targets. Very few organization supports that employee are the main assets of the organization. They satisfied and need to motivate to fulfillment the task. The main focus of the study achieving goals and task completion. so objectives near the author one is the factors increase through motivation level of the employees and other factor is the relationship of the employees motivation can be examined. Globalization and the advancement of the technology create more innovation for achieving the targets. Top management create relationship between the employees and the organization demands to creating rules and regulation. They need to satisfy through motivation process as well as different rewards. High

profiles companies create customer loyalty through spending of money but often ignore employee motivational factors .motivation levels affects both characteristics working environment as well as customer satisfaction. if organizations play role in motivation employs they are 100 percent able to achieve the targets easily. Motivation effects performance of the employee in the organization he give up the performance with the same skills a person have more skill they sometime effort less but the person who have less skill they are more motivated with the work as well and put 100 percent with the work.

## II. LITERATURE REVIEW

### REWARDS:

(Asghar Ali & Muhammad Naseem Akram e'al) Author says employees in the any sector are the real assets of the organization. if they are motivated they perform their duties with full honour and dedication. also they become full loyal with it.they consider as a human capital of the organisation. they actively perform their duties with all this.in the hypothesis show the relationship with the rewards specially financial rewards with motivational factors and also more motivated if their salary and job position are according to your qualification.

(Ali Usman et'al 2010) Authors says firstly Human resource it is the major resources of above all. which directly relate with the orgaisation the impact more and check the overall performance of the orgaisation. Its help to check the retain effientancy and work force are the major problem for the organisation. It help to solve all matters related to Human resource. They can motivate employee with full profitable way and show relationship among rewards with motivation factors. The data will gather on motivation factors through different ways mostly collect through questionares .During gathering data responded should be under confidentially and show significant relationship.

### PROMOTION:

(Syed Umer farroque et'al 2010).According to the author point of view this study is to show that rewards are the major role to increasing the performance of the organization. They gather data through different senerios like through questionare. the aim of the study is explaining the varience of variable like payments. promotion and benefits. The author interested to gather the data through questionare and direct interaction. Above all the promotional factor directly effects the motivation in the organization and works of the employees.

### EMPLOYEE MOTIVATION:

(Qurat-ul-aan manzor et'al 2012)The main purpose of the paper is to check and identify of the factors which effects more on the employee motivation and check the relationship between the organizational effectiveness and the EM. the hypothesis is build on the basis of the this relationship.its show the relationship of the literature. According to the literature these are all factors which effects more on employee motivation with the organization effectiveness.

Employee empowerment is also factor. The relationship is stronger in the end the more employees are able to successful as well as performance is manageable. This study is mainly two factors one is the motivation and other is the performance. The organisation is making design on the basis of the model. motivation level are increasing with all this organization were more effective as well. its also able to enhance the empowerment of the rules and policies as well.is help to fulfillment of the growth in the employee satisfaction. its appreciate the tasks management. above all shurity were increase.

(Qurat-ul-Ann manzor et'al 2012)According to the author every new orgation as well as stable organization must wants to successful and must be in the desire consatant stage.it is very highly effective manner and in the size. they face a lot of challenges. due to this its overcome the restriction and able to increase the relationship more stronger and positive. its also create a bond between employee and the organisation.HR is needed more influential to maintain and maintain the task fulfillment. organisation size are the impact more on the EMPLOYEE PERFORMANCE. there are some objectives near to the author first is employee motivation and on the other side organization effectiveness as well. they are positively related one increase other factor increase. Motivation is the one of them.

(Qurat-ul-aan et al 2012) Webster's says motivation is the something we are desire which cause a person to acts as well. its turn its provide to motivate.it is acts of the motivation. some says its derived from the word motivate which mean to move. its more influential and must wants to manage. its must push to fulfillment a more wanted.

(Saif ullah malik et'al 2012).the author says employees plays more important factors in the success and failure in the organisation.in the education sectors its effect more on the performance. the level is increasing with it. its creates more in the students as well. if the motivation level was increasing. if organization stands on every steps. the performance was increasing. Motivation level is the directly and positive relationship with the EMPLOYEE PERFORMANCE and the organization commitments. Organisations spends mor on the training and enhancing capabilities of the employees. They bhost more and with increasing the financial and non financial rewards. the mind setting was increase. the behavior of the companies changes with the passage of change of technology as well as change of the moods of the organisation. new environment in the organisation changed due to the set global standard. introduce new rewards systems. With the reference to the context of the author motivation is the simple terms which may be the understand the force which causes people in behave in the different positive levels. some major factors which effects more on the level of the motivation. productivity is the one of them. if productivity is best then at the end quality is increase according to the author. there are some different needs and expectation of

the employees. its change after some times. management finds different ways to motivating the employees for enhancing the performance. organisations prefer more human capital than the financial measures. because some assumes competitive advantages then other rewards.due to increase in the technology and global standards organizations must improve old culture organisation into the new style organization. employees mostly focus on joining these organisation where promotional opportunities are in the good way and follow all rules to increase promotional activites. due to this all performance is increase. employees interest to joining these type of the organization. because in this organisation job security is good. and decrease the employee's effort to fit in the new setup.

### III. EMPLOYEE PERFORMANCE

(Anthony Afful-Broni et'al 2012) According to the author this particular study shows the relationship between motivation factors as well as the employee performance in the education sector.he is particularly focus on the education sector employees.near to the author point of view income level in the organisation impact positively on the employee performace as well as employee performance. Every human being need to survive in the organization with full respect and honour.they stay when the organization pay more with return of the proper satisfaction.employee have targets professional goals and targets.some scholars said individual performance with orgasation performance effects equally.there are three main factors which generally determine one is ability,work envionrmeint and last but not the least is capabilities to do the jobs.maslow believed that human nature which is satisfied their performance is achieved.

(Nupur Chaudhary et'al 2012).Due to set global standards and change in technological factors businesses around the world are more chanlenging and tough day after day.global market increase the revenue growth due to the internal as well as external factors.highly competition among the firms all because of the globalization.Human resource management is very strong and highly competitive.

(Dauda Abdulsalam et'al 2012) .According to the author study search about relationship between motivation and performance are in in the on hand.research performance and motivation factor on the other end.they gather a data on different senerio and different relationship and motivational factor on the both sides.positive nd negative.effective employee performance effects the academic staff and its able to lead the realization of the broad objectives.All over the universities have main prime objective is to impact knowledge through research and teaching and other community service.performance not just base on function of academics its also based on the importance of the ability as well and motivation.

### TRAINING:

Employee performance is directly based on the function of the training.with motivation and employee performance. Training helps to create good result in performance if training is good performance is also good. Due to training skills and development

is properly perform. If the job is perform not well employee not motivated and at the end results cant generate up to the mark. According to performance model Blanchard in this model shows enable with the skill and knowledge and abilities. He person not perform well until he is not motivated.

**PROBLEM STATEMENT:**

This study investigates the relationship between reward, promotion on the employee motivation with effects from employee performance more specifically on education sector.

**RESEARCH QUESTION:**

How reward and promotion can effects on the employees' motivation with intervention of training?

**SIGNIFICANCE OF THE STUDY:**

The significance of the study to analysis that motivation can effects employee performance ,reward and promotion with intervention of training with in the context of the education sector.

**IV. RESEARCH OBJECTIVE**

To explore the relationship between the reward and employee motivation with respect to employee performance with mediating of training.

To explore the relationship between the promotion and employees motivation with respect to employee performance with mediating of training.

**HYPOTHESIS:**

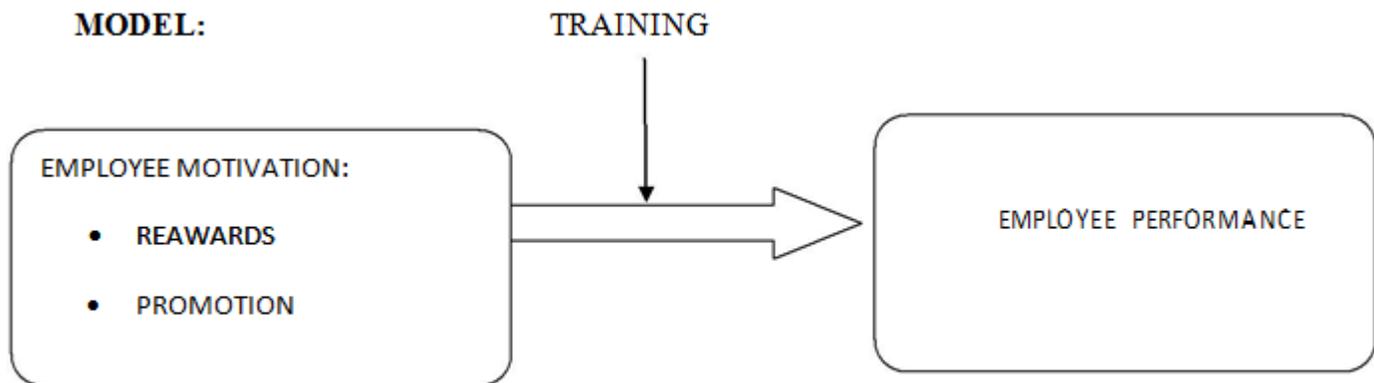
**H1:** Rewards are positive related with effect from employee performance on employees motivation in education sector.

**H0:** rewards does not positive related with effect from employee performance on employee motivation in education sector.

**H2:** Promotion is positive related with effect from employee performance on employee motivation in education sector.

**H0:** promotion is not positively related with effect from employee performance on employee motivation in education sector.

**V. THEORITICAL FRAMEWORK**



**EXPLAINATION:**

**REWARDS:**

Reward is process that give to human more strength and motivated if on the basis of any performance. its behave like as reinforce which sometimes as before and after the behavior. But probability is mostly after it. if its delivery has increased the probability of a behavior. There are two rewards one is the primary and other is secondary rewards. primary include such as food and other necessary items.secondary rewards is the derived from the primary rewards in the secondry money is the one of the good example.Music touch is also secondary reward.Reward effects positive as well as negative effects on the performance of EMPLOYEE PERFORMANCE. it is just say in simple words that whrn you are doing well every one give good rewards in the organization. There are two types of the rewards intrinsic and extrinsic rewards. *intrinsic* rewards is the reward is the activity itself own rather any benefits that may come.Intrinsic came from

when in the the time of the need which is competent,autonomy and relation are match.Intrinsic rewards goes hand to hand with enjoyment of the situation.

**PROMOTION:**

Promotion effects in the different style taking as ladders as motivator but sometime as prize and sometime as taking as incentive and recruitment.more talented workers are usually high productivity its assigns according to their skills quickly move toward talented workers. There are some other purpose of the promotion its can help as rewards as past employee effort, promote investment in the some specific manner in human capital and low turnover.There are pre post and post promotion jobs for the firm taking as pofit from promotion.in the organsation worker are promoted because they think their status are increase as well as wage rate specially increase later on. It is

time of need that regular job turnover are the rising star having some little bit disadvantages for seeking the older jobs with the firm wage structure are seen as a whole. Rewards are taking as team and individual efforts of the human capital. Its effects the overall performance of the firm. Productivity increase as well. Promotion are regular prize offered for encouraging more efforts at the lower level. The rewarding of team and individual effort provision and the accumulation of human capital. It is the structure of wages within the firm rather than individual current wages and productivities that can be important to the overall productivity of the firm. Some proper reward are being promoted and sorting employees into senior jobs that better matching their own relative abilities and skills for accumulating human capital. Incentives and promotion increase the productivity of the employee its enhanced commitment in the work performance good impact on the psychological satisfaction and subordinate toward he works and get maximum capabilities of the exploited less.

### **EMPLOYEE PERFORMANCE:**

Abilities and skills are effectively understand to complete and up to date job description for the position. and must understand it with the job description. performance review process typically takes place on the annually basis but it can schedule more frequent manner. it is highly depended whether it is classified as professional staff. its also include labour contract, contract establishment process. Supervisor play tremendous role in the employee performance its give feedback. personal relationships in the organisation has large impact on the promotion and more firing decisions where personal relationship are more still important today. some organisation try to systematically judge worker performance to increase the productivity. There are four major classes measure the productivity likes.

- Production Counts
- Personnel Data
- Judgmental Methods
- Production Counts

There are some constraint on performance which are as follows:

- Lack of proper equipment and skills
- high work load
- insufficient working environment
- insufficient more clerical hold
- non-attendance of key human resources
- insufficient routine of managers
- undecided objectives or performance standards
- insufficient statement within the organization
- Pressure from co-workers to limited presentation
- Lack of ability to get things done more

### **EMPLOYEE MOTIVATION:**

According to the latest survey there are more than 1,000 people from many several hundred companies and found that able that when leaders and supervisor can use four or more methods of influence in combine format. they're ten times more likely to create change. Some specific forces are to consider

when influencing employee motivation its includes: personal, social, and structural. In the below there are some sort of the increase steps. Good supervisor have make an eye on the lower staff members they diagnose when imagine that there are some flaws they judge the employees that they are demotivated., apathetic and show laziness They give care to the employees for the betterment in the performance. Without the correct and exact knowledge and training or coaching, even then the most motivating employee will quickly grow depressed, frustrated and unproductive.

The place where trying to enhancing employees motivation lies in the satisfaction on the gain from the task itself. There are some target dates. In the Routinely ask people if they enjoy what they're doing and do your best to match them to their changing desires and satisfaction. Some

Research on job satisfaction explains that the employees are most satisfied when they're working on taking challenging task. Now a days interval come with each email, phone call, and text message. When the boss give some positive appreciation to the subordinates it is good sign for the whole team they get motivated. normally use phrase likes that "Thank you for your good work." these words normally show the difference between the a satisfied employees and one feels demoralized and overwork load. in the organisation peers have more important role for delivering satisfaction. They permit people to work with dedication. basically in the organization people work with most of the time like own family sometimes its damage morale and motivation and some time not. incentive and prize and other factors of the extrinsic rewards motivate the employees. some taking as long term but some taking as short term. but finally rewards taking as a actual reward to getting motivated the employees.

### **TRAINING:**

Ep is directly based on the function of the training, with motivation and employee performance. Training helps to create good result in performance if training is good performance is also good. Due to training skills and development is properly performed. If the job is perform not well employee not motivated and at the end results can't generate up to the mark. According to performance model Blanchard in this model shows enable with the skill and knowledge and abilities. He person not perform well until he is not motivated.

### **POPULATION:**

The population of our research is the education sector near Wahcantt and Taxila and specifically the universities. The population consists of the faculty members as well as administration staff cadre in education sector.

### **SAMPLE SIZE:**

Data is gathering from all universities in wahcantt. 30 questionnaires are distributed to each university, making a total of 150 questionnaires. But respondent is just 118 from all 150.

### **INSTRUMENT FOR DATA COLLECTION:**

All questions are based on the five likert scale. All are clear, simple and able to understand and float after the approval of the supervisor. All questionnaire distributed personal basis.

**DATA ANALYSIS:**

**Case Processing Summary**

	N	%
Cases Valid	118	100.0
Excluded <sup>a</sup>	0	.0
Total	118	100.0

**Reliability Statistics**

alpha Is one of appropriate common internal and reliability show multiple

Cronbach's	N of Items
Alpha	3
.684	

Cronbach's the most most measure of consistency having likert

questions in the questionnaire having scale and show how it is realizable. There are two common measurement tools in the management sciences which is reliability and validity. Validity shows the test is on the target or not reliability shows he accuracy in the data. Due to internal consistency of the items its leads that positioning are reliable or not they are more correlate having called test retest reliability. cronbach reflects that there are internal consistency measure in the reliability having show taking as  $\alpha$ , which can be the developed by using number taken a K in an instrument. it is very common research having to collect multiple same construct.the data reflects the multiple measures of the data having agree with one another. The data reflect that there are three variables in the data shows results of taking 118 respondents having the value of the alpha is 0.689 which shows that dependent variable is mediating reliable on the independent variables. The variables are maximum reliable on each other.

**DESCRIPTIVE STAT:**

**INTERPRETATION:**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
motivation	118	4.67	5.00	4.9901	.05012
training	118	4.67	5.00	4.9915	.04276
ep	118	5.00	5.00	5.0000	.00000
Valid N (listwise)	118				

**INTERPRETATION:**

In the data valid N is using for the non missing values in the data. N shows there are number of the values which are valid in the observation and sum of total missing values. Minimum values shows the the relationship having smallest vales in the data as well. maximum table shows that date is largest overall the values in the data. in the data mean shows that data must be centrally and must be average in the data. mean show that the sensitivity values having more extreme small and large. the S.D data shows that there is square roots in the data having variance as well. It help the data which is spread of set of all observations.

Large SD there is more spread in the data and observation. variance measure the variability and show the sum of the square of the data.sum of square reflect the substance of the value from the average data. Variance is corrected which is divisible by N-1.we get generally measure the variance in the indexes as well. Instead of measuring the S.D.inthe descriptive statistics skewness measures the degree as well as direction of the asymmetry. this is the distribution which is normal and must equal to 0.e.g when the mean is less than median its mean it is negative skewness. In the above data the relationship shows that N is the total observation which the data is collected from the respondent. Minimum shows

motivation as well as training show the relationship is minimum as compare to the EP In the maximum table the relationship is balanced in the data. Mean data shows that maximum mean is the ep other than two. S.D shows more in the motivation as compared other two.

**CORRELATION:**

**Correlations**

	training	motivation	ep
training			
Pearson	1	.848**	.a
Correlation			
Sig. (2-tailed)		.000	.
N	118	118	118
motivation			
Pearson	.848**	1	.a
Correlation			
Sig. (2-tailed)	.000		.
N	118	118	118
ep			
Pearson	.a	.a	.a
Correlation			
Sig. (2-tailed)	.	.	.
N	118	118	118

\*\* . Correlation is significant at the 0.01 level (2-tailed).

**INTERPRETATION:**

Correlation measure strength and the direction in the linear relationship between the two variables. it is range between +1 to -1.which indicated a perfect relationship which is highly negative as well as highly positive. And the 0 relationship shows that the data is no correlation. In the table N shows that these the respondent and population size in the data. High correlation mean the relationship is more strong toward the strong relationship. And shows significance level in the data as well. in

the table motivation is strongly relate with the moderating variable like training shows 0.848.its mean it is highly significant and more positive. Motivation also show positive relationship in the data. And more significant as well. The value of p related with the correlation and explains what the single is and double data is significantly shows that if the value is missing in the data there is is the different correlations.

**REGRESSION:**

**Variables Entered/Removed<sup>b</sup>**

Model	Variables Entered	Variables Removed	Method
1	training <sup>a</sup>	.	Enter

- a. All requested variables entered.
- b. Dependent Variable: motivation

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson	df1	df2	Sig. F Change
					R Square Change			
1	.848 <sup>a</sup>	.720	.717	.02666	.720	1	116	.000

**INTERPRETATION:**

Linear regression is the next step after correlation. It used how the value is predict and one value is based on the other variables. The variables which the data is predicted is called dependent variables some time called outcome variables. the first

tables show the model summary having R and R square which show the simple regression. R square indicated that how much the variables which is independent.e.g its shows whether performance is significant or not. the value of the P is always less than  $p < 0.0005$ .which show highly significant.

**ANOVA<sup>b</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.211	1	.211	297.611	.000 <sup>a</sup>
	Residual	.082	116	.001		
	Total	.294	117			

- a. Predictors: (Constant), training
- b. Dependent Variable: motivation

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.028	.288		.096	.924
	training	.994	.058	.848	17.251	.000

a. Dependent Variable: motivation

**INTERPRETATION:**

The next table in the correlation is the ANOVA table. the table indicated that regression model predict and significant as well. here P value is less than 0.0005 which is highly significant. This result shows that model is predicted and highly significant. In the above table it is the coefficients in the data. its give us information that we need to predicts motivation with the training. Beta value show the data is the 0.848 which is highly correlated and more significant.

The choose data is analysis in the independent t test is the part of the process involve and make sure that the data wants to analysis can actually in the independent data and t test.

**Descriptive Statistics**

	Mean	Std. Deviation	Analysis N
training	4.9915	.04276	118
motivation	4.9901	.05012	118
ep	5.0000	.00000	118

**FACTOR ANALYSIS:**

**Correlation Matrix**

	training	motivation	ep
Correlation training	1.000	.848	.
motivation	.848	1.000	.
ep	.	.	1.000

**INTERPRETATION:**

Factor analysis shows the method in the data reduction .these are some factor which shows in the data analysis and generally shows least square and unweighted least square. in the factor analysis these are some varimax as well as equinox rotation in the data. which impose restriction in the data. With all these there is prom ox analysis is also set. which help to allow the factors is the correlated with one another. Factor analysis is the technique that require a large sample size. It is based on the correlation matrix and usually shows large sample size before the stability. Factor analysis also involve generating one and more

unobserved value which is highly independent and positively measure. It is commonly used to reduce different technique to overlap the smaller number of the different factors. In the data mean is highly significant is the employee motivation as compare to the training and motivation as well. and training show more correlation with motivation as well.

## VI. CONCLUSION

The purpose of this study to check the impact of the motivation level of the employee with the employee performance with the effect of the training in the education sector. In the education sector motivation play positive results in the performance as well motivation increase as well as employee performance is increase. Our results also show the positive relationship. If the EMPLOYEE PERFORMANCE .Increase they contribute more in the organization. Its show high performance as well as high motivation level. Motivation directly affects the rewards and promotion. The paper gives the relationship with the HR practices like performance, reward, motivation as well as the promotional factors in the education sector. According to the results it is positive impact with the rewards as well as the training. Training needed to created positive results among the employees. With the training promotion is other factor to increase it. Performance of the employees indicated significant relationship with the financial rewards as well as non financial rewards. With the light of the results motivation factor is the one of them impact positively on the performance with the intervention of the training. Training helps to investigate overall performance of the employee. Training session cover the quantitative as well as qualitative manners. Organizations evaluate the employees through training process. For creating better results organization invest a lot of the resources for the fulfillment of the training need for improving skills and training programs. Training and the employee process is completely linkage with the competition. Training promotes competitive advantage with reference with the context of the job satisfaction as well as performance and decrease non attendance issues. Future studies mention that its properly focused how these practices are linked and how these linking practices produce more accurate results like other variables as well not only focused on training and promotion. With promotion and some other factors teacher needed to improve performance in the organization. At the end there are some findings that indicated rewards increase the motivation levels and progressively maintain the standard to increase it. Its also highlighted the features through employee training and cover all the quantitative as well as qualitative factors

## VII. LIMITATION

- There is very short time span for conducting the research. There are small number of the respondent like just 118 and due shortage of time just cover surrounding area universities
- Some Respondents were unwilling to give the response during floating the questionnaire.
- Respondents are equally taking divided on the basis of the gender based. But due to the unavailability and less interaction with females there is gender biasness. But perhaps the results is different if the accessibility is free to the females.

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# A Causative Routing Metric in Wireless Mesh Networks

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**Abstract-** Wireless Mesh Networks (WMNs) being an emerging technology has in recent years received research focus. Considered to be the next step in the evolution of wireless networks, WMNs promises greater flexibility, reliability and performance. In wireless mesh networks, there are multiple potential paths exist between any pair of mesh stations; as each route uses a different set of links with varying link quality, these routes may have different throughputs. Routing protocol selects the route with the best possible throughput. Routing metrics used by routing protocols decides which route to use between pair of nodes. A routing metric is a transaction that provides a number assigned to each route then the routing protocol selects the route with the best one. Our prime concern to design routing metric referred RETT: Revised Expected Transmission Time. Our proposed metric can be able to estimate the end-to-end delay experienced by packet for the available paths to enable the routing protocol to select the best path. RETT considers the link rate, number of retransmissions, control overhead, etc. We consider the control overhead of sending a data packet that includes the time to send a RTS, CTS, DIFS, SIFS. So, the metric show the exact transmission time of a packet from one node to another. It modified the ETT routing metric and represents a new way to calculate expected transmission time.

**Index Terms-** Wireless Mesh Network Routing, WMN Routing Metric, Best Path Selection in WMNs, Wireless Routing Strategy.

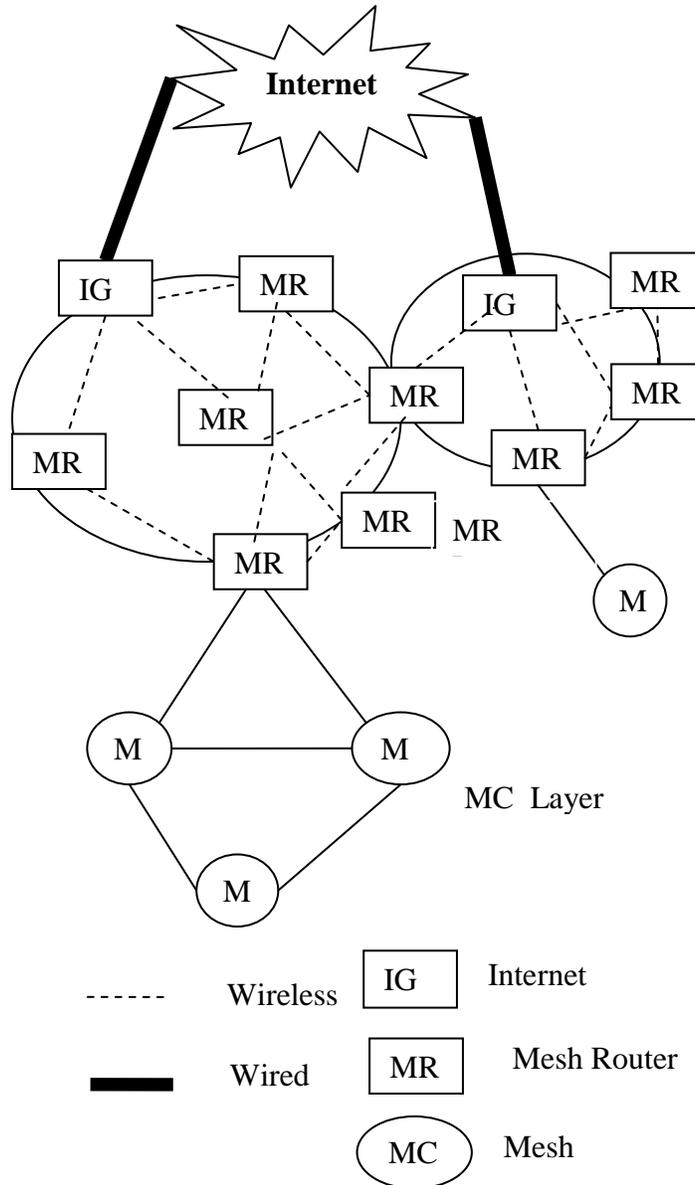
## I. INTRODUCTION

Communication traffic over wireless devices has been increasing enormously, handling a wide range of collective communication based applications. The Internet, in future world, be everywhere, and will be a vastly deeper and more powerful environment than we know today. The information society will be a networked society, with individuals and enterprises always linked locally and to the Internet. Even today, the Internet has a significant influence as a requisite part in individuals' life. Many Internet access devices are used nowadays, including portable devices such as mobile phone, PDA, laptop PC, PlayStation Portable [1], etc. and non-portable devices such as desktop PC, PlayStation 3 [2], and digital TV etc. At the service provider side, they try to offer services within different features, from webpage browsing to video browsing in wide areas in order to meet various demands. However, such services cannot be

afforded by applying traditional networking technology owing to two points: bandwidth and construction cost. In the bandwidth side, the bandwidth of 2.5G GPRS cellular network is up to 48 kbps, and even 3G cellular network provides data rates at 384 kbps. In fact, this speed is only enough for the web browsing and emailing applications, but not adequate to support neither high quality video streaming nor Internet gaming. It is worth indicating that only the cable broadband such as DSL and Wi-Fi can offer high speed Internet access. On the other hand, as for the construction cost, it is needed to set up base stations for cellular networks (2G, 2.5G, 3G and for 4G) which are costly. In addition, the installation of the cable broadband is also expensive. Therefore, Wireless Mesh Networks (WMNs) [3] is an ideal candidate to construct scalable high-bandwidth broadband network with low deployment cost. Thus, the main focus of this study is on the WMN technology in order to investigate community mesh networks. WMNs have shown a great potential locally and globally to deploy wireless networks. Due to its high quality and cost effective performance, WMN has been attractive to different Internet service providers, aiming to fill the UK's broadband black spots. For instance, in Scotland, Speed net Scotland [4] uses a mesh network to provide wireless broadband access to the area surrounding Troon, Ayrshire, where many telephone exchanges were unable to support broadband until recent time. Locust World [5] is a pioneer within this growing market, offering a range of broadband access services to business and residential customers in different areas in the UK and worldwide.

## II. WIRELESS MESH NETWORKS

Wireless Mesh Networks (WMNs) being an emerging technology has in recent years received research focus. Considered to be the next step in the evolution of wireless networks, WMNs promises greater flexibility, reliability and performance. A wireless mesh network (WMN) is a communications network made up of radio nodes organized in a mesh topology. Wireless mesh networks often consist of mesh clients, mesh routers and gateways. The mesh clients are often laptops, cell phones and other wireless devices while the mesh routers forward traffic to and from the gateways which may but need not connect to the Internet. When one node can no longer operate, the rest of the nodes can still communicate with each other, directly or through one or more intermediate nodes.



**Fig-1: A typical Wireless Mesh Network**

WMN architecture employs multi-hop communication among network nodes, i.e., mesh nodes and mesh clients, to forward packets from source to destination through intermediate nodes which not only boost the signal, but cooperatively make forwarding decisions based on their knowledge of the network. The peculiar characteristics of dynamic self-organization, auto configuration and self-healing in WMNs offer many benefits such as low upfront investment, increased reliability and scalability. The wireless routers in WMNs have minimal or no mobility and form the backbone for mesh clients. They contain additional routing functions to support mesh networking other than the routing capability for gateway/bridge functions as in the conventional wireless routers. To further improve the flexibility of mesh networking, a mesh router is usually equipped with

multiple wireless interfaces built on the same or different wireless access technologies. However, mesh and conventional wireless routers are usually built based on a similar hardware platform. Although mesh clients can also work as routers for mesh networking, they can be much simpler in the hardware platform and software.

This simplicity can be reflected: in the communication protocol which can be light-weighted, the inexistence of gateway or bridge functions, availability of only a single wireless interface, etc. So conventional nodes, such as, desktop, laptops, PDAs, pocket PCs, phones, etc, equipped with wireless network interface cards(NICs) can connect directly to wire-less mesh routers, otherwise, customers without wireless NICs can also be always-on-line anywhere anytime by connecting the wireless

mesh routers through Ethernet for example. The integration of WMNs with other already existing wireless networks such as wireless sensor, wireless-fidelity (Wi-Fi), cellular, worldwide inter-operability for microwaves access (WiMAX) and media networks is enabled by the gateway/bridge functionalities in the mesh routers.

Most application scenarios of WMNs are broadband services with various QoS requirements. Other applications include community and neighborhood networks, enterprise networking, building automation, etc. Since a WMN is dynamically self-organized, self-configured and provides self-healing, i.e., every node has a link to every other node, alternative links can be used in case of a node failure or traffic congestion in a direction. The network can be deployed incrementally one node at a time as need be. Increase in new installed nodes increases accordingly the reliability and connectivity for the users. But despite the admirable present day achievements in the area of WMNs, considerable research efforts are still required.

In this regard, we focus in the network layer, more specifically in routing, wherein considerable research has been going on in recent years. The performance of the WMN routing protocol relies on the routing metrics to perform efficient routing decisions. The performance routing metrics must capture critical design features such as end-to-end delay, throughput, bandwidth, etc. The research target in this thesis is to increase the overall network throughput (i.e., the amount of data received by the destinations in unit time) of IEEE 802.11 based WMNs. To develop the overall network performance, we propose for high throughput path selection routing metric.

### III. MAJOR CHALLENGES AND MOTIVATION

There are lots of challenging issues in the area of IEEE 802.11s wireless mesh networks, such as medium access control (MAC), routing metric design, topology control, mesh security, mesh connectivity control, congestion control etc. [7]. In a WMN, as the wireless medium is shared among neighboring mesh node and data frames need to be transferred over multi-hop wireless paths; the wireless mesh networks act as wireless infrastructure or backbone network and therefore, volume of traffic in a WMN is much high. With multiple channels, each radio interface on adjacent links can be assigned a different channel such that the interference among links can be eliminated and the network capacity can be improved. In general with proper design, leveraging multiple links has several benefits, including increasing system throughput, decreasing end-to-end delay, achieving better load balancing and preventing the starvation problem in single channel WMNs.

WMNs exhibit a topology that does not have a device dedicated for central coordination which can guarantee QoS. On the other hand, WMNs are expected to provide quality-of-service (QoS) to meet the increasing demands of multimedia applications (such as VOIP, video). In wireless mesh networks, there are multiple potential paths exist between any pair of mesh stations; as each route uses a different set of links with varying link quality, these routes may have different throughputs. Routing protocol selects the route with the best possible throughput. Routing metrics used by routing protocols decides which route to

use between pair of nodes. A routing metric is a transaction that provides a number assigned to each route then the routing protocol selects the route with the best one. Designing a routing metric for WMNs requires consideration of the unique architecture and the associated wireless networking environment of WMNs. Therefore, we need to consider other factors such as data rate, transmission time of the contending nodes, packet size, control overhead etc., while designing a routing metric. All these requirements make the design of a routing metric a challenging issue. Therefore, our second challenge in this context is to design a routing metric to select a path the path where a packet experiences minimum end-to-end transmission delay among the available paths for a specific link.

### IV. ROUTING METRICS FOR WMNS

Routing in multi-rate multi-hop wireless networks has been an active area of research for many years. Efficient data transfers over multi-hop networks require an appropriate routing metric that is critical in selecting a path with the highest achievable throughput. The design of such a routing metric is much more difficult on wireless networks than on wired networks, due to the conflicting and dynamic characteristics of multi-hop wireless network with shared unreliable links. Currently, various routing metrics have been proposed.

#### Shortest Path Metric

The shortest path metric is one of the most popular routing metrics in multi-hop networks. Many multi-hop routing protocols select paths based on this lowest hop count metric [8] [9] [10]. The primary strengths of this metric reside in its simplicity and low computing overhead. However, it has been shown that a path based on minimal hop count does not necessarily yield a high throughput performance [11]. The shortest path metric selects the path with the smallest hop count, but that may suffer from higher loss rate (as shown in Section I). A wireless link with higher loss rate requires on average more transmissions for one successful packet delivery, and hence leads to lower throughput. Therefore, considering the link quality is important to design a good routing metric in wireless networks.

#### Drawbacks of Shortest Path Metric

The shortest path metric, which is used to find routes by most multi-hop routing protocols, has been proved to be flawed. It tends to choose paths with more physically distant nodes that result in higher loss rates. As shown in Figure 1, the path A – D – E has only two hops, but the distance is longer between nodes A, D and E than for the three hop path A – B – C – E may be higher than with path A–D–E. This simple example shows that it is crucial to consider the quality of each wireless link when designing a routing metric.

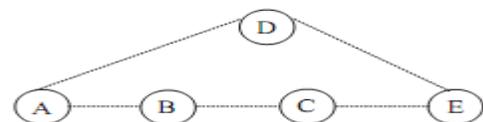


Fig-2: Simple example of Shortest Path Metric

### Hop count (HC)

Hop count is the simplest of routing metrics, because it only needs to know if a link exists or not. However, because of this feature, the hop count cannot provide helpful information about a link, such as packet loss, link quality, etc.

Thus, routing protocols based on hop-count only consider one performance parameter, i.e., the minimum hop count of each routing path. In very few cases the minimum hop-count is a reasonable metric to find a good routing path. However, in most cases the minimum hop-count is not enough for a routing protocol to achieve a good performance. Nevertheless, the hop-count is used in some existing routing protocols for WMNs, mainly because of its simplicity. In some application scenarios, if reachability instead of optimized performance is the main concern, the hop-count is a useful routing metric.

### Drawbacks of HC

The Hop count routing metric fails to account for the specifics of wireless environments (links may have different transmission rates, loss ratios, etc.) and it doesn't consider the congestion level resulting from the shared use of the transmission medium. Many prior researches [12-16] have recognized the shortcomings of shortest path-routing in multi-hop wireless networks. Hop count tends to select long distance links with low quality, which typically already operate at the lowest possible rate, due the link layers auto rate mechanism. This can lead the hop count metric to choose paths with low throughput and cause poor medium utilization, as slower links will take more time to send packets.

### Expected Transmission Count (ETX)

The Expected Transmission Count (ETX) metric was introduced by De Couto et al. ETX is the number of expected transmissions for a successful transmission over a hop. ETX is derived from the measured hop packet loss rate. The quality of a path is characterized by the sum of ETX's.

Let,  $P_f$  and  $P_r$  be the hop forward and reverse direction loss rates respectively. The probability of unsuccessful delivery rate P for this link is:  $P = 1 - (1 - P_f) \times (1 - P_r)$

Thus the expected number of transmissions of a packet on this hop is:  $ETX = 1/1-p$

The weight of a path with n links is the sum of all link's

$$ETX \text{ is: } ETX = \sum_{i=1}^n ETX_i$$

ETX captures the effect of both the path length and each link's loss rate. Draves et al. reported that the ETX metric performs better than the shortest path and RTT metrics.

### Drawback of ETX

The weakness of ETX is that ETX ignores that links may have very different data transmission rates in multi-rate radio networks. Since ETX is measured using periodic broadcast packets which are sent at a very slow interval (usually 1 sec), they do not reflect how busy a link is. ETX might vary when there is very high load due to 802.11 MAC unfair-nesses [17] or when there is loss of the broadcast packets due to collision with

packets from hidden terminals. However, whether sender of the ETX broadcast packet can hear (or sense) the neighboring transmissions, collision does not happen and ETX is not affected. Thus, ETX does not capture the interference experienced by the links completely. ETX was designed for net-works using a single channel, so it cannot exploit the presence of multiple channels and find paths that have better channel diversity.

### Expected Transmission Time (ETT)

Modern wireless radios utilize multiple data transmission in order to accommodate variable channel conditions. This multi-rate strategy has been shown to greatly improve wireless multi-hop networks performance [18]. Currently, the IEEE802.11g [19] standard offers data rates of 6, 9, 12, 18, 24, 36,48 and 54 Mbps while the earlier IEEE 802.11b [20] standard supports 1, 2, 5.5 and 11Mbps data rates. Thus, a wide range of data transmission rates may exist simultaneously within one single network scenario.

In a heterogeneous data rate network, the ETX metric does not accurately capture link quality of a path. Draves et al. addressed this problem and improved the ETX metric into the Expected Transmission Time (ETT) metric [13] by considering the data rate. ETT depends on the packet size S, the data rate B, and the loss rate. It is the expected time required for one successful data packet delivery. Let S be the packet size, B the data rate, and ETX the expected transmission count on a given hop, ETT is defined as:

$$ETT_i = ETX_i \times \frac{S}{B_i}$$

Where,  $B_i$  is the data rate of the  $i^{th}$  link.

### Drawbacks of ETT

Though, ETT has been considered as the most widely used metric for routing in WMN, it still has some limitations, which do not allow ETT to always select high throughput paths. ETT do not consider the presence of multiple channels and therefore, find paths with less channel diversity. Also ETT characterizes the expected transmission time in the absence of interference in the network.

## V. PROPOSED METRICS

In wireless mesh networks (WMNs) route selection is an important issue due to existing lot of wireless path among the nodes. Designing of a routing metric is very important issue in the telecommunication era. In congestion and for dynamic network topology route selecting issue is the most measure issue. For selecting efficient route for best throughput an efficient routing metric is most important. We have tried to design a routing metric that is the almost perfect to select a route as it consider the very effective parameters. We consider mainly on focusing the control overhead data rate of that link that make the metric strategic and efficient. For performance analysis analytical proof and explanation of the metric working process given below with related graph and chart.

### Problem Statement and Motivation

In wireless mesh network (WMNs) transmission of packet efficiently from one node to another is an important issue. There may be lot of links for a source to send a packet to destination. The end to end delay of packet transmission is different due to shared nature of wireless link. To choice a link for sending a packet is depends upon the less time taken by to transmit the packet to the destination. Our goal is to design a routing metric that will be able to estimate the end-to-end delay experienced by packet for the available paths to enable the routing protocol to select the best path. If all the packets can be delivered within minimum delays, the overall network throughput will be increased. In the following we discuss the issues that are related to a packet forwarding from a node to another node.

### Transmission Rate

In telecommunications, effective transmission rate (average rate of transmission, effective speed of transmission) is the rate at which information is processed by a transmission facility. The effective transmission rate is calculated as (a) the measured number of units of data, such as bits, characters, blocks, or frames, transmitted during a significant measurement time interval divided by (b) the measurement time interval. The effective transmission rate is usually expressed as a number of units of data per unit time, such as bits per second or characters per second.

### Size of the Packet

Size of the packet is most important issue in wireless mesh networks (WMNs). If the size of the packet is larger, the impact of control overhead: RTS, CTS, ACK is such that the throughput is better than that of being the packet size smaller. Again, being the packet size very much larger packet loss ratio is high, so there should be a standard size for packet that is for higher throughput and also less packet loss ratio.

### Success Rate

Success rate is the rate of successful transmission of packet. If the transmission attempt for successful transmission is high then it is considered as poor success rate. When a sender received an acknowledgement of a message from the destination then it is said that the transmission attempt is successful. Success rate depends upon network congestion, and success rate affects the total network throughput. So, for best performance and for higher throughput the success rate is an important issue.

### Considering Issues

To design an efficient routing metric in wireless mesh networks (WMNs) there are lot of issues considered by lot of articulate, but we tried to consider more and much imported and impacted issues. We also tried to design the metric contributing the better decision from these issues.

The issues we consider to design and analyze the metric are as follows.

- Link rate and number of retransmissions
- Control overhead

### Link Rate and Number of Retransmissions

We consider the link rate of a link to count the Advanced Expected Transmission Time (AETT). Number of retransmissions of a packet to make the attempt successful is one kind of issue that is fully determined by the matrix Expected Transmission Count (ETX). Basically link rate of network control the network throughput. Data rate of a link is always different than that of the basic rate of the link. So, there is a vast variation with the data rate of the link to the basic rate of the link. Both of them depends upon the link rate, and link rate is relates the number of retransmissions for successful attempts. Modern wireless radios utilize multiple data transmission in order to accommodate variable channel conditions. This multi-rate strategy has been shown to greatly improve wireless multi-hop networks performance [7]. Currently, the IEEE 802.11g standard offers data rates of 6, 9, 12, 18, 24, 36,48 and 54 Mbps while the earlier IEEE 802.11b standard supports 1, 2 , 5.5 and 11Mbps data rates. Thus, a wide range of data transmission rates may exist simultaneously within one single network scenario.

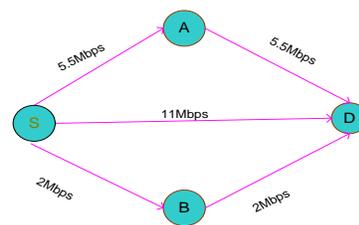
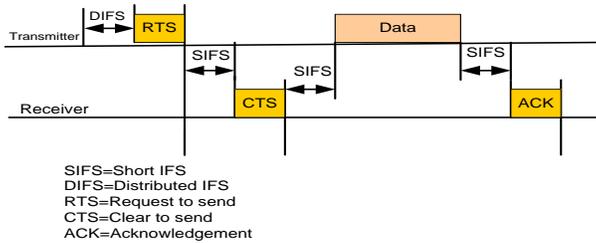


Fig-3: WMNs with various link rate

In the above network S, D are the source and destination node. A, B are the intermediary nodes there are paths of different data rate. For the better data rate the number of retransmission is lower, but for the lower data rate link the number of retransmission is higher.

### Control Overhead

In wireless mesh network (WMNs) for sending data there is an data channel and for sending control information there is a control channel. All the metric always considers various issues such as link rate, transmission delay, number of retransmission, number of interfering nodes, MAC delay but never consider the control channel rate i.e. basic rate for control information. This control channel rate makes delay that is called control overhead delay time for control overhead may have great impact to the network throughput. When source send a packet data to a destination, it exchanges control messages are RTS, CTS, ACK and SIFS, DIFS etc. This Control Over head time will be must delayed to get the channel for sending data. So, if we don't consider this issue there will be big wrong measurement to the counting the transmission time. The following figure represents the control overhead delay slot for exchanging control information.



**Fig-4: Exchange of control frame between sender and receiver**

The exchanging of control frames is major issue and it have huge impact on routing in wireless networking. According to the above figure we can calculate it and have the impact of it in route selecting through our proposed metric.

**Revised Expected Transmission Time (RETT)**

For wireless mesh network there are a lot of metric for routing a packet, each of these consider various issues. We also tried to consider those issues for efficient routing a packet from source node to destination. Finally we have designed a metric for wireless mesh networks (WMNs) as stated below.

Our proposed metric is:

$$RETT = ETX \times \left( \frac{S}{B} + \frac{C_o}{B_{br}} \right) \text{-----}(i)$$

Where,

ETX = Expected Transmission Count; S = Data packet size;  $C_o$  = Control overhead

B = Bandwidth data rate of the link;  $B_{br}$  = Basic rate, i.e. data rate for control message

In our metric Revised Expected Transmission Time (RETT), we consider the impact of control overhead that is the delay of a packet only to be transmitted. To calculate control overhead, we consider Expected Transmission Count (ETX), packet size, basic rate, bandwidth of the link. Impact of Control Overhead on the total network throughput is very much high.

Revised Transmission Time (RETT) metric is designed to take into account the Control Overhead with packet size and bandwidth. In the time of computing the RETT that is composition Number of retransmission, bandwidth packet size. Expected Transmission Time (ETT) depends on packet size, the data rate and the loss rate. It is the expected time required for on successful data packet delivery.

Let,

S = Packet size; B = Data rate or bandwidth of the link and

ETX = Expected transmission count on a given hop

ETT is defined as:

$$ETT = ETX \times \frac{S}{B} \text{-----}(ii)$$

The ETT metric for a path is the sum of all links ETT over the path. The ETT metric uses equation (ii) considering loss rate, packet size and data transmission rate. But ETT does not consider the transmission time which is not only the transmission rate and lose rate but also the control frames which are sent at basic data rate of 1 Mbps such as RTS, CTS, DIFS, SIFS and ACK of IEEE802.11 networks. This paper assumes a full control packet exchange before a data packet transmission. Thus the overhead of sending a data packet includes the time to send a RTS, CTS, DIFS, SIFS and ACK.

$$RETT = ETX \times \left( \frac{S}{B} + \frac{C_o}{B_{br}} \right) \text{-----}(iii)$$

The considering control frame size is constant but the impact of control overhead in transmission time is depends on different transmission rate. The basic rate of control overhead is 1 Mbps and control overhead is 48B. Consideration of control overhead in Revised Transmission Time (RETT) calculates exact delay that protects deviation between expected throughput and practical throughput.

**VI. PERFORMANCE ANALYSIS**

The Revised Expected Transmission Time (RETT) metric is designed to take into account the Control Overhead with packet size and bandwidth when computing Revised Expected Transmission Time (RETT). The proposed metric that affects the performance of itself in routing can be as the impact of control overhead on the network throughput.

**Impact of Control Overhead**

Expected Transmission Time (ETT) depends on packet size, the data rate and the loss rate. It is the expected time required for on successful data packet delivery.

Let,

S = Packet size; B = Data rate or bandwidth of the link and

ETX = Expected transmission count on a given hop

ETT is defined as:

$$ETT = ETX \times \frac{S}{B}$$

The ETT metric for a path is the sum of all links ETT over the path. The ETT metric uses equation 4(iii) considering loss rate, packet size and data transmission rate. The transmission delay not only considers loss rate, packet size, data transmission rate but also the control frames which are sent at basic rate. This paper assumes a full control packet exchange before a data packet transmission. Thus the overhead of sending a data packet includes the time to send a RTS, CTS, DIFS, SIFS and ACK. Now,

$$RETT = ETX \times \left( \frac{S}{B} + \frac{C_o}{B_{br}} \right)$$

Hence, the considering control frame size is constant but the impact of control overhead in transmission time is depends on

different transmission rate of data packet. The IEEE802.11g standard offers Data rate of 6, 9, 12, 18, 24, 36, 48, and 54Mbps. 6Mbps is the basic rate for transmission of control frame where the control overhead is 48B. Consideration of control overhead in the transmission delay calculates exact delay that protects deviation between expected throughput and practical throughput.

We can calculate the time need to transmit the control frames and time need to transmit the data frame.

$$\text{Time need to transmit the control overhead} = \frac{48 \times 8 \text{byte}}{6 \times 1024 \times 1024 \text{byte} / \text{sec}} = 61.033 \mu\text{s}$$

For the data packet size =256KB, according to the IEEE802.11g standard data rate 54Mbps we have following

$$\text{Time need to transmit data packet} = \frac{256 \times 8 \text{byte}}{54 \times 1024 \times 1024 \text{byte} / \text{sec}} = 36.17 \mu\text{s}$$

Now,

$$\text{The total time required to transmit a packet} = 61.03 \mu\text{s} + 36.17 \mu\text{s} = 97.20 \mu\text{s}$$

The earlier IEEE 802.11b standard supports 1, 2, 5.5 and 11Mbps data rates to which we can have the accounts of impact of control overhead.

$$\text{Time need to transmit the control overhead} = \frac{48 \times 8 \text{byte}}{1 \times 1024 \times 1024 \text{byte} / \text{sec}} = 366.20 \mu\text{s}$$

For the data packet size =256B, according to the IEEE802.11g standard data rate 11Mbps we have following

$$\text{Time need to transmit data packet} = \frac{256 \times 8 \text{byte}}{11 \times 1024 \times 1024 \text{byte} / \text{sec}} = 17.26 \mu\text{s}$$

Now,

$$\text{The total time required to transmit a packet} = 366.20 \mu\text{s} + 17.26 \mu\text{s} = 383.46 \mu\text{s}$$

On the change in packet size and data rate there is change in the impact of control overhead on the data volume.

### Graphical Analysis

#### Impact of Control Overhead

When a node transmits a data packet, it transmits also control frames that affect the data packet transmission time. Control packet sent at the basic rate of the link and the time need to send control overhead is constant. The following figure 4.9 represents the impact of control overhead over data packet size.

As the packet size increase the impact of constant control overhead on transmission time is decreases.

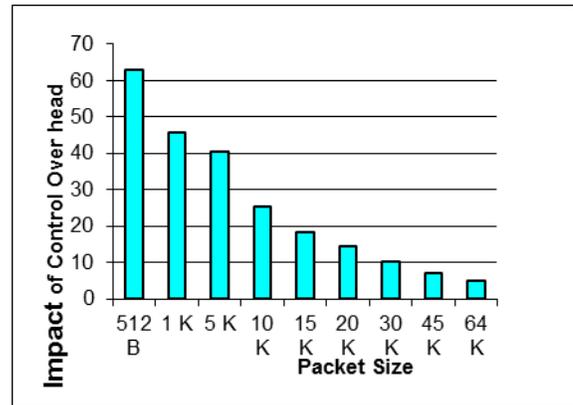


Fig-5: Impact of control overhead over packet size

In the following figure 4.10 shown that time need to send control overhead is constant and the time to send packet data is varying with respect to data packet size. We see that when the packet data size is near about to the control frame size the time needed to transmit data and time needed to transmit the control overhead is almost same. Being the high variation between data packet and the control data the time variation between control overhead and data is high.

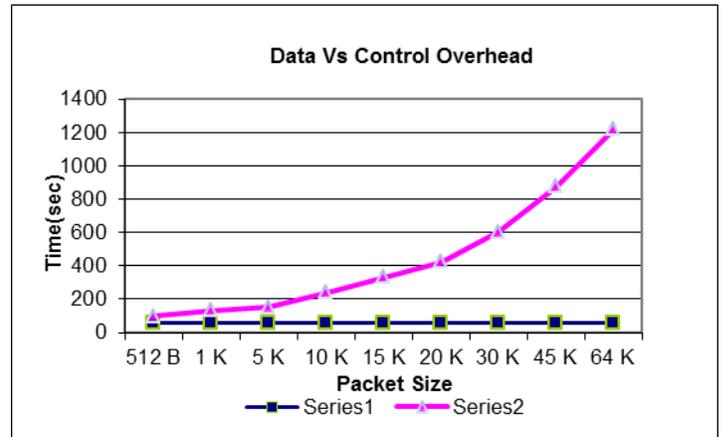


Fig-6: Transmission timed for control overhead and data packet

#### Computing Revised Expected Transmission Time

In the routing metric Expected Transmission Time (ETT) control overhead is not considered that makes the metric time estimation is different than that of exact transmission time. In our proposed metric Revised Expected Transmission Time (AETT) control overhead is considered with data packet transmission time that represents exact Transmission time. The following fig-7 and fig-8 represents the transmission delay by ETT and our proposed metric RETT respect to two aspects i.e. dynamic in data packet size and link rate.

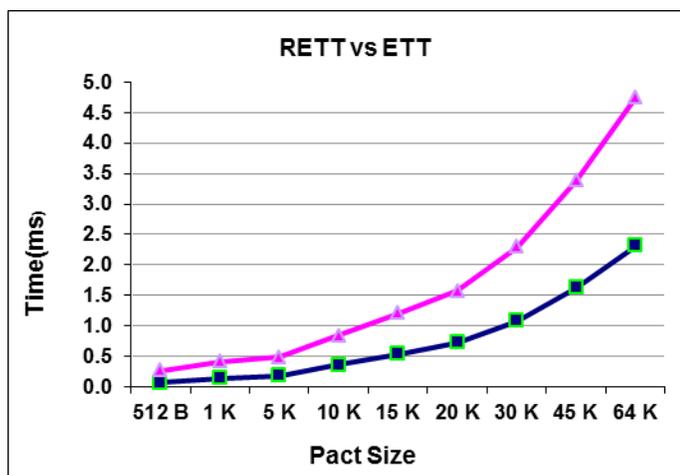


Fig-7: Exact transmission time on the basis of data packet size

## VII. CONCLUSIONS

Due to its promising technology, WMN has recently attracted much attention. It is becoming a major avenue for the next generation wireless network. For wireless mesh networks, it is a big challenge to make an efficient and fluent communication and routing metric is one of the hot research topics to ensure this. So, we have done our research in routing metric for wireless mesh networks to provide high through and efficient communication. The main concern of this thesis is to improve the network throughput for wireless mesh networks (WMN). The current IEEE 802.11s standard provides a complete layer-2 solution for WMNs where along with network discovery, interworking and security both channel access and path selection procedures are performed in the same layer. In this proposal we have introduced a new routing metric the RETT: Revised Expected Transmission Time, which selects the path with highest throughput. This paper shows with analysis how other factors such as control overhead (CO), a full control packet exchange before a data packet transmission; effective to select best throughput path. The effect of adding control overhead with the packet size will highly effective when the network size increases. The RETT metric is the précis of transmission delay; channel control overhead. Also, it has been demonstrated that the proposed metric is shown more accurate transmission time considering some necessary factors which are avoided in some existing routing protocols. Routing metric in wireless and mesh network system is a hot contemporary topic; we believe that our work can provide major contributions in analysis of future wireless mesh networks as well as real world practice in industry. We are in process to work on this topic in future considering the interference intensity of contending nodes.

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# Comparative Effects of Aerobic and Anaerobic Workouts on Performance Enhancement of Selected Physical Fitness Variables among First Year Sport Science Students of Wolaita Sodo University, Ethiopia

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**Abstract-** The study was conducted to compare the effects of aerobic and anaerobic workouts on performance enhancement of selected physical fitness variables among first year Sport Science students at Wolaita Sodo University. Thirty (15 male and 15 female) students from Sport Science department were selected as subjects and their age were 19 - 21 years. Subjects were randomly assigned to aerobic training group (5 male, 5 female,) anaerobic training group (5 male, 5 female) and control group (5 male, 5 female). The experimental groups were participated in a supervised aerobic and anaerobic training program 3 days/week for 12 weeks. The control group did not participate in any of the program. The physical fitness variables selected for the study were: cardiovascular endurance, muscular strength, muscular endurance, flexibility, body composition and Agility. Data were analyzed using ANOVA and multiple comparison of post test means were held to discover which treatment means differ at 95% confidence interval by using Fisher's LSD. The results obtained in this study indicate that there was significant improvement in selected physical fitness variables due to the effects of aerobic and anaerobic training ( $p < 0.05$ ). This study proved that aerobic exercise was significantly better than anaerobic exercise in improving cardiovascular endurance and flexibility ( $p < 0.05$ ) and anaerobic exercise was significantly better than aerobic exercise in improving muscular endurance, muscular strength and agility ( $p < 0.05$ ) while both exercises had almost the same effect in improving the body composition of the participants.

**Index Terms-** aerobic exercise, anaerobic exercise, performance enhancement, physical fitness variables.

## I. INTRODUCTION

Life will not be life without the presence of physical activities. Regular exercise is necessary to develop and maintain an optimal level of health, performance and appearance. It makes us to feel good both physically and mentally (Michaud and Narring, 1996). In the 21<sup>st</sup> century, it has become necessary to think about the ways to increase the physical fitness capacities of human beings and to sustain those potentialities. The research in that direction will definitely help the future generations to understand

the type of exercise that develops the specific physical fitness variables.

Physical fitness is the biggest potentiality of human being. It can not be bought. It can only be achieved through day to day physical activity (Bharath and Mukesh, 2011). The American College of Sports Medicine describes aerobic exercise as "any activity that uses large muscle groups, can be maintained continuously, and is rhythmic in nature". Anaerobic activity may target large or small muscle groups and differs from aerobic activity in that it involves short bursts of strenuous exertion, followed by periods of rest. Aerobic activity generally has a low to moderate-intensity and long duration, while anaerobic activity is highly intense and short-lasting (Suzanne, 2011).

The greatest benefits of regular aerobic and anaerobic exercises are probably well known theoretically for students of Sport Science. Since aerobic exercise can be sustained for long periods of time, it increases the strength and size of the heart and the efficiency of the lungs, increases the body's endurance and lowers blood pressure. Anaerobic training is beneficial in building muscle mass, which results in faster calorie-burning during exercise and a heightened metabolism. This allows the body to burn fat more quickly, and it can allow an athlete to eat larger portions of food without gaining weight (Gregory, 2009).

The general objective of this research study was to compare the effects of aerobic and anaerobic workouts on performance enhancement of selected physical fitness variables. The specific objectives were to investigate the significance of aerobic and anaerobic workouts on improving selected physical fitness variables of students, to evaluate the physical fitness improvements of students after the aerobic and anaerobic workouts have been given and to compare the obtained physical fitness results and status of students.

## II. MATERIALS AND METHODS

### The Study Design

A complete randomized block design was used for this research study. The block was based on gender (male or female). Participants were assigned to blocks, based on gender. Then, within each block, participants were randomly assigned to treatments.

**Sampling Size and Sampling Techniques**

Simple random sampling technique was used to identify the groups and for treatment allotment. The experimental groups were divided in to two i.e. aerobic and anaerobic. Thus, totally there were three groups. The three groups contain 10 (5 male and 5 female) students for aerobic group, 10 (5 male and 5 female) students for anaerobic and 10 (5 male and 5 female) students for control group.

**Methods of Data Analysis**

The data collected through fitness tests were analyzed interpreted and tabulated in to a meaningful idea using manually and software in order to compare the selected physical fitness variable changes observed in all three group participants. To test the statistical significance of the treatments, the data was analyzed through SAS version 8.12 and analysis of variance (ANOVA) was computed. Further; multiple comparison analysis on post test mean was done with Fisher’s LSD at the 0.05 levels of significance.

**Training Schedule**

**Table 1: Pre, post and mean difference values for cardiovascular endurance of the participants**

Test	Aerobic group	Anaerobic group	Control group	F value	CV%	LSD
PT	76.80	77.70	75.40	0.18	11.18	7.87
POT	112.60	91.90	79.40	71.83*	6.61	5.75
MD	35.80	14.2	4			

PT= pre training, POT= post training, MD= mean difference, CV=coefficient of variance LSD=least significant difference, \* Significant

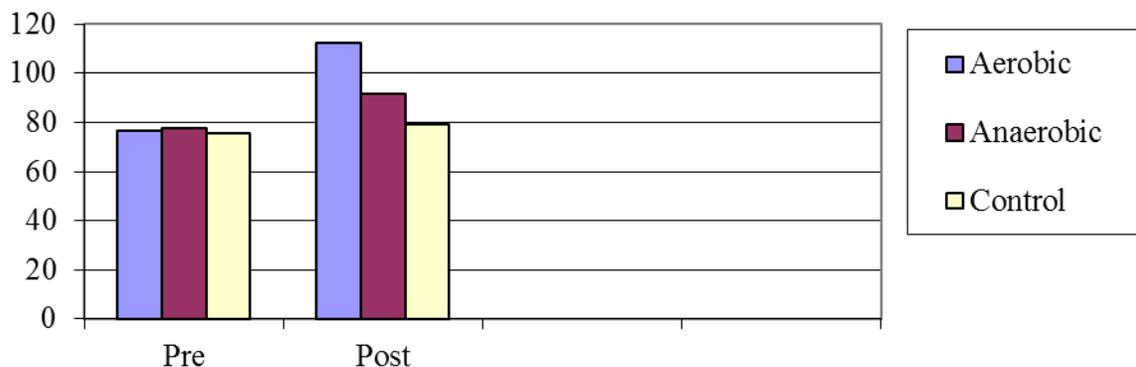
As indicated in Table 1, the pre test mean showed that at initial stage there was no significant difference between the groups. The multiple comparisons on post test data proved that due to 12 weeks treatment the significant difference existed in between the groups. The post test mean difference value was 20.7 between aerobic and anaerobic group, 33.2 in aerobic and control group and 12.5 in between anaerobic and control group. This indicates that there was significant difference between

The training program lasted for about 12 weeks. Participants were trained three times a week. It was done twice a week in the gymnasium and once a week outdoor (in the field). The sessions were taken in two different groups as aerobic and anaerobic group. Each aerobic exercise session involves a 10 minute warming up period, followed by at least 20-30 minutes of moderate intensity exercise involving the large muscle groups for the first 6 weeks and gradually increased up to 40 minutes for the next 6 weeks. In anaerobic group participants were engaged in stations of 5-8 exercise. For anaerobic group the participants were trained in a 1:1 work/rest ratio for a few weeks and progress to a 2:1 work/ rest ratio for about 30-40 minutes. Ten minutes time was given for warming up and 5 minutes for cool down exercise. No program was given to control group; they were continuing with their own daily routine.

**III. RESULTS AND DISCUSSIONS**

aerobic and anaerobic group, aerobic and control group and anaerobic and control group. In this study the cardiovascular endurance of participants were improved due to 12 weeks aerobic and anaerobic training programs and aerobic group was found to be significantly better than anaerobic groups in improving the cardiovascular endurance of the participants. The graphical representation of mean values of cardiovascular endurance of the participants has been exhibited in figure 1

**Figure 1: Comparative analysis of pre and post test data of participants on cardiovascular endurance (scores in ml kg<sup>-1</sup>min<sup>-1</sup>)**



**Table 2: Pre, post and mean difference values for muscular strength of the participants**

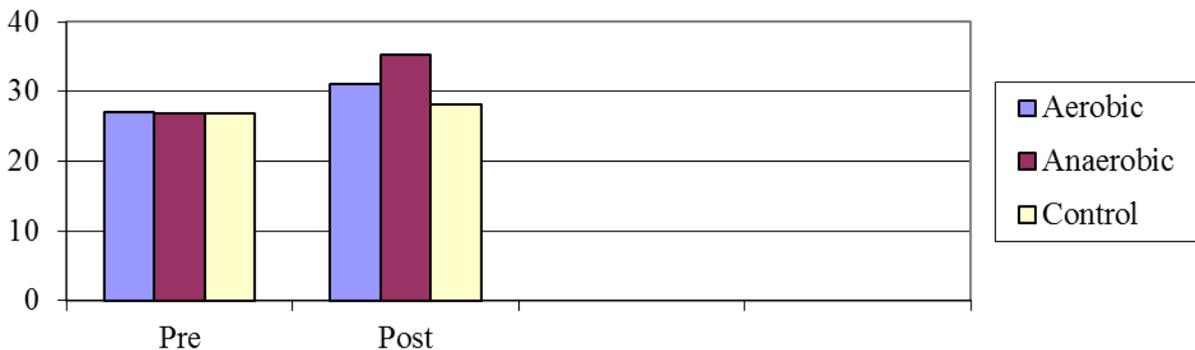
Test	Aerobic group	Anaerobic group	Control group	F value	CV%	LSD
PT	27.10	26.90	26.80	0.02	12.33	3.05
POT	31.10	35.30	28.20	5.70*	14.99	4.34
MD	4	8.4	1.4			

PT= pre training, POT= post training, MD= mean difference, CV=coefficient of variance LSD=least significant difference, \* Significant

Table 2 showed that the mean difference between pre and post test was 4, 8.4 and 1.4 for aerobic, anaerobic and control groups respectively. The mean difference value of post test means was 4.2 between anaerobic and aerobic group, 2.9 aerobic and control group and 7.1 anaerobic and control group. The multiple comparison analysis proved that there was no significant difference between aerobic and anaerobic and aerobic and control group as the mean difference value between the groups was less than the LSD value of the group (4.34). In this study, the

participant's muscular strength significantly improved because of anaerobic and aerobic exercises which enabled the subjects to perform significantly better in pushups than that of the control group counterparts. Even though both exercises show significant improvements on the muscular strength of the participants the post test mean difference was higher in anaerobic group than that of aerobic group. The graphical representation of mean values of muscular strength of the participants has been exhibited in figure 2

**Figure 2: Comparative analysis of pre and post test data of participants on muscular strength (scores in number)**



**Table 3: Pre, post and mean difference values for muscular endurance of the participants**

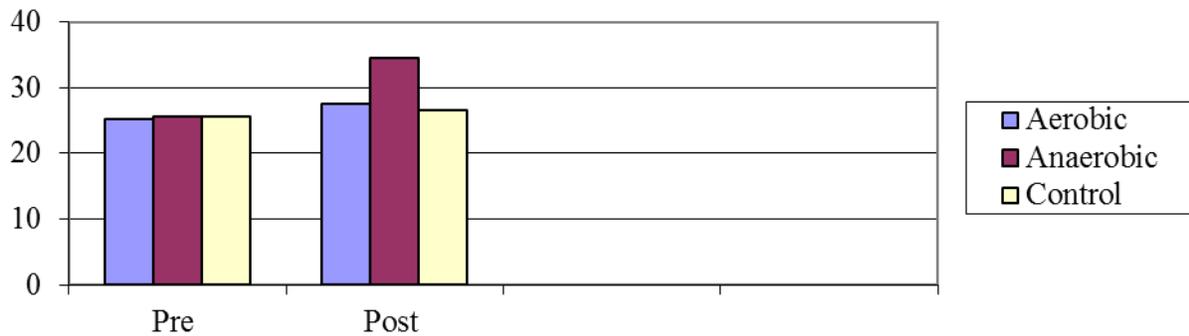
Test	Aerobic group	Anaerobic group	Control group	F value	CV%	LSD
PT	25.30	25.60	25.70	0.03	14.38	3.37
POT	27.60	34.50	26.60	13.80*	12.38	3.36
MD	2.3	8.9	0.9			

PT= pre training, POT= post training, MD= mean difference, CV=coefficient of variance LSD=least significant difference, \* Significant

As indicated in Table 4, the pre test mean was almost the same for all groups. This showed that in their initial level the groups were almost the same in their physical fitness performance. The multiple comparisons showed that there was significant difference between the post test means of the groups. The post test mean difference of anaerobic and aerobic group was 6.9 and anaerobic and control group was 7.9. There was no

significant difference between aerobic and control group as the mean difference 1 was less than that of the LSD value of 3.36 at 5% level. Therefore, anaerobic exercise was recommended for those who want to develop their muscular endurance. The graphical representation of mean values of muscular endurance of the participants has been exhibited in figure 3

**Figure 3: Comparative analysis of pre and post test data of participants on muscular endurance (scores in number)**



**Table 4: Pre, post and mean difference values for flexibility of the participants**

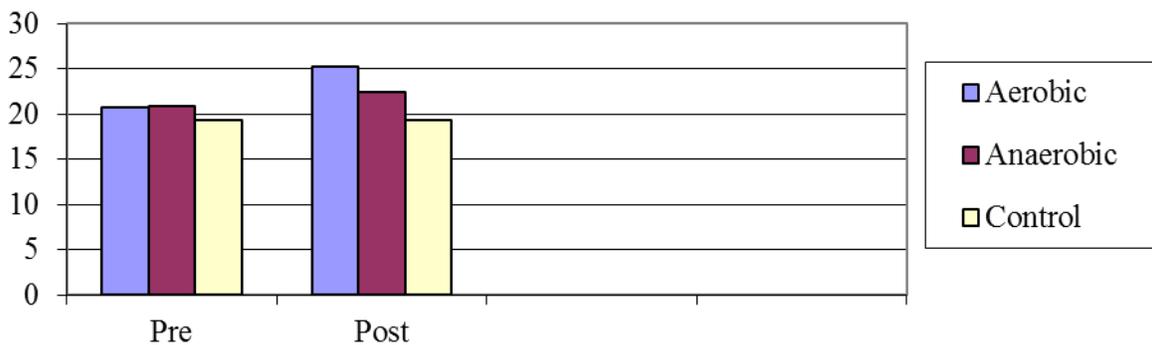
Test	Aerobic group	Anaerobic group	Control group	F value	CV%	LSD
PT	20.74	20.89	19.38	0.34	22.32	4.17
POT	25.33	22.45	19.35	4.27*	20.46	4.20
MD	4.59	1.56	-0.03			

PT= pre training, POT= post training, MD= mean difference, CV=coefficient of variance LSD=least significant difference, \* Significant

The data Table 5 showed that the pre test mean scores of flexibility in aerobic group was 20.74, anaerobic group 20.89 and control group 19.38. The post test means of aerobic (25.33) and anaerobic groups (22.45) showed improvements over the pre test scores. The post test mean difference was recorded as 2.88, 5.98 and 3.1 between aerobic and anaerobic, aerobic and control and anaerobic and control group. The multiple comparisons showed that there was significant difference between the post test means

of aerobic and control group. But no significant difference was observed between aerobic and anaerobic as well as anaerobic and control group. Thus, aerobic exercise was more effective in enhancing the flexibility of the participants than that of anaerobic exercise. The graphical representation of mean values of flexibility of the participants has been exhibited in figure 4

**Figure 4: Comparative analysis of pre and post test data of participants on flexibility (scores in centimeter)**



**Table 5: Pre, post and mean difference values for body composition of the participants**

Test	Aerobic group	Anaerobic group	Control group	F value	CV%	LSD
PT	20.52	21.11	20.33	0.43	9.58	1.82
POT	19.83	20.26	20.23	0.17	9.01	1.66
MD	-0.69	-0.85	-0.1			

PT= pre training, POT= post training, MD= mean difference, CV=coefficient of variance LSD=least significant difference, \* Significant

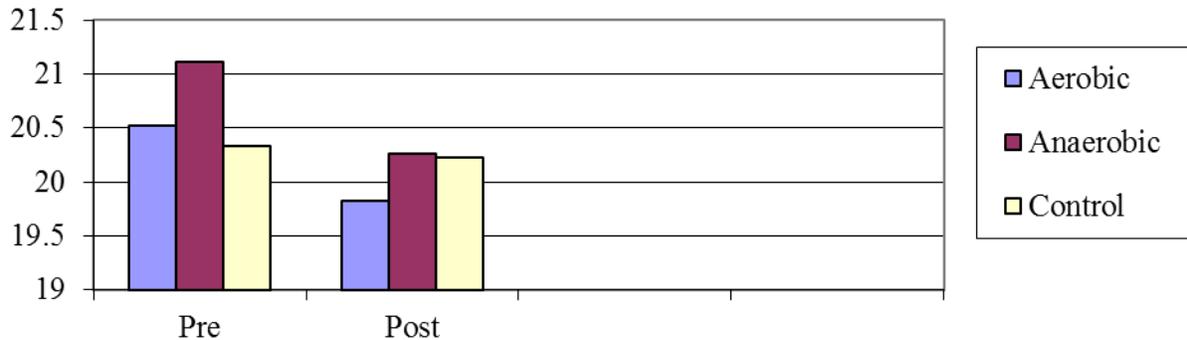
Table 6 indicate that the difference among pre and post test mean of aerobic group (-0.69), anaerobic group (-0.85) and

control group was (-0.1). The mean difference showed a slight reduction over the pre test due to training program. The post test

mean difference value was 0.43 between aerobic and anaerobic group, 0.4 aerobic and control group and 0.03 anaerobic and control group. The multiple comparisons proved that no significant difference existed between the post test means of all groups since all mean difference values was less than the LSD

value of the groups (1.66) at 0.05% level. The improvements in this study were not significant. The graphical representation of mean values of body composition of the participants has been exhibited in figure 5

**Figure 5: Comparative analysis of pre and post test data of participants on body composition (scores in percentage)**



**Table 6: Pre, post and mean difference values for agility of the participants**

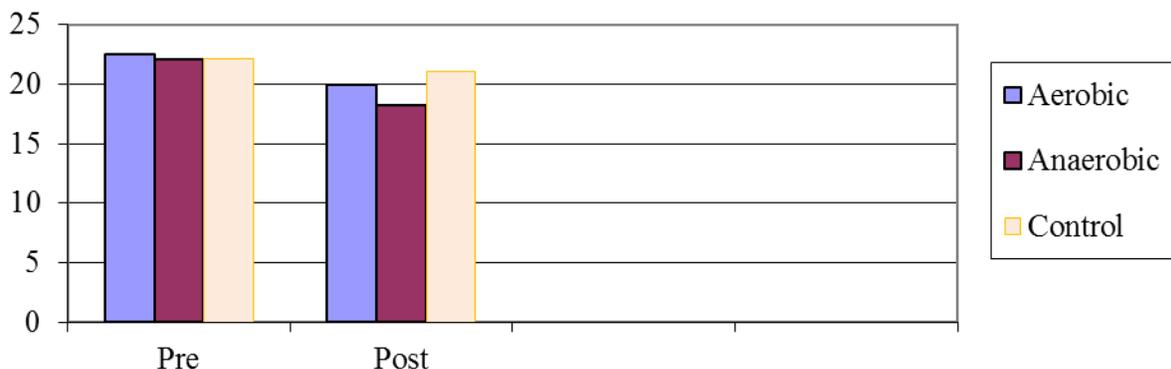
Test	Aerobic group	Anaerobic group	Control group	F value	CV%	LSD
PT	22.49	22.06	22.14	0.25	6.46	1.32
POT	19.99	18.21	21.11	11.72	6.83	1.24
MD	-2.5	-3.85	-1.03			

PT= pre training, POT= post training, MD= mean difference, CV=coefficient of variance LSD=least significant difference, \* Significant

As indicated in Table 7, the pre test mean was almost the same. The post test mean for aerobic group was 19.99, anaerobic group 18.21, and control group mean was 21.11. The mean difference was -3.85 for anaerobic group, -2.5 for aerobic group and -1.03 for control group. The post test mean difference between aerobic and anaerobic group was 1.78, aerobic and control group 1.12 while it was 2.9 for anaerobic and control group. The multiple comparisons showed that there was significant difference between the post test means of aerobic and

anaerobic and anaerobic and control groups. But there was no significance difference between aerobic and control groups as the mean difference 1.12 was less than the LSD value of 1.24 at 5%. Thus, it was proved that aerobic and anaerobic group improved agility of the participants compared to control group and anaerobic group was better than aerobic group in improving agility of the participants. The graphical representation of mean values of agility of the participants has been exhibited in figure 6

**Figure6: Comparative analysis of pre and post test data of participants on agility (scores in seconds)**



#### IV. CONCLUSION

Within the limitations and delimitations of the study, the following conclusions were drawn:

- Aerobic and anaerobic exercise programs significantly improved selected physical fitness variables, cardiovascular endurance, muscular strength, muscular endurance flexibility and agility of the participants.
- Aerobic exercise was found better than anaerobic exercise in improving cardiovascular endurance and flexibility performance of the participants.
- Anaerobic exercise was better than aerobic exercise in improving muscular strength, muscular endurance and agility of the participants
- Both aerobic and anaerobic exercise programs had no effects in improving body composition of the participants provided that the participants are in their ideal weight.
- There was no significant improvement observed on control groups.

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# Developing and Easing the Brazing Method

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**Abstract-** Brazing generally require cumbersome apparatus be it induction, vacuum or torch brazing. In torch brazing, metals are joined by using the oxyacetylene cylinder. It thus becomes difficult to carry out brazing at the places where it is not possible to take heavy gas cylinders and brazing apparatuses. So it is tried to figure out the method to carry out brazing at places where conventional brazing is not feasible. And thus Brazing was done by usual Shielded Metal Arc Welding, by developing the electrode composition for the joining process of three different kinds of metals and alloys, without using the oxyacetylene cylinder and other heavy brazing apparatus. The results show that this newly developed brazing method gave almost same appropriate welding results as it is given by the conventional brazing method.

Flux composition is determined to braze three combinations of metals and alloys

- Aluminium and Copper
- Galvanized iron and copper
- Galvanized iron and aluminium

**Index Terms-** Brazing filler material, base metal, Flux compositions, welding

## I. INTRODUCTION

**B**razing is a joining process wherein metals are bonded together using a filler metal with a melting (liquidus) temperature greater than 450 °C (840 °F), but lower than the melting temperature of the base metal. To melt the filler material a heating source is required. To carry out this operation, a welding transformer is chosen. Not only it is a good source of heat, but also easy to carry at different places. Amount of heat required can be easily controlled by setting the amperage of the welding transformer.

A series of experiments were conducted to do brazing with the help of a welding transformer.

## II. PROCEDURE

Experiment No. 1:

Firstly, brazing was performed by holding filler metal (bronze) as an electrode and setting voltage to 45 – 50 V and current to 54 to 60 A. Work piece here taken was iron. But it does not lead to positive results because filler metal does not deposit on the work piece and started running away on the work piece. Small droplets of filler material are being formed.

### **Challenges Faced:**

It was found that filler metal does not deposit on work piece due to the following reasons:

1. The work piece was not cleaned prior to brazing to remove dust and paint impurities.
2. Flux was not used which allow the removal of surface oxides and thus facilitating metal deposition.

It was necessary now to find a flux composition to braze different sets of metal combinations. Various flux materials commonly available are:

**Borates** are useful in formulating the fluxes at higher temperatures. They have good oxide dissolving power and provide protection against oxidation for longer periods. Most borates melt and are effective at a

temperature range of 760<sup>0</sup>C or higher. They have relatively high velocity in molten state, therefore it should be mixed with other minerals to increase its fluidity. (Na, K, Li)

**Elemental Boron powder** is added to increase flux action. Silver brazing fluxes that contain Boron offer protection on carbides and on materials that form refractory oxides such as chromium, nickel and cobalt.

**Fuoborates** are similar to borates. They flow better in molten state and helps in removing oxide layers. But they are less effective as compared to borates.

**Fluorides** react wildly with metallic oxides at high temperatures and thus act as cleansing agents. They help in removing refractory oxides such as aluminium oxide. They are also added with borates because of their high fluidity in molten state. But they can generate dangerous fumes thereby limiting its use in some cases.

**Chlorides** are similar to fluorides but are used at temp below that of used in fluoride fluxes. So they are use to depress the melting pint of fluoride base fluxes.

**Boric Acids** is principal constituent as helps in removing the glass like flux residue left after brazing. Fluoride content to these fluxes is low usually 2-3%.

**Alkalies** such as sodium hydroxide and potassium hydroxide elevate useful working temperature of flux. The major drawback of using alkalies is that they are deliquescent in nature. So they absorb water if exposed to humid water.

**Table 1: Melting Point of Different Flux Minerals.**

	carbonate	chloride	nitrate	sulphate	nitrite	oxalate	flouride	borates
<a href="#">Ammonium NH4+</a>	58	338	169	235	60	70	100	110
<a href="#">Calcium Ca2+</a>	825	772	561	1460	42.7	200	1418	
<a href="#">Iron Fe2+</a>		667	47	400			970	
Iron Fe3+	-	306	47	480	-			
<a href="#">Magnesium Mg2+</a>	540	714	88	1124		100	1263	1360
<a href="#">Potassium K+</a>	891	770	334	1069	440	160	858	815
<a href="#">Sodium Na+</a>	851	801	308	884	271	260	993	743(borax)
lithium	723	605	255	859	222	255	360	917
zinc		292						
aluminium		192		770	73		1291	

**Wetting Agents** are used in paste and liquid fluxes to facilitate spread of flux.

Based on the properties of these flux constituents various composition of flux combination are tried experimentally. Finally a suitable flux composition is found for various combinations of base metals.

**Extraction:**

Composition of the electrode for the brazing of different metals was evaluated using the concept and chemical equations evolved during the extraction of the respective metal.

### Extraction of Iron:

Important aspect for brazing in the iron extraction is Reduction of ore in Blast furnace:

- Charge fed up from top, preheated air at 1500°C.  
 $C + O_2 = CO_2 + \text{Heat}$   
Temperature Rises to 1900°C.
- $CO_2 + C = CO - \text{Heat}$   
Temperature falls to 1100°C.
- CO is main reducing agent.
- Reaction in blast furnace.  
 $Fe_2O_3 + 3C = CO + Fe$   
 $Fe_3O_4 + C = CO_2 + Fe$   
 $CO_2 + C = CO$   
Overall,  $Fe_2O_3 + CO = Fe + CO_2$

### Extraction of Aluminium:

- Purified  $Al_2O_3$  is mixed with  $Na_3AlF_6$  and  $CaF_2$  which lowers melting and increase conductivity.
- Anode- Steel or Graphite used for reduction  
 $Al_2O_3 + C = Al + CO_2$
- $O_2$  liberated at anode degrade or burn carbon to  
form CO and  $CO_2$ .
- Cathode :  $Al^{3+} + 3e^- = Al$   
Anode:  $C + O^{2-} = CO + 2e^-$   
 $C + O^{2-} = CO_2 + 4e^-$

Description:

- Alumina extracted by Bayer's Process  
 $NaOH + Al_2O_3 \cdot xH_2O = 2NaAlO_2 + (x+1)H_2O$

### Extraction of Copper:

Getting Copper from Chalcopyrite,  $CuFeS_2$

- $CuFeS_2 + SiO_2 + O_2 = Cu_2S + FeSiO_3 + SO_2$
- $Cu_2S + O_2 = Cu + SO_2$
- From Cuprous Oxide:  
 $Cu_2S + O_2 = Cu_2O + SO_2$   
 $Cu_2S + C = Cu + CO$
- Another Method:  
 $FeS + O_2 = FeO + SO_2$   
 $FeO + SiO_2 = FeSiO_3$   
 $Cu_2S + O_2 = Cu_2O + SO_2$   
 $Cu_2O + Cu_2S = Cu + SO_2$

### Equations:

Following equations and calculations has been made to calculate the exact mass of deposition layer for the brazing and the current required to do the appropriate brazing at particular voltage, density, diameter of the electrode and the feed.

Feed= 120 mm/min.

Diameter of electrode: 3.5 mm

Density: 8.5 g/mm<sup>3</sup>

Volume:  $[3.14 * (\text{Dia})^2 * (\text{Feed})] / 4$

**Table 2: Welding Parameters**

Sno.	Dia (mm)	Feed (mm)	vol. (mm <sup>3</sup> )	density	mass(g)	specific heat	Mp (°c)	heat	voltage	current(A)
1	3.15	120	934.6995	8.5	7.94495	0.38	930	2717.2	40	67.929286
2	3.15	120	934.6995	8.5	7.94495	0.38	930	2717.2	45	60.381588
3	3.15	120	934.6995	8.5	7.94495	0.38	930	2717.2	50	54.343429
4	3.15	120	934.6995	8.5	7.94495	0.38	930	2717.2	55	49.403117
5	3.15	120	934.6995	8.5	7.94495	0.38	930	2717.2	60	45.286191

$$= (3.14 \times 3.5 \times 3.5 \times 120) / 4$$

$$= 934.6995 \text{ gm/mm}^3$$

$$\text{Mass} = \text{Volume} \times \text{Density}$$

$$= 934.6995 \times 8.5$$

$$= 7.9449 \text{ gm.}$$

$$Q = m \times c \times (\text{Change in Temperature})$$

$$= 7.9449 \times 0.380 \times 900$$

$$= 2718.9$$

For Voltage = 40V

$$\text{Current} = Q / V$$

$$= 2718.9 / 40$$

$$\text{Current} = 67A$$

**1. To braze Aluminium and Copper**

Some facts were found out for brazing these alloys:

- If elemental P is present in copper alloys, than self fluxing because alloy is capable of reacting with oxygen.
- Lithium has high affinity for oxygen.
- Lithium salts helps in dissolving stubborn aluminium oxide.
- For aluminium oxide, sodium fluoride is generally used.

**Table 3: Chemical Composition of the electrode for Brazing of Aluminium and Copper**

Composition	Potassium borate	Boric acids	Potassium fluoborate	Sodium Aluminium fluoride	Lithium chloride	Zinc chloride
Wt %	30%	45%	20%	2%	3%	1%

- Melting point of various oxides :
  - Copper oxide – 1201 C
  - Copper carbonate – 200 C
  - Aluminium sulphide – 1130 C
  - Aluminium oxide – 2072 C

## 2. To braze Galvanized Iron and Copper

Some facts were found out for brazing these alloys:

- A mixture of borax and ammonium chloride is used as a flux when welding iron and steel.
- It lowers M.P. of iron oxide allowing it to run off.
- Molecular hydrogen can be used to reduce surface oxides of tin and indium at temp above 430 and 470C respectively. Whereas zinc at temp above 500 C.
- HCl acid and zinc chloride is also used for soldering galvanized iron.
- Self fluxing copper based brazing alloys contain P thereby Facilitating brazing on Cu to Cu in air without use of flux.

**Table 4: Chemical Composition of electrode for Brazing of Galvanized Iron and Copper**

Composition	Boric acid	Borax	Aluminium Chloride	Zinc Chloride
Wt%	60%	20%	15%	5%

**Table 5: Chemical Composition of Electrode for Brazing of Galvanized Iron and Aluminium**

Composition	Ammonium Chloride	Borax	Potassium chloride	Sodium Flouride	Lithium Chloride	Zinc chloride
Wt. %	25%	20%	20%	15%	20%	5%

### 3. To braze Galvanized Iron and Aluminium

Melting point of various oxides:

- zinc oxide – 1975 C
- iron oxide – 200 C

#### Experiment No. 2:

In second experiment, filler metal is first coated with brazing flux. Current used was A.C. It was chosen because A.C. current facilitates the removal of oxide layer. All other conditions were kept same. This time a strong joint was achieved, contrary to last time where filler metal did not even deposit on the work piece. But another problem was encountered here. Filler metal flow was not there. Therefore continuous brazing was difficult to perform. The reason behind this was found to be lack of hold time at high temp. Therefore another experiment was conducted. Few more things were considered this time.

Time for which molten metal remain in molten state should be increased. It can be observed from the brazing cycle that the hold at the liquidous temperature of the filler metal is between 0-60 min. While using welding transformer, hold at liquidous temp is just for few seconds. It can be increased by heating the work piece or using D.C. transformer so that more heat is produced at the work piece instead of filler metal.

There are two important things required in order to get good brazing joints. First, it should be clean thoroughly. Flux is used to remove the surface oxide but effective only when it is cleaned from surface contaminants like dust materials, paint etc. These surface contaminants can be removed by physical or mechanical methods like scrubbing by sandpaper. Secondly, proper braze joint should be made. A joint clearance of 0.0010 to 0.0029 inches is given to get good strength and filler metal penetration.

Considering these two factors, brazing was again performed with welding transformer. Filler metal flow was comparatively more this time.

### III. CONCLUSION

We achieved a required strength in joints. However application is limited. We can only join metals where deep penetration of molten metal is not required.

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# Iterated Pythagorean Fractal Tree Multiband Antenna

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**Abstract-** This paper presents the design & analysis of a planar multiband antenna (Iterated Pythagorean fractal tree antenna) with impedance steps in base path. Impedance steps are adopted with finite ground plane for better impedance matching, multiband & bandwidth characteristics as compare to non-iterated form. As tree iteration increases new resonance frequency will obtained, Iterated Pythagorean fractal multiband tree antenna (IPTFA) has compact size of  $41.08 \times 41.08 \times 1.57$  mm<sup>3</sup> and operates over the frequency band of 2.4 GHz. The improvement in multiband behavior is investigated & discussed with  $V_{SWR} < 2$ .

**Index Terms-** planar fractal antenna (PFA), Pythagorean fractal tree (PFT), Impedance steps, Multiband.

## I. Introduction

In the past several years antenna have capability to operate at a single midband frequency & in narrow bandwidth which limits the operational capability of antenna. Modern fast communication urged large amount of bandwidth, dual band, multiband & UWB (3.1 GHz – 10.6 GHz) communication antennas. Fractal antenna provides the multiband behavior having self-similarity [1], [2] & space filling properties. Fractal concept has emerged as novel method for designing multiband antennas [1], [3].

This paper presents the designing of a novel modified Iterated Pythagorean fractal multiband tree (IPFT) antenna based on multifractal technique, Most of the fractal objects have self-similar shape although there are some fractal objects exist that are hardly self-similar at all and have endless complexity and details [4]. Fractal Geometry was first defined by B.Mandelbort, describes the complex geometries and it was generated with iterative procedure in 1975 [4]. Fractals are made of union of several copies of itself each reproduction being transformed by a function system called iterated function system (IFS), IFS is a method of creating fractals resulting structure is always self-similar [5], [9].

A very good miniaturization ability is achieved due to itself similarity without affecting the bandwidth & accuracy of IPTF antenna, New resonance is obtained as iteration increases but radiation patterns just like Euclidean-shape patches unchanged & it also having several degree of freedom over conventional type patches [1].

## II. ANTENNA DESIGN

The Iterated Pythagorean fractal multiband tree (IPFT) is 2-D planar antenna, constructed by squares [6], [7] and named after Greek mathematician Pythagoras because each triple of touching of squares enclose a right triangle based on configuration traditionally used to depict the Pythagoras theorem. If the basic patch of having dimensions of  $L \times L \text{ mm}^2$  then entire structure is fit into the structure of dimension  $6L \times 4L \text{ mm}^2$ , Further squares are iterated on the base patch and each square is further scaled down by the factor of  $(1/2) \times \sqrt{2}$ , the meshing of the scale down structure can be merged for the proper flow of current supplied from the base patch through SMA connector having impedance of  $50\Omega$  [1].

If  $n$ = iteration factor

No. of squares in each iterations  $= 2^n$

Size of patch scale down after  $n$  iteration  $= [1/\sqrt{2}]^n$

The basic patch is chosen from the microstrip rectangular patch antenna at frequency of 2.4 GHz. Antenna is feeded by the microstrip feeding of 13 mm length & 3 mm width, it is 0.5 mm inserted in square patch for the activation. Antenna is fabricated on the dielectric substrate having dielectric constant  $\epsilon = 2.2$  and loss tangent  $\tan\delta = 0.001$  and thickness of substrate  $h = 1.57 \text{ mm}$ , separation between the ground plane & base patch  $= 1 \text{ mm}$ .

Each square patch follows the Pythagoras theorem as they are iterated on the base patch making a right angle between two square patches touches base patch, each iteration depends on size of base shape patch but angle remain constant don't depends on any factor.

The designing of antenna consists of  $W_p = 41.08 \text{ mm}$ ,  $L_p = 41.08 \text{ mm}$ ,  $W_f = 3 \text{ mm}$ ,  $t = 1 \text{ mm}$ ,  $a = 4.375 \text{ mm}$ ,  $b = 8.745$ ,  $c = 5.9 \text{ mm}$  &  $h_1 = h_2 = 1.57 \text{ mm}$

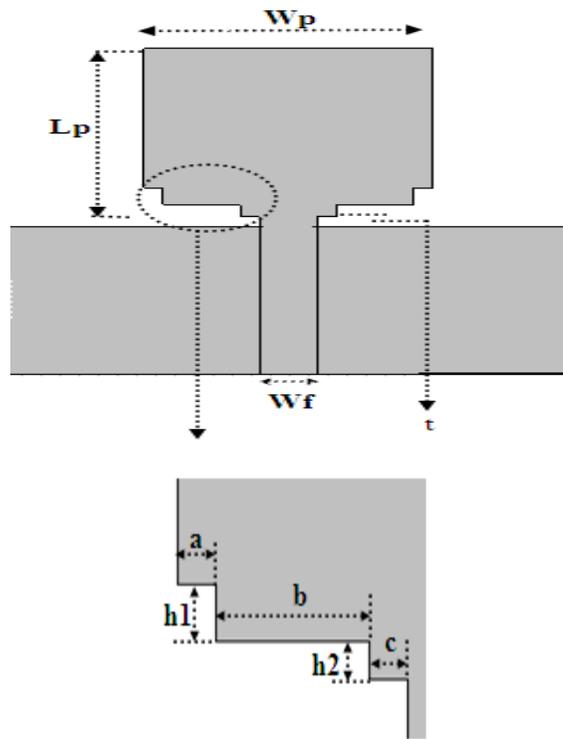


Fig 1: Existing antenna design with impedance steps & finite ground plane[2].

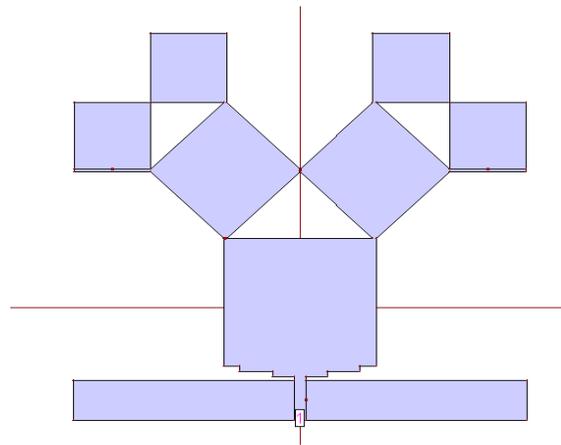


Fig 2: proposed Pythagorean tree antenna design with impedance steps & finite ground plane.

By varying steps in impedance we can tune the impedance matching for better signal transmission.

### III.RESULT AND DISCUSSION

The proposed antenna is simulated over integral equation in 3 dimension (IE3D) software as simulation tool, characteristics of iterated Pythagorean fractal multiband tree antenna (IPTFA) have been analyzed in term of return loss, impedance bandwidth & radiation characteristics.

Multiband behavior is achieved at frequency of 3.39 GHz with return loss (RL) =-12.38dB, second band is at 4.82 GHz frequency with RL=-12.35 dB, third band of return loss is obtained at 5.05 GHz frequency with RL=-14.47 dB and fourth band is dictated at 5.61 GHz frequency having minimum value of RL=-15.76dB.

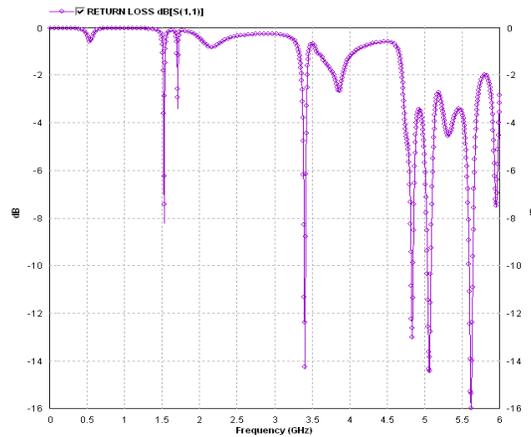


Fig 3: simulated IPTF antenna Return loss (RL) plot

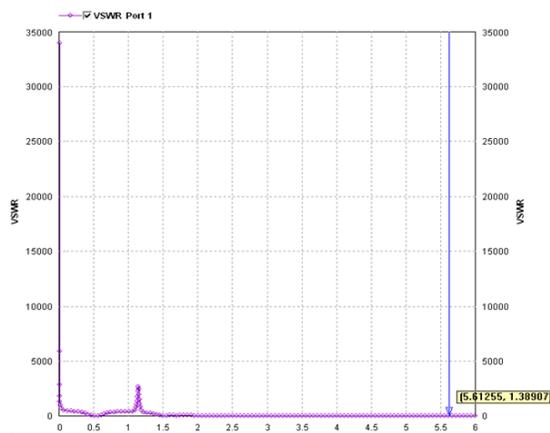


Fig 4: VSWR pattern plot

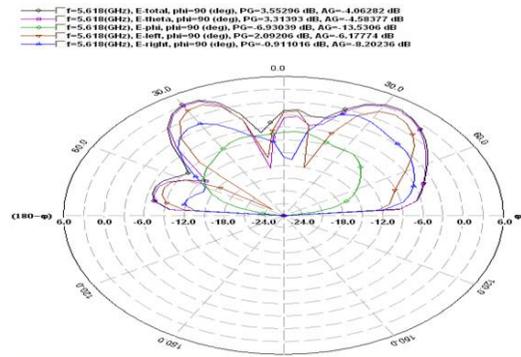


Fig 5: Radiation pattern (Polar plot) of proposed IPTF antenna at different elevation & azimuthal angle.

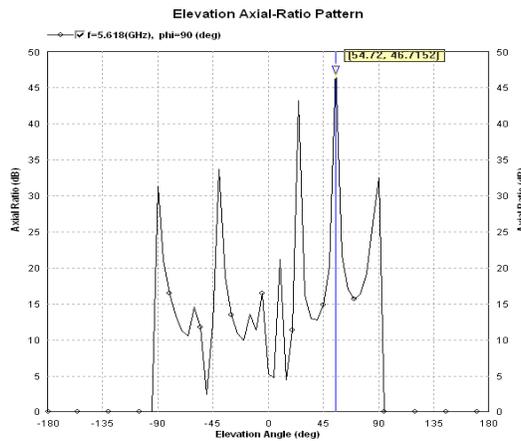


Fig 6: Elevation axial ratio pattern plot at phi= 90 (deg) for proposed IPTF antenna

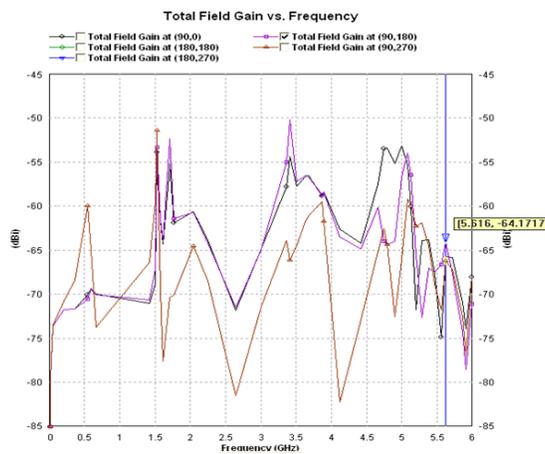


Fig 7: Total Field gain Vs. Frequency at phi=90(deg) & theta=180(deg)

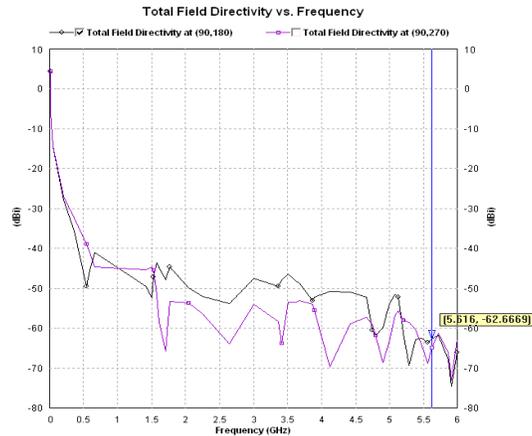


Fig 8: Total field directivity Vs. Frequency at phi= 90 (deg)& theta= 180(deg)

Impedance steps enhance current distribution path, which improves the bandwidth and multiband characteristics under VSWR=1.38 at frequency of 5.61 GHz, total gain=-64.17 dBi and total directivity=-62.66 dBi at phi=90 (deg) and theta= 180 (deg) is obtained

Table: 1 Summary of measured parameter characteristics of IPTF antenna

Frequency	5.61 GHz
Incident Power	.01 w
Input Power	0.00974179 (w)
Radiated Power	0.00715859 (w)
Average radiated power	0.000569662 (w/s)
Radiated efficiency	73.483%
Antenna efficiency	71.5859%

#### IV. CONCLUSIONS

A planar Iterated Pythagorean tree (IPTF) antenna with impedance steps are investigated, by using impedance steps in base patch better impedance matching is obtained. First band appears between 3-3.5 GHz with return loss RL=-12.38 dBi, 2<sup>nd</sup> band appears between 4.5-5 GHz with RL value=-12.35 dBi, 3<sup>rd</sup> band appears between

5-5.5 GHz with RL value=-14.28 dBi and finally 4<sup>th</sup> band appears between 5.5-6 GHz with minimum value of RL=-15.76 dB. This particular IPTF antenna is capable to operate for the mobile wi-max(2-6 GHz) and also usable for the IEEE802.11a radio utilizes(5.180-5.825 GHz).

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# Effects of Yoga Training Aerobic Training and Detraining on Muscular Endurance among College Boys

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**Abstract:** The purpose of the study was to find out the effects of yoga training aerobic training and detraining on muscular endurance among college boys. To achieve this purpose of the study, forty five college boys were selected as subjects who were studied various departments in the Nagaland University, Lumami. The selected subjects were aged between 18 to 21 years. The selected subjects were randomly divided into three groups of 15 subjects each group. Group one acted as experimental group I (yoga training) and group two acted as experimental group II (aerobic training) and group three acted as control group. The subjects were tested on selected criterion variable such as muscular endurance prior to and immediately after the training period. The selected criterion variable such as muscular endurance was measured by Bent knee sit ups. The collected data from the three groups before, during and after the experimentation was statistically analyzed by using two-way (3×3) factorial analysis of variance with last factor repeated measures. The data collected from the three groups at post test and detraining (three cessation) was statistically analyzed by using two way (3×4) factorial ANOVA with last factor repeated measures. Two way factorial ANOVA was used to find out the significant differences if any, the Scheffe's test is applied as post hoc test to determine which of the paired mean had significant differences. The 0.05 level of confidence was fixed to test the significance. The result of the present study has revealed that there was a significant difference among the experimental and control group on muscular endurance.

**Index Terms-** yoga training-aerobic training-physical fitness variables

## I. INTRODUCTION

Physical Education aims to keep people "healthy". The Physical Education / health programmed provide boys and girls with accurate and significant knowledge related to their individual needs and interest. There is also concern for health services and healthy physical and emotional environment. Physical fitness is more than is not being sick or merely being well. It is different from resistance or immunity from disease. Physical fitness therefore is an essential quality in humans. Yoga is a systematic and methodological process to control and develop the mind and body to attain good health, balance of mind and self-realization. Thought yoga has the potential power to make us healthy added to our vigor, still most of the people lack the knowledge of systematic practice of yoga. They perform yogic exercises for a short period and when their health improves, they discontinue the practices. For this reason, the effective results of yogic practices cannot be determined perfectly. Many scientists, doctors, psychologists etc, all over the world are extensively studying the beneficial aspects of yoga which encourages us to attain positive health through yoga. Aerobic exercise comprises innumerable forms. In general, it is performed at a moderate level of intensity over a relatively long period of time. For example, running a long distance at a moderate pace is an aerobic exercise, but sprinting is not. Playing singles tennis, with near-continuous motion, is generally considered aerobic activity, while golf or two person team tennis, with brief bursts of activity punctuated by more frequent breaks, may not be predominantly aerobic.

## II. METHODOLOGY

The purpose of the study was to find out the effects of yoga training aerobic training and detraining on muscular endurance among college boys. To achieve this purpose of the study, forty five college boys were selected as subjects who were studied various departments in the Nagaland University, Lumami. The selected subjects were aged between 18 to 21 years. The selected subjects were randomly divided into three groups of 15 subjects each group. Group one acted as experimental group I (yoga training) and group two acted as experimental group II (aerobic training) and group three acted as control group. The subjects were tested on selected criterion variable such as muscular endurance prior to and immediately after the training period. The selected criterion variable such as muscular endurance was measured by bent knee sit ups. The collected data from the three groups before, during and after the experimentation was statistically analyzed by using two-way (3×3) factorial analysis of variance with last factor repeated measures. The data collected from the three groups at post test and detraining (three cessation) was statistically analyzed by using two way (3×4) factorial ANOVA with last factor repeated measures. Two way factorial ANOVA was used to find out the significant differences if any, the Scheffe’s test is applied as post hoc test to determine which of the paired mean had significant differences. The 0.05 level of confidence was fixed to test the significance.

### III. RESULTS

**Findings:** The mean and standard deviation values on muscular endurance of pretest, mid test, posttest, first cessation, second cessation and third cessation period scores of yogic, aerobic and control group are given in table I.

**Table I: MEAN AND S.D. VALUES ON MUSCULAR ENDURANCE OF PRETEST, MID TEST, POSTTEST, FIRST CESSATION, SECOND CESSATION AND THIRD CESSATION PERIOD SCORES OF YOGIC, AEROBIC AND CONTROL GROUPS**

Group		Pretest	Mid test	Post test	I cessation	II cessation	III cessation
Yogic	Mean	17.47	21.27	23.67	21.53	20.27	18.87
	S.D	7.75	7.75	7.79	7.50	7.39	7.44
Aerobic	Mean	17.60	23.93	27.60	23.27	21.47	19.53
	S.D	3.91	3.45	3.46	2.89	2.85	2.59
Control	Mean	17.67	17.73	17.80	17.80	17.73	17.73
	S.D	5.05	4.96	4.84	4.84	4.71	4.68

Table I shows the analyzed data of muscular endurance. The pre means for yogic, aerobic and control group are 17.47, 17.60 and 17.67 respectively. The mid test means for yogic, aerobic and control group are 21.27, 23.93 and 17.73 respectively. The post means for yogic, aerobic and control group are 23.67, 27.60 and 17.80 respectively. The I cessation means for yogic, aerobic and control group are 21.53, 23.27 and 17.80 respectively. The II cessation means for yogic, aerobic and control group are 20.27, 21.47 and 17.73 respectively and the III cessation means for yogic, aerobic and control group are 18.87, 19.53 and 17.73 respectively.

The data on muscular endurance during training period have been analyzed by two way factorial ANOVA (3×3) with repeated measures on last factor and the results are presented in Table II.

**Table II: TWO WAY ANALYSIS OF VARIANCE WITH LAST FACTOR REPEATED MEASURES ON MUSCULAR ENDURANCE OF CONTROL AND EXPERIMENTAL GROUPS AT THREE DIFFERENT TESTING PERIODS**

Source of Variance	Sum of Squares	df	Mean Squares	‘F’ ratio
Rows (Groups)	639.748	2	319.874	3.29*
Error	4079.911	42	97.141	
Columns (Testing Periods)	680.726	2	340.363	989.67*
Interaction (Rows × Columns)	380.385	4	95.096	279.51*
Error	28.889	84	0.344	

Table II it is clear that the obtained ‘F’ ratio for groups, different stages of testing period and interaction are 4.796, 214.46 and 45.85 respectively, which was greater than the table value (2 and 42 =3.22, 2 and 84 =3.106 and 4 and 84 = 2.482 respectively).

The result of the study indicates that, significant differences exist among the experimental and control groups irrespective of different stages of testing muscular endurance.

The results of the study indicate that significant differences exist in the interaction effect (between groups and tests) on muscular endurance. Since the interaction effect is significant, the simple effect test has been applied as follow up test and it is presented in Table III.

**Table III: THE SIMPLE EFFECT SCORES OF GROUPS AT THREE DIFFERENT TESTING PERIODS ON MUSCULAR ENDURANCE**

Source of Variance	Sum of Squares	df	Mean Squares	'F' ratio
Groups and Pre test	0.156	2	0.078	0.227
Groups and Mid test	145.089	2	72.545	210.89*
Groups and Post test	364.822	2	182.411	530.27*
Tests and Control Group	0.067	2	0.034	0.097
Tests and Yoga Group	146.60	2	73.30	213.08*
Tests and Aerobic Group	151.667	2	75.834	220.45*
Error	28.889	84	0.344	

Table III shows that the obtained 'F' ratio for groups at mid and post test are 210.89 and 530.27 respectively. The result of the study indicates that significant difference on muscular endurance exists between groups at mid and post test. Further it denotes that the obtained 'F' ratio values for tests of yogic and aerobic group are 213.08 and 220.45 respectively. The result of the study indicates that significant difference on muscular endurance among the tests of yogic and aerobic group.

Whenever, the obtained 'F' ratio value is found to be significant, the Scheffe's post hoc test is applied to find out the paired mean differences and it is presented in Tables IV and V.

**Table IV: SCHEFFÉ S TEST FOR THE DIFFERENCE BETWEEN THE DIFFERENT GROUPS ON MUSCULAR ENDURANCE**

Testing Periods	Yogic Group	Aerobic Group	Control Group	Mean Difference
Pre test	17.47		17.67	0.20
		17.60	17.67	0.07
	17.47	17.60		0.13
Mid test	21.27		17.73	3.54*
		23.93	17.73	6.20*
	21.27	23.93		2.66*
Post test	23.67		17.80	5.87*
		27.60	17.80	9.80*
	23.67	27.60		3.93*

From the above table it has been observed that the mean difference values on muscular endurance during the mid test between the yogic and control group are 3.54, aerobic and control group are 6.20 and yogic and aerobic group are 2.66. The post test between the yogic and control group are 5.87, aerobic and control group are 9.80 and yogic and aerobic group are 3.93. There is significant difference among the three groups which denotes that both the experimental groups are significantly better on muscular endurance than the control group.

**Table V: SCHEFFÉ S TEST FOR THE DIFFERENCE BETWEEN THE EACH GROUP AT DIFFERENT TESTING PERIODS ON MUSCULAR ENDURANCE**

Group	Pre test	Mid test	Post test	Mean Difference
Yogic	17.47	21.27		3.80*
	17.47		23.67	6.20*
		21.27	23.67	2.40*
Aerobic	17.60	23.93		6.33*
	17.60		27.60	10.00*
		23.93	27.60	3.67*

<b>Control</b>	17.67	17.73		0.06
	17.67		17.80	0.13
		17.73	17.80	0.07

From the above table it has been observed that the mean difference values on muscular endurance of yogic group during the pre test to mid test are 3.80, pre test to post test are 6.20 and mid test to post test are 2.40. The mean differences of aerobic group pre test to mid test are 6.33, pre test to post test are 10.00 and mid test to post test are 3.67. There is significant difference during the pre test to mid test, pre test to post test and mid test to post test period.

**Table VI: TWO WAY ANALYSIS OF VARIANCE WITH LAST FACTOR REPEATED MEASURES ON MUSCULAR ENDURANCE OF CONTROL AND EXPERIMENTAL GROUPS AT FOUR DIFFERENT TESTING PERIODS**

Source of Variance	Sum of Squares	df	Mean Squares	'F' ratio
<b>Rows (Groups)</b>	831.744	2	415.872	3.58*
<b>Error</b>	4878.50	42	116.155	
<b>Columns (Testing Periods)</b>	457.994	3	151.665	289.98*
<b>Interaction (Rows × Columns)</b>	265.856	6	44.309	84.72*
<b>Error</b>	65.90	126	0.532	

Table VI it is clear that the obtained 'F' ratio for groups, different stages of testing period and interaction are 3.58, 289.98 and 84.72 respectively, which was greater than the table value (2 and 42 = 3.22, 3 and 126 = 2.68 and 6 and 126 = 2.17 respectively). The result of the study indicates that, significant differences exist among groups at each test and also significant differences between tests for each group on muscular endurance.

**Table VII: THE SIMPLE EFFECT SCORES OF GROUPS AT THREE DIFFERENT TESTING PERIODS ON MUSCULAR ENDURANCE**

Source of Variance	Sum of Squares	df	Mean Squares	'F' ratio
<b>Groups and Post test</b>	364.822	2	182.411	342.88*
<b>Groups and I Cessation</b>	117.067	2	58.534	110.03*
<b>Groups and II Cessation</b>	54.489	2	27.245	51.21*
<b>Groups and III Cessation</b>	12.422	2	6.211	11.68*
<b>Tests and Control Group</b>	0.22	3	0.073	0.138
<b>Tests and Yoga Group</b>	62.283	3	20.761	39.02*
<b>Tests and Aerobic Group</b>	177.978	3	59.326	111.52*
<b>Error</b>	65.90	126	0.532	

Table VII shows that the obtained 'F' ratio for groups at post, I cessation, II cessation and III cessation are 342.88, 110.03, 51.21 and 11.68 respectively. The result of the study indicates that significant difference on muscular endurance exists between groups at post test, I cessation, II cessation and III cessation. Further it denotes that the obtained 'F' ratio values for tests of yogic and aerobic group are 39.02 and 111.52 respectively. The result of the study indicates that significant difference on muscular endurance among the tests of yogic and aerobic group.

Whenever, the obtained 'F' ratio value is found to be significant, the Scheffe's post hoc test is applied to find out the paired mean differences and it is presented in Tables VIII and IX.

**Table VIII: SCHEFFÉ'S TEST FOR THE DIFFERENCE BETWEEN THE DIFFERENT GROUPS AT EACH TRAINING CESSATION ON MUSCULAR ENDURANCE**

Testing Periods	Yogic Group	Aerobic Group	Control Group	Mean Difference
<b>Post test</b>	23.67		17.80	5.87*
		27.60	17.80	9.80*
	23.67	27.60		3.93*
<b>I Cessation</b>	21.53		17.80	3.73*
		23.27	17.80	5.47*
	21.53	23.27		1.74*
	20.27		17.73	2.54*

		21.47	17.73	3.74*
	20.27	21.47		1.20*
<b>III Cessation</b>	19.07		17.73	1.34*
		19.53	17.73	1.80*
	19.07	19.53		0.46

From the above table it has been observed that the mean difference values on muscular endurance is found to be significant for the three groups during the post test, I cessation, II cessation and III cessation.

**Table IX: SCHEFFÉ S TEST FOR THE DIFFERENCE BETWEEN THE EACH GROUP AT DIFFERENT TESTING PERIODS AT TRAINING CESSATION ON MUSCULAR ENDURANCE**

Group	Post test	I Cessation	II Cessation	III Cessation	Mean Difference
<b>Yogic</b>	23.67	21.53			2.14*
	23.67		20.27		3.40*
	23.67			18.87	4.80*
		21.53	20.27		1.26*
		21.53		18.87	2.66*
			20.27	18.87	1.40*
<b>Aerobic</b>	27.60	23.27			4.33*
	27.60		21.47		6.13*
	27.60			19.53	8.07*
		23.27	21.47		1.80*
		23.27		19.53	3.74*
			21.47	19.53	1.94*
<b>Control</b>	17.80	17.80			0.00
	17.80		17.73		0.07
	17.80			17.73	0.07
		17.80	17.73		0.07
		17.80		17.73	0.07
			17.73	17.73	0.00

From the above table it has been observed that the mean difference values on muscular endurance of yogic group and aerobic group have significant difference during the all training cessation.

#### IV. DISCUSSION/CONCLUSIONS

The results of the present study indicate that both the experimental groups have significantly increased the muscular endurance when compared to the control group. The result of the study is in consonance with Madanmohan et al, (2008), Chen et al, (2009) and Liel et al, (2006). Further, the improvement of muscular endurance is significantly higher for the aerobic group when compared to yogic group during training periods. But during the training cessation periods both the experimental groups has significantly reduced gradual manner for first, second and third cessation period.

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# Comparative phytochemical analysis of *Diospyros chloroxylon* leaves in various extracts

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**Abstract-** A comparative preliminary study on the phytochemistry of acetone, methanol ethanol and aqueous extracts of the leaves of *Diospyros chloroxylon* of family Ebenaceae was carried out using specific chemical color reaction tests. The results obtained revealed that acetone was the best extractive solvent with the phytochemical properties of the *D.chloroxylon* leaves. Phytochemical studies indicated that the leaf contain a broad spectrum of secondary metabolites. Different extracts of leaf powders have been screened for qualitative determination of different secondary metabolites like carbohydrates,cardioglycosides, alkaloids, flavonoids, tannins, , amino acids and proteins, saponins etc.

**Index Terms-** *Diospyros chloroxylon*, Phytochemistry, secondary metabolites, soxhlet extraction

## I. INTRODUCTION

The medicinal value of plants lies in some chemical substances that produce a definite physiologic action on the human body. The most important of these bioactive compounds of plants are alkaloids, flavonoids, tannins and phenolic compounds. The phytochemical research based on ethno-pharmacological information is generally considered an effective approach in the discovery of new anti-infective agents from higher plants (Duraipandiyan et al, 2006). Phytochemicals are not considered to be essential to the human diet, but are believed to be beneficial to human health. According to phytochemicals info, there are more than a thousand known preventive chemicals in many plants that ward off diseases.

Phytochemical studies have attracted the attention of plant scientist due to development of new and sophisticated techniques. These techniques played a significant role in giving the solution to systematic problems on the one hand and in the search for additional resources of raw material for pharmaceutical industry on the other hand. Plant synthesizes a wide variety of chemical compounds, which can be sorted by

their chemical class, biosynthetic origin and functional groups into primary and secondary metabolites. With the development of natural product chemistry, the potential of chemotaxonomy is now becoming increasingly obvious. The application of chemical data to systematic has received serious attention of a large number of biochemists and botanists during the last three decades (Santosh MK et al 2007).

The present study was to investigate the phytochemical properties of the plant *Diospyros chloroxylon* Roxb. which has medicinal properties. The leaves are used to cure many types of ailments includes boils, body pains, swellings, skin diseases etc. (K N Reddy et al., 2008).

## II. MATERIAL AND METHODS

Fresh leaves of plant *Diospyros chloroxylon* free from diseases were collected from Madras Christian College, Tambaram, Chennai. They were washed thoroughly 2-3 times with running tap water and once with sterile water, air-dried, powdered and used for soxhlet extraction. 3 g of the powder was filled in the thimble and extracted successively with various extracts like acetone(90%), methanol(90%), aqueous and ethanol(90%). Phytochemical screening procedures carried out were adapted from the previous work on plant analysis (Thenmozhi. M . et al, 2010.) .This analysis determines the biologically active non nutritive compounds such as alkaloids,tannins,cardiac glycosides ,quinones, saponin etc.

## II. RESULTS

The preliminary phytochemical screening carried out on methanolic,ethanolic,aqueous and aceone extracts of *D. chloroxylon* leaves revealed the presence of phytoconstituents such as carbohydrates, cardioglycosides, terpenoids, alkaloids, flavonoids, phenols, tannins, amino acids and proteins, quinones and saponins. (Table-1). The results obtained revealed that

acetone was the best extractive solvent. The acetone extracts of the leaf of have shown positive results for carbohydrates, cardioglycosides, terpenoids, alkaloids, phenols, tannins, and saponins. But flavonoids, quinones and fixed oils and fats are absent in *all the four extracts*. Carbohydrates, tannins, saponins and cardioglycosides are present in all the four extracts.

#### IV. DISCUSSION AND CONCLUSION

Successful prediction of botanical compounds from plant material is largely dependent on the type of solvent used in the extraction procedure. The traditional healers or practitioners make use of water primarily as a solvent, but our studies showed that ethanol, methanol extracts of these plants were certainly much better than water. This may be due to the better solubility of the active components in organic solvent (Boer *et al.*, 2005). Thus results obtained in the present study suggest that the alcohol extracts of the leaves revealed a significant scope to develop a novel broad spectrum of antimicrobial drug formulation (Cragg, and Newman, 2001).

The observed activity may be due to the presence of some metabolites like alkaloid, saponins, and terpenes which have been implicated in various biological activities. The present study carried out in leaves of *D. chloroxylon* have showed that the plant is rich in carbohydrates and cardioglycosides. Acetone extract showed the presence of terpenoids, alkaloids, tannins, phenols and saponins. Both aqueous and ethanol extract showed the presence of quinines, aminoacids and proteins and fixed oils and fats are completely absent in all the extracts. Methanol and acetone extract showed the presence of phenols.

Similar studies by previous workers showed the presence of steroids and anthocyanin in the seeds of *Boerhavia orellana* and alkaloids and steroids in *Cardiospermum officinalis* (Adeniyi *et al.*, 2005); Terpenoids, tannins and guaabins from *Psidium guajava* and polygalacturonases in *Mangifera indica* (Akinpelu *et al.*, 2006); alkaloids, tannins, steroids, flavonoids from the ethanolic and aqueous extracts of stem and bark of *Picralima nitida* (Nkere *et al.*, 2005); lenolinic acid in *Ocimum sanctum*

(Singh, S *et al.*, 2005); phenolic compounds, flavonoids, cyclobutane in *Combretum alpopunctatum* (Kavitha *et al.*, 2004); diterpenes, flavonoids, andrographolates and polyphenols from *Andrographis paniculata* (Dua *et al.*, 2006; Rao *et al.*, 2004) and the presence of tannins, alkaloids, phenols and saponins in twelve Indian medicinal plants (Vimal Kumar *et al.*, 2009).

The presence of these metabolites suggests great potential for the plant as a source of useful phytochemicals (Kunle *et al.*, 2003). For instance, the presence of tannins could also show that it is an astringent, help in wound healing and anti-parasitic. Tannins bind to proline rich proteins and interfere with the protein synthesis (Shimada T, 2006).

It may be concluded that the awareness of local community should be enhanced by incorporating the traditional knowledge with scientific findings. The results of the present study support the folkloric usage of the studied plant, *D. chloroxylon* as a medicine. Hence it is necessary to explore the maximum potential of the plant in medicinal field and pharmaceutical sciences for further application. And also further studies are required about the appropriate characterisation of the compounds present in the plant.

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**Table-1: Phytochemical analysis of leaves of some selected plant species**

	<b>Phyto Constituents</b>	<b>Various Extracts</b>			
		<b>Acet one</b>	<b>Metha nol</b>	<b>Etha nol</b>	<b>Aqueous</b>
	Carbohydrates	+	+	+	+
	Cardioglycosi des	+	+	+	+
	Terpenoids	+	-	+	-
	Alkaloids	+	-	-	-
	Flavanoids	-	-	-	-
	Tannins	+	+	+	+
	Phenols	+	+	-	+
	Aminoacids and Proteins	-	-	-	-
	Quinones	-	-	+	+
	Fixed oils and Fats	-	-	-	-
	Saponins	+	+	+	+

+ - Positive

- - Negative



**Figure 8:***Diospyros chloroxylon Roxb.*

# SECURITY ISSUES IN THE WEB COMMERCE

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**Abstract-** WEB commerce security is an important issue that has been leading to negative or adverse effects on the further development and growth of WEB-commerce. We discuss objectives such as security goals integrity, confidentiality, availability and we discussed the security services and how these are related to the three security goals. Here we took the example service namely SET(Secure Electronic Transaction) and in this case study we have discussed some security techniques to avoid this manipulation of the credential data which would guarantee an increased customer base and eventually prove to be very profitable.

**Index Terms-** Availability, Confidentiality, Integrity, SET;

## I. INTRODUCTION

Web is now widely used by business, government and individuals. But both internet and web are vulnerable. So it has a variety of threats such as integrity, confidentiality, denial of services and authentication. Therefore there is a need of added security mechanisms. The utilization of the internet is increasing rapidly every year; availability of low cost peripheral devices and wider internet accessibility options are key contributing factors. This raises a number of risks and issues including technological, security, privacy, trust, legal and other related issues. The following research focuses on the security issues. The factoring of Security in web-commerce models is of considerable importance to consumers, businesses, and regulators. The majority of customers feel insecure towards the existing policies and guidelines with respect to security online. Such insecurities have a negative impact upon any economical model. That said, online security breaches can be considered as a spreading menace in current day economical settings around the world. Here in this case study, a customer places a request to the merchant to purchase any item. Remember as these are the transactions that are going to take place through online, we need to purchase the item by using our credit cards or debit cards which are to be linked through the bank. To make the payment we need to use this credit card information. Here is a chance to manipulate this information. So, here in this case study we have discussed some security techniques to avoid this manipulation of the credential data.

Until a few decades ago, the information collected by the organizations are stored on the physical files. The confidentiality of the files is achieved by restricting the access to the few authorized and trusted people in the organization. Similarly only a few authorized people are allowed to make changes to the content of the files. Availability was achieved by designating at least one person who would have access to the files at all times [1].

## II. Security goals

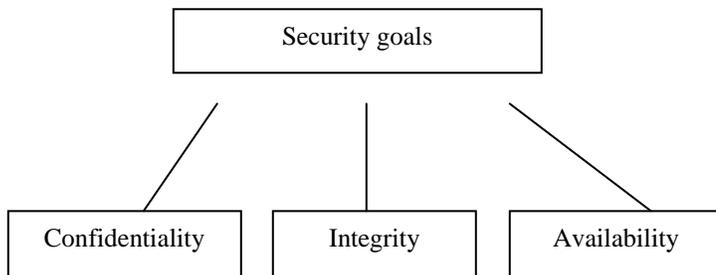


Figure 1: Taxonomy of security goals

### A. Confidentiality

Confidentiality refers to limiting information access and disclosure to authorized users "the right people" and preventing access by or disclosure to unauthorized ones "the wrong people." Underpinning the goal of confidentiality are authentication methods like user-IDs and passwords that uniquely identify a data system's users, and supporting control methods that limit each identified user's access

to the data system's resources. Also critical to confidentiality and data integrity and availability as well are protections against malicious attacks [2].

### *B. Integrity*

Integrity refers to the trustworthiness of information resources. It includes the concept of "data integrity" namely, that data have not been changed inappropriately, whether by accident or deliberately malign activity. It also includes "origin" or "source integrity" -- that is, that the data actually came from the person or entity you think it did, rather than an imposter. Integrity can even include the notion that the person or entity in question entered the right information -- that is, that the information reflected the actual circumstances (in statistics, this is the concept of "validity") and that under the same circumstances would generate identical data (what statisticians call "reliability"). On a more restrictive view, however, integrity of an information system includes only preservation without corruption of whatever was transmitted or entered into the system, right or wrong [3].

### *C. Availability*

Availability refers, unsurprisingly, to the availability of information resources. An information system that is not available when you need it is at least as bad as none at all. It may be much worse, depending on how reliant the organization has become on a functioning computer and communications infrastructure. Almost all modern organizations are highly dependent on functioning information systems. Many literally could not operate without them. Availability, like other aspects of security, may be affected by purely technical issues (e.g., a malfunctioning part of a computer or communications device), natural phenomena (e.g., wind or water), or human causes (accidental or deliberate). While the relative risks associated with these categories depend on the particular context, the general rule is that humans are the weakest link. (That's why each user's ability and willingness to use a data system securely are critical) [4].

## III. Secure Electronic Transaction (SET)

SET is an open encryption and security specification. It protects the credit card transactions on the internet. Companies involved are:

Master card, Visa, IBM, Microsoft, Netscape, RSA and VeriSign. SET is not a payment system. It is a SET of security protocols and formats architecture. As the name implies, the secure electronic transaction (SET) protocol is used to facilitate the secure transmission of consumer credit card information via electronic avenues, such as the Internet. SET blocks out the details of credit card information, thus preventing merchants, hackers and electronic thieves from accessing the information. SET allows merchants to verify their customers' card information without actually seeing it, thus protecting the customer. The information on the card is instead transferred directly to the credit card company for verification. It will protect buyers by providing a mechanism for their credit card number to be transferred directly to the credit card issuer for verification and billing without the merchant being able to see the number [5].

### *A. SET Services*

SET provides a secure communication channel in a transaction. SET ensures the privacy. It provides trust by the use of digital certificates. The SET protocol addresses the payment phase of a transaction from the individual, to the merchant, to the acquirer (the merchant's current bankcard processor). It can be used to help ensure the privacy and integrity of real time bankcard payments over the Internet. In addition, with SET in place, everyone in the payment process knows who everyone else is.

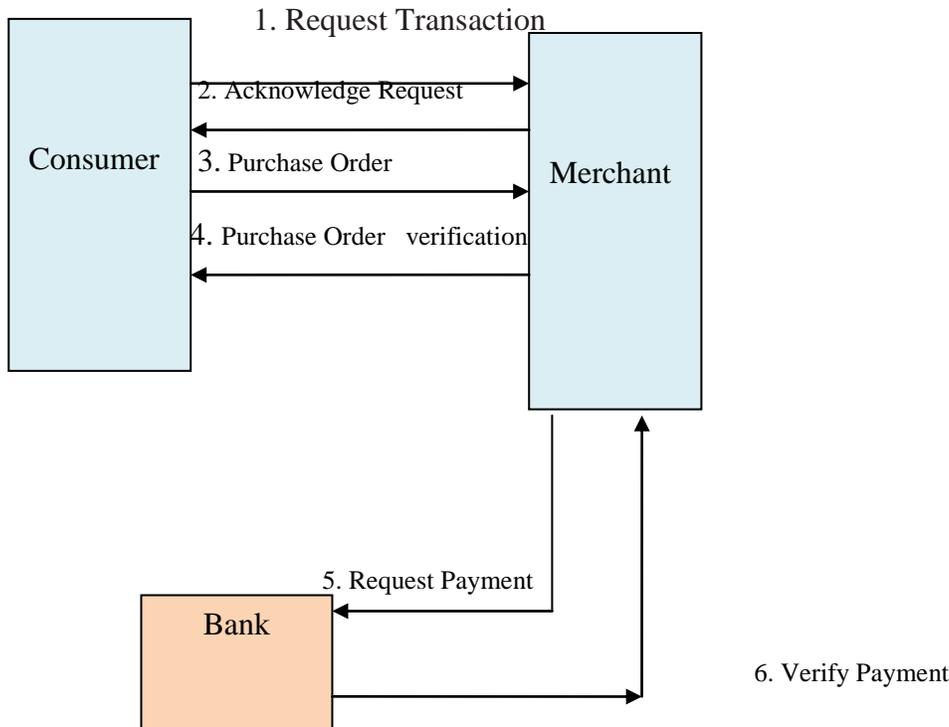


Figure 2: Scenario of SET

The card holder, the merchant, and the acquirer can be fully authenticated because the core protocol of SET is based on digital certificates. Each participant in the payment transaction holds a certificate that validates his or her identity. The public key infrastructure allows these digital certificates to be exchanged, checked, and validated for every transaction made over the Internet. The mechanics of this operation are transparent to the application.

Under the SET protocol, every online purchase must be accompanied by a digital certificate which identifies the card-holder to the merchant. The buyer's digital certificate serves as an electronic representation of the buyer's credit card but does not actually show the credit card number to the merchant. Once the merchant's SET application authenticates the buyer's identity, it then decrypts the order information, processes the order, and forwards the still-encrypted payment information to the acquirer for processing. The acquirer's SET application authenticates the buyer's credit card information, identifies the merchant, and arranges settlement. With SET, the Internet becomes a safer, more secure environment for the use of payment cards [6].

#### *B. Key features of SET*

To meet the business requirements, SET incorporates the following features [7]:

- Confidentiality of information
- Integrity of data
- Cardholder account authentication
- Merchant authentication

#### IV. Security vulnerabilities in web commerce

There are many points of failure, or vulnerabilities, in an web-commerce environment. Even in a simplified web-commerce scenario, a single user contacts a single web site, and then gives his credit card and address information for shipping a purchase many potential security vulnerabilities exist. Indeed, even in this simple scenario, there are a number of systems and networks involved. Each has security issues [8]:

A user must use a web site and at some point identify, or authenticate, himself to the site. Unfortunately, security problems in home computers offer hackers other ways to steal web commerce data and identification data from users. Some current examples include a popular home-banking system that stores a user's account number in a Web "cookie" which hostile web-sites can crack ineffective encryption. While these specific security problems will be fixed by some software developers and web-site administrators, similar problems will continue to occur. Alternatives to the home computer include Point-of-Sale (POS) terminals [9].

The user's web browser connects to the merchant front-end. When a consumer makes an online purchase, the merchant's web-server usually caches the order's personal information in an archive of recent orders. This archive contains everything necessary for credit-card fraud [10].

The merchant back-end and database. A site's servers can weaken the company's internal network. This not easily remedied, because the web servers need administrative connections to the internal network, but web server software tends to have buggy security. Here, the cost of failure is very high, with potential theft of customers' identities or corporate data. Additionally, the back-end may connect with third party fulfillment centers and other processing agents. Arguably, the risk of stolen product is the merchant's least-important security concern, because most merchants' traditional operations already have careful controls to track payments and deliveries. However, these third parties can release valuable data through their own vulnerabilities [11].

#### V. Recommended steps for security

There are many relevant technologies, including cryptographic technologies that can overcome the above vulnerabilities. The most visible security technologies are the encryption algorithms.

- Public key infrastructure (PKI) systems are one such encryption technology [12]. The PKI is a flexible key-distribution system in which every participant carries two cryptographic keys, one for encryption and one for decryption; together these two keys make up what is called an asymmetric *key pair* [13]. A performance advantage of PKI is that it does not require a centralized, highly available intermediary for every secured transaction; however, this also makes it difficult to know when another party's key has been stolen or otherwise compromised.
- A digital signature [14] is the salient application of public-key cryptography, and is an analog of a handwritten signature. A digital signature is a cryptographic tag that only one author can calculate; the tag can be combined with any kind of data that the author might create (e.g., financial, entertainment, medical); and the tag's validity can be checked by anyone who can access the data.
- Other technologies can be used to perform both authentication and data protection. For example, smart cards can be used to store data about the bearer of the card, including financial data, medical records, identification credentials. Because those data are so sensitive, it is critical to store the associated encryption keys in tamper-resistant hardware. Further, the smartcard shouldn't ever have to share the bearer's personal data or his keys with a POS terminal [15].
- Software developers must develop software to enhance safety and security and provide safety measures like encryption, digital signatures, biometrics, virus protection, etc. Introducing security seals is also advisable. Moreover, educating customers on security issues and how to protect their computers is also a major part of the security implementation process [16].

Therefore, as can be seen, in order for e-commerce security to blossom, it is important to look at it from many different angles, and focus on not only the company's guarantees, but also on customer's needs and the initial software development process. Security must also be achieved in a collective manner rather than individualistic in order to improve the worldwide perception of online security [17].

#### VI. DISCUSSION

A review of the impact of security issues on web-commerce development reveals that with today's rapid growth and expansion of e-commerce, security concerns are increasing amongst customers. This research tells how customers' perception of possible risks and threats to the security of their personal information affects their online purchasing behavior. Due to the increase in warnings by the media from security breaches like identity theft and financial fraud, and the elevated awareness of online customers about the threats of performing transactions online, e-commerce has not been able to achieve its full potential. Many customers refuse to perform online transactions and relate that to the lack of trust or fear for their personal information. Therefore, in order for e-commerce to expand and achieve its full potential, companies need to understand these needs collectively try and develop systems would ensure the private and secure communication of information between buyers and sellers.

## VII. CONCLUSION

The research introduced the issues in the current e-commerce environment, here in this example service namely SET , we have discussed some security techniques to avoid this manipulation of the credential data. This was all done in order to facilitate the further expansion and development of e-commerce. We are living in the information age. Information need to be secured from the attacks. To be secured, information need to be hidden from the unauthorized access (confidentiality), protected from unauthorized change (integrity) and available to authorized entity when it is needed (availability). It elaborated its effect on e-commerce growth, reasons behind it and the importance of providing secure communication networks and we expect that these studies will bring greater clarity and proficiency.

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# Tribological behaviour of AA 5083/Micron and Nano SiC composites fabricated by ultrasonic assisted stir casting process

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**Abstract-** Metal Matrix composites (MMCs) are light weight, high-strength materials with potential application in areas such as automobile, aerospace, defence and other industries. MMCs are projected to significantly reduce the overall weight of the vehicle and aircraft while maintaining satisfactory structural strength. Micron and Nano-sized ceramic particle reinforced aluminum matrix composites fabricated using conventional stir casting technique usually present poor distribution of these particles within the matrix and high porosity. In this study, AA 5083 alloy micron and nano SiC composites have been fabricated by Ultrasonic assisted Stir casting process. Different weight % of SiC particles Micron (10 wt%) and Nano (1, 2, 3, and 4 wt%) were used for synthesis of aluminum matrix composites. Scanning electron micrographs show uniform distribution of SiC particles however with agglomeration at some places. An attempt has been made to study the influence of wear parameters like applied load, sliding speed, sliding distance and percentage of reinforcement on the dry sliding wear behaviour of aluminum matrix micron and nano SiC composites. Results revealed that at low load and smaller sliding distance composites with nano SiC show higher wear resistance; however at high load and longer sliding distance composites with micron SiC shows higher wear resistance among all composites tested. The application of ultrasonic vibration on the composite during melting not only refined the grain structure of the matrix, but also improved the distribution of nano-sized reinforcement.

**Index Terms:** Metal Matrix Composites, Ultrasonic Assisted Stir Casting, Agglomeration, Nanocomposites, SiC particles.

## I. INTRODUCTION

The properties attainable in any alloy system are limited to a certain extent and reach a saturation limit; further improvement can be done by strengthening mechanism, controlling microstructure, alloying constituents, addition of modifiers etc. During design & research of such materials, the concept of composite materials is used which can bring together the combined advantages of the constituent materials not possible when they are employed alone [1]. Aluminium matrix composites have drawn immense interest for various applications in making aerospace and automobile components due to their high strength to weight ratio, high stiffness, lower cost, good formability and low coefficient of thermal expansion. Particulate-reinforced Aluminum matrix composites (AMCs) are of particular interest due to their ease of fabrication, lower costs, recyclability and isotropic properties. Overall strength of such particle reinforced AMCs depends on size of the particles, the inter-particle spacing, volume fraction of the particles and the nature of matrix and reinforcement interface. Bindumadhavan et. al. [2] reported that applied load is one of the major factors influencing the wear rate of the composites. Lim et. al. [3] studied the effect of load on wear rate of alloy and composites reinforced with micron SiC particles at fixed speed, percentage of SiC<sub>p</sub> and for 30 minutes test duration. Results revealed that the wear rate of the unreinforced alloy is found to be higher than that of the composites. Hassan et. al. [4] and Kwok and Lim [5] reported that composites with SiC<sub>p</sub> exhibits significantly higher wear resistance than the matrix alloy due to the addition of hard SiC particles which acts as a load bearing constituent. As the percentage reinforcement of SiC particles increases, the wear rate of the composite decreases. Veeresh Kumar et. al. [6] compared the tribological properties of Al6061-SiC<sub>p</sub> (20 μm) and Al7075-Al<sub>2</sub>O<sub>3</sub> (20 μm) composites with 2-6 wt. % of particulates. Results revealed that the wear resistance of the composites increases with increase in wt % of reinforcements. Hosking et. al. [7] reported that SiC<sub>p</sub> reinforced composite is superior to Al<sub>2</sub>O<sub>3</sub> reinforced one for improving the wear resistance of the alloy because of the former one have superior hardness and toughness than the later one. Sudarshan and Surappa [8] & Mahendra and Radhakrishna [9] both stated that wear mechanism is strongly dependent on the sliding distance. At any constant load for a constant period of time the wear rate increases with increase in sliding distance and wear rate of the unreinforced alloy is found to be higher than that of the composites.

In the present work, AA 5083-SiC<sub>p</sub> composites have been fabricated by Ultrasonic assisted stir casting. Different weight % of SiC particles Micron (10 wt. %) and Nano (1, 2, 3 and 4 wt. %) were used for synthesis of composites. SEM microstructure shows uniform distribution of SiC particles with some places agglomeration. An attempt has been made to study the influence of wear parameters like applied load, sliding speed, sliding distance and percentage of reinforcement on the dry sliding wear of micron and nano SiC metal matrix composites (MMCs).

## II. EXPERIMENTAL

**Selection of Material:** Aluminum alloy 5083 has been selected as matrix alloy for synthesis of AMCs. The chemical compositions are shown in Table 1.

Table 1 Composition of AA 5083 Al alloy

Element	Zn	Fe	Ti	Cu	Si	Pb	Mn	Mg	Cr	Al
Percent	0.03	0.173	0.04	0.0181	0.16	0.014	0.526	5.13	0.097	Balance

**Selection of Reinforcement Particles:** Micron and Nano size Silicon Carbide particulates have been used as reinforcement material. SiC micron size particles with average particles size of 35  $\mu\text{m}$  SiC<sub>p</sub> (99% Pure) and SiC Nano particles of average particle size 40 nm (SiC<sub>p-b</sub>, 99+% pure) were used.

**Fabrication of Aluminum matrix-SiC<sub>p</sub> Composites:** 1400 gram Aluminum 5083 alloy has been melted in graphite crucible in electrical resistance furnaces at a temperature 760°C which is above the melting point of the alloy. When the alloy reaches to a semi-pasty stage, the surface was covered with flux (Coveral-11). About 5 grams of the flux was added to the molten alloy. After complete melting, the dross is removed from the surface using a graphite-coated skimmer. The dissolved gases were removed by passing dry nitrogen grade I gas into the melt for 5 minutes. Dross is also removed by nitrogen gas bubbling, most probably by mechanical action i.e., inert gas carrying the oxides to the surfaces of the melt. After degassing, the surface was again cleaned and the temperature of the melt increased to 780°C. It is worth mentioning that during degassing, the temperature of the melt is brought down to 680°C. This takes care of minimum gas absorption during bubbling. Stirring the alloy melt with the help of a mechanical stirrer and add the pre-heated micron SiC particles with different wt. % in the melt. After stirring for about 10 minutes, ultrasonic treatment was given to the melt for about 5 minutes with ultrasonic probe to prevent agglomeration of fine SiC particles. Composites have been prepared with 10 wt. % of micron SiC<sub>p</sub> particles and also with 1, 2, 3 and 4 wt% of Nano SiC<sub>p</sub> particles through ultrasonic assisted stir casting. Figure 1 shows the Ultrasonic assisted stir casting setup for the casting of composites. After successful addition of particles, the composite melt was solidified into a mild steel die in the form of cylindrical samples (20 mm diameter and 200 mm length). Figure 2 shows the photograph of die used for casting of samples. Standard size cylindrical pins were machined for wear test from the cast cylindrical samples.



Fig. 1 Ultrasonic assisted stir casting setup



Fig.2- Die for casting of samples for wear test

### III. RESULTS AND DISCUSSIONS

**Effect of Sliding distance on Wear Rate:** Wear mechanism is strongly dependent on the sliding distance. The Fig. 3 shows that at constant load (10 N) and for constant period of time (30 minutes) the wear rate increases with increase in sliding distance and wear rate of the unreinforced alloy is found to be higher than that of the composites. This clearly shows from figure 3 that SiC particles improve the load bearing properties of AA 5083 alloy during sliding. As the sliding distance increases from 754 m to 1885 m the wear rate of the composite increases, which gives a direct relation between sliding distance and wear rate.

Similar trend was observed in the study of dry sliding wear behaviour of particles reinforced with Al alloys [9, 10]. Composite with nano SiC (both 3 and 4%) shows higher wear resistance than 10 % micron SiC up to the sliding distance of 1131 m. At a sliding distance above 1131 m, the wear rate of composites with nano SiC starts to increase marginally than the composites with micron SiC particles and composites with micron SiC particles exhibits low wear rate than composites with nano SiC particles at higher sliding distance and higher speed. This may be due to the breakage of particles at high sliding distance. In addition thermal softening of matrix material may take place, which further lowers the bonding effect of the nano SiC particles with that of matrix material. Due to its lower bonding strength, nano SiC particles can easily pull out from the matrix under dry sliding conditions. Similar trend was observed in the study of dry sliding wear behaviour of Al 2219/SiC, Al5083/B4C and A356/25SiCp metal matrix composites [11, 12, 13].

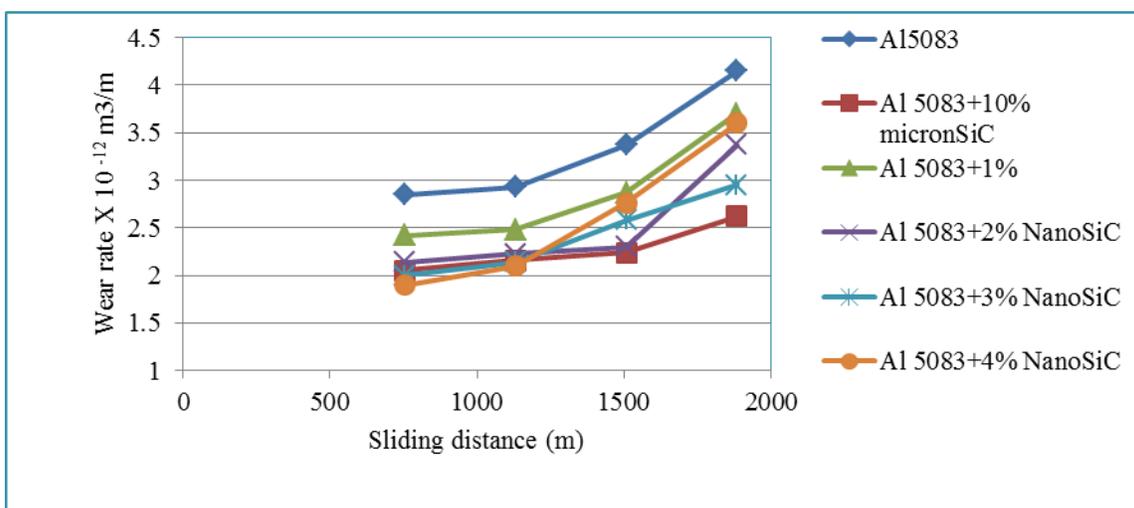


Fig. 3 Wear rate at Load 10 N and test duration 30 minutes

**Effect of Applied load on Wear Rate:** Applied load is also one of the major factors influencing the wear rate of the composites. The wear rate of the unreinforced alloy is found to be higher than that of the composites. This is primarily due to the fact that the hard dispersoids, present on the surface of the composites, act as protrusions, which protect the matrix from severe contact with the counter surfaces and thus resulting in less wear in composites as compared to that in the case of alloy for all loads. Figure 4 shows that at constant sliding distance (754 m), the wear rate of the composites increases with increase in load.

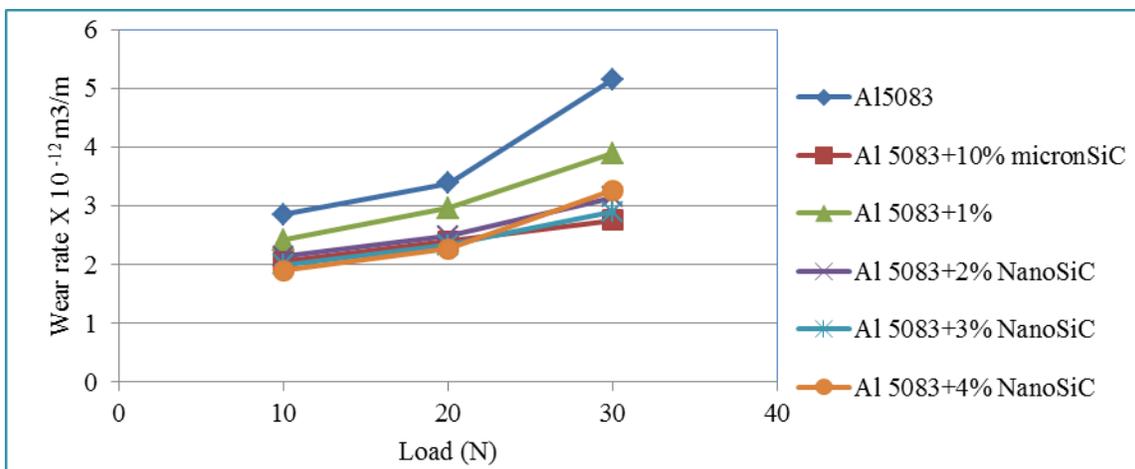


Fig.4 Wear rate at Sliding distance 754 m and test duration 30 minutes

At load 10N and 20N wear rate of Composites with 4 % nano SiC is minimum. Composites with 10 % micron SiC and composites with 3 % nano SiC have shown almost same wear rate at 10N and 20N. When there is an increase in load from 20N to 30N, the composites with 10 % micron SiC shows lower wear rate then all the nano SiC composites. From the Fig. 5, it is shown that the composites with 10 % micron SiC particles exhibits better wear resistance than all the composites with nano SiC particles at higher load, higher sliding distance and higher speed. This may be due to the fact that nano particles tend to get ploughed away from the surface of the matrix easily, thus increasing the wear. In composites with micron particles, the particles get fragmented into small pieces and continue to restrict the particle removal, thereby decreasing the wear.

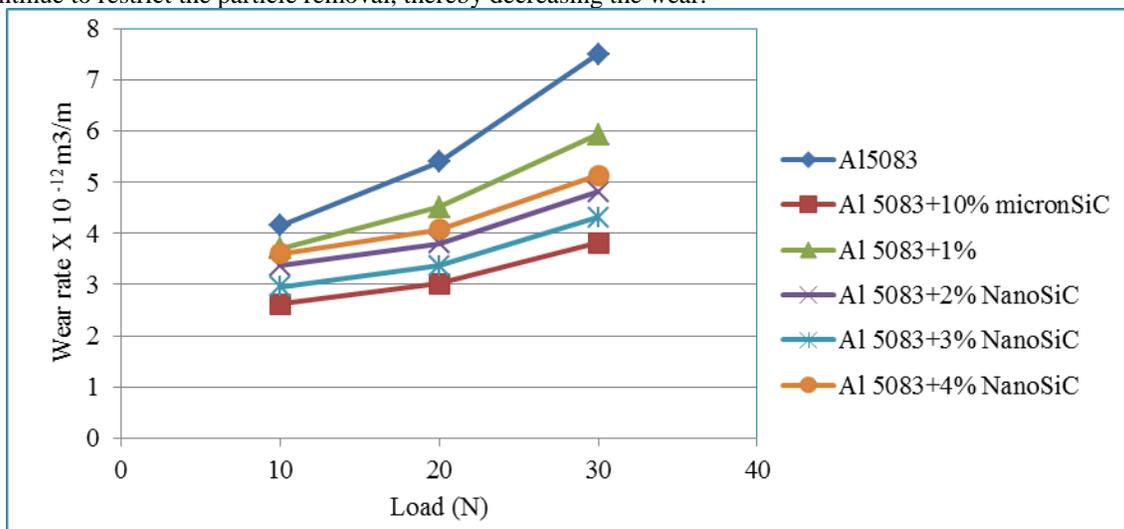


Fig.5 Wear rate at Sliding velocity 1885 m and test duration 30 minutes

The effective wear from the specimen surface is due to the combined effect of a number of factors. The increase in the applied load leads to increase in the penetration of hard asperities of the counter surface to the softer pin surface, increase in micro cracking tendency of the subsurface and also increase in the deformation and fracture of asperities of the softer surface. Beyond the critical load for each composite, the wear rate starts increasing abruptly with the applied load. The load at which wear rate increases suddenly to a very high value is termed as the transition load [14].

**Effect of Reinforcement on Wear Rate:** It was observed from figure 6 that the composites reinforced with micron and nano SiC exhibits significantly higher wear resistance than the matrix alloy due to the addition of hard SiC particles which acts as a load bearing constituent. As the percentage reinforcement of Nano SiC particles increases, the wear rate of the composite decreases. Increase in the addition of SiC particles restricts the deformation of the matrix material with respect to load, hence the wear rate for composites with higher percentage of SiC is low.

The particle size is also one of the factor which influences wear. At low speed and low load the wear resistance of composites with nano SiC particle is higher than the composites with micron SiC particles due to higher hardness of Nano SiC composites. But at higher load and high speed composites with micron SiC shows better wear resistance than composites with nano SiC particles. This may be due to the fact that the probability for the Nano SiC particles pulling out from the matrix is higher as the interfacial strength between the particle-matrix becomes weak due to smaller contact area. In composites with Micron SiC particles the interfacial

strength is high due to large surface bonding which avoids particle pull out and the matrix holds the particle strongly until the particles break down into small particles.

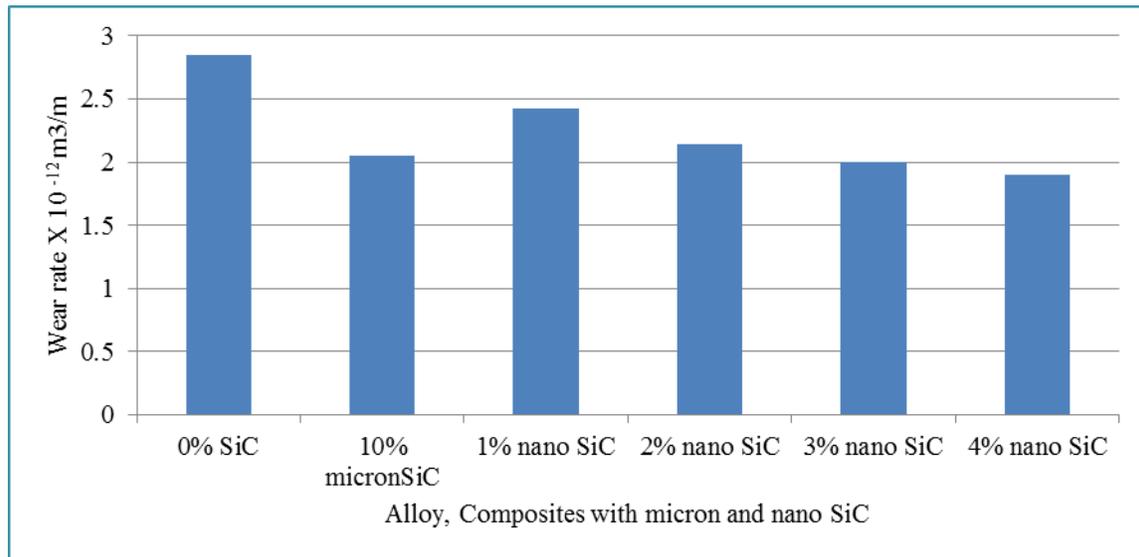


Fig.6 Variation of wear rate of alloy and composites at a Load 10N and sliding distance 754 m and test duration of 30 minutes

#### IV. CONCLUSIONS

- (1) Aluminium matrix micron 10 wt. % and nano (1, 2, 3 and 4 wt. %) SiC<sub>p</sub> composites have been successfully fabricated by ultrasonic assisted stir casting process.
- (2) Wear rate of Al-SiC<sub>p</sub> composites increases with increase in sliding distance. This indicates that fracturing tendency of the surface is more predominant than strain hardening of the surface during sliding wear tests.
- (3) Wear rate of the unreinforced alloy is found to be higher than that of the composites. As the sliding distance increases from 754 m to 1885 m the wear rate of the composite also increases with sliding distance which gives a direct relation between sliding distance and wear rate.
- (4) The wear rate of Al-SiC<sub>p</sub> composites with micron particles exhibits better wear resistance than composites with nano particles at higher load (30 N) and higher sliding distance (1885 m).
- (5) The particle size is also one of the factor which influences wear. At low speed and low load the wear resistance of composites with nano SiC particle is higher than the composites with micron SiC particles due to higher hardness of Nano SiC composites.

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# Pica- A Case Report on Eating Disorder of Rural Adolescent Girl

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*Abstract- This report is based on the interesting clinical case study of a teenage based in India with long - standing history of ingesting nonnutritive materials. She was initially non-selective, but later began more exclusively consuming mud obtained from a wall in the back yard of her house on regular basis. She suffered from a eating disorder known as pica. The DSM-IV defines pica as a form of feeding and eating disorder of infancy or early childhood ,characterized by “the persistent eating of non nutritive substance for a period of at least one month : inappropriate to the developmental level , not part of a culturally sanctioned practice and sufficiently severe enough to warrant independent attention.” Currently there is no clearly established etiology for pica. This case particularly psychopathology of recurrent, unwanted ,thoughts of the mud wall and eating the mud ,feeling of distress and anxiousness that were relieved after consumption of mud and significant effect on her daily life from her uncontrollable need to return home and eat mud from the same wall of her back yard. These symptoms suggests obsessive thought distress consumption relief that is consistent with obsessive compulsive disorder. This case study reflects pica as a part of obsessive compulsive developing spectrum disorder. This case does not necessarily need generalization but is a subjected to mental health of adolescent girl.*

Index Terms- “ Pica “, “ obsessive- compulsive disorder”, “Sehore” ,”DSM –IV”.

## I. INTRODUCTION

This case study is based on the interesting clinical case study of a 14 year –old girl from a village Deria of Sihore District ,Bhopal M.P. India .She belongs to low socio economical background with long - standing history of a eating disorder known as pica .

## II. LITERATURE REVIEW (THEORETICAL AND RESEARCH BASIS)

The puzzling phenomenon of pica has been recognized and described since ancient times. Pica has been observed in ethnic groups worldwide, in both primitive and modernized cultures, in both sexes, and in all age groups. The word pica comes from the Latin name for magpie, a bird known for its unusual and indiscriminate eating habits. Extensive research on the history and terminology of eating disorders from the 16th to the 20th century suggests that, historically, pica was regarded as a symptom of other disorders rather than a separate entity. (B Parry-Jones and W L Parry-Jones 1992)

In addition to humans, pica has been observed in other animals, including the chimpanzee. Pica in humans has many different subgroups, defined by the substance that is ingested. Some of the most commonly described types of pica are eating earth, soil or clay (geophagia), ice (pagophagia) and starch (amylophagia). However, pica involving dozens of other substances, including cigarette butts and ashes, hair, paint chips, and paper have also been reported.

Pica is considered developmentally normal Till two years of age in most of the cultures, beyond that there is cross cultural agreement that it is inappropriate. (Castiglia 1993). . Pica occasionally extends into adolescents, and rarely observed in adults who are not mentally normal .(Rose, Porcerelli and Neale 2000) Among the different substance like coin, pins, paint, paper, cosmetic product, glass are consumed as part of pica the geophagia (earth ,mud eating) is the most common. It is part particularly found in those living

in poverty, in the tropics, and tribal oriented societies. (Robinson, Tolan, and Golding- Beeaheer,1990). Pica is frequently observed in pregnant women irrespective of culture. In Indian rural villages it is observed more frequently than Urban cities.

The Diagnostic and Statistical Manual of Mental Disorder (DSM-IV) defines pica as a form of feeding and eating disorder of infancy or early childhood, characterized by “the persistent eating of non nutritive substance for a period of at least one month: inappropriate to the developmental level, not part of a culturally sanctioned practice and sufficiently severe enough to warrant independent clinical attention.” In the Draft of ICD-10, only anorexia nervosa and bulimia nervosa are listed under eating disorders. Pica in children, and feeding disorder in infancy and childhood, are incorporated with enuresis, encopresis, and feeding, movement and speech disorders in a separate "heterogeneous group of disorders". The *Handbook of Clinical Child Psychology* currently estimates that prevalence rates of pica range from 4%-26% among institutionalized populations. Research among non-institutionalized populations takes the form of individual case studies, making prevalence rates difficult to estimate.

Some form of pica are linked with iron deficiency anemia, zinc deficiency, sickle cell anemia and family history.(Federman, Kirsner and federman,1997;Ivascu et al.,2001).Gastrointestinal tract complications associated with pica are most common ranging from mild or moderate symptoms of constipation to obstructions cause by bezoars formation and the presence of indigestible material to life threatening conditions such as hemorrhages, ulcerations and soil borne infections .(Rose et al.,2000) Robinson, Tolan, and Golding- Beeaheer, (1990) found 70% rate of intestinal parasite in children with Pica .

Sayetta explained theoretical views on etiology which includes nutritional , sensory, physiologic, neuropsychiatric ,cultural and psychosocial perspective. DSM-IV only gives some epidemiological account that pica is frequently associated with developmental delay , poverty ,neglect and lack of parental supervision and doesn't make any suggestion of etiology or specific categorization. The adolescents without developmental delay raised the possibility that some form of it fit under the umbrella of obsessive compulsive spectrum disorder.(Hollander,1998) The obsessive compulsive spectrum disorder are divided into three subgroup ,First :Obsession with specific bodily sensation or appearance or Preoccupation such as body dysmorphic disorder, eating disorder and hypochondriasis ,Second :selected neurological disorders affecting basal gaglia that result in repetitive behavior such as Touretts's Syndrome ,Torticollis etc and Third :impulse control disorder ,impulsivity ,aggression ,and risk taking behavior such as like kleptomania ,pyromania, pathological gambling ect , etc. (Holland ,1998;Holland &Wong, O.Sullivan, Mansueto, Lernes, and Miguel 2000) These OCDS share symptomatology of Obsessive Compulsive disorder (OCD) itself. There are some evidences to support the possibility that pica can present as OCD itself. Gundogar , Demir , and Eren (2003) reported three cases of pica (two had impulse control disorder and one OCD).Five cases of pica and two cases of compulsions (OCD) and two compulse control disorder.(Stein ,Bouwer ,and Van Heeden 1996).Still Pica remains a phenomenon with little understood etiology and treatment approach ,pica may be consider as OCD particularly among those with no delay in development.

### III. METHOD

#### Case Presentation

Veena is a 14 year –old girl from a village called Deria of Sihore District ,Bhopal of Madhya Pradesh India. She was referred to hospital of Bhopal with complain of severe abdominal distention, distress, constipation and abdominal cramps and pain. She confessed about ingesting mud on daily basis since her early childhood. The physical examination revealed multiple marks in the oral mucosa (due to injury from mud ,straws and small stones) but no other indications. There was no other remarkable findings ,surgery or complications. Pathology tests reported normal hemoglobin (as per Indian norms), electrolytes and differentials in white blood counts and

no sickle cell disease/ anemia . Her stool examination reveals multiple parasites which were treated later by physician and referred to psychologist for follow up.

### Presenting Complaints

Veena visited the OPD with her mother and Uncle . The interview was conducted with Veena in Hindi language and local dialectics . The information collected from mother revealed that Veena started ingested nonfood item such as soil /mud and anything from floor in early childhood which was observed in most of the peer children of village but after two years of age mud became most preferred substance for Veena where as her peer group of children had stopped ingesting. None of the family members could stop her from eating mud and with age her consumption of mud increased and she started eating the mud wall from backside of their house and her single ingestion went up to 200 grams of mud a day at the time of assessment.

### History

Veena explained that since past 4 years she had been aware of her problem of ingestions and also it has increased with thoughts and images of mud of wall and eating it .She reported that it is not normal to ingest mud but with time her frequency of thoughts and desire to ingest mud wall has increased. She was aware that ingestions were related to her increasing images and thoughts of mud wall and eating it longingly. The thoughts were frequent and last for minutes and with time it was increasing (around two hours a day). Those thoughts and images were strong, destructive and intrusive, even when she tries to resist or control herself ,she fails and give up trying and forcefully coupled to go at back side of her house and ingests mud greedily from particular wall. After getting relief from intrusive thoughts and images ,she would stop ingestion .She would tries to hide herself from her parents for any confrontation .Following that she gets abdominal discomfort and detention that would lead to regretful for ingestion and feels embarrassed. She was gives herbal laxative and local treatment .As her problem was not cured she came to Bhopal for treatment with her parents .She has increased amount of distress ,anxiety and she was unhappy to leave her village but at the same time she was motivated to seek treatment.

### IV. ASSESSMENT

The general screenings and assessment at Bhopal hospital revealed she had no neurovegetative abnormality, no psychotic features, no substance abuse, no delayed development, no mental retardation and has adequate sociability and personality but showed dysphoric. She had anxiety induced by the thoughts and images of mud and mud eating. There were no symptoms of generalized anxiety, attention deficient or hyperactive difficulties .There was history of multiple parasitosis and abdominal distension. There was no OCDS . There was no family history of pica. She had no dimorphic features ,no history of childhood trauma, no involvement in love affaire, no suicidal or self injurious ideas or impulse. She wanted to solve her problem ,she knew her behavior was normal and compelling but was helpless to change it. Based on DSM-IV she was diagnosed with pica and further with obsessive compulsive disorder.

Her Mother revealed developmental history of Veena that she was born after full term, the pregnancy and delivery of child was normal .There was no postpartum depression in Mother .She had no anomaly at the time of birth , no dismorphic features , normal reflexes and normal in intelligence. She touched all developmental milestone on time .Her social development was normal ,adjusted with peer group . No childhood trauma or peer bullying. No suicidal ideation or self injurious ideas or impulse. She was aware of her problem and wanted to get rid of it.

As per DSM –IV she was diagnosed with pica by psychiatrist as age inappropriate mud ingestion of mud and was further diagnosis OCD. The OCD diagnosis by psychologist was leveled moderate.

## V. CASE CONCEPTUALIZATION

Veena has pica and hallmark of features of OCD are clearly present: the mud wall and mud eating were persistent thoughts and images that were experienced as intrusive and inappropriate. Effort to ignore and suppress this obsession failed, leaving her with marked anxiety and distress, leading to compulsive behavior strategies to prevent and reduce anxiety and distress by ingesting mud from particular wall. Her obsession and compulsion were increasingly distressing ,time consuming and were disrupting her adolescent life.

The formulation of OCD diagnosis in veena case ;to distinguish from an impulsive control disorder, patient did not drive gratification through mud –eating impulse or compulsion , it did not bring her relief but eventually she was regretful and wanted to seek help.The early onset and long period of pica behavior would have resulted in some desensitization and habituation of the behaviors. Although she did not have usual risk factors like genetic predisposition ,mood fluctuations ,anxiety ,apprehensions ,or environment stressors or childhood trauma ,peer victimizations etc. Thus it is possible that a subset of pica can manifest as OCD and this subset may be best represented in the nondevelopmentally delayed in population.

It is conceptualizes that Veena’s Pica started as childhood maladaptive habit but OCD may have played the role in perpetuating it. With age pica became socially unaccepted behavior but she continued it. It is possible that she was vulnerable to develop Pica to begin with and her ongoing pica conveniently provided the content of her OCD illness. There is no prevalent agreement on the etiology of pica. Veena had attempted to correct herself of the mud eating behavior over the years and failed, the clinic would be in the position to teach her behavior approach more effectively.

### Course of Treatment and Assessment of Progress (Therapeutic procedure)

.Veena along with her Mother was given psycho-education in their native language on the condition on pica and OCD along with pharmacotherapy(serotonin-enhancing medication) recommended by psychiatrist.During her weekly session /assessment using clinical interview and impression as primary tool. She was scheduled with 30 min session , encouraged to use thought diary and thought shaping ,to monitor relief from obsession thought of mud ingestion. She was encouraged to narrate thoughts and thought stopping technique (cognitive behavioral model) was used to monitor and relive her obsession thought. She started the psychotherapy positively which she narrated help her a lot but was not persistent in her approach. By the end of fifth week she noticed improvement and attributed to medicines. She started spending more time with peer groups and cousins as she was free from the thought of consuming mud. After 6 months she reported complete stoppage of pica and occasional unwanted thoughts and images of mud eating ,which were under control. She was happy with the present situation.

### Follow up

Veena continued her medication till six months .She came to hospital till six months then stopped coming to clinic due to distance from village and commuting problems. She was visited by Author in seventh month she was active and happy . Her mother reported that Veena still try to go at back side of House and stands in front of mud wall and she(mother) keeps a check over Veena and follows her whenever she goes at the backside of

the house. She reported that my Veena is able to control her ingestion and related behavior. She was advised to continue medicines and sessions.

### Discussion

Veena ,s pica was likely to started out in early childhood maladaptive habit which was initially neglected by her parents as normal childhood behavior ,but OCD may have played a role in perpetuating it .As she started growing pica became problem and socially less acceptable .She did not have the usual OCD risk factor (Lochner et al..'2002) or peer victimizer .(Storch et al.,2005).There are diagnostic complexities ,in this case she was finally diagnosed with subset of pica manifest with OCD.

There is no prevalence agreement on the etiology of pica. Most of pica in early adolescent and adolescent are found with developmental delay and the behavior modification approach is most effective (McAdam, et al.,2004) , but with non developmental delay it is not so effective. Schwartz et al.,( 1996) have demonstrated using brain imaging technique ,that behavior technique therapy for OCD can have direct brain chemistry change. Veena made many attempt to correct herself for mud eating behavior but failed. Thus cognitive behavioral therapy was applied .The weekly session using clinical interview and impression as primary tool was applied. During session she was encouraged to use the thought diary and thought stopping techniques ,to monitor and relieve obsessive thoughts ,images of mud ingestion The technique was effective and improvement was noticed and reported by Veena and her mother in terms of having less anxiety inducing obsessive thoughts and images and able to delay and decrease the amount of mud ingested. In Indian medical scenario patients are more confident in taking pills then to continue psychotherapy.

The outcome lends support to diagnostic formation of OCD and responded positive to treatment although limited literature for cases are found.(Gundogar et al.,2003; stein et l ;1996) The pharmacology treatment alone seem to worked for stretch of time but sustained improvement could be achieved with psychotherapy. There are encouraging treatment are found with psychotherapy.The habit reversal approach such as awareness training ,self monitoring ,relaxation training, healthy competing response training ,and contingency management can Help in anxiety ,obsession, compulsion, impulse control related problems such as OCD in patients.( Diefenbach et al,2000.; Luselli, 1996; Wilhelm et al 2003.) This case study reveals that there is possible etiological link between OCD and pica and treatment of pica is ineffective with cognitive behavior therapy and pharmacology support.

### VI. CONCLUSION

Veena showed good response to pharmacotherapy and hasn't continued all the cognitive behavior therapy session. It is possible that more sustainable improvement could be achieved if more behavior based psychotherapy were feasible with her.

This case study reflects pica as a part of obsessive compulsive disorder ( OCD) . This case does not necessarily need generalization but is a subjected to mental health of adolescence girl and needs family and peer group intervention .

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# Implementation Status of Public Libraries' Enabling Laws: The Cagayan-Iligan Corridor and Misamis Oriental Experiences

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**Abstract-** It is a national policy to promote the holistic well-being of the Filipinos by elevating the literacy level and recognizing the vital role of knowledge and information in nation-building by establishing public libraries in every congressional district, city and municipality, and reading centers in every barangay. The aforesaid fact led the researcher to assess the implementation of the Public Libraries' Enabling Laws; the R.A. 7160, R.A. 7743, and R.A. 9246, which are all focused on the establishment and operations throughout the country. This study was conducted in the provinces of Lanao del Norte and Misamis Oriental in Northern Mindanao, Philippines. The main thrust was directly to find out the present status as based on the Minimum Standards for Public Libraries. To find answers, a researcher-made instrument was used and the results revealed that both cities and municipalities did not fully accord the prescribed standards specifically on staff qualifications, annual budget, collections, physical facilities, and services. The results of the said assessment can be utilized as administrative guides in planning the goals for development, setting directions for the future, and revitalizing public libraries to meet the demands and realities of the present society for peace and progress of the 21<sup>st</sup> century.

**Index Terms-** Social Sciences, Public Libraries, Librarianship, Descriptive and Survey Methods, Minimum Standards for Public Libraries, Public Libraries Enabling Laws in the Philippines, Public Libraries in Cagayan-Iligan Corridor and Misamis Oriental

## INTRODUCTION

A well-informed person is educated and has the chances to enjoy life to the fullest. There is no doubt therefore that the future of a country mostly depends upon education and the different sources of information that the government provides to the people which will lead the way for them to be successful citizens. With these expectations, addressing the needs instantly in the provision of education and information to them are one of the many ways to help build up social progress. In fact, learning is not only confined in the four corners of the classroom, but can also be acquired and further stimulated and enhanced through visitation and reading in library. This learning environment is considered the heart and spine of education in the community for it caters to clientele from all walks of life. It also offers learning materials and services for quick access to relevant needed information.

Known as the local gateway to an enlightened world, public libraries aim to promote equal opportunities among citizens for personal cultivation, for literary and cultural pursuits, for continuous development of knowledge, personal skills and civic skills, for internationalization, and for lifelong learning. The impact is expectedly a basic pillar in the provision of educational, cultural and social services, which support the aspirations of the entire population to achieve a high state of intellectual development (UNESCO, 2004).

In support to the ideas of UNESCO, George W. Bush, former president of the United States of America, stated:

*"Public libraries promote the sharing of knowledge, connecting people of all ages with valuable information resources. These dynamic and modern institutions, and the librarians who staff them, add immeasurably to our quality of life" (<http://www.ifla.org/humour/subj.html>).*

The above statement emphasized the importance of libraries in our lives and further gave recognition to the people who man these sources of information. His words were a challenge to all political leaders around the world to promote learning connections that would encourage gauging them in establishing public libraries in their respective countries.

In consonance with the contents of the library enabling laws, it cannot be disputed that freedom, prosperity, and the development of society and of individuals are fundamental human values. They can only be attained through the ability of well-informed citizens to exercise their democratic rights and to play an active role in society. Constructive participation and the development of democracy depend on satisfactory education as well as on free and unlimited access to knowledge, thought, culture, and information (Gill, 2004).

In particular, public libraries support the educational and cultural goals of the Philippine government. Through books, newspapers, magazines, and documents in the libraries, patrons broaden their knowledge on history both national and local, as well as of famous Filipinos, developing in them a sense of national pride and love of country. Their visits to public libraries also develop their interests for reading and stimulate their desires for knowledge.

Similarly, public libraries are also in the forefront of whatever cultural activity is launched and implemented by the local government. They put up an exhibit in cooperation with other government agencies. They also construct booths for this purpose where different facets of Philippine life and culture, customs and traditions, material or spiritual, are displayed to the public (IFLANET, 2000). In other words, public libraries are not just repositories of collections; they are also actively involved in the nurturance and enhancement of the educational and cultural developments of the Filipino people. Moreover, this is also in line with the United Nations' aim for education which is to save the succeeding generations from the scourge of war due to misunderstanding of ideologies and to enable every child, woman and man to live in dignity and freedom. Establishing a library in every city or municipality of the country is a prospective vision of education which is necessary to help adapt the foreseeable social changes and to face the challenges and demands of future evolutions (Harrod, 2008).

## FRAMEWORK

It is a general belief and an undisputed fact that public libraries are living forces for education, culture and information, and as an essential agent for the fostering of peace and spiritual welfare through the minds of men and women. To this, UNESCO therefore encourages national and local government units to implement what has been mandated by law on the establishment of public libraries.

The line that states *"smart libraries build smart communities"* reflects the vital role of public libraries in the social, educational, and cultural life of local communities. Libraries are in an excellent position within the community to drive change through the development and provision of services and resources that strengthen community partnerships. By providing a wide range of resources and services, public libraries play key roles in the development of social capital, cultural enrichment, lifelong learning, citizenship, and economic regeneration of the 21<sup>st</sup> century.

As shared by James A. Michener with his personal impression of public libraries, he stressed that:

*"Public libraries have been a mainstay of my life. They represent an individual's right to acquire knowledge; they are the sinews that bind civilized societies the world over. Without libraries, I would be a pauper, intellectually and spiritually deficit. No libraries, no progress."*

The above striking concept simply relates that libraries can change lives. This is a great challenge to everybody. The library that addresses the opportunities of educational, cultural, and social development, within its locality also contributes to a more prosperous and culturally vibrant society. The American Library Association believes that cultural activity should be regarded as a fundamental role of public libraries. This has always been the case with the best public library services.

### OBJECTIVES OF THE STUDY

The main thrust of this study was to assess the implementation of the public libraries' enabling laws-- R.A. 7160, R.A. 7743, and 9246 to the public libraries in Cagayan de Oro-Iligan Corridor and Misamis Oriental and to appraise their present status as based on Minimum Standards for Public Libraries in the Philippines. Specifically, this study aimed to answer questions on the present status of LGU libraries in Cagayan de Oro-Iligan Corridor and Misamis Oriental specifically on staff, budget, collections, physical facilities, and services.

### MATERIALS AND METHODS

This study employed the descriptive and survey methods of research because these allow the fulfillment of the goals of science which are systematic descriptions based on occurrence of facts and to collect data on phenomena that cannot be directly observed. These were relative to apply the aforesaid methods to the recent study because both delved into the present status on the implementations of LGU public libraries.

The respondents in this study were the public library heads and the technique of selection was on purposive sampling and specifically adopted the **stratified purposeful method which simply** illustrated characteristics of particular subgroups of interest and facilitated comparisons. To simplify the selection, there were representatives from the classes of municipalities based on income status and from the two directions (east and west) in which Cagayan de Oro City served as the focal area and the three cities, Cagayan, Iligan, and Gingoog were automatically included. Moreover, in determining the specific municipalities, the researcher attended a seminar on librarianship in which all the participants were private and public librarians in Mindanao. Only the public library heads who attended the said activity and were representatives of the classes of municipalities served as respondents of the study.

Researcher-made instrument, personal interviews, and secondary data supplemented the needed information which was taken from the annual inventory reports, databank of information, and other relevant records were utilized in order to obtain the desired data. To facilitate the gathering of data, permissions were obtained from the respective Chief Executives of the localities for the conduct of the survey. The data were tabulated and interpreted to assess the actual information needed and the computations were done manually.

### RESULTS AND DISCUSSIONS

**Table 1: Actual Number of Library Staff by City and Municipality**

Cities and Municipalities	Library Staff						
	Quantity			Quality			
	Professional : Support Services			Qualification of the Library Head			
	Standard	Actual	Dev*	Standard	Actual	With/Without Librarian's	Dev

	City	Mun.	City	Mun.				License	
<b>1<sup>st</sup> Class Cities</b>									
A	4:3		1:3		-2:0	BSLs/BSILs/ BSEd-LS/AB- LS/MLS/MSILs	AB-Lib Sc	Licensed Librarian	Qualified
B	4:3		7:8		+3:5	BSLs/BSILs/ BSEd-LS/AB- LS/MLS/MSILs	MS-Lib Sc	Licensed Librarian	Qualified
C	4:3		6:7		+2:4	BSLs/BSILs/ BSEd-LS/AB- LS/MLS/MSILs	AB-Lib Sc	Licensed Librarian	Qualified
<b>3<sup>rd</sup> Class Municipalities</b>									
A		1:3		1:1	0:-2	BSLs/BSILs/ BSEd-LS/AB- LS/MLS/MSILs	AB-Lib Sc	Not Licensed Librarian	Not Qualified
B		1:3	W/o	W/o	W/o	W/o	W/o	W/o	W/o
<b>4<sup>th</sup> Class Municipalities</b>									
C		1:3		1:3	0	BSLs/BSILs/ BSEd-LS/AB- LS/MLS/MSILs	BSEED with 15 units in Lib Sc	Not Licensed Librarian	Not Qualified
D		1:3		0:1	-1:-2	BSLs/BSILs/ BSEd-LS/AB- LS/MLS/MSILs	BEED- P.E.	Not Licensed Librarian	Not Qualified
<b>5<sup>th</sup> Class Municipalities</b>									
E		1:3		0:3	-1:0	BSLs/BSILs/ BSEd-LS/AB- LS/MLS/MSILs	BSBA- Mgmt	Not Licensed Librarian	Not Qualified
F		1:3		1:1	0:-2	BSLs/BSILs/ BSEd-LS/AB- LS/MLS/MSILs	BSBA- Acctng.	Not Licensed Librarian	Not Qualified

**\*Legend:** Dev - Deviation W/o - Without Library

The data imply that the three (3) cities had complied the standards of the law for having libraries in the city jurisdiction because the city allocated budget in library services and personnel of the office. The implementers also felt the importance of the law in prioritizing the establishment of library in their jurisdiction which are necessary to the field of learning and education to their citizenry. Since, almost all of them were educated and/or finished college degree, they responded positively to the needs of greater knowledge in the community in a way through the presence of library.

However, in city A, did not comply the required number and qualification's of personnel. It has an actual number of one (1) professional and three (3) support services. It implies that this city class did not meet the minimum standards for professional librarians. Though this city belongs to class A but with less number of library personnel as can be gleaned in the table. Based on the interview to the library heads, it revealed that the city is willing to hire additional library personnel but none applied for the vacancy. It can be concluded therefore, that there are plenty of vacancies in this field of work but only few have the courage to take up library science.

In third class municipalities, B has no library, while A has an actual number of one (1) professional and one (1) for support services. It implies therefore that the municipality A had met the number standards of professional librarians and did not satisfy the standards for the support services.

Municipality B did not implement the standard mandates of the Law. It can be inferred that the library implementer in this municipality does not have the intention to establish a public library in his locality because he did not fully understand its presence. He might have other priority projects, thus, putting aside the library matters. It may also consider of his lack of library orientation, hence, it breeds negative support to library implementation. Moreover, a negative attitude can be attributed also to other avenues of their income and/or allocated to other priority offices and personnel in the government and/or no qualified librarians applied in the field to man the library knowing the fact that no library school is present in their jurisdiction. It further implies that municipality A has no concerned of the standard requirements of the law in terms of library staff and having satisfied the standard of professional services but it failed to meet the standard quantity of support services. However, the library head is not qualified based from the qualification's requirement of the law.

In fourth class municipalities, D has only one (1) support service in the library, while C has an actual number of one (1) professional and three (3) for support services. It implies that C had met the number standards of professional librarians and support services; whereas, the municipality of D never satisfied standard requirements of the Law.

The municipality C had satisfied the standard requirement of the professional and support services but the qualification of its library head is not qualified. In the municipality D, the government only heeds one (1) support service in the library and did not meet the qualification standards for the position of library head.

In fifth class municipalities, F has an actual number of one (1) professional personnel in the library and one (1) support service, while E has no professional librarian but with three (3) for support services. It implies that the municipalities E and F never meet the standards of professional librarians and support services. It means that they did not meet the required number for support services and professional services, respectively because of the meager income and that therefore allocated to other priority offices and personnel in the government and/or no qualified librarians applied in the field to man the library knowing the fact that no library school is present in their jurisdiction which is the same to the above-mentioned third and fourth class municipalities.

**Table 2: Actual Library Budget by City and Municipality**

Cities and Municipalities	Library Budget				
	Sources of Funds		Standard Annual Budget	Actual Annual Average Budget CY '04-'06	Deviation
	City	Municipality			
<b>1<sup>st</sup> Class Cities</b>					
A	√		P50,000.00*	P83,825.33**	+P33,825.33
B	√		P50,000.00*	P2,874,558.00**	+P2,824,558.00
C	√		P50,000.00*	P1,888,000.00**	+P150,000.00
<b>3<sup>rd</sup> Class Municipalities</b>					
A		√	P20,000.00*	No Specific Budget	Undetermined
B	W/o Library	W/o Library	W/o Library	W/o Library	W/o Library
<b>4<sup>th</sup> Class Municipalities</b>					

C		√	P20,000.00*	No Specific Budget	Undetermined
D		√	P20,000.00*	No Specific Budget	Undetermined
<b>5<sup>th</sup> Class Municipalities</b>					
E		√	P20,000.00*	No Specific Budget	Undetermined
F		√	P20,000.00*	No Specific Budget	Undetermined

\*Legend :  
(Source)

\* Philippine National Library (PNL) as cited in by Nunag (1998).

\*\* Library Heads from the three (3) Cities – Gingoog , Cagayan de Oro, and Iligan at the time of the Survey.

Table 2 shows the sources of funds, the standard and actual library budget apportioned by the respondent cities and municipalities in the study for CY 2004-2006. The data imply that only first class municipalities A, B and C had allocated the annual average budget which is more than the required standard annual budget specified by the law. However, being not the priority programs of the locality, the third, fourth and fifth class municipalities, had no budget allocations for the library. It also implies that may be the library implementers itself were not library oriented especially during in their student days and other reasons that they were not willing to advocate the presence and the need of library in their jurisdiction. The people also ignored its importance or not even visit their municipal library or having a negative attitude towards it because the presence had not been advertised. Further, the buildings also intended for the library were not accessible to the reading public that entails to its viability and transportability (Thompson, 2009).

**Table 3a: Actual Library Collection (Books) by City and Municipality**

Cities and Municipalities	Library Collection		
	Books		
	Standard Volumes	Actual Volumes	Deviation (Volumes)
<b>1<sup>st</sup> Class Cities</b>			
A	3,000	3,429	+429
B	3,000	11,516	+8,516
C	3,000	9,274	+6,274
<b>3<sup>rd</sup> Class Municipalities</b>			
A	2,000	2,382	+382
B	W/o	W/o	W/o
<b>4<sup>th</sup> Class Municipalities</b>			
C	2,000	2,624	+624
D	2,000	2,475	+475
<b>5<sup>th</sup> Class Municipalities</b>			
E	2,000	788	-1,212
F	2,000	1,564	-436

\*Legend: W/o - Without Library

Table 3a shows the complete summary of books and non-books in the library collection in cities and municipalities. The data reveal that in City A, instead of a standard volume of three thousand (3,000) books to be collected in the library, there are nine thousand and two hundred seventy-four (9,274) actual volumes collected which has a clear deviation of six thousand and two hundred seventy-four (6,274).

It is to be noted that for non-books collection particularly the special collections (local history), newspapers (foreign/local), journals/magazines and AV materials, the law did not specify or distinguish the standard volume requirement in these areas. Nevertheless, in City C, in terms of Special Collection for local history, has an actual volume of fifty-one (51) bearing no standard requirements specified by the law; three (3) regular for actual titles of foreign and local newspapers; thirteen (13) for actual titles of journals/magazines; and eighty-one (81) for actual AV materials.

In City B, instead of a standard volume of three thousand (3,000) books to be collected in the library, there are eleven thousand and five hundred sixteen (11,516) actual volumes collected which has a clear deviation of eight thousand and five hundred sixteen (8,516).

In terms of Special Collection for local history, it has an actual volume of one hundred twenty-one (121) bearing no standard requirements specified by the law; three (3) regular for actual titles of foreign and local newspapers; twenty (20) for actual titles of journals/magazines; and five hundred thirty-two (532) for actual AV materials.

In City A, instead of a standard volume of three thousand (3,000) books to be collected in the library, there are three thousand and four hundred twenty-nine (3,429) actual volumes collected which have a clear deviation of four hundred twenty-nine (429).

In terms of Special Collection for local history, it has an actual volume of eleven (11) bearing no standard requirements specified by the law; three (3) regular for actual titles of foreign and local newspapers; eleven (11) for actual titles of journals/magazines; and thirty-four (34) for actual AV materials.

In third class Municipalities, B, has no library which implies that the Local Government Unit did not implement the public library in their locality and/or did not make the library a top priority project, but in municipality A, instead of a standard volume of two thousand (2,000) books to be collected in the library, there are two thousand and three hundred eighty-two (2,382) actual volumes collected which has a clear deviation of three hundred eighty-two (382).

**Table 3b: Actual Library Collection (Non-Books) by City and Municipality**

Cities and Municipalities	Library Collection											
	Non-Books											
	Special Collection (Local History)			Newspapers (Foreign & Local)			Journals/Magazines			AV Materials		
	Strd	Actual Vols.	Dev	Strd	Actual Titles	Dev*	Strd	Actual Titles	Dev*	Strd	Actual	Dev*
<b>1<sup>st</sup> Class Cities</b>												
A	NS	11	Un	NS	3 reg.	Un	NS	11	Un	NS	34	Un
B	NS	121	Un	NS	3 reg.	Un	NS	20	Un	NS	532	Un
C	NS	51	Un	NS	3 reg.	Un	NS	13	Un	NS	81	Un
<b>3<sup>rd</sup> Class Municipalities</b>												
A	NS	10	Un	NS	2 reg.	Un	NS	11	Un	NS	6	Un
B	W/o	W/o	W/o	W/o	W/o	W/o	W/o	W/o	W/o	W/o	W/o	W/o
<b>4<sup>th</sup> Class Municipalities</b>												
C	NS	8	Un	NS	1 reg.	Un	NS	10	Un	NS	104	Un
D	NS	9	Un	NS	2 irreg.	Un	NS	11	Un	NS		
<b>5<sup>th</sup> Class Municipalities</b>												

E	NS	5	Un	NS	2 irreg.	Un	NS	5	Un	NS	8	Un
F	NS	7	Un	NS	2 irreg.	Un	NS	7	Un	NS	10	Un

**\*Legend:**

- Dev - Deviation
- Un - Undetermined
- W/o - Without Library
- NS - Not Specified
- Strd - Standard

Table 3b focuses on the non-books collection. The data imply that the library collections of the cities and municipalities, except in municipality B, were more than the required standard volumes specified by law in the respective respondent jurisdiction. It further implies extra efforts or initiatives of the Local Government Units (LGU) in the implementation/establishment of library books and non-books collections made. All available materials and magazines were placed in the library so long as these can be useful to the mind of the client readers in the locality (McNicole, 2003). It is quite alarming that all the LGU libraries in the areas of study had minimal collections of local history which is essential in understanding the culture of the people because only few Filipino writers have interest in writing about our culture. Some of our famous writers went abroad; hence, our country is experiencing “brain drain” problem. We can also say that LGU library implementers and library heads lacked the initiative to contact/link offices or agencies to help in acquiring local reading materials.

**Table 4a: Actual Library Physical Facilities (Building and Seating Capacity) by City and Municipality**

Cities and Municipalities	Library Physical Facilities					
	Building			Seating Capacity		
	Standard	Actual	Dev*	Standard	Actual	Dev*
<b>1<sup>st</sup> Class Cities</b>						
A	NS	Separated	Un	48-60	36	-16
B	NS	Separated	Un	48-60	50	+2
C	NS	Separated	Un	48-60	80	+32
<b>3<sup>rd</sup> Class Municipalities</b>						
A	NS	Separated	Un	36-48	38	+2
B	W/o	W/o	W/o	W/o	W/o	W/o
<b>4<sup>th</sup> Class Municipalities</b>						
C	NS	Separated	Un	36-48	50	+2
D	NS	Separated	Un	36-48	34	-2
<b>5<sup>th</sup> Class Municipalities</b>						
E	NS	Shared with other Office	Un	36-48	20	-16
F	NS	Part of a Building	Un	36-48	25	-11

**Legend:**

- Dev - Deviation
- Un - Undetermined
- W/o - Without Library
- NS - Not Specified

**Table 4b: Actual Library Physical Facilities (Furniture and Equipment) by City and Municipality**

Cities and Municipalities	Library Physical Facilities					
	Furniture			Equipment		
	Standard	Actual	Dev*	Standard	Actual	Dev*
<b>1<sup>st</sup> Class Cities</b>						
A	NS	63	Un	NS	3	Un
B	NS	71	Un	NS	23	Un
C	NS	198	Un	NS	9	Un
<b>3<sup>rd</sup> Class Municipalities</b>						
A	NS	58	Un	NS	2	Un
B	W/o	W/o	W/o	W/o	W/o	W/o
<b>4<sup>th</sup> Class Municipalities</b>						
C	NS	94	Un	NS	13	Un
D	NS	42	Un	NS	8	Un
<b>5<sup>th</sup> Class Municipalities</b>						
E	NS	8	Un	NS	2	Un
F	NS	45	Un	NS	1	Un

**Legend:**

- Dev - Deviation
- Un - Undetermined
- W/o - Without Library
- NS - Not Specified

Tables 4a and b show the complete summary of library physical facilities in cities and municipalities. Be it noted that the law did not distinguish the standards of the buildings, furniture and equipment requirement. Further, all the first to fourth classes of cities and municipalities, except in municipality B, the libraries are separated from the city and municipal halls, while in fifth class Municipalities (E and F), their libraries are part of the municipal buildings and shared with other office respectively.

The figures in the table, imply therefore that in the implementation of the library physical facilities, some had meet the standards as required by law and others only comply minimally as to what has been prescribed, may be because it would only depend on the judgment of the priority projects in the locality by the

library implementers that are considered basic to the needs of the people in the community. In addition, for cities and municipalities with seating capacities of more than the required standards, it implicates spacious library reading areas, and may also be used not only for library services but to cater conferences/meetings of barangay officials and men and/or the subject Local Government Units (LGU) had prioritized budget allocation for it. It may be considered also the initiative of the librarians to make request from the library implementers and other link agencies for the provision of more chairs needed in the library. It also further implies of the librarians and library implementers' observations regarding the vital use of the library for reading and for other learning purposes (Van House, et al., 1987).

For municipalities with less than seating capacities as prescribed by the standards, it implies no initiative on the part of the librarians and library implementers, shortage of the area or library buildings and/or insufficient income on the part of the locality. It can be recalled that the required standards of the law regarding physical facilities and the site of the building shall be centrally located within the community with provisions for expansion for future growth. It should be accessible to library users by all means of transportation and be an integral part of an integrated cultural complex. In the event that the building is inaccessible to a great majority of the reading public, at least one bookmobile unit should be provided and more barangay libraries should be established, and the building should as much as possible provide access to the disabled (Yancey, 2005).

**Table 5: Library Services by City and Municipality**

Library Services	Standard		Freq	%	Deviation
1. Days of Services	NS				
Mondays to Fridays			7	87.5	Undetermined
Mondays to Saturdays			1	12.5	Undetermined
		Total	8	100.0%	
2. Service Hours					
8:00 – 12:00 noon - 1:00pm to 5:00pm (Mondays through Fridays, with Noon Break except Holidays)	8-12/1-5/ M-Fr w/ noon break		7	87.5	Undetermined
8:00 – 12:00 noon - 1:00pm to 5:00pm (Mondays through Saturdays, with Noon Break except Holidays)	8-12/1-5/ M-Sat w/ noon break		1	12.5	Undetermined
		Total	8	100.0%	
3. Accessibility of Library Collections	NS				
Open Shelf System			8	100.0	Undetermined
Closed Shelf System			0	0	
		Total	8	100.0%	
4. Offered Library Services					
Circulation	NS		7	87.5	Undetermined
Compilation and Indexing of Government Documents	NS		3	37.5	Undetermined
Duplicating Machines	NS		1	12.5	Undetermined
Extension of Services	NS		3	37.5	Undetermined
Indexing of Periodicals	NS		5	62.5	Undetermined
Interlibrary Loans	NS		0	0	Undetermined
Library for Children	NS		5	62.5	Undetermined
Operating Book Mobile	NS		0	0	Undetermined

Organizing Extension Services	NS		2	25.0	Undetermined
Periodical Clippings	NS		7	87.5	Undetermined
Preservation and Conservation of Special Materials	NS		2	25.0	Undetermined
Reading Guidance	NS		2	25.0	Undetermined
Reference and Research	NS		8	100.0	Undetermined
Searching and Supplying of Information	NS		4	50.0	Undetermined
Updated Posters and Bulletin	NS		3	37.5	Undetermined
Others					
Barangay Reading Center	NS		1	12.5	Undetermined
Library Orientation	NS		1	12.5	Undetermined
Storytelling	NS		1	12.5	Undetermined

\*Legend : NS - Not Specific

Table 5 shows the complete summary of the distribution of respondents by library services. Be it noted that the law did not distinguish the standard requirements of the library in cities and municipalities for the days of services, service hours, accessibility of library collection and offered library services.

The data imply that days of library services and service hours were leniently and religiously offered by the library heads and library implementers to the needs of the library users where at most, they offered services convenient during daytime everyday, except holidays and Sundays. Further, these services offered were in line with the laws of the Civil Service Commission (CSC) for the required number of hours to be rendered by a civil servant. Since, library professionals and support services are government employees, therefore, they are under the CSC rules and regulations for governmental duties and responsibilities.

Relevant to the mandates of the law in the Administrative Code of 1997 and CSC Memorandum Circular No. 21, dated June 4, 1991, it provides that all government officials and employees are required to render eight (8) working hours a day for five (5) working days a week or a total of forty (40) hours a week, exclusive of time for lunch.

There is also no strict restriction in a part-time employee. He has to work from 8:00 to 12:00 noon, or 1:00 to 5:00 p.m. Likewise, there is no provision or rule which states that one position can be filled only by a single part-time employee. If there is, then service would be available only half the time, with nobody to do the job the rest of the hours or days when public service is needed. Putting it in another way, one half of the service would not be utilized. Further, in Republic Act No. 1880, otherwise known as the Forty-Hours Work Week Law which provides that employees should render services of not more than eight (8) hours a day for five (5) days a week or a total of forty (40) hours a week, exclusive of time for lunch.

It is to be noted that library service shall be provided with the highest degree of efficiency and integrity keeping in mind that public library is a service agency of the government for the people. The accessibility of Library Collections, all of them in a total of eight (8) or (100%) have practiced the Open Shelf System implying that the client readers have their freedom to brows and use the books and/or avail the library collections as they wanted to use for their knowledge enrichment (Woodsworth, 2001).

### CONCLUSIONS

The public libraries' enabling laws were not fully implemented in the cities and municipalities. There are some provisions of the laws which did not distinguish or specify some of the standards for public libraries.

### RECOMMENDATIONS

1. That, the maintenance of the qualifications standards of the library implementers and library heads should be greatly maintained and observed in the implementations of library to harmoniously meet the

standards of the law. However, since the law did not distinguish or specify provisions in some of the standards in the library to LGUs, amendments of the standards in the area as well as its services in the library, qualifications of the library heads and collection in library shall be made soon by the lawmakers of the country to attain/achieve high level of standards and professionalization of librarianship;

2. That, there is a need to establish a public library in all the municipalities and should be greatly encouraged as not to transgress the special law enforced;
3. That, municipalities with no ample or insufficient library professional and support services should be given more attention by the LGU for them to satisfy the provisions of the law;
4. That, in the implementations of libraries in the municipalities, available funds and/or budget allocation must be specifically appropriated;
5. That, for non-book collection specially the local history, both library heads and library implementers find ways to acquire such library materials so that clientele can appreciate and understand information in their own localities; and
6. That, library buildings should be separated from the municipal hall so that better atmosphere of learning will be attained and maintained. Further, the library services must also be physically accessible to all members of the community. This requires well situated library buildings, good reading and study facilities as well as relevant technologies and sufficient opening hours convenient to users. And that LGU should be made aware of the importance of public libraries, to generate their full support in the establishment and active operation.

## APPENDICES

### Appendix A: MINIMUM STANDARDS FOR PUBLIC LIBRARIES IN THE PHILIPPINES

#### Introduction

##### The Role of the Public Library

The public library is catalyst in planning for community development and in the continuous education of the citizens of a nation. It serves as an impartial, non-partisan, and non-sectarian agency of information for all people.

Public library services should therefore be free and be made available to everyone throughout the country.

Public library service should aim to:

1. facilitate informal self-education
2. support and complement research in all fields of endeavors
3. provide bibliographic access to the country's information resources
4. provide wholesome recreation and beneficial use of leisure time of the people

### *Public Library Service in the Philippines*

In the Philippines, public library service is discharged by the National Library which has a dual function, that of a National Library and that of a public library through its Public Libraries Division.

The Public Libraries Division of the National Library takes charge of the organization and supervision of all regional, provincial, city, municipal, and barangay libraries as well as bookmobile services all over the country. It also is responsible in the training and upgrading skills of field librarian as well as non-professional staff of public libraries throughout the country.

### **RATIONALE**

Formulating of public library standards reflect concept of public library service and organization so as to stimulate new development and focus attention in the field of librarianship.

Standards are used as administrative guide in planning goals for development and setting directions for the future.

In formulating this minimum standards the aim is to propose a guide that will serve as challenge to those concerned to revitalize public libraries to meet demands and the realities of the present society.

### **Standard 1. Objectives of the Public Library**

- 1.1.** To provide library and information service responsive to the needs of the community.
- 1.2.** To build within each library and information center about its respective community -- its resources, its history, its people, its customs and traditions, etc.
- 1.3.** To develop with other libraries within each region or province a network of public library service with the regional library or in the lack of it, the provincial library as its center to facilities research and reference needs within the area.

### **Standard 2. Organization and Management**

- 2.1. Each public library shall operate under the direct management and supervision of a competent and professionally trained librarian.
- 2.2. The public library shall operate under the direct supervision of the National Library on matters that affect its resources and services.
- 2.3. The public library as a local government unit shall have the local executive of the government units as its immediate superior.
- 2.4. The public library shall be provided with reasonable budgetary appropriations annually to carry out plans and activities effectively.

### Standard 3. Library Advisory Board

- 3.1 A trisectoral Library Advisory Board shall be established composed of representatives for the civic, religious and government sectors.
- 3.2 The Library Advisory Board shall assist the librarian in the formulation of policies which aim to bring the library closer to its users.
- 3.3 The Library Advisory Board could organize a Friends of the Public Library Club to support library projects and activities especially concerning material and financial resources.

### Standard 4. Staff

- 4.1. The public library system should be manned by qualified and professionally staff in order to render adequate service and serve as an effective center for culture and information.
- 4.2. Sufficient numbers of personnel should be hired to obtain quality service.
- 4.3. There should be clean out delineation of staff duties and responsibilities.
- 4.4. Size
  - 4.4.1. The number and kinds of positions in a public library will depend on the population being served and the size of the collection.
  - 4.4.2. As a minimum standard, regional, provincial and city libraries should at least have four professional and three supportive non-professional staff. On other hand municipal libraries should at least have one professional and one clerical staff for a municipality lower than first class. First class municipalities should have at least 3 professional librarians and as many supportive staff as needed.
  - 4.4.3. Since barangay libraries in a municipality are directly under the municipal librarian, 2

supportive staff should be the required minimum number of personnel.

**4.4.4.** The increase in the number of staff shall depend on the number of increase in population of the community served. For every increase of 50, 000 people in the community a corresponding increase of 1 professional and 1 supportive staff are suggested.

**4.5. Qualifications**

**4.5.1.** Professional librarian are individual with any of the following degrees:

**4.5.1.1.** Bachelor of Library Science or Information Science

**4.5.1.2.** Bachelor of Science in Library Science or Information Science

**4.5.1.3.** Bachelor of Science in Education major in Library Science

**4.5.1.4.** Bachelor of Science in Education with Specialization in Library Science

**4.5.1.5.** Bachelor of Arts major in Library Science

**4.5.1.6.** Master of Library Science or Information Science

**4.5.1.7.** Master of Arts in Library Science or Information Science

**4.5.1.8.** Master of Science in Library Science or Information Science

**4.5.2** They could be assigned any of the following titles depending on educational attainment, experience and available positions.

**4.5.2.1.** Superintendent of Libraries

**4.5.2.2.** Director of Libraries

**4.5.2.3.** Chief Librarian

**4.5.2.4.** Head Librarian

**4.5.2.5.** Supervising Librarian

**4.5.2.6.** Senior Librarian

**4.5.2.7.** Librarian

**4.5.2.8.** Cataloger

**4.5.3. Supportive Staff**

**4.5.3.1.** Technical staff – should either as BSE or AB minor in library science. They could be appointed as junior librarians.

**4.5.3.2.** Clerical staff – should have taken exam special studies in Secretarial Science.

**4.5.3.3.** Library Aides – should at least have finished two years of college or have

had at least two years experience working in a library:

4.6. Civil Service Eligibilities

**4.6.1.** Professional librarians are required to have had passed the Librarian or Supervising Librarian examination or Career Service Professional Examination, pending passage of the Professionalization Bill in Congress, in which case no librarian shall be appointed to professional position until properly licensed by the proposed Board for Librarians.

**4.6.2.** Supportive staff are required to have passed the sub-professional examination.

4.7. Salary

**4.7.1.** Salary is undoubtedly the major consideration which attraction an intelligent professional staff.

**4.7.2.** Heads of Libraries (Regional, Provincial, City & Municipal) are to be considered on the level of assistant corresponding to the position.

**4.7.3.** Other personnel follows accordingly.

4.8. Staff Development

**4.8.1.** To foster intellectual development and update knowledge and skills in librarianship it is necessary to send public librarians and other supportive technical personnel to seminars, conferences, and in-service training programs when necessary and budgetary appropriations should be set aside for this matter.

**4.8.2.** Scholarship grants should be given to deserving ones when available.

Standard 5. Budget

**5.1.** The library shall be provided with an adequate, realistic, annual budgetary appropriations of the local government unit to which it belongs.

**5.2.** The head librarian shall prepare the annual budget in consultation with local budget officer and shall exercise full control over its expenditures accordingly to procedures followed by the local government unit and COA.

**5.3.** The library budget shall cover the following:

5.3.1. Personal Services

**5.3.1.1.** Salaries of personnel

**5.3.1.2.** Adequate funds for travel to attend seminars, conferences, etc. either held

locally and / or abroad; to get book allocations from the National Library and other donors; to inspect and supervise subordinate libraries; to attend professional and officials meetings; to canvass books and other materials needed in the library.

**5.3.1.3.** Allowances as maybe provided by the local government unit.

**5.3.2.** Operational expenses to include office and janitorial supplies; subscription to periodicals; ;purchase of additional books; printing and binding; seminar expenses; communication services; repair and maintenance of office equipment; other sundry expenses.

**5.3.3.** Capital Outlay to cover the cost of needed furnishings and equipment from time to time.

**5.3.4.** The Library budget shall be adjusted annually as the need arises.

## Standard 6. Collection

- 6.1.** The collection must reflect the objectives of the library and the needs of the community served.
- 6.2.** It should include aside from books, periodicals, globes, maps, atlases pamphlets, clippings, various audio-visual materials like pictures, photos, charts, films, microforms, music scores, sound recordings, cassettes, tape reels, realias, dioramas, and other graphic materials.
- 6.3.** Aside from the above, the library shall maintain a local history collection composed of materials about community, its history, resources, people, customs, traditions, etc.
- 6.4.** The size of the book collection is dependent on the allocations given by
- 6.5.** The National Library and the amount of budgetary appropriations available from the local government unit annually.
- 6.6.** A minimum stack of 10, 000 volumes regardless of population is deemed appropriate for a regional, provincial, city and first class municipal libraries.
- 6.7.** For municipal libraries lower than first class, a book collection of 6, 000 volumes is recommended while for barangay libraries 2, 000 volumes.
- 6.8.** The head librarian shall responsible for the selection and acquisition of all library material which should be based on the educational, informational, cultural and recreational needs of the community.
- 6.9.** Emphasis is placed on those materials which best foster the sound development of the individual at all age levels.

## Standard 7. Physical Facilities

### 7.1. Building

#### 7.1.1. Site

7.1.1.1. The site of the building should centrally located within the community with provision for expansion for future growth.

7.1.1.2. It should be accessible to library users by all means of transportation.

7.1.1.3. In the development plan of the local government unit, it should be an integral part of an integrated cultural complex.

7.1.1.4. In the event that the building is inaccessible to a great majority of the reading public, at least one bookmobile unit should be provided and more barangay

libraries should be established.

7.1.1.5. The building should as much as possible provide access to disabled.

#### 7.1.2. Size

7.1.2.1. The elements to considered in planning the size of the library building are the population or size of the community, the library collection , the size of the staff and budgetary appropriations.

7.1.2.2. Even in communities where the size of the population suggests a library many times larger than the existing or planned library, budgetary appropriations may force limitation on the size of the building. It is therefore wise to include plans for expansion for the future.

7.1.2.3. Each library should at least provide adequate space for bookshelves and reading areas, tables and chairs for library users, office tables and chairs for library personnel, workroom, multi-purpose room, storage, quarter for the personal needs of the staff and library furnishings and equipment.

7.1.2.4. Provision should be made for a minimum seating capacity of 100 per regional, provincial, city and first class municipal libraries; and at least 50 for other municipalities and 30 per barangay library.

7.1.2.5. Equipments and furnishing should be sufficient and adequate to generate a physical environment conducive for the pleasant and effective use of its materials and services.

7.1.2.6. Furniture should be functional and in harmony with the architecture of the building.

7.1.2.7. Equipment should be properly selected in such a way that will help in the efficient operation of the library activities.

7.1.2.8. Layout of equipment and furnishings should allow the smooth mobility of readers and materials.

7.1.2.9. Standards equipment and furnishings are as follows:

	Atlas Stand	Charging desk
	Book display rack	Dictionary Stand
	Bookshelves	Newspaper rack
	Cabinets, Filing	Tables, Office
	Card Catalog	Tables, reading
Typewriting	Carrels	Table,
	Chairs, Office	Typewriter
hardware Equipment	Chairs, reading	Various (when necessary)

## Standard 8. Library Services

- 8.1.** Library Services shall be provided with the highest degree of efficiency and integrity keeping in mind that the public library is a service agency of the government of the people.
- 8.2.** The library shall reflect the needs of the community which shall include books, pamphlets, non-print as well as ephemeral materials classified and catalogued according to the standard procedures for easy retrieval.
- 8.3.** Open shelves system shall be adopted to give library users free access to all materials in the collection except for some non-print materials which necessitates special handling.
- 8.4.** The library shall provide wholesome materials for all types of readers in all age levels regardless of civic, cultural, ethnic, religious and political affiliations.
- 8.5.** The library should collect local history materials for preservation and conservation.
- 8.6.** Sufficient number of local newspapers and other periodicals should be acquired to keep the community abreast of national affairs as well as

information on daily living.

- 8.7.** The library should have a written statement of its objectives as well as its functions which should be reviewed periodically to keep up with the times and needs of the community.
- 8.8.** There should be a well-planned hours of service to meet the needs of the community and maximize use of library resources and facilities.
- 8.9.** Circulation of books for home use should be for periods as liberal as the collection permits.
- 8.10.** The library should initiate or organize group activities within the framework of its own program. These activities could be storytelling, puppet shows book discussions, play reading, poetry interpretation lectures, demonstrations, exhibits, etc.
- 8.11.** To promote the effective use of the library by the community, the library shall offer the following services according to their resources and facilities capability
  - 8.11.1** Reference and research services.
  - 8.11.2** Circulation of books for home use.
  - 8.11.3** Organizing a library for children.
  - 8.11.4** Reading guidance for children and out-of-school youths.
  - 8.11.5** Compilation of periodical clippings on various government thrusts and other important subjects.
  - 8.11.6** Indexing of periodicals.
  - 8.11.7** To search and supply information needed by officials and offices of the local government units.
  - 8.11.8** To compile and index various public documents made available by the local government and to disseminate those needed by the public.
  - 8.11.9** Extension of library services to outreach areas.
  - 8.11.10** Interlibrary loans with other public and school libraries.
  - 8.11.11** Organizing extension libraries.
  - 8.11.12** Operating bookmobile service when available.

Standard 9. Reports and Inventory

- 9.1 The library shall accomplish monthly statistical report as required by the National Library as a measure of its activities and accomplishments and shall furnish a copy to the local government unit.
- 9.2 Annual narrative and statistical reports are to be prepared for comparative studies and evaluation of its program and activities, copies of which are to be furnish the local government unit and the National Library.
- 9.3 The library shall develop a monitoring system of its operations and procedures to assess and evaluate from time to time its efficiency and its effectivity as a service agency of the government.
- 9.4 An annual inventory of resources shall be made to determine their loss if any, quality and serviceability. Report of their conditions shall be submitted to the proper governing authorities.

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Appendix B: **THE LOCAL GOVERNMENT CODE  
OF THE PHILIPPINES**

*GENERAL PROVISIONS*

*TITLE ONE. - BASIC PRINCIPLES*

*CHAPTER 1. - THE CODE: POLICY AND APPLICATION*

**SEC. 17. Basic Services and Facilities.**

(a) Local government units shall endeavor to be self-reliant and shall continue exercising the powers and discharging the duties and functions currently vested upon them. They shall also discharge the functions and responsibilities of national agencies and offices devolved to them pursuant to this Code. Local government units shall likewise exercise such other powers and discharge such other functions and responsibilities as are necessary, appropriate, or incidental to efficient and effective provision of the basic services and facilities enumerated herein.

(b) Such basic services and facilities include, but are not limited to, the following: **(1) For a Barangay:**

(i) Agricultural support services which include planting materials distribution system and operation of farm produce collection and buying stations;

(ii) Health and social welfare services which include maintenance of barangay health center and day-care center;

(iii) Services and facilities related to general hygiene and sanitation, beautification, and solid waste collection;

(iv) Maintenance of katarungang pambarangay;

(v) Maintenance of barangay roads and bridges and water supply systems;

(vi) Infrastructure facilities such as multi- purpose hall, multipurpose pavement, plaza, sports center, and other similar facilities;

(vii) Information and reading center; and

(viii) Satellite or public market, where viable;

**(2) For a Municipality:**

(i) Extension and on-site research services and facilities related to agriculture and fishery activities which include dispersal of livestock and poultry, fingerlings, and other seeding materials for aquaculture; palay, corn, and vegetable seed farms; medicinal plant gardens; fruit tree, coconut, and other kinds of seedling nurseries; demonstration farms; quality control of copra and improvement and development of local distribution channels, preferably through cooperatives; interbarangay irrigation system; water and soil resource utilization and conservation projects; and enforcement of fishery laws in municipal waters including the conservation of mangroves;

(ii) Pursuant to national policies and subject to supervision, control and review of the DENR, implementation of community-based forestry projects

which include integrated social forestry programs and similar projects; management and control of communal forests with an area not exceeding fifty (50) square kilometers; establishment of tree parks, greenbelts, and similar forest development projects;

(iii) Subject to the provisions of Title Five, Book I of this Code, health services which include the implementation of programs and projects on primary health care, maternal and child care, and communicable and non-communicable disease control services; access to secondary and tertiary health services; purchase of medicines, medical supplies, and equipment needed to carry out the services herein enumerated;

(iv) Social welfare services which include programs and projects on child and youth welfare, family and community welfare, women's welfare, welfare of the elderly and disabled persons; community-based rehabilitation programs for vagrants, beggars, street children, scavengers, juvenile delinquents, and victims of drug abuse; livelihood and other pro-poor projects; nutrition services; and family planning services;

(v) Information services which include investments and job placement information systems, tax and marketing information systems, and maintenance of a public library;

(vi) Solid waste disposal system or environmental management system and services or facilities related to general hygiene and sanitation;

(vii) Municipal buildings, cultural centers, public parks including freedom parks, playgrounds, and sports facilities and equipment, and other similar facilities;

(viii) Infrastructure facilities intended primarily to service the needs of the residents of the municipality and which are funded out of municipal funds including, but not limited to, municipal roads and bridges; school buildings and other facilities for public elementary and secondary schools; clinics, health centers and other health facilities necessary to carry out health services; communal irrigation, small water impounding projects and other similar projects; fish ports; artesian wells, spring development, rainwater collectors and water supply systems; seawalls, dikes, drainage and sewerage, and flood control; traffic signals and road signs; and similar facilities;

(ix) Public markets, slaughterhouses and other municipal enterprises;

(x) Public cemetery;

(xi) Tourism facilities and other tourist attractions, including the acquisition of equipment, regulation and supervision of business concessions, and security services for such facilities; and

(xii) Sites for police and fire stations and substations and the municipal jail;

**(3) For a Province:**

(i) Agricultural extension and on-site research services and facilities which include the prevention and control of plant and animal pests and diseases; dairy farms, livestock markets, animal breeding stations, and artificial insemination centers; and assistance in the organization of farmers' and fishermen's cooperatives and other collective organizations,

as well as the transfer of appropriate technology;

(ii) Industrial research and development services, as well as the transfer of appropriate technology;

(iii) Pursuant to national policies and subject to supervision, control and review of the DENR, enforcement of forestry laws limited to community-based forestry projects, pollution control law, small-scale mining law, and other laws on the protection of the environment; and mini-hydro electric projects for local purposes;

(iv) Subject to the provisions of Title Five, Book I of this Code, health services which include hospitals and other tertiary health services;

(v) Social welfare services which include programs and projects on rebel returnees and evacuees; relief operations; and, population development services;

(vi) Provincial buildings, provincial jails, freedom parks and other public assembly areas, and other similar facilities;

(vii) Infrastructure facilities intended to service the needs of the residents of the province and which are funded out of provincial funds including, but not limited to, provincial roads and bridges; inter-municipal waterworks, drainage and sewerage, flood control, and irrigation systems; reclamation projects; and similar facilities;

(viii) Programs and projects for low-cost housing and other mass dwellings, except those funded by the Social Security System (SSS), Government Service Insurance System (GSIS), and the Home Development Mutual Fund (HDMF): Provided, That national funds for these programs and projects shall be equitably allocated among the regions in proportion to the ratio of the homeless to the population;

(ix) Investment support services, including access to credit financing;

(x) Upgrading and modernization of tax information and collection services through the use of computer hardware and software and other means;

(xi) Inter-municipal telecommunications services, subject to national policy guidelines; and

(xii) Tourism development and promotion programs;

**(4) For a City:**

All the services and facilities of the municipality and province, and in addition thereto, the following:

(i) Adequate communication and transportation facilities;

(ii) Support for education, police and fire services and facilities.

(c) Notwithstanding the provisions of subsection (b) hereof, public works and infrastructure projects and other facilities funded by the national government under the annual General Appropriations Act, other special laws, pertinent executive orders, and those wholly or partially funded from foreign sources, are not covered under this Section, except in those cases where the local government unit concerned is duly designated as the

implementing agency for such projects, facilities, programs, and services.

(d) The designs, plans, specifications, testing of materials, and the procurement of equipment and materials from both foreign and local sources necessary for the provision of the foregoing services and facilities shall be undertaken by the local government unit concerned, based on national policies, standards and guidelines.

(e) National agencies or offices concerned shall devolve to local government units the responsibility for the provision of basic services and facilities enumerated in this Section within six (6) months after the effectivity of this Code. As used in this Code, the term "devolution" refers to the act by which the national government confers power and authority upon the various local government units to perform specific functions and responsibilities.

(f) The national government or the next higher level of local government unit may provide or augment the basic services and facilities assigned to a lower level of local government unit when such services or facilities are not made available or, if made available, are inadequate to meet the requirements of its inhabitants.

(g) The basic services and facilities hereinabove enumerated shall be funded from the share of local government units in the proceeds of national taxes and other local revenues and funding support from the national government, its instrumentalities and government-owned or -controlled corporations which are tasked by law to establish and maintain such services or facilities. Any fund or resource available for the use of local government units shall be first allocated for the provision of basic services or facilities enumerated in subsection (b) hereof before applying the same for other purposes, unless otherwise provided in this Code.

(h) The Regional offices of national agencies or offices whose functions are devolved to local government units as provided herein shall be phased out within one (1) year from the approval of this Code. Said national agencies and offices may establish such field units as may be necessary for monitoring purposes and providing technical assistance to local government units. The properties, equipment, and other assets of these regional offices shall be distributed to the local government units in the region in accordance with the rules and regulations issued by the oversight committee created under this Code.

(i) The devolution contemplated in this Code shall include the transfer to local government units of the records, equipment, and other assets and personnel of national agencies and offices corresponding to the devolved powers, functions, and responsibilities. Personnel of said national agencies or offices shall be absorbed by the local government units to which they belong or in whose areas they are assigned to the extent that it is administratively viable as determined by the said oversight committee: Provided, That the rights accorded to such personnel pursuant to civil service law, rules and regulations shall not be impaired: Provided, Further, That regional directors who are career executive service officers and other officers of similar rank in the said regional offices who cannot be absorbed by the local government unit shall

be retained by the national government, without any diminution of rank, salary or tenure.

(j) To ensure the active participation of the private sector in local governance, local government units may, by ordinance, sell, lease, encumber, or otherwise dispose of public economic enterprises owned by them in their proprietary capacity.

Costs may also be charged for the delivery of basic services or facilities enumerated in this Section.

## Appendix C: REPUBLIC ACT NO. 7743

### AN ACT PROVIDING FOR THE ESTABLISHMENT OF CONGRESS, CITY AND MUNICIPAL LIBRARIES AND BARANGAY READING CENTERS THROUGHOUT THE PHILIPPINES, APPROPRIATING THE NECESSARY FUNDS THEREFOR AND FOR OTHER PURPOSES.

**Sec. 1** Declaration of policy – It is hereby declared the national policy to promote the moral and intellectual well-being of the people: elevate the literacy level of every Filipino to the end that illiteracy is eradicated by the end of the century; and recognize the vital role of knowledge and information in nation-building by establishing public libraries in every congressional district, city and municipality, and reading centers in every barangay throughout the Philippines.

**Sec. 2** Establishment of Public Libraries and Reading Centers. – The National Library in coordination with the Department of the Interior and Local Government (DILG) shall undertake the establishment of additional public libraries to serve all congressional districts cities and municipalities in the Philippines and reading centers in every barangay except in cities or municipalities where there are existing public libraries or in barangay where there are existing reading centers: Provided, That the establishment of such libraries and reading centers shall be based on the development program of the National Library, in coordination with development council of each city or municipality and in the case of the barangay reading centers in coordination with the respective barangay councils: Provided further, That where these public libraries and reading centers already exist the National Library shall continue to upgrade the facilities thereof. The National Library shall continue to coordinate and organize seminars, workshops and other trainings for the professional benefit of librarians.

**Sec. 3** Role of the National Library. – The National Library shall provide the standard set reference books and other materials such as but not limited to encyclopedias, dictionaries, maps and globes upon the establishment of the libraries. The National Library shall continue to supply the public libraries with the other books, non-book materials, equipment supplies and other appropriate and relevant reference and reading materials taking into consideration the needs of the community concerned.

**Sec. 4** Site – The establishment of the public libraries and reading centers shall be an integral part of the development plan of each local government unit: Provided, That barangays shall provide the site for barangay reading centers.

**Sec. 5** Period of Implementation. – The overall national plan of implementation shall cover initially a period of five (5) years: Provided, That those congressional districts, cities and municipalities with no existing public libraries as well as barangays situated in remote, isolated and rural areas shall have priority in the allocation of resources.

Within one hundred twenty (120) days from the effectivity of this Act, the National Library in consultation

with the DILG, the Department of Public Works and Highways (DPWH) and the different local government units, shall come out with the list of priority areas, taking into account the commitment of the local government units in the establishment and maintenance of public libraries and barangay reading centers.

**Sec. 6** Functions of the Public Libraries and Barangay Reading Centers. – The public libraries and barangay reading centers shall have the following functions:

- (a) to make available to the members of the community reading materials of wide array including reading materials prescribed by the Department of Education Culture and Sports and national newspapers of general circulation and others;
- (b) to be used as a venue for audio-visual presentation in the community and other kinds of exhibition and activities aimed at increasing the literacy rate by government agencies, non-government organizations or private entities in the dissemination of information of general interest; and
- (c) to offer such other related services in the furtherance of the Act.

**Sec. 7** Appropriations. – The amount necessary to carry out the provisions of this Act shall be included in the General Appropriation Act of the year following its enactment into law and for the next five (5) years; thereafter, the local government units shall undertake the maintenance of public libraries and reading centers while the National Library shall continue to provide reading materials and supplies to the said libraries and reading centers.

**Sec. 8** Submission of Reports. – Within ninety (90) days from the approval of this Act, and at the end of every calendar year thereafter the Director of the National Library shall submit progress report to each House of Congress on the implementation of this Act.

**Sec. 9** Rules and Regulations. – Within sixty (60) days from the approval of this Act, the National Library, in coordinator with the DILG and the Philippine Information Agency (PIA), shall promulgate the implementing rules and regulations.

**Sec. 10.** Repealing Clause. – All acts, presidential decrees, executive orders and issuance inconsistent with this Act are hereby repealed or amended accordingly.

**Sec. 11** Separability Clause. – If any provision of this Act is declared unconstitutional or inoperative, the other provisions not so declared shall remain in force and effect.

**Sec. 12** Effectivity Clause. – This Act shall take effect fifteen (15) days after publication in a newspaper of general circulation.

**Approved: June 17, 1994**

**Appendix D: Republic Act No. 9246**

**AN ACT MODERNIZING THE PRACTICE OF LIBRARIANSHIP IN THE PHILIPPINES THEREBY REPEALING REPUBLIC ACT NO. 6966, ENTITLED: "AN ACT REGULATING THE PRACTICE OF LIBRARIANSHIP AND PRESCRIBING THE QUALIFICATIONS OF LIBRARIANS," APPROPRIATING FUNDS THEREFOR AND FOR OTHER PURPOSES**

*Be it enacted by the Senate and House of Representatives of the Philippines in Congress assembled:*

**ARTICLE I**

**TITLE, STATEMENT OF POLICY, DEFINITION OF TERMS, SCOPE OF THE PRACTICE**

**SECTION 1. *Short Title.*** - This Act shall be known as "The Philippine Librarianship Act of 2003."

**SECTION 2. *Statement of Policy.*** - The State recognizes the essential role of librarianship as a profession in developing the intellectual capacity of the citizenry thus making library service a regular component for national development. It shall, through honest, effective and credible licensure examination and regulatory measures, undertake programs and activities that would promote and nurture the professional growth and well-being of competent, virtuous, productive and well-rounded librarians whose standards of practice and service shall be characterized by excellence, quality, and geared towards world-class global competitiveness.

**SECTION 3. *Objectives.*** - This Act shall govern the following:

- a) National examination for licensure, registration of librarians, issuance of Certificate of Registration and Professional Identification Card;
- b) Supervision, control and regulation of practice of librarianship;
- c) Integration of librarians under one national organizations;
- d) Development of professional competence of librarians.

**SECTION 4. *Definition of Terms.*** - As used in this Act, the following terms shall be defined:

- a) *Librarian* - refers to an individual who is a bona fide holder of a Certificate of Registration and Professional Identification Card issued by the Professional Regulatory Board for Librarians and by the Professional Regulation Commission in accordance with this Act.
- b) *Commission* - refers to the Professional Regulation Commission.
- c) *Board* - refers to the Professional Regulatory Board for Librarians.

**SECTION 5. *Scope of the Practice of Librarianship.*** - Librarianship shall deal with the performance of the librarian's functions, which shall include, but not be limited to the following:

- 1) Selection and acquisition of multi-media sources of information which would best respond to clientele's need for adequate, relevant and timely information;
- 2) Cataloguing and classification of knowledge or sources of information into relevant organized collections and creation of local databases for speedy access, retrieval or delivery of information;
- 3) Development of computer-assisted/computer-backed information systems which would permit online and network services;
- 4) Establishment of library system and procedures; dissemination of information; rendering of information, reference and research assistance; archiving; and education of users;
- 5) Teaching, lecturing and reviewing of library, archives and information science subjects, including subjects given in the licensure examination;
- 6) Rendering of services involving technical knowledge/expertise in abstracting, indexing, cataloguing and

classifying' or the preparation of bibliographies, subject authority lists, thesauri and union catalogues/lists;

7) Preparation, evaluation or appraisal of plans, programs and/or projects for the establishment, organization, development and growth of libraries or information centers, and the determination of library requirements for space, buildings, structures or facilities;

8) Provision of professional and consultancy services or advice on any aspect of librarianship; and

9) Organization, conservation, preservation and restoration of historical and cultural documents and other intellectual properties.

## ARTICLE II

### CREATION OF THE PROFESSIONAL REGULATORY BOARD FOR LIBRARIANS

**SECTION 6. *Creation and Composition of the Board.*** - There is hereby created a Professional Regulatory Board for Librarians, hereinafter called the Board, under the administrative supervision and control of the Professional Regulation Commission, hereinafter referred to as the Commission, to be composed of a Chairperson and two (2) members who shall be appointed by the President of the Philippines from among the list of three (3) recommendees for each position submitted by the Commission from among the list of five (5) nominees for each position submitted by the accredited integrated national professional organization of librarians from among the librarians of recognized standing who qualify under Section 7 of this Act. The new Board shall be constituted within three (3) months from the effectivity of this Act.

**SECTION 7. *Qualification of Members of the Board.*** - The Chairperson and members of the Board, at the time of their appointment, shall possess the following qualifications:

- a) A natural born citizen and resident of the Philippines;
- b) A good reputation and moral character;
- c) A librarian as defined in "Section 4(a)" of this Act;
- d) Active in the practice of librarianship for at least ten (10) years, five (5) years of which is in a managerial position;
- e) Must not be a member of the faculty of a university, college, school or institution conferring the academic degree on librarianship, or offering review classes for librarian licensure examination; nor a person who has a direct or indirect pecuniary interest in any such institution; and
- f) Must not be an incumbent officer of the accredited, integrated national professional organization librarians.

**SECTION 8. *Powers, Functions and Duties of the Board.*** - The Board shall exercise executive/administrative, rule making and quasi-judicial powers in carrying out the provisions of this Act. It shall be vested with the following specific powers, functions, duties and responsibilities;

- a) To promulgate and administer rules and regulations necessary to carry out the provisions of this Act;
- b) To administer oaths in connection with the administration of this Act;

- c) To adopt an official seal of the Board;
- d) To issue, suspend or revoke the Certificate of Registration and Professional Identification Card or grant or cancel a temporary/special permit;
- e) To look into the conditions affecting the practice of librarianship, and when necessary, adopt such measures as may be deemed proper for the enhancement and maintenance of high ethical, moral and professional standards of librarianship;
- f) To adopt policies and set the standards for all types of libraries, librarians and the practice of librarianship;
- g) To ensure, in coordination with the Commission on Higher Education (CHED), that all institutions offering library, archives and information science education comply with prescribed standards for curriculum, faculty and facilities for course offerings of library science, or library and information science;
- h) To adopt and prescribe a Code of Ethics and a Code of Technical Standards for Librarians;
- i) To hear and decide administrative cases involving violations of this Act, its Implementing Rules and Regulations or the Code of Ethics or the Code of Technical Standards for Librarians; and for this purpose, issue subpoena ad testificandum and subpoena duces tecum to ensure the appearance of witnesses and the presentation of documents in connection therewith;
- j) To prescribe guidelines in the Continuing Professional Education (CPE) in coordination with the accredited and integrated association for professional librarians;
- k) To prepare, adopt, issue or amend the syllabi or terms of specification of subjects for the librarian licensure examination consistent with the policies and standards set by the CHED; and
- l) To discharge other powers and duties as the Board may deem necessary for the practice of librarianship and the continued growth and development of librarians, libraries and library education in the Philippines.

The policies, resolutions, rules and regulations issued or promulgated by the Board shall be subject to review and approval of the Commission. However, the Board's decision, resolution or order rendered in administrative case shall be subject to review only if on appeal.

**SECTION 9. *Term of Office.*** - The Chairperson and the members of the Board shall hold office for a term of three (3) years until their successors shall have been appointed and duly qualified: Provided, That members of the first Board to be appointed after the approval of this Act shall hold office for the following terms: the Chairperson for three (3) years, one member for two (2) years and the other member for one (1) year. Provided, further, That the Chairperson or any member may be reappointed for another term of three (3) years but in no case shall the whole term exceed six (6) years. Interim vacancies in the Board shall be filled for the unexpired portion of the term only. Each member shall take the proper oath of office.

**SECTION 10. *Compensation of the Board.*** - The Chairperson and members of the Board shall receive compensation and allowances comparable to that being received by the Chairperson and members of existing regulatory boards under the Commission as provided for in the General Appropriations Act.

**SECTION 11. *Removal or Suspension Board Members.*** - The Chairperson or any member of the Board may be removed or suspended by the President of the Philippines on recommendation of the Commission if found guilty after a proper administrative investigation, based on the following grounds: neglect of duty, incompetence, unprofessional, unethical, immoral or dishonorable conduct; any violation of this Act, or the Code of Ethics and the Code of Technical

Standards for Librarians; or commission or toleration of irregularities in the examination such as manipulation, rigging of examination results, disclosure of secrets and information on examination questions prior to conduct of examination, tampering of grades or final judgment, or criminal offense involving moral turpitude.

**SECTION 12. *Executive Officer and the Secretary of the Board.*** - The Chairperson of the Commission shall be the Executive Officer of the Board and shall conduct the licensure examination for librarians. The Commission shall designate the Secretary of the Board and shall provide the Secretariat and other support services to implement the provisions of this Act.

All records of the Board including the examination papers, minutes of deliberations, and records of administrative proceedings and investigations shall be kept by the Commission under the direct custody of the Secretary.

**SECTION 13. *Annual Report.*** - The Board shall submit to the Commission after the close of each calendar year, its annual report of accomplishments which shall include a detailed account of the operation of the Board for the year and the appropriate recommendation on issues or problems affecting the profession.

### ARTICLE III

#### LICENSURE EXAMINATION AND REGISTRATION

**SECTION 14. *Examinations.*** - Applications for registration, except those specifically allowed under Section 19 of this Act, shall be required to undergo a written licensure examination to be given by the Board in such places and dates the Commission may designate subject to compliance with the requirements prescribed by the Commission.

**SECTION 15. *Qualifications of Applicants.*** - Applicants for licensure examination must meet the following qualifications at the time of filing of applications:

- a) Citizen of the Philippines or a foreign citizen whose country has reciprocity with the Philippines as regards the practice of librarianship;
- b) Good health and good moral character, and
- c) Graduate of Bachelor's degree in Library Science and Information Science: Provided, That a holder of a master's degree in Library and Information Science Shall be allowed to qualify for application to the licensure examinations: Provided, further, That within five (5) years from the effectivity of this Act, holders of the following degrees shall also be allowed to qualify for application to the licensure examination:
  - 1) Bachelor of Science in Education or Elementary Education; or Bachelor of Arts with a major or specialization in Library Science;
  - 2) Master of Arts in Library Science or Library and Information Science; or
  - 3) Any masters degree with concentration in Library Science.

**SECTION 16. *Scope of Examination.*** - The licensure examination for librarianship shall consist of the following subjects;

- 1) selection and acquisition of multi-media sources of information;

- 2) cataloguing and classification;
- 3) indexing and abstracting;
- 4) reference, bibliography and information services;
- 5) organization, management and development and maintenance of multi-media based library or information service, laws, trends and practices affecting the profession; and
- 6) information technology.

The Board is hereby authorized to modify or add to the subjects listed above as the needs and demands in the library profession may require.

**SECTION 17. *Rating in the Board Examination.*** - To be qualified as having passed the licensure examination, a candidate must obtain a weighted general average of seventy-five percent (75%), with no grade lower than fifty percent (50%) in any subject.

**SECTION 18. *Report of Results of Examination.*** - The Board shall report to the Commission the results of the examination and the ratings of the examinees within ten (10) days after the examination.

**SECTION 19. *Registration Without Examination.*** - Upon application and payment of the required fees, the Board shall issue a Certificate of Registration and Professional Identification Card to an applicant who, on the date of effectivity of Republic Act No. 6966, is:

- a) a practicing librarian who has completed at least a bachelor's degree, and a librarian or supervising librarian eligible;
- b) a practicing librarian who completed at least a bachelor's degree, eighteen (18) units in Library Science, five (5) years experience in librarianship, and a first grade eligible or its equivalent;
- c) a practicing librarian who has completed a masters degree in Library Science or Library and Information Science, and a first grade eligible or its equivalent; or
- d) a practicing librarian who has completed at least a bachelor's degree, eighteen (18) unit in Library Science, and seven (7) years experience in librarianship.

Those who qualify under this Section shall be given three (3) years within which to apply for registration upon the effectivity of this Act.

**SECTION 20. *Issuance of Certificate of Registration and Professional Identification Card.*** - The Commission, on recommendation of the Board, shall issue a Certificate of Registration and Professional Identification Card to each person who passed the licensure examination for librarians and to those who are registered without examination under this Act and shall enter name of the registered professional in the Roster of Philippine Librarians.

The Certificate of Registration shall bear the signature of the Chairperson of the Commission and the Chairperson and members of the Board, stamped with official seals of the Board and Commission indicating that the person named therein is entitled to the practice of the profession with all the privileges appurtenant thereto. The said certificate of registration shall remain in full force and effect until suspended or revoked in accordance with this Act.

A professional identification card bearing the name and signature of the registrant, registration number, date of issuance,

expiry date, duly signed by the Chairperson of the Commission, shall likewise be issued to every registrant who has paid the prescribed fee.

**SECTION 21. *Oath of Profession.*** - All successful examinees qualified for registration and all qualified applicants for registration without examination shall be required to take an oath of profession before any Commission Officer, or member of the Board or any government official authorized to administer oaths, prior to entering into practice of librarianship in the Philippines.

**SECTION 22. *Refusal to Issue Certificate of Registration and Professional Identification Card.*** - The Board shall not register any successful examinee nor any applicant for registration without examination if he/she has been convicted by a court of competent jurisdiction of any criminal offense involving moral turpitude or has been found guilty of immoral and is honorable conduct after investigation of the Board, or has been declared to be of unsound mind. The reason for the refusal shall be set forth in writing.

**SECTION 23. *Revocation and Suspension of Certificate of Registration and Professional Identification Card or Cancellation of Temporary/Special Permit.*** - The Board has the power, after due notice and hearing, to revoke or suspend the Certificate of Registration or cancel a temporary or special permit of any librarian on any ground stated under Section 22 of this Act, or for any of the following: unprofessional or dishonorable conduct; practice of librarianship; fraud; deceit or falsification in obtaining a certificate of registration, professional identification card, or temporary/special permit; abetment of illegal practice by allowing illegal use of his/her certificate of registration, or professional identification card, or temporary/special permit; practice of profession during the period of suspension; or any violation of this Act, its Implementing Rules and Regulations, the Code of Ethics or the Code of Technical Standards for Librarians, or Board policies. The respondent may appeal the Board's decision, order/resolution to the Commission within fifteen (15) days from receipt thereof,

**SECTION 24. *Reissuance of Revoked Certificate of Registration and Replacement of Lost Certificate of Registration and Professional Identification Card.*** - The Board after two (2) years from the date of revocation of the Certificate of Registration may reissue a certificate upon proper application.

A new Certificate of Registration and Professional Identification Card or temporary/special permit, which has been lost, destroyed or mutilated, may be reissued after payment of the required fee prescribed by the Commission.

**SECTION 25. *Roster of Librarians.*** - The Board, in coordination with the accredited and integrated national organization of librarians, shall maintain an up-to-date, complete and properly organized Roster, which shall include those who had been issued Certificates of Registration under Republic Act No. 6966 and those who shall qualify under this Act, to contain the following data;

- a) alphabetical list by surname of librarians with their addresses and license numbers;
- b) the list of licensees, numerically arranged by license numbers; and
- c) such other lists which the Board may deem necessary.

Copies of the Roster, which shall be provided to the National Library, the Civil Service Commission, and the accredited national organization of librarians, shall be kept as permanent record.

## ARTICLE IV

### PRACTICE OF LIBRARIANSHIP

**SECTION 26. *Illegal Practice of Librarianship.*** - A person who does not have a valid Certificate of Registration and

Professional Identification Card or a temporary/special permit from the Commission shall not practice or offer to practice librarianship in the Philippines or assume any position, which involve performing the function of a librarian as provided under Section 5 of this Act.

**SECTION 27. *Certificate of Registration/Professional Identification Card and Professional Tax Receipt.*** - The Certificate of Registration, Professional Identification Card and Professional Tax Receipt number of the librarian shall be reflected in any document issued/signed in connection with the practice of the profession.

**SECTION 28. *Foreign Reciprocity.*** – A librarian from another country shall be admitted for licensure examination, be issued a Certificate of Registration and Professional Identification Card and be entitle to the rights and privileges appurtenant to this Act, if the country or state he/she is a citizen of or subject, permits Filipino librarians of said country or state: Provided, That the requirements for Certificate of Registration in said country or state are substantially the same as the requirements under this Act: Provided, further, That the law of such country or state grants Filipino librarians the same privileges as the citizens/subjects of that country/state.

**SECTION 29. *Vested Rights: Automatic Registration of Practicing Librarians.*** - All practicing librarians who are registered at the time this Act takes effect shall automatically be registered.

**SECTION 30. *Integrated and Accredited National Organization of Librarians.*** - All registered librarians shall be integrated under a single organization recognized and accredited by the Board and approved by the Commission.

A librarian duly registered and licensed by the Board and the Commission shall automatically become a member of the integrated and accredited professional organization and shall receive the benefits and privileges appurtenant thereto upon payment of the required fees and dues. Membership in the integrated and accredited professional organization shall not be a bar to membership in any other association of librarians.

**SECTION 31. *Employment of Librarians.*** - Only qualified and licensed librarians shall be employed as librarians in all government libraries. Local government units shall be given a period of three (3) years from the approval of this Act to comply with this provision.

## ARTICLE V

### PENAL AND FINAL PROVISIONS

**SECTION 32. *Penal Provisions.*** - Any person who practices or offers to practice any function of a librarian as provided for under Section 5 of this Act who is not registered and has not been issued by the Commission a Certificate of Registration and Professional Identification Card, or a temporary license/permit or who violates any of the provisions of this Act, its Implementing Rules and Regulations, shall, upon conviction, be penalized by a fine of not less than Thirty thousand pesos (P100,000.00), or imprisonment of not less than one (1) month nor more than three (3) years at the discretion of the court.

**SECTION 33. *Funding Provision.*** - The Chairperson of the Professional Regulation Commission shall immediately include in the Commission's program the implementation this Act, the funding which shall be included in the annual General Appropriations Act.

**SECTION 34. *Transitory Provision.*** - The present Board shall continue to function in the interim until such time as the new Board shall have been constituted pursuant to this Act.

**SECTION 35. *Implementing Rules and Regulations.*** - The Board, subject to the approval of the Commission, shall promulgate, adopt and issue rules and regulations, and the Code of Ethics and the Code of Technical Standards for Librarians which shall take effect fifteen (15) days following publication in the official Gazette or newspaper of general

circulation.

**SECTION 36. *Separability Clause.*** - If any clause, provision, paragraph or part hereof shall be declared unconstitutional or invalid, such judgment shall affect, invalidate or impair any other part hereof, but such judgment shall be merely confined to the clause, provision, paragraph or part directly involved in the controversy in which such judgment has been rendered.

**SECTION 37. *Repealing Clause.*** - Republic Act No. 6966 is hereby repealed and all other laws, decrees, orders, rules, regulations, ordinances or parts thereof which are inconsistent with this Act are hereby repealed or amended accordingly,

**SECTION 38. *Effectivity.*** - This Act shall take effect fifteen (15) days following its publication in the Official Gazette or a national newspaper of general circulation.

Approved,

**FRANKLIN DRILON**  
President of the Senate

**JOSE DE VENECIA JR.**  
Speaker of the House of Representatives

This Act which is a consolidation of House Bill No.5351 and Senate Bill No. 2579 was finally passed by the House of Representatives and the Senate on December 2, 2003 and December 16, 2003, respectively.

**OSCAR G. YABES**  
Secretary of Senate

**ROBERTO P. NAZARENO**  
Secretary General  
House of Representatives

Approved: February 19, 2004

**GLORIA MACAPAGAL-ARROYO**  
*President of the Philippines*

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(Accessed: March 16, 2006)



# Human Proclamation in Success: A Case Study of Immunisation Programme of Bihar. India

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**Abstract-** Health Care service delivery system is the main source or base for the implementation of programme or project. The present paper aims to provide a standard model of follow up in BIMARU states if not all over India. **Materials and Methods-** The present paper is the outcome of the evaluation of the programme of Muskan Ek Abhiyaan (Immunisation Programme) which was launched on October 11, 2007 with the objective of achieving hundred percent immunizations of infants and pregnant women in the state of Bihar (India). The study used two stage thirty cluster analysis. Overall 1936 support workers were interviewed on various aspects for the availability of material and training. **Conclusion-** Scenario of Immunisation has changed drastically over four years in Bihar and it is interesting to conclude that factors behind such thumping success are due to the change in the health system, its governance and marked strategic shift the previous programme intervention in otherwise one of the worst performing states of India.

**Index Terms-** Health programme, human resource, health governance, Programmatic interventions

## I. INTRODUCTION

The success of programmatic interventions has been thought of major importance by giving proper thrust to the human resource at the very grass root level [i]. The health system research stresses on the integrative approach which can be multidisciplinary field, focuses on health services [ii] therefore WHO provided basic framework of six building box [iii] of health system which stresses upon the health professionals and their dependency on the support staff for success. Health care system research has taken an unprecedented interest in the recent past. Due to axis shift in implementation strategy of 'smile campaign' (*Muskan ek ABhiyaan*) has become one of major success stories to be emulated. For much needed community mobilisation health planners developed 'micro plan' and 'architectural corrections' [iv]. The overall success of National Rural Health Mission

(NRHM)<sup>v</sup> had enormously taken support and gave its due to the human resource during the implementation phase which reflected even in the success of Muskan Abhiyan.

The present paper in the very first section introduces some current health status indicators in comparison of the past performance of the same indicators in Bihar a state in India. Second section gives information on the survey and the area it covered. Third and the final section hinges on the findings to develop key areas which if given more stress can turn the Smile campaign into a glorious laughter and others programmes also can model the strategies to achieve tremendous acceptability in the public health campaign.

## II. HEALTH INDICATOR PERFORMANCE: BIHAR

Bihar, the third most populous State in India, with a population density of 880 persons per sq. km., has recorded the highest decadal growth during the nineties and around 40% of its population is below poverty line. The major health and demographic indicators of the State like infant mortality rate, maternal mortality ratio, total fertility rate, etc. are much higher than the all India level and reflect a poor health status in the State. Amongst the major States, the Human Development Index in Bihar has been the lowest for the last three decades. Children who are underweight – 3 SDs from the median of the International Reference population are 55% of the total children and severely malnourished children were more than twenty percent according to DLHS-RCH 2002-2004 [vi].

Nevertheless, not everything is all that bleak in Bihar [vii] for past five years the statistics have started showing an uptrend, visibly in some of the significant area of health concerns such as infant mortality rate, maternal mortality immunisation coverage, institutional deliveries especially in government hospitals and skilled attendance at birth mainly due to infrastructure improvement, strategy and have been happening bad believing the data available on health records (Table 1)

Table 1. Health Indicators' trend in Bihar			
Indicator Bihar Trend India	Bihar	Trend	India
Under 5 Mortality Rate (U5MR)	72	Improved from 105 in 1998	69
Infant Mortality Rate (IMR)	52	Improved from 61 in 2006	50
3+ ANC visits by mothers	34%	Improved from 17% in 2006	69
Skilled attendance at Birth	53.2%	Improved from 34% in 2007	76.2
Maternal Mortality Ratio (MMR)	312	Improved from 371 in 2002	254
Total Fertility Rate (TFR)	3.9	Worsened by 0.3 since 2002	2.7
Contraceptive Prevalence Rate	28.4%	Improved from 27% in 2005	56
Full Immunisation coverage	66.6%	Improved from 41% in 2007	61
Underweight % children (0-3 yrs)	55%	Worsened by 3% since 2002	40
Mean age at Marriage	17.6	Improved from 17 in 2002	19.7
Institutional Deliveries pvt	12.9%	Improved from 11% in 2008	26
Institutional Deliveries govt	48%	Improved from 24% in 2007	47
Anaemic women in reproductive age group(15-49 yrs)	68.2%	Worsened from 60% in 1998	56.2
Source: NFHS 3 (2005-06), SRS 2006, 2007 and 2009, CES 2009 and FRDS 2010			

Bihar has achieved some of the most enviable marks in the state health programme by implementing the Muskan Abhiyan. The anomaly which needs further attention in the backdrop of the success of Muskan project can be that while declines in infant mortality have been noteworthy, especially in the context of the extremely poor strata of society in the country, still the Infant Mortality Rate in Bihar reported in 2004 remains high at 61 deaths per 1000 live births, with the rural IMR at 63 [viii]. The most recently released indicators of child nutritional status reflect an even graver situation. The National Family Health Survey-III (2005-06) reports that 58 percent of children in Bihar (compared to an all-India average of 46 percent) are underweight and 42.3 percent of children under 3 are stunted, reflecting widespread and chronic under-nutrition during the critical first years of life. The incidence of anaemia among this age group is also very high at 87.6 percent. Not surprisingly, infection rates are high and health and nutrition practices poor. Breastfeeding practices, an essential aspect of childcare and nutrition, are particularly poor in the state, with an extremely low 4 percent of newborns breastfed within the first hour of birth and only 28 percent of infants in the 0-5 month age group exclusively breastfed, in contrast to an average of 46 percent across India. 2 out of every 3 children being raised in Bihar do not receive the recommended schedule of immunizations. Given the close linkages between women and children's health, predictably women's health is poor with 68.3 percent of ever married women anaemic and 43 percent in the 15-49 year age group with chronic energy deficiency [ix].

NRHM as one of the turning point in the history of health care programmes begun with set objectives which were interlinked such as maternal mortality rate, antenatal care, institutional delivery, nutrition in children, immunisation rate. Muskaan campaign (Smile campaign) thus not actually brought smile to several mother and child but certainly a lot of cheers to the people working incessantly in one of the most smoothly coordinated campaigns in India. The Muskaan campaign was launched in 2007 in the aftermath of the revelations of the coverage evaluation survey [x] which indicated that the fully immunised children were only 19% in 2005.

### III. METHODOLOGY

The 30 cluster survey is a two-stage cluster sample. Before the sampling begins, the population needs to be divided into a complete set of non-overlapping subpopulations, usually defined by geographic or political boundaries. These subpopulations are called *clusters*. In the first stage, 30 of these clusters are sampled with probability proportionate to the size (PPS) of the population in the cluster. Sampling with probability proportionate to size allows the larger clusters to have a greater chance of being selected.

Of these selected clusters the Peripheral health workers which included ASHA (Accredited Social Health Activist), ANM (Auxiliary Nurse Midwife) and AWW (Anganwadi Worker) were drawn randomly. The total sample constituted of 690 Anganwadi workers, 397 ANM and 896 ASHA were interviewed.

### IV. RESULTS AND DISCUSSION

The interview schedule covered background, education, content knowledge of the campaign, training for programme implementation, compensation and record maintenance.

- Content knowledge though was high yet ANM have the highest percentage of the knowledge of the programme followed by Anganwadi and ASHA.
- Though the workers reported to know the reason of the training yet ANMs got highest percentage of training and ASHA, AWW claimed to have less training (82%) than ANMs.
- Significant percentage (almost 20%) of ASHA and ANM said to have not received compensation.
- Vaccination schedule was known to all peripheral health workers.

	Amount Approved	Actual Expenditure	Amount Approved	Actual Expenditure
ASHA Support System at State Level	407.04	NA	619.21	NA
ASHA Support System at District Level	21.60	NA	406.20	19.89
ASHA Support System at Block Level	799.50	NA	536.15	57.66
ASHA Training	2583.95	905.74	2000.0	27.67
ASHA Drug Kit & Replenishment	225.56	110.68	851.47	42.60
Motivation of ASHA- Saree & Umbrella	631.73	NA	380.98	129.00
Capacity Building/Academic Support	10.00	NA	10.00	5017
ASHA Diwas	812.30	339.64	900.00	292.36
<b>Source: NRHM. Bihar 2012.p 31</b>				

**Table 2. Some Strategic shift taken from 2007 to 2009 under Smile Campaign**

<b>Muskaan Oct 07 to Aug 09</b>	<b>Muskaan Sept 09 onwards</b>
Immunization sessions to be based in health facilities and Aganwadi centre	Immunization sessions extended to villages and hamlets without any health facility or aganwadi centers
All beneficiaries to be registered and tracked in Muskaan tracking registers	Registration of all beneficiaries and their tracking to continue
Due-lists to be prepared by all mobilizers (ASHA and ICDS workers)	Due list preparations to continue.
Incentives to vaccinators and mobilizers based on percentage of doses administered per ICDS center against target doses in due lists.	Incentives to vaccinators and mobilizers based on number of beneficiaries vaccinated in each session.
Mahila Mandal payments through ANM	Mahila mandal meetings through Village Health and sanitation committees
Verification of achievement by ANM, Medical Officers and ICDS officers	No verification only process of certification by ANM and beneficiaries
<b>Source: NRHM. Bihar.2012</b>	

- All health workers have Muskaan register yet almost 21% of ASHA said that they did not update the register as they were not aware of this responsibility.
- Almost 15% of the ASHA and ANM have reported to have not received duty list register.

#### V. HEALTH SYSTEM INNOVATIONS: SMILE CAMPAIGN

Routine Immunisation sessions were generally held at sub-centers on every Wednesday and in one anganwadi center on every Saturday. The micro plan was changed and Auxiliary Nurse Midwife (ANM) also conducted sessions on every Friday in 2 to 3 AWCs in the first phase (2007). In the second phase (2009) immunisation sessions were also extended to villages and hamlets where health facilities AWCs did not exist (Table 2).

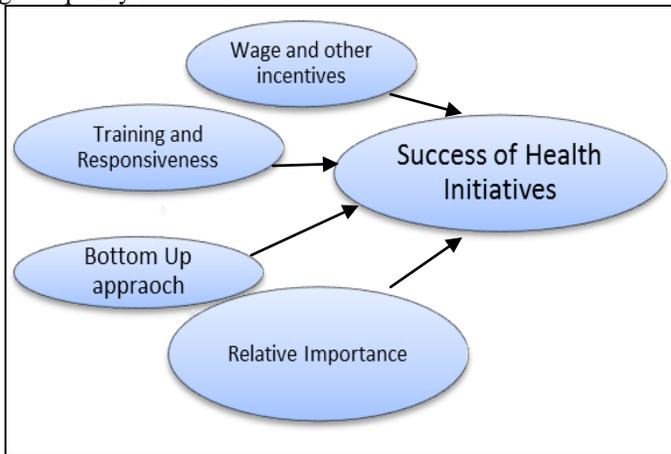
The revised micro plan not only ensures that all AWCs are covered at least once every month but actively participated in mobilisation campaign when not busy in the sessions [xii] (Table 2). There is lack of satisfaction at the level of training and compensation provided especially to ASHA and AWW. Table 3 indicates that there is huge underutilisation of funds. If the funds available can be exploited fully will not only monetarily help these grass root link workers but they will work more enthusiastically and with higher vigour (Table 3).

#### VI. CONCLUSION AND RECOMMENDATIONS

Deliberating on the human resource which can be clinical and non-clinical becomes key success points in the success of interventions Kabene et al [xii]. Explored the problems and prospects of the health human resource in the implementation of health services in developed countries and developing countries where developing countries fail in good outcome of health programmes due to lack of permanent trained staff. Fig. 1 tries to put in summative way how the wages, training along with correct flow of responsibilities from down till the top and sense of responsibility will lend remarkably acceptable and the most replicable model of performance in future.

There were certain limitations as consistent data is not available on the peripheral workers in the past immunisation coverage reports. The sudden spurt of shift from one programme to another generally leads to confusion in these health workers as they parallel work for other programmes also. The micro level plan though has given immense boost to the programme yet these peripheral workers were got least recognition. The paper recommends that these health workers must be acknowledged as 'Symbol of Success' by recognising them separately. Substance incentives such as umbrella, Saree can be added as household level incentives (especially children's education, employment

regularity related encouragement) and also by giving them all good quality footwear too.



**Fig.1 Defining success by devising concerns of Human Resource.**

A lot of lethargy and monotony occurs during the schedules of regular programmes which can be broken by interaction with middle level government functionaries from time to time (though they get multilevel interaction with NGOs, health centre level). There is no grievance redressal mechanism in the campaign and hence several times these health workers are at the mercy of the reporting authority. Giving opportunity to large number of available human resource [xiii] may further help in rise of immunisation level. There is certainly lack of predicted future of these health workers and high assumption of temporary existence leads to lack of sustained interest in the programme. The research paper thus acknowledges the growth plan of such experienced workforce should be properly discussed. Training modules should be completely imparted along with the disposal of wastes in appropriate way[xiv].

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- ii Lucy Gilson, Health Policy and System Research, A Methodology Reader, Who and Alliance for Health Policy and System Research Publication, Geneva. (2012), 22-23
- iii WHO, 2007
- iv National Rural Health Mission: Project Implementation Plan Bihar, , State Health Society Bihar, Department of Health and Family Welfare. 2011-12 available
- v National Rural Health Mission (NRHM) is an Indian health program for improving health care delivery across rural India.
- vi India, DLHS-RCH, 2004-04. (22. 24).
- vii National Rural Health Mission
- viii Sample Registration Survey 2004, Registrar General of India
- ix National Family health Survey 3, 2005-06
- x District Level Health Survey (DLHS) 3 revealed that child immunization status suddenly jumped from 23% (DLHS-2) to 41% (DLHS-3). The smile campaign was introduced in the 2007 and DLHS-3 was conducted in 2007-8.
- xi Goel, Dogra et al., Effectiveness of Muskaan Ek Abhiyan ( The Smile Campaign) for Strengthening Routine Immunisation in Bihar, India, Ind Paediatrics 2012; 49.(18)
- xii Stefane M Kabene, Carole Orchard et al., The Importance of Human Resources management in Health Care: A Global Context, Human Resources for Health, (2006)
- xiii NRHM, Bihar. Report grieves lack of human resource and unmet demand of healthcare. (189)
- xiv Universal Immunisation Programme Review; Orissa.All these outreach workers were not told how to dispose the waste generated in immunization process in the field.