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Implementation of Trie Structure for Storing and Searching of English Spelled Homophone Words

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Abstract- Searching is the fundamental computing task in computer applications. Storage and data structure has greater impact on retrieval of data. Numbers of implementation are available to efficiently store and manipulate data. The selection of such appropriate structure depends on the nature of the application and the way in which data are manipulated. Key plays a vital role for searching data. In most of the implementation search is performed based on entire key value. Trie structure is a data structure that performs storing and searching based on individual character or digit that composite a key. Trie structure is suitable for many applications where efficient searching is the prime requirement and one such an application is to storage of homophone. This paper implements a trie structure for storage and retrieval of English homophones. Homophone is the term used to describe words which have similar type of pronunciation having different spelling and meaning. Many computer applications require manipulation of homophones. In this research paper an effort has been made to implement trie structure to store and search homophones. The paper describes two implementation algorithms for constructing a trie structure and then searching from the constructed structure. Phonetic algorithms are used to determine phonetic identity of the words but once identified it is required to store them efficiently as well as search them efficiently. The paper is concluded with resultant sample data set.

Index Terms- Trie structure, m-ary Tree, Storage Structure, Data Structure, Searching, Phonetic Matching, Pronunciation, Homophone

I. INTRODUCTION

Two basic operations of major computer applications are storing data and searching them efficiently. Various data structures are used to make searching data more efficient and effective. If an attempt is being made for efficient storage and manipulation of data then searching specific data requires more efforts. Similarly, if searching of data is being made efficient then storage and manipulation if data requires more efforts. For example widely used searching technique is binary search which performs according order function of logarithm but when inserting an element it must be inserted at proper position to maintain the list ordered either ascending or descending. In contrast to binary search, linear search performs insertion of an element very easily without concerning of maintaining order but searching a linear list is an order of total number of elements. Thus trade off is required between inserting and searching

element. Further most of the searching is applied on entire key value comparison. This paper models and implements a trie structure which performs insertion as well as searching based on individual character rather than entire search key value. Homophones are the words having similar pronunciation but different spelling and different meaning. Many algorithms are available to identify homophones as per the application requirement. In this paper several homophone are stored and searched. Homophones have some similarity in their spellings structure, trie structure is used to store and search homophones because trie structure stores and search according to individual character positions. Homophones can be stored and manipulated in number of different ways including neural network, grouping them or using special indexing schemes. Trie structure is chosen due to its individual character manipulation to determine the specific position in a structure. A model is proposed to insert and search homophone and then it is implemented. The model is tested using set of several homophones.

II. TRIE STRUCTURE INTRODUCTION

In computer science field data structure determines the organization of data and how these data are manipulated. Trie structure is a special kind of data structure in which data are organized as per the individual characters of key element. In any other implementation of tree branching occurs based on entire key value where as in trie structure branching occurs according to a part of an entire key value. Trie structure is also referred to as an m-ary tree due to number of branches according to individual characters. Branching at each level depends on a particular character position. Here for the sake of simplicity key consists of only alphabetic characters.

An three dimensional character array is used to store the key values. Te specific position is calculated based on the first character. Row is identified by alphabetic positions starting from A to Z and column is identified by a branching level number. First character of key value determines the row number and initial column number 1 where it will be stored. Whenever second key with the same character encountered same position is calculated which is occupied by the previous key term. So now branching occurs. It is not possible to store two keys at a single position so next level is computed and which replaced the previous key value. Now to store the first key value, second character is selected to determine the row and column number is the level number here 2 for example where the first key will be allocated. To store second key again second character position is determined to select the row in column level 2. This process is

repeated for any number of keys with limited to the storage defines for the trie structure. Here the structure is flat and looks like a matrix form but the values stored along with the level number in matrix creates branching for the storage and hence the name m-ary tree. Implementation requires calculating of rows and columns to determine the key position. Once the trie structure is constructed it can be searched in better way with the similar kind of processing. Homophone words are stored and searched using trie structure according to designed model algorithm. This processing will not identify whether the given words re homophones or not but merely stores and searches identified homophones using any of the available algorithms.

III. PHONETIC ALGORITHMS

Many phonetic algorithms are developed to determine phonetic similarity. Few of them are listed below.

Soundex

The soundex algorithm was developed by Robert C. Russell and Margaret K. Odell in 1918[2]. The soundex algorithm determines phonetic similarity using four character coded string for the given words. The first character among them represents the first alphabet of the given English word and remaining three characters are digits according to the given word.

Daitch-mokotoff soundex

A modified algorithm of original soundex is D-M soundex developed in 1985 by Gary mokotoff and then improved for efficiency by Randy Daitch to compare surnames of Slavic and German languages using the six digit numeric code for the given word[1,5].

Kolner phonetic

This algorithm is similar to that of soundex algorithm but was designed for German words rather than English words[1].

Metaphone, Double metaphone and Metaphone 3

Metaphone algorithm was originally developed by Lawrence Phillips in 1990 which determine phonetic similarity using a string of three characters derived from the given word. Then enhanced metaphone algorithm was developed by him to support other languages and was known as the double metaphone. Again next variation of algorithm was designed in 2009 to achieve greater accuracy in identifying homophones.

NYSIIS

New York state Identification and Intelligence System in short NYSIIS phonetic algorithms, which was developed in 1970 with higher accuracy than soundex algorithm.

Match Rating Approach

The match rating Approach MRA is a phonetic identification algorithm concludes using the distance among characters of words and was developed by Western Airlines in 1977 for preparing indices and matching homophonous names[1].

Caverphone

The Caverphone phonetic algorithm was developed in 2002 by David Hood at the University of Otago in New Zealand and then was revised in 2004 which was created for the purpose of data matching between late 19th century and early 20th century electoral rolls to commonly recognize the names[1].

Any of the algorithms can be used or combining them to determine the phonetic similarity between given words. In this paper homophone words are directly taken which are common English words. These words are used to store as key in a trie structure. Trie structure prepares and organizes data using individual character positions. Homophone have more similarity in their spelling so trie structure is selected to store such homophone.

Construction of model to prepare Trie Structure For Homophones

A model is prepared to construct trie structure that will hold homophones. Number of data structures exist to store and search efficiently but due to phonetic similarity and hence having some spelling similarity trie structure is selected to store and retrieve homophones.

Trie structure instead of entire key value search it uses index based on the individual character position to store and retrieve element. Following model represents construction and insertion of homophone in a trie structure.

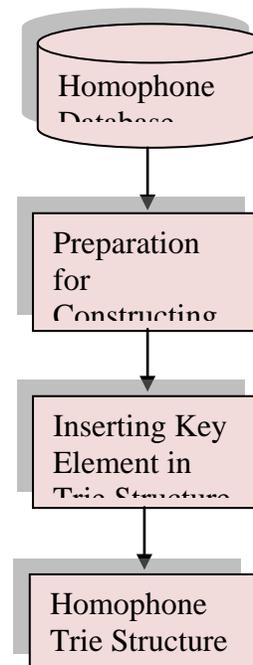


Figure 1 : Construction of Homophone Trie Structure

First it is required to have a set of homophones available which is ready to be inserted in a trie structure. To determine the homophones either of the available common phonetic algorithms can be useful. Then data structure is selected to construct and store these homophones. To determine the character position, alphabet character string is required to locate the position of homophone. Once the empty location is found it can be stored otherwise next level is created to store. After the trie structure is

created it can be searched using the similar manner. Detailed process is implemented in a following algorithm.

IV. IMPLEMENTATION OF HOMOPHONE TRIE STRUCTURE

Following algorithm implement the construction of a trie structure.

PROCEDURE TRIE_HOMOPHONE (KEY, ROW, COL, TRIE) : This procedure insert KEY in a trie structure TRIE represented using three dimensional character array. ROW and COL represents row and column without any initial value but after successful insertion ROW and COL contains the position where the KEY is inserted and on unsuccessful both of them contain value zero. The detailed algorithm is listed given below which contains some of the housekeeping variables.

```

PROCEDURE TRIE_HOMOPHONE (KEY, ROW, COL,
TRIE)
BEGIN
S = "ABCDEFGHIJKLMNOPQRSTUVWXYZ"
COL = 1
LEN = LENGTH(KEY)
REPEAT FOR K = 1 TO LEN
BEGIN
    ROW = INDEX(S, KEY[K])
    IF TRIE[ROW][COL] IS EMPTY THEN
        TRIE[ROW][COL] = KEY
        RETURN
    IF TRIE[ROW][COL] = KEY THEN
        PRINT "DUPLICATE KEY VALUE"
        ROW = COL = 0
        RETURN
    IF INDEX("0123456789", TRIE[R][C][1]) <> 0 THEN
        COL = TRIE[ROW][COL]
    ELSE
        LEVEL = LEVEL + 1
        TMP = TRIE[ROW][COL]
        TRIE[ROW][COL] = LEVEL
        COL = LEVEL
        ROW = INDEX(S, TMP[K+1])
        TRIE[ROW][COL] = TMP
    END REPEAT
RETURN
END PROCEDURE
    
```

FUNCTION INDEX (S, C) : This function searches the first occurrence of character C in string S consisting of alphabets A to Z and returns the index number if found otherwise zero. For simplicity all the KEY entries are considered as upper case entries.

```

FUNCTION INDEX (S, C)
BEGIN
LEN = LENGTH (S)
REPEAT FOR I = 1 TO LEN
BEGIN
    IF S[I] = C THEN
        RETURN I
    
```

```

END REPEAT
RETURN 0
END FUNCTION
    
```

First a variable S is initialized with string of ordered alphabets from A to Z. Initial value of COL is set to 1 means level no 1. Length is calculated and stored in LEN for the given KEY which is to be inserted in a structure. Process begins by using a looping structure from K = 1 to LEN. Initially TRIE is empty.

For example if KEY is "CHECK" then length LEN = 5. Now K = 1 at first iteration. INDEX is a function returns the index of the specified character if found otherwise zero. If character is 'A' then index is 1, if 'B' then index is '2' and so on if character is 'Z' then index is 26. Index is used to determine the ROW number of the KEY to be placed in a trie structure. So INDEX(S, 'C') will return 3 as index which is assigned to ROW. So now COL = 1 and ROW = 3. First it tests whether TRIE[ROW][COL] is empty so in this case it will return true and stores KEY = "CHECK" at position TRIE[3][1].

Now second homophone "CHEQUE" is inserted KEY = "CHEQUE". Same process is repeated. At first iteration again it will calculate ROW = 3 and COL = 1 because INDEX (S, 'C') will return 3. But now in this case TRIE[3][1] is not empty because it is occupied by previous KEY "CHECK". So condition will be failed and it will test second if statement to test whether occupied KEY entry is same as the given current KEY. If so it will print the message of duplicate key and return. Here both the entries are different as stored key is "CHECK" and current KEY to be inserted is "CHEQUE" so condition will become false. Now third if statement will test whether occupied entry contains any digit or not using the function call to INDEX ("0123456789", TRIE[ROW][COL][1]). If digit is found then move to that column using variable COL. But in this case it contains KEY value "CHECK" so now else part will be executed. Initially LEVEL is 0 so due to collision it is increased to next level so now LEVEL = 1. TMP will hold previous KEY "CHECK" stored at TRIE[ROW][COL] which will be updated with level number LEVEL = 1. Now COL = 1 and ROW is calculated as ROW = 8 using function INDEX(S, 'H') where position of character 'H' is 8. Now TRIE[8][1] is assigned a previous key "CHECK". This process is repeated for K = 2 so now ROW = 8 due to INDEX(S, 'H') for new KEY so again COL = 1 and ROW = 8 which is occupied by KEY "CHECK". So again LEVEL is increased to LEVEL = 2 and COL = 2 with ROW = 5 due to the third character 'E' has an index 5. So "CHECK" is moved to TRIE[5][2] and TRIE[8][1] = 2. In next iteration K = 3 due to third character matching tie occurs. So now ROW = 5 and COL = 3 so TRIE[ROW][COL] contains key value "CHECK". Same process is repeated and level is increased by 1 so now LEVEL = 3 so COL = 3 and ROW = 3 due to INDEX (S, 'C') the key "CHECK" is moved too TRIE[3][3] and TRIE[5][2] = 3. Now K = 4 in next iteration so now ROW = 17 due to INDEX(S, 'Q') and COL = 3 which is an empty entry so "CHEQUE" will be stored at location TRIE[17][3]. This process is repeated for all the entries of all the homophones.

Searching model of key element from homophone trie structure

Once the trie structure is constructed it can be searched for a given key homophone. Following model depicts the process of searching from trie structure.

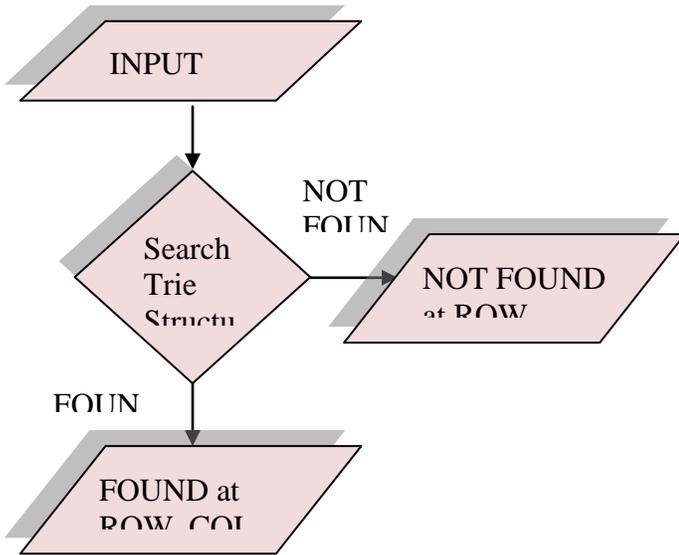


Figure 2: Searching key from Homophone Trie Structure

To search key element from a constructed trie structure it follows the similar process as of insertion procedure. It tries to search an element from level 1 that is COL = 1 and ROW = Index of first character and if an occupied entry is KEY element then search process is over with success and if number found search moves to next level and continues the process until an element is found or failed due to not found. The detailed searching process is listed in the following algorithm.

V. IMPLEMENTATION OF SEARCHING KEY HOMOPHONE FROM TRIE STRUCTURE

Following algorithm implements the searching key element from homophone trie structure.

PROCEDURE TRIE_SEARCH (KEY, ROW, COL, TRIE)

This procedure searches given KEY from trie structure TRIE and if KEY is found then sets ROW and COL accordingly otherwise it assigns 0 to both meaning element is not found. This procedure also uses the alphabet array from A to Z to determine the ROW and uses the described INDEX function.

```

PROCEDURE TRIE (KEY, ROW, COL, TRIE)
BEGIN
S = "ABCDEFGHJKLMNOPQRSTUVWXYZ"
LEN = LENGTH (KEY)
COL = 1
REPEAT FOR K = 1 TO LEN
BEGIN
ROW = INDEX (S, KEY[K])
WHILE TRIE[ROW][COL] IS NOT EMPTY
BEGIN
IF TRIE[ROW][COL] = KEY THEN
RETURN
IF INDEX ("0123456789",
  
```

```

TRIE[ROW][COL][1] ) = 0 THEN
ROW = COL = 0
PRINT "UNEXPECTED KEY"
RETURN
ELSE
COL = TRIE[ROW][COL]
END WHILE
END REPEAT
ROW = COL = 0
RETURN
END PROCEDURE
  
```

This procedure searches given KEY element starting with first column COL = 1 and first character's index ROW. Then it repeats until TRIE[ROW][COL] is not empty. First it tests whether it contains KEY and if it is then returns indicating KEY is found at ROW and COL. If it is not found at that position it will test whether entry at TRIE[ROW][COL] contains any digit means move to next level that is next column which is stored at TRIE[ROW][COL] and which is the ELSE part of the second IF. If it does not contain digit means it is occupied by some other entry and returns failure by printing message and setting ROW = COL = 0 as in IF statement. This process is repeated until conclusion is found.

For example consider the same example as given in insertion. If KEY = "CHECK" then searching starts from ROW = 3 and COL = 1 where level number 1 is stored. It is digit so COL = 1 and ROW = 8 due to second character 'H'. Now TRIE[8][1] contains next level number 2 so now COL = 2 and ROW = 5 as third character is 'E'. Now TRIE[5][2] will be tested which contains level 3 so COL = 3 and ROW = 3 as 4th character in KEY is 'C'. So now TRIE[3][3] is tested with KEY. Now match is found so search process is terminated with ROW = 3 and COL = 3. In each of the above steps while loop terminates when an empty entry is found and search begins from next character by selecting ROW as index number of next character. If all the characters are scanned and no element is found then at last it display the message KEY not found and terminates the search procedure by assigning zero to ROW and COL.

VI. SAMPLE DATA TEST, RESULT AND STORAGE

The entire process of insertion and searching homophone is tested with sample data set and accordingly found how the data is stored in a trie structure. Following figure represents how 20 homophones are organized in a trie structure using implantation of entire process described in algorithm. Following list of homophones are tested and where actually they are located is depicted in the following trie structure.

1. CHEQUE
2. CHECK
3. SINE
4. SIGN
5. PIECE
6. PEACE
7. FOUR
8. FOR
9. SHE

- 10. SEA
- 11. DONE
- 12. RIGHT
- 13. WRITE
- 14. CLOCK
- 15. CLOAK
- 16. LEAVE
- 17. LIVE
- 18. TWO
- 19. TO
- 20. GOOD

	1	2	3	4	5	6	7	8	9	10	11	12
1	A									CLOAK		
2	B											
3	C	1	CHECK							CLOCK		
4	D	DONE										
5	E		3	SEA	PEACE						LEAVE	
6	F	7										
7	G	GOOD			SIGN							
8	H	2		SHE								
9	I			5	PIECE						LIVE	
10	J											
11	K											
12	L	11	9									
13	M											
14	N				SINE							
15	O					8					10	TO
16	P	6										
17	Q		CHEQUE									
18	R	RIGHT					FOR					
19	S	4										
20	T	12										
21	U						FOUR					
22	V											
23	W	WRITE										TWO
24	X											
25	Y											
26	Z											

Figure 3 : Homophone Trie Structure Storage Representation

Above representation is a storage structure of sample 20 homophones. Each row number is index based on alphabet and column as level number. Level increases as collision found and branches the structure m number of times that's why it is also known as an m-ary tree which may have m branches in general.

Conclusion

Many applications require to store and retrieval of homophones and many data structure exists to fulfill the needs of application. The paper is represented to construct the trie structure to store and search homophones. The algorithm for

inserting and searching is implemented and tested for sample data and concluded with storage representation. Search becomes efficient due to character by character position finding approach instead of comparing entire key value and hence improvement of searching can be achieved. On drawback of this approach is the storage requirement. Also time and space complexity for any algorithm are in reverse proportional. So to achieve time efficiency it is required to sacrifice space efficiency. The process described here assumes key value only uppercase alphabetic but the algorithms can be improved to store and retrieve keys having digits as well any other special characters.

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Technical Efficiency Analysis of Groundnut Production in the Gezira Scheme, Sudan

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Abstract- The primary objective of this study is to measure and evaluate the production efficiency of groundnut crop in Gezira Scheme, to investigate the main tenant-specific factors behind tenants' technical inefficiency in the Gezira scheme. Both primary and secondary data were used for the study purposes. Stochastic frontier production function was estimated using a sample of 150 tenants were collected during season 2011/2012 in the Gezira Scheme. The results show that an average of technical efficiency of 65% for groundnut production is found, implying that scope to increase groundnut yield through the better use of the tenants available resources are exist. Age farmers, education years, sowing date, farm income, irrigation numbers and total labour is the major factors that are associated with changes in groundnut yield. The experience farmers and family size are the appeared to be the most important socio-economic factors determining farmers' efficiencies in groundnut production in Gezira scheme. The results also showed that 94% of groundnut output deviation from normal is due to differences in farmers' level of technical efficiencies as opposite to the conventional random variability. The study recommended improving technical efficiency for groundnut production in the Gezira Scheme.

Index Terms- Technical Efficiency, Production inefficiency, Groundnut, Stochastic Frontier, Gezira Scheme, Sudan.

I. INTRODUCTION

Groundnuts (*Arachis hypogaea*) family leguminaceae, are the edible seeds of a legume plant that grow to maturity in the ground. In Sudan, groundnut is one of the main sources of edible oil production for local consumption and exports [1]. The crop is primarily used for oil extraction in Sudan. It is consumed directly because of its high food value it plays an important role in diets of rural populations, particularly children, because of its high contents of protein, fat, and carbohydrate. Groundnut haulms are nutritious for feeding livestock [2]. Sudan is one of the major groundnut producing countries. The total area under groundnut production is approximately one million hectares with an average yield of 855 kg/ hectares. The crop is grown under irrigation mainly in Gezira scheme, New Halfa scheme, some Northern region and Kassala. Under rain fed the crop grown in western Sudan in Kordofan and Darfor regions [3]. Sudan groundnuts contribution to the total exports of the country is also fluctuating and declining as well, that was attributed to the decrease in the area planted in irrigated sector and to changes in climate in the traditional sector, in addition to the decrease in the international prices which forced the exporters to sell locally [4]. The Gezira scheme is the area that extends from latitude 13° N to latitude 15°

N between the Blue and White Niles. The scheme stretches over 115 kilometers south of Khartoum and north of the railway line between Sinnar and Kosti. It covers a net cultivable area of little less than one million hectares (about 2.1 million feddans). Gezira scheme consists of two main parts: Gezira main with an area of 1.1 million feddan and Managil extension of 1.0 million feddan [5]. The main crops grown in Gezira Scheme are cotton, sorghum, wheat, groundnuts, vegetables, fruits, and Fodder, it produces 58% and 23% of the country main export crops, cotton and groundnut, respectively and as such it is a leading source of foreign exchange earnings and raw materials for local industries, and produces 46% and 12% of the country's wheat and sorghum respectively, as well as considerable amount of vegetables [6]. After the Gezira Scheme Act of 2005, farmers are free to manage their productive and economic development and they have the right to participate in planning, management and management of irrigation channels at the level of the field by Water-User Associations (WUAs). This Act of 2005, to influence for rotation in scheme and deterioration area under groundnuts cultivated and lead to low yield in recent years. The Gezira Scheme production of groundnuts sharply dropped from 266 thousand metric tons in 2008/09 season to 68 thousand metric tons in 2009/10 season. Thus due to decreasing in area cultivated and yield from 231 thousand feddan, 1200 kg/feddan in 2008/09 season to 150 thousand feddan, 650 kg/feddan in 2009/10 season, respectively [7]. May be problems behind groundnut productivity deterioration in Gezira Scheme these include such as tenants' technical inefficiency, scheme management inefficiency and scheme management's decisions of area allocation between the different crops. Production can be increased by increasing the technical efficiency of crop using existing technology. If farmers are found to be technical efficiency, production can be increased to a large extent using the existing level of input and available technology. The main aim of this paper was to measure and evaluate the technical efficiency of groundnut producing and to investigate the main tenant-specific factors behind tenants' technical inefficiency in the Gezira scheme.

II. METHODOLOGY

2.1 DATA COLLECTION

Both primary and secondary data were used for the study purposes. Primary data were collected by using structural questionnaire using stratified random sampling techniques through direct personal interviewing, where a sample of 150 tenants from (north, central, and hush) groups was collected during season 2011/2012. Secondary data collected from different relevant sources which include Planning and Socio-

economic Research Administration (PSERA) of the Gezira schemes, Central Bank of Sudan, in addition to different documents, books, internet and journals.

2.2.1 STOCHASTIC FRONTIER PRODUCTION FUNCTIONS:

Technical efficiency is just one component of overall economic efficiency. Technical efficiency is defined as the ability to produce a given level of output with a least amount quantity of inputs under certain technology. Technical efficiency which reflects the ability of a firm to obtain the maximal output from a given set inputs [8]. Early studies focused primarily on technical efficiency using a deterministic production function with parameters computed using mathematical programming techniques. However, with insufficient characteristics of the assumed error term, this approach has an inherent limitation on the statistical inference on the parameters and resulting efficiency estimates. Aigner, Lovell, Meeusen and Battese independently developed the stochastic frontier production function to overcome this deficiency [9], [10].

2.2.2 MODEL SPECIFICATION:

The stochastic frontier production function model for estimating farm level technical efficiency is specified as:

$$\ln Y_i = f(X_i; \beta) + \varepsilon_i \quad (1)$$

Where

$i = 1, 2, \dots, n$

$\ln Y_i$ is the logarithm of output, X_i denotes the actual input vector, β is vector of production function and ε is the error term that is composed of two elements, that is:

$$\varepsilon_i = V_i - U_i \quad (2)$$

Where v_i is the symmetric disturbances assumed to be identically, independently and normally distributed as $N(0, \sigma^2 v)$ given the stochastic structure of the frontier. The second component u_i is a one-sided error term that is independent of v_i and is normally distributed as $(0, \sigma^2 u)$, allowing the actual production to fall below the frontier but without attributing all short falls in output from the frontier as inefficiency

2.2.3 MODEL BUILDING

The model included the tenant's factors influencing the farmer technical efficiency. Stochastic Production Frontier Model of the Cobb-Douglas form was used to find out the tenants' technical efficiency for groundnut production in Gezira scheme.

$$\ln y_i = \beta_0 + \sum_{j=1}^9 \beta_j \ln X_{ij} + V_i - U_i \quad (3)$$

Where:

\ln = the natural logarithm, y_i = yield of groundnut (sack / faddan); X_1 = Tenancy location (1 when location at the head of the canal, 2 when location at the middle and 3 when location at the tail); X_2 = Age (years of interviewed tenant); X_3 = Education (schooling years of interviewed tenant); X_4 = Sowing date (dummy variable which receives one when at the optimum time and zero, otherwise); X_5 = Farm income (SDG); X_6 = off- farm

income (SDG); X_7 = Number of irrigations; X_8 = Number of weeding; X_9 = Total labour (number of labor in mandays); B_0 and β_j are unknown parameters to be estimated for the variables, respectively. v_i represent the statistical error and the other factors which are beyond the tenants control such as weather, topography and other factors which are not included and may be either positive, negative or zero. u_i is non negative random variable, The u_i in the stochastic production frontier model is a non-negative random variable, associated with the tenants' technical inefficiency in production and assumed to be independently distributed, such that the technical inefficiency effect for the i th tenant, u_i , will be obtained by truncating at zero of the normal distribution with mean, μ_i , and variance, δ^2 , such that

$$U_i = \delta_0 + \sum_{s=1}^4 \delta_s Z_{si} \quad (4)$$

Where:

Z_{1i} = Education level (0 when illiterate, 1 when khalwa, 2 when primary, 3 when intermediate, 4 when secondary, 5 when university);

Z_{2i} = Tenants experience (number of years spent as a tenant);

Z_{3i} = Family size (1 when (1-5), 2 when (6-10), 3 when (> 10);

Z_{4i} = Marital status (dummy variable which has the value one married and zero, otherwise);

δ_0 and δ_s coefficients are unknown parameters to be estimated; together with the variance parameters which are expressed in terms of

$$\sigma^2 = \sigma_u^2 + \sigma_v^2 \quad \text{and} \quad \gamma = \sigma_u^2 / \sigma^2$$

Where the γ parameters has value between zero and one. The parameters of the stochastic frontier production function model are estimated by the method of maximum likelihood, using the computer program, FRONTIER Version 4.1.

III. RESULT AND DISCUSSION

3.1 Stochastic Frontier Production Function Results

The maximum likelihood estimate of the parameters of the stochastic frontier production function with inefficiency model is presented in table (1). The mean technical efficiency of groundnut production is 0.65 in the groundnut model, with a minimum of 40% and maximum of 97%. This means that on average, the tenants in the scheme produced 65% of groundnut output that achievable by best practice, given their current level of production input and technology used. This implies that the respondents can increase their groundnut output by 35% from a given mix of production inputs if the tenants are technically efficient. Tenancy location has a positive and not significant. Age years has positive sign and significant at 5% level of significant for groundnut, positively significant parameter of age means that technical efficiency increases with the increase of age of farmers due to accumulate experience and knowledge. The coefficient of education years has a positive sign and significantly different from zero at 10 percent level of significance for groundnut, positively significant parameter of education means that technical efficiency increases with the increase in education of farm operators. The reasons is that the

level of education of tenants are indicators of the farmers awareness and their abilities of taking decisions on how and what to produce, approaching credit, allocating their available resources and adopting new agricultural technologies as argued by [11]. Sowing date is an important factor affected crops yield. The coefficient of the sowing date has a negative sign and highly significant at 1 percent level of significance for groundnut, the negative sign reflects the bad effects of late sowing on production level of groundnut; this result was in conformity with the findings of [12]. The coefficient of farm income had positive sign and significant at 5 % level of significant. The may be reason is that a high percent of income directed toward groundnut crop production in the Gezira scheme. This result was in conformity with the findings of [6] and [13]. Off- farm income most of the tenants in the scheme have an off-farm income from other sources. The estimated coefficient of the part of the off-farm income that is used in agriculture had positive sign and

insignificant for groundnut. A possible explanation of this result is that a part of off- farm income is used for other crops in the scheme like (chickpea, onion sorghum and wheat); education fees for students and live expenditures rather than groundnut production. The coefficient of irrigation number had a positive sign and significant at 10% level of significance for groundnut. A positively significant parameter of irrigation means that technical efficiency increases with the increase in irrigation number. That means irrigation is one of the main determinants of groundnut crop production in the Gezira scheme. Coefficient of the weeding number has positive sign and not significant. Labour (in man-days): The coefficient of labour is positive sign and significant at 1% level of significance for groundnut. Labour is required to carry out crop activities timely, particularly weeding and harvesting. That means labour is one of the main determinants of groundnut crop production in the Gezira scheme.

Table (1): Maximum Likelihood Estimate for the Parameters of the Stochastic Frontier Production Function and Technical Inefficiency Effect Model for groundnut.

Parameters	Variable	Coefficient	Standard -error	T- ratio
β_0	Constant	-1.038	1.007	-1.030
β_1	Tenancy location (x_1)	0.008	0.360	0.022
β_2	Age (x_2)	0.517	0.219	2.351**
β_3	Education years (x_3)	0.277	0.155	1.789*
β_4	Sowing date (x_4)	-12.393	1.578	-7.851***
β_5	Farm income (x_5)	.922	.045	2.021**
β_6	Off- farm income (x_6)	0.005	0.018	0.323
β_7	Irrigation (x_7)	0.507	0.289	1.749*
β_8	Weeding (x_8)	0.206	0.333	0.618
β_9	Total labour (x_9)	0.683	0.232	2.938***
Inefficiency model				
δ_0	Constant	0.414	0.185	2.519**
δ_1	Education level (z_1)	0.064	0.100	0.645
δ_2	Experience (z_2)	- 0.012	0.009	-1.797**
δ_3	Family size (z_3)	-0.051	0.025	-1.646*
δ_4	Marital status (z_4)	-2.909	3.567	-0.815
Sigma-squared	$\sigma_s^2 = \sigma_v^2 + \sigma^2$	0.162	0.039	2.413**
gamma	$\gamma = \sigma^2 / \sigma_s^2$	0.94	0.05	19.913***
	Mean Efficiency		0.65	
	Maximum Efficiency		0.97	
	Minimum Efficiency		0.40	
	Log likelihood function		17.081	

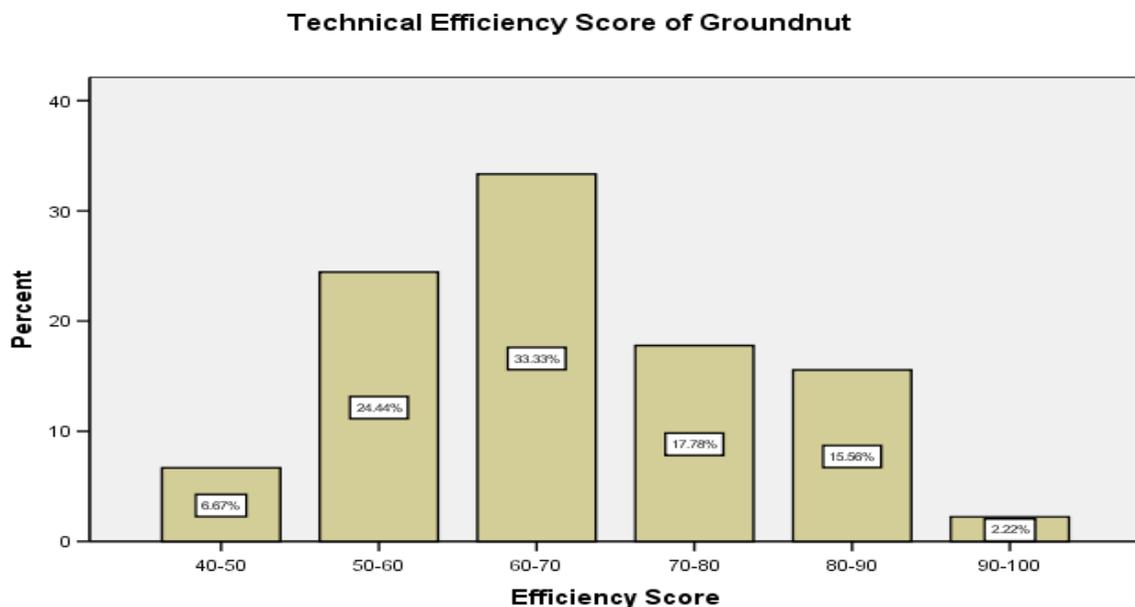
Source: author calculation

***, ** and * asterisks on the value of the parameters indicate it's significant at 1, 5, and 10 percent level of significance, respectively.

3.1.1 Frequency Distribution of Tenants Technical Efficiency

The tenants in Gezira scheme have wide range of technical efficiency ranging from 40% up to 97% for groundnut crop. The frequency distribution of the efficiency estimates obtained from the stochastic frontier for groundnut (Figure 1) shows that 82.2% of the tenants operate with efficiency ranged between (40-80) and 17.8 % of the farmers operate with efficiency ranged between (80-100). This implies that on average, the tenants producing groundnut in Gezira scheme achieved almost 65 % of the potential stochastic frontier groundnut production level given their current level of production inputs and technology used. 82.2% of groundnut production model for farmers in the Gezira scheme operated below 80% of the maximum groundnut production, obtained by the fully efficient and 17.8% operated above the 80% level of technical efficiency in the groundnut

model. The variance parameter, γ , with a value of 0.94 is significant component in explaining the variability of groundnut production level in the Gezira scheme. This relatively high value of the variance parameter implies that substantial proportion, 94%, of the groundnut production total variability is mainly associated with tenants' technical inefficiency of production. The estimate of the variance parameter γ , is significantly different from zero, indicating that the inefficiencies are significant in determining the level of variability of groundnut yield in the Gezira scheme [14]. Tenants low technical efficiencies are consistence with relatively high (γ) variance of tenants' effects which indicate that the stochastic frontier and the average production function are expected to be quite different. The variance of the random effects (v_i) was not a significant component of the groundnut yield variability.



Source: author calculation

Figure (1): Technical Efficiency Score of Groundnut crop in Gezira scheme, 2011/2012.

3.2 Inefficiency model:

The results of the factors affecting tenants' technical inefficiency were presented in table 1. Education level coefficient has not significant. The coefficients of experience had negative sign and significantly different from zero at 5% level of significance for groundnut. A negatively significant parameter of experiences of tenant means that the inefficiency effects decrease with increase in experience years. This result is in conformity with the findings of [11]. He found a negative association between the technical inefficiency and farmer experience. Family size coefficient had negative sign and significant at 10% for groundnut. Family size is negative sign indicate that farmers with large family size tend to have smaller inefficiency effects then farmers with small family size. Family size is assumed to influence technical efficiency positively. It is expected that as the family size increases the number of the members who participate in farming activities increase. Family size has a negative effect on the inefficiency of groundnut crop produced in the Gezira

scheme. The marital status has negative sign and insignificant for groundnut.

3.3 Hypotheses Test of Groundnut crop Production Model

Here were testing the coefficients of the farm-specific variables on the technical inefficiency effect models using the generalized likelihood- ratio statistic.LR. [15] suggested that the one-sided generalized likelihood-ratio test should be performed when ML estimation is involved because this test has the correct size (i.e. probability of a type 1 error). This is testing the null hypothesis that the inefficiency effects were not present. In other words, the null hypothesis is that there are no technical inefficiency effects in the model. That is, $H_0: \gamma = \delta_0 = \delta_1 = \dots = \delta_5 = 0$ [11].

Table (2): Groundnut crop model, test of hypothesis for the parameters of stochastic frontier production function.

MODEL	Groundnut	Decision
$H_0: \gamma = \mu = 0$	19.913***	H_0 : Rejected
LR H_0 : No technical inefficiency	2.293**	H_0 : Rejected

Source: Author calculation.

***, ** and * asterisks on the value of the parameters indicate it's significant at 1, 5, and 10 percent level of significance, respectively.

As revealed in table (2), test hypothesis of groundnut likelihood ratio test (LR), which tests the null hypothesis for the technical efficiency effect for groundnut crop production in the Gezira scheme are rejected.

The value of the test is calculated as:

$$LR = -2\{\ln[L(H_0) / L(H_1)]\} = -2\{\ln[L(H_0)] - \ln[L(H_1)]\}$$

Where $L(H_0)$ and $L(H_1)$ are the values of the likelihood function under the null hypothesis and alternative hypothesis, respectively [11] & [6]. Table 2 reveals that there are significant technical inefficiency effects in groundnut crop production, because the null hypotheses H_0 are fully efficient given the specification of (SPF) in Cobb-Douglas form. Then the ($H_0: \gamma = \mu = 0$): null hypothesis are rejected.

IV. CONCLUSIONS AND RECOMMENDATIONS

The aim of this paper are to measure and evaluate groundnut technical efficiency, identify technical inefficiency determinants and quantify the technical gain from enhancing the technical efficiency of groundnut farmers in Gezira scheme of Sudan. The study used the stochastic frontier analysis model to estimate technical efficiency and inefficiency determinants. The results revealed that the mean technical efficiency was found to be 65% for groundnut production. In other words, groundnut production could have increased by 35% at the same level of inputs had farmers been technically efficient. The results also showed that 94% of groundnut output deviation from normal is due to differences in farmers' level of technical efficiencies as opposite to the conventional random variability. Also, the study found that age farmers, education years, sowing date, farm income, irrigation numbers and total labour is the major factors that are associated with changes in groundnut yield. The experience farmers and family size are the appeared to be the most important socio-economic factors determining farmers' efficiencies in groundnut production in Gezira scheme. The study recommends improving technical efficiency for groundnut production in the Gezira scheme, through improved farmer specific efficiency factors, which include improved farmer education, Gezira Scheme management should improve the extension services and supervision, and supply of credit, agricultural inputs should be at the right time with easy access for tenants.

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Sufistic influences had all along been working upon Ghazali's mind right from early childhood

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Abstract- Imam al-Ghazali has been regarded as the mujaddid (the reviver or the Islamic reformer) of the 5th century AH of Islam, and has been credited with various titles, of which the most famous is as Hujjat al-Islam (Proof of Islam). This article investigates the development of al-Ghazali's thought and spiritual journey through different stages of his life, ie Spiritual Illumination, Al-Ghazzali Praises Sufism, Becomes a Sufi, Sufism The One True Way. Ghazali's Impact on Sufism .This article basesd how Al-Ghazali renounced his brilliant career and turned to Sufism and radically transformed to become a personal Sufi during the seclusion period, leading to his subsequently becoming an active public Sufi.and contributed in this field

Index Terms- al-Ghazali, spiritual journey Spiritual Illumination, Sufism The One True Way, during seclusion, *personal* Sufi, *public* Sufi. internal conflict, Impact on Sufism

I. INTRODUCTION

One of the greatest re newers of the faith in history was the 11th century scholar Abu Hamid al-Ghazali. Today, he is known as *Hujjat al-Islam*, the Proof of Islam, because of his efforts in intellectually fighting against some of the most dangerous ideas and philosophies that plagued the Muslim world during his time. From the ubiquitous nature of ancient Greek philosophy to the rising tide of political Shi'ism, Imam al-Ghazali did not leave a stone unturned in his effort to bring back serious Islamic scholarship in the face of heterodox threats.

Al Ghazali was born in 1058 AD in Tus, which lies within the Khorasan Province of Persia (Iran). He started to learn about Islam at the age of 7 by attending the local *madrassa* (school).He studied Arabic, Persian, the Qur'an and the principles of religion. He went on to intermediate and higher education at a *madrassa*. Here he studied *fiqh* (Islamic jurisprudence), *tafsir* (Quran'ic exegesis) and *hadith* (Prophetic tradition).Towards the age of fifteen, Al Ghazali moved to Jurjan to study *fiqh*.He then moved to Nishapur, where he studied *fiqh*, *kalam*(scholastic theology), logic and, possibly, some philosophy. Al Ghazali was 23 at the time. He also began to write and study Sufism.

At the age of 28 he moved on travelling to meet Nizam ul-Mulk, the Seljuq minister, and remained with him in his 'camp' for six years, during which time he lived the life of a 'court jurist'.He took part in political and learned disputes and wrote books until he was appointed as a professor to the Nizamiya *madrassa*at Baghdad, the most celebrated and important centre of science and teaching in the *Mashriq* (Islamic East) at that time. He worked there for 4 years. In 1095, at the age of 38, Al Ghazali suddenly underwent a six-month-long spiritual crisis;

internal conflict between rational intelligence and the spirit, between this world and the hereafter. His crisis had two dimensions. He questioned the efficacy of the tools of knowledge; and he questioned his own intentions. This crisis brought on a physical illness which prevented him from speaking or teaching, finally causing him to leave his post and renounce wealth, fame and influence.⁽¹⁾

II. SPIRITUAL ILLUMINATION

Among the Sufis, al-Ghazali came to know the certainty that philosophy had failed to provide. He became convinced that knowledge of God results only from spiritual illumination, from the soul journeying back towards its source. He wrote:

"I learnt with certainty that it is above all the mystics who walk on the road to God; their life is the best life, their method the soundest method"⁽²⁾

Returning to his hometown of Tus, he took charge of a *khanka* (Sufi hospice or even monastery, which included a study house). There he taught what became the content of his most

(1) Al-Ghazali *Al-Munqidh min al-Dalal wa al-Muwassil ila dhi al-'Izzah wa al-Jalal*. Edited with introduction by

Jamil Saliba and Kamil 'Ayyad. 7th ed. Bayrut: Dar al-Andalus,

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Translated, introduced and annotated by Michael E Marmura. 2nd ed. Provo, Utah: Brigham Young University Press.

important work, the *Ihya ulum al-din* (The Revivication of the Religious Sciences). This work again singled him out as the most important theologian of the day. However, after 11 years away from his formal post, he again felt the compulsion to teach, commenting that it was "God most high who determined this move." He began to ask colleagues whether he ought to return to teaching, as he now feared that it was love of retirement and of a life of ease that was holding him back from public duty. His friends urged him to return to his own alma mater, Nishapur, which had become lax. They pointed out the promise of a renewer (*mujaddid*) towards the start of each new century, and that he was well equipped to take up that reviving role. Ghazali therefore ended his seclusion for a short period, at the behest of Fakh al-Mulk, the vizier of the Seljuk ruler of Khorasan, to teach at the Nizamiyyah (1106). He also gave some lectures on the *Ihya* in Baghdad. It was not really, he wrote, a 'return' to what he had been doing before, since before he had "disseminated the knowledge by which worldly success is gained," while now he taught the knowledge "whereby worldly success is given up and its low portion in the Scale of real worth is recognized."⁽³⁾

III. GHAZZALI PRAISES SUFISM

What Imam has to say about the Sufistic path, in his candid and heartfelt *Confessions of Al-Ghazzali*:

"I saw that in order to understand Sufism thoroughly one must combine theory with practice. The aim which the Sufis set before them is as follows: To free the soul from the tyrannical yoke of the passions, to deliver it from its wrong inclinations and evil instincts, in order that in the purified heart there should only remain room for Allah and for the invocation of His holy name."⁽⁴⁾

But without a clear path of practice, Al-Ghazzali undertook an exhaustive study of the great books on Sufism:

"As it was easier to learn their doctrine than to practice it, I studied first of all those of their books which contain it: *The Nourishment of Hearts*, by Abu Talib of Mecca, the works of Harethel Muhasibi, and the fragments which still remain of Junaid, Shibli, Abu Yezid Bustami and other leaders (whose souls may Allah sanctify). I acquired a thorough knowledge of their researches, and I learned all that was possible to learn of their methods by study and oral teaching. It became clear to me that the last stage could not be reached by mere instruction, but only by transport, ecstasy, and the transformation of the moral being...I saw that Sufism consists in experiences rather than in definitions, and that what I was lacking belonged to the domain, not of instruction, but of ecstasy and intuition."⁽⁵⁾

Al-Ghazzali's heart and mind were cast into a sea of conflicting intentions and emotions:

"Coming seriously to consider my state, I found myself bound down on all sides by these trammels. Examining my actions, the most fair-seeming of which were my lecturing and professorial occupations, I found to my surprise that I was engrossed in several studies of little value, and profitless as regards my salvation."⁽⁶⁾

Munir Ahmad Mughal. Lahore- Pakistan: Kazi Publications,

(5) Al-Ghazali. *Kimiya'-i-Sa'adat (Alchemy of Eternal*

(3) Al-Ghazali. (1967). *Al-Munqidh min al-Dalal wa al-Muwassil ila dhi al-'Izzah wa al-Jalal*. Edited with introduction by Jamil Saliba and Kamil 'Ayyad. 7th ed. Bayrut: Dar al-Andalus,

Bliss). Full English translation of the Persian original texts. Translated by Muhammad Asim Bilal. Revised by Munir Ahmad Mughal. Lahore- Pakistan: Kazi Publications,

(4) Al-Ghazali. *Kimiya'-i-Sa'adat (Alchemy of Eternal Bliss*

(6) Al-Ghazali. *Kimiya'-i-Sa'adat (Alchemy of Eternal Bliss*). Full English translation of the Persian original texts. Translated by Muhammad Asim Bilal. Revised by

IV. GAZALI S AS A SUFI

A distinction needs to be made between the Sufism of al-Ghazali and some of the various brands of Sufism today. Al-Ghazali's support of the sufis in his time should not be taken as a blanket endorsement of all of today's 'sufi' ideologies.

Much of al-Ghazali's journey to Sufism is described eloquently in what is often called his 'spiritual auto-biography' (the *munqidh*). He describes how he turned to the way of Sufism by examination and exhaustion of all other paths to certainty (*yaqin*).

'I knew with certainty that the sufis were masters of states, not purveyors of works, and that I had learned all I could by way of theory. There remained, then, only what was attainable, not by hearing and study, but by fruitional experience and actually engaging in the way. From the sciences which I had practiced and the methods which I had allowed in my inquiry into the two kinds of knowledge, revealed and rational, I had already acquired a surer and certain faith in God Most High, in the prophetic mediation of revelation, and in the Last Day. These three fundamentals of our Faith had become deeply rooted in my soul, not because of any specific, precisely formulated proofs, but because of reasons and circumstances and experiences too many to list in detail...'

'The sufi path consists in cleansing the heart from whatever is other than God... I concluded that the sufis are the seekers in God's Way, and their conduct is the best conduct, and their way is the best way, and their manners are the most sanctified. They have cleaned their hearts from other than God and they have made them as pathways for rivers to run, carrying the knowledge of God.'⁽⁷⁾

To al-Ghazali, Sufism meant purifying the soul and turning it towards God, and as practice, the sufi is busy in detachment from all else for the sole purpose of attachment to God alone. Al-Ghazali states this as:

'The aim of their knowledge [the sufis] is to lop off the obstacles present in the soul and to rid oneself of its reprehensible habits and vicious qualities in order to attain thereby a heart empty of all save God and adorned with the constant remembrance of God.'

His most succinct summary of Sufism being:

Munir Ahmad Mughal. Lahore- Pakistan: Kazi
Publications,

(7) Al-Ghazali. *Al-Munqidh min al-Dalal wa al-Muwassil*

ila dhi al-'Izzah wa al-Jalal. Edited with introduction by

Jamil Saliba and Kamil 'Ayyad. 7th ed. Bayrut: Dar al-
Andalus,

'...truthfulness with God Almighty and good conduct with people.'

Al-Ghazali attained early information and some understanding of Sufism through: his first teacher, the ongoing influence of his older brother and by reading many works of great Sufis. This form of knowledge he describes as being 'indirect', with verification only through trust and reason. He realized, however, that the essence of Sufism is essentially a matter not of knowledge, but of lived experience. Al-Ghazali then describes 'direct' knowledge as being 'tasted' or 'savoured', insisting upon the subjectivity of its experience and internal appreciation. Hence, he admits that he had no true knowledge of Sufism until he himself began to live by it, similar to how a simple description of love pales in comparison to its actual, lived experience.

He recounts that Sufism is a path through which one experiences an intimate relationship of love with his Creator. How this is possible can be understood through a human analogy. When one intends to grow in love and nearness to another, some level of commonality must be sought. He can approach them, and thus occupy similar locations in space and time; or he can reason with them, experiencing a convergence of the intellect; or he can express emotional sentiments, sharing in experience through empathy. Similarly, if one intends to draw near to God, who cannot be approached in any of these human capacities (as He is Transcendent and Formless), one must seek to purify the heart of all that is 'ungodly' and experience total absorption in God through the annihilation of the self (*fana*). In a practical sense this is first to rid oneself of the ego and of undesirable qualities, such as: greed, gluttony, ostentation and conceit. Then, it is to struggle to embody qualities praised by God, which parallel (at an incomparably lesser capacity) the Infinite, Flawless Qualities and Attributes of God, such as: mercy, compassion, love, justice, honesty, generosity and kindness. In this light, a gnostic once said:

'A sufi is not a sufi unless, were everything that is in him to be exposed on a plate in the marketplace, he would not be ashamed of anything that came to light.'⁽⁸⁾

V. SUFISM THE ONE TRUE WAY

He then sums up his life of a most exhaustive and devoted study of Allah and His Islam, with these words:

"During my successive periods of meditation there were revealed to me things impossible to recount. All that I shall say for the edification of the reader is this: I learnt from a sure source that the Sufis are the true pioneers on the path of God: that there

(8) Al-Ghazali. *The Book of Knowledge*. Translated by
Nabih Amin Faris. New Delhi: Islamic Book Service

is nothing more beautiful than their life, or more praiseworthy than their rule of conduct, or purer than their morality.)⁽⁹⁾

"The intelligence of thinkers, the wisdom of philosophers, the knowledge of the most learned doctors of the law would in vain combine their efforts in order to modify or improve their doctrine and morals; it would be impossible. With the Sufis, repose and movement, exterior or interior, are illumined with the light which proceeds from the central Radiance of Inspiration. And what other light could shine on the face of the earth? In a word, what can one criticize in them?"

"From the time that they set out on this path, revelations commence for them. They come to see in the waking state angels and souls of prophets; they hear their voices and wise counsels. By means of this contemplation of heavenly forms and images they rise by degrees to heights which human language cannot reach, which one cannot even indicate without falling into great and inevitable errors."⁽¹⁰⁾

For those who condemn or deride the life and practices of the Sufis, Imam Al-Ghazzali offers this advice:

"But behind those who believe comes a crowd of ignorant people who deny the reality of Sufism, hear discourses on it with incredulous irony, and treat as charlatans those who profess it. To this ignorant crowd the verse applies: *"There are those among them who come to listen to thee, and when they leave thee, ask of those who have received knowledge, 'What has he just said?' There are they whose hearts Allah has sealed up with blindness and who only follow their passions"*.

It was during the period of seclusion and search that he wrote his remarkable work *Ihya-ul-Uloom* which resuscitated Islam which had become merely a set of rituals and ethical rules under the domination of the orthodox *Ulema*. His indomitable will and devoted work earned him the title of *Hujjat-ul-Islam* (the proof of Islam) and the charges leveled against him that he did not follow the scriptures and canonical laws, that he accepted the rules of philosophy and followed them and thus lowered the dignity of ritual and canonical laws of Islam were all leveled to dust.

VI. AL GHAZALI'S IMPACT ON SUFISM

Al Ghazali sought and succeeded in creating a synergy of scholarly knowledge and evidence to support Islamic teachings.

He however gained a greater in depth understanding of Islam and inspiration through Sufism.

Al Ghazali sought and succeeded in creating a synergy of scholarly knowledge and evidence to support Islamic teachings. He however gained a greater in depth understanding of Islam and inspiration through Sufism.

Sufism is a form of Islamic mysticism that seeks to rid oneself of the ego, will and self-centred actions and thought to seek God's pleasure. As a result of his support, Sufism gained momentum in mainstream Islam. Sufism for Al Ghazali bridged the gap between the current transient world and the world of the hereafter. Al Ghazali reconciled Shari'a and Sufi mysticism at a time when Sufism was being rejected as being un-Islamic. He defined Sufism as: "two things: truthfulness with God Almighty and good conduct with people. Anyone who practices these two things is a Sufi".

He stated, "The Sufi path consists in cleansing the heart from whatever is other than God... I concluded that the Sufis are the seekers in God's Way, and their conduct is the best conduct, and their way is the best way, and their manners are the most sanctified. They have cleansed their hearts from other than God and they have made them as pathways for rivers to run, carrying the knowledge of God".⁽¹¹⁾

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Studies on Medicinal Plants Used by Tribal Communities in District Singrauli of Madhya Pradesh

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Abstract- Singrauli district of Madhya Pradesh is inhabited by number of tribal communities residing in remote villages and forests. These tribal people depend on medicinal plant wealth for the treatment of various human diseases. For present study authors have visited different sites and recorded 24 plant species used by the tribes for various disease controls.

Index Terns- Medicinal plants, tribals, Sonkhan, Singrauli.

I. INTRODUCTION

India is one of the few countries of the world having a large primitive tribal population. In the recent years a remarkable interest and trend has been setup world wide for the ethno-botanical studies. Most of the studies are associated with the study of plants used by the aboriginal tribes in different parts of country. Tribes mostly live in the forests, hills, plateaus and naturally isolated regions. These tribes follow a distinct life style identified as tribal culture. Due to their long association with the forests, these people have acquired valuable information with regard to the medicinal and other use of plants. Tribal people have full faith and confidence in their way of treatment. The district Singrauli is inhabited by number of tribes namely baigas, gonds, dhaikars, kols, bhurtiyas, khairwars, agarias, and patharis etc. these tribal people use local plants in medicine. They prepare paste, powder, pills, aqueous extract, decoction and other herbal preparations for single plants or in combination with other plants for the treatment of various disease and ailments.

II. LOCATION OF STUDY AREA

Singrauli is located between latitude $24^{\circ} 00'$ - $24^{\circ} 15'$ N and longitude $82^{\circ} 15'$ - $82^{\circ} 45'$ E. It is spread over an area 5672 sq. km. The landscape dotted with hills, mountains, plateaus, waterfalls and rivers. The forest cover of district is 2430 sq. km. (41.50 %) of total reported area.

III. METHODOLOGY

The present study is based on the information gathered about medicinal plants from tribal peoples of villages Sonkhan and other near areas in Chitrangi tehsil. The information about medicinal uses of plants was obtained from local people, inhabitants, hakims and field workers. Immediately after collection the specimen were identified with the helps of floras (Duthie, 1994; Hooker 1872-1897 and chopra et al 1980). The collected and identified specimens have been deposited in the herbarium in Botany Department S.G.S. Govt. Autonomous P.G. College Sidhi (M.P.).

IV. RESULTS

Some of medicinal plants used by tribal people of village Sonkhan and other near areas for the treatment of various disease are mentioned below :

1. ***Aegle marmelos correa*** (rutaceae) Bel: The pulp of the ripe fruits are useful in the disorders of the stomach.
2. ***Calatropis procera*** R. Br; (Asclapediaceae) Aak: The latex of the stem is used in rheumatism and leprosy.
3. ***Ricinus communis*** Linn (Euphorbiaceae) Arandi: Oil obtained from seed is highly purgative
4. ***Azarieticha indica*** Linn. (Meliaceae) Neem: Leaves and stems are Insecticidal, carminative, expectorant, antihelmintic.
5. ***Alstonia scholaries***, R. Br; (Apocynaceae) Chatium Barks of plants used in malaria, dysentery and snake bite and their milky juice is applied to ulcers.
6. ***Asperagus racemosus*** Willd. (Liliaceae) Satawar: The tuberous roots are powdered and mixed in water and given to woman for strength and vigour
7. ***Aristolochia indica*** Linn (Poaceae) Isharmul: The powdered roots are given in honey for leucoderma and juive of leaces for snake bites.
8. ***Bryonopsis laciniosa*** Linn (Cucurbitaceae) Shivlingee: The plants are used in bilious attacks and also in fever with flatulence.
9. ***Cyperus rotundus*** Linn (Cyperaceae) Motha: The tuberous roots are used in disorders of stomach and disorders of bowels.
10. ***Fumaria indica*** Linn (Famariaceae) Pit papara : The powder of dried plants are very usefull to purify blood in skin diseases.
11. ***Gravia asiatica*** Linn (Tiliaceae) Phalsa : The leaf paste is used as application to postural eruptions and their fruits in stomach and cooling diseases.
12. ***Holarrhena antidysenterica*** Linn (Apocynaceae) Kurchi: The bar decoction is rubbed over the body in dropsy and their seed powder is used externally as well internally for fever and intestine warms.
13. ***Moringa oleifera*** Linn (Moringaceae) Munga: The paste of root bark is applied on boils for suppression as well as suppuration and root decoction is taken orally in scorpion bite.
14. ***Martynia annua*** Linn (Pedaliaceae) Bichu : The leaves of plants are given in epilepsy, applied to tuberous glands of neck and their juice are used as gargel for sore throat.
15. ***Nyctanthes arbortristis*** Linn (Oleaceae) Harsinghar : The leaves of plants are useful in fever and rheumatism.
16. ***Operculine turpethum*** Linn (Convolvulaceae) Nisoth : The powdered roots are given in scorpion sting and snake bite.
17. ***Rauwolfia serpentina*** Benth. (Apocynaceae) Sarpghandha: The powdered roots are given in reduction of blood pressure , remedy in painful affections of the bowels leaves juices are used for removal of opacities of cornea of eyes.
18. ***Scherebera swietenoides*** Roxb. (Oleaceae) Ghanta: The decoction of stem bark is used to cure mental depression.
19. ***Tinospora cordifolia*** Miers (Menispermaceae) Guruch: The aquous extraction of stem is given to cure nocturnal emissions and plant paste is also applied to bone fractures.
20. ***Teramnus Labialis*** Spreng (Fabaceae) Mashaparni: The fruits of plants are used in nerve diseases, paralysis.
21. ***Tamarindus indica*** Linn. (caesalpiniaaceae) Iml: The leave juice is applied on eyes to cure inflammation.
22. ***Gymenema sylvestre*** R. br; (Asclapediaceae) merasingi: The leaves of plants are used in diabetes, chewed to cure glycosurea.
23. ***Venda Tesellata*** Roxb. Hook (Orchidaceae) Bandh, Rasna: The warm leaf juice is used to cure boils inside the ear and put in ear for internal ear ache.
24. ***Woodfordia fruiticosa*** Linn (Lytheraceae) Dhawai: The stem paste is used for healing of cut and wounds

V. DISCUSSION

The present investigation included information on 24 plant species belonging to 20 angiospermic families. These are employed to treat different disease of human being. The common form of dosages are decoction, infusion, powder, extract, juice, paste, latex prepared by using various underground and aerial plant parts. Mostly single plant species is employed for these applications except in few cases more than one species had been employed for the treatment of ailments. It is a fact that backward people use ethno-medicines due to affordable cast or even free of cost. Also they are readily available in their vicinity. The traditions passed orally represent community supported autonomous healthcare management system. This runs parallel to modern system. The claimed therapeutic values of these species however, invite for modern laboratory studies to establish their efficacy and safety. These also need preservation because of obvious forces of deforestation acculturation.

ACKNOWLEDGEMENT

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Computational Fluid Dynamics Study of IC Engine - Energy Recovery System

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Abstract- It is confirmed that in internal combustion engines (ICEs), more than 30–40% of fuel energy wastes from the exhaust and just 12–25% of the fuel energy converts to useful work. On the other hand, statistics show that producing amounts of the internal combustion engines growth very fast and the concern of increasing the harmful greenhouse gases (GHG) will be appeared. So, researchers are motivated to search alternative solutions by using conservation ways, recover the heat from the waste sources in engines which not only reduces the demand of fossil fuels, but also reduce the GHG and help in energy saving. On the other hand, because exhaust gas heat recovery using heat exchanger may make a pressure drop and effects on the engine performance hence its design is very important and crucial. To select an appropriate heat exchanger design limitations for each heat exchanger type firstly should be considered. Though production cost is often the primary limitation, several other selection aspects such as temperature ranges, pressure limits, thermal performance, pressure drop, fluid flow capacity, cleanability, maintenance, materials, etc. are important. One of the most effective methods to increase heat transfer is using the fins which are widely used by the researchers across the heat recovery designers. Some of the special HEXs designs to recover the exhaust heat are introduced. This paper aims to model the heat transfer through exhaust gases to a cold fluid with modeling the fins with suitable viscous model to calculate the heat recovery amount. Two cases of previous experimental work are selected and numerical results are compared with experimental outcomes. Also, effect of fins size and engine load and speed on heat recovery is examined graphically.

Index Terms- CFD, Heat Exchangers, Heat Recovery, Numerical Simulation

I. INTRODUCTION

Recently, Ghazikhani et al. estimated in an experimental work that brake specific fuel consumption (BSFC) of the diesel engine could be improved approximately 10% in different load and speeds of an OM314 diesel engine by using the recovered exergy from a simple double pipe heat exchanger in exhaust. Pandiyarajan et al. designed a finned-tube heat exchanger and they used a thermal energy storage using cylindrical phase change material (PCM) capsules and found that nearly 10–15% of fuel power is stored as heat in the combined storage system in different loads. In another experimental work, Lee and Bae designed a little heat exchanger with fins in the exhaust by design of experiment (DOE) technique. They reported that fins should be in the exhaust gases passage for more heat transfer and designed 18 cases in different fins numbers and thicknesses and found the most effective cases. Zhang et al. modeled a finned tube evaporator heat exchanger for an ORC cycle. They concluded that waste-heat recovery efficiency is between 60% and 70% for most of the engine's operating region also they mentioned that heat transfer area for a finned tube evaporator should be selected carefully based on the engine's most typical operating region. Recently, Hossain and Bari used a new HEX for heat recovery in a diesel engine experimentally and numerically. They applied SST $k-\omega$ for their modeling and they optimized the working fluid pressure and the orientation of heat exchangers and found the additional power increased from 16% to 23.7%.

II. METHODOLOGY

Two different cases of heat exchanger which previously are used by researchers for exhaust waste heat recovery are selected which are shown in Fig. 1.

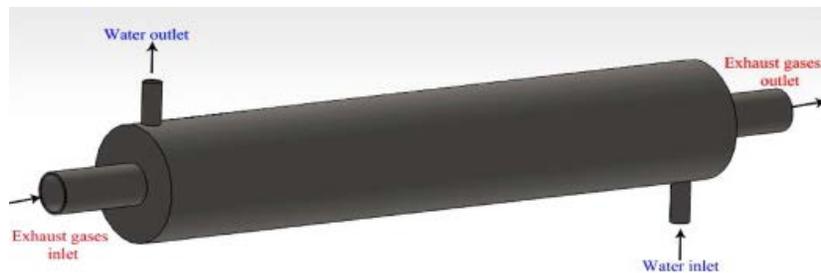


Fig. 1 Double pipe Heat exchanger

Case 1 is a simple double pipe heat exchanger with water coolant which is installed in the exhaust of an OM314 diesel engine by Ghazikhani et al. The length of this HEX is 70 cm with 12 cm inlet and 14 cm outlet diameters. In this case, water mass flow rates are in 10–100 g/s and exhaust gases are in 30–60 g/s ranges in different engine's operating condition. Also, temperature range for water is 10–25 and for exhaust gases is 100–220 degree of centigrade in different engine loads and speeds. Case 2 is an optimized finned heat exchanger with special design which a mixture of 50% water and 50% ethylene glycol circulate around the tube as coolant used by Lee and Bae to recover the heat from a gasoline engine.



Fig.2 Schematic of their geometries

Both these studies investigated the amount of waste heat recovery in different engine loads and speed. This study aims to model both these HEXs numerically using commercial CFD code, FLUENT software which a schematic of their geometries are shown in Fig. 2.

The mesh generation software Gambit, combined with the FLUENT software which depends on the finite volume methods as the described by Patankar, helped to define the boundary layers and zone types. The mesh was then exported to FLUENT. Full information about each case is described in the results and discussion section. Every simulation case takes approximately 9 h to get converged solutions.

The numerical simulation was performed with a three dimensional steady-state turbulent flow system. To solve the problem, governing equations for the flow and conjugate heat transfer were modified according to the conditions of the simulation setup. As the problem was assumed to be steady, the time dependent parameters were dropped from the equations.

In this paper, three viscous models are examined. Renormalization-group (RNG) $k-\epsilon$ model, Shear-stress transport (SST) $k-\omega$ model and Reynolds stress model (RSM). These three models were selected because previous studies which are reviewed by previous authors, introduced these models as efficient models. For RNG $k-\epsilon$ model thermal effect is considered in the enhanced wall treatment panel.

III. RESULTS AND DISCUSSION

As mentioned before, two cases shown in Fig. 2 are modeled numerically in different load and speeds, furthermore four different geometries are considered for case 2 to show the effect of fin number and sizes. As an approximation, the properties of air can be used for diesel exhaust gas calculations which the error associated with neglecting the combustion products is usually no more than about 2%. Due to high temperature in exhaust, temperature dependent properties are considered for exhaust gases which Fig. 3 shows those variations.

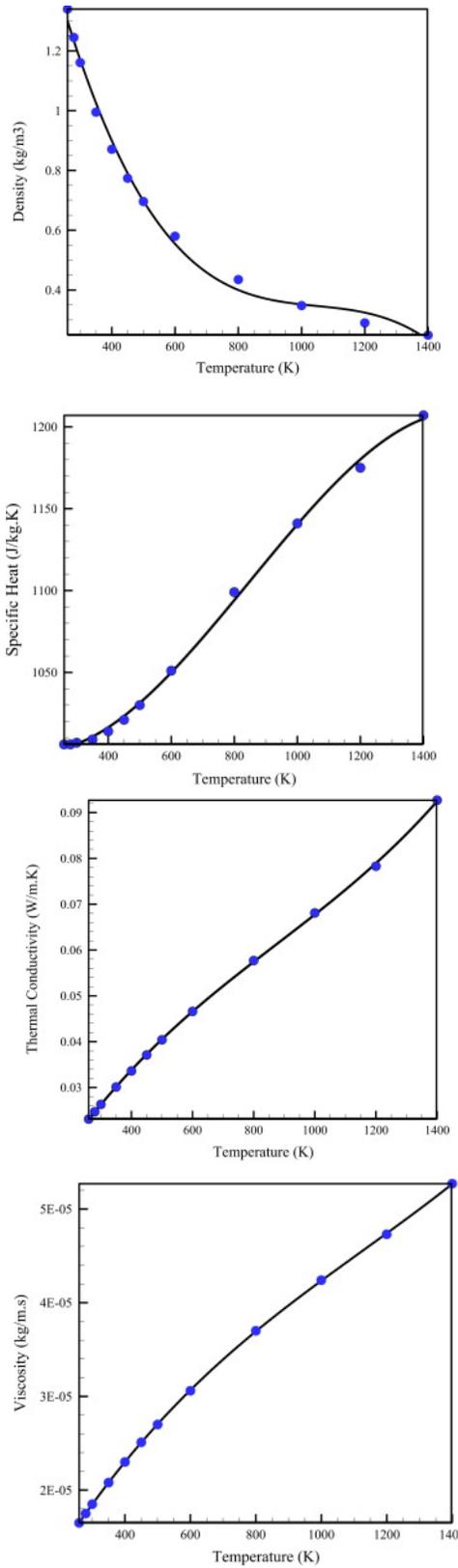


Fig.3 Temperature vs Temperature dependent properties graphs

For each property, a fourth order polynomial is plotted which its equation and coefficients are shown in Table 1.

Exhaust gas properties	A	B	C	D
$\rho(\text{kg/m}^3)$	2.50e+00	-5.95e-03	5.57e-06	-1.77e-09
$C_p(\text{J/kg K})$	1.02e+03	-1.51e-01	4.54e-04	-1.78e-07
$\mu(\text{kg/m s})$	1.32e-06	6.74e-08	-3.74e-11	1.11e-14
$k(\text{W/m K})$	-3.18e-03	1.18e-04	-7.70e-08	2.93e-11

Solid phases which contain tubes and fins are considered to be carbon steel which its thermal properties and cold fluid properties are shown in Table 2.

	$\rho(\text{kg/m}^3)$	$C_p(\text{J/kg K})$	$\mu(\text{kg/m s})$	$k(\text{W/m K})$
Water	998.2	4182	0.001003	0.6
Ethylene glycol	1111.4	2415	1.61e-02	0.252
Water-ethylene glycol (50-50)	1050.44	3499	0.8e-03 (in 80 °C)	0.4108
Carbon steel	7858	486	-	52

First, to model the case 1 with water coolant, three mesh numbers are constructed to show the mesh independency. Table 3 shows these mesh number values while volume 1 represent to gases pass, volume 2 is solid phase (walls or fins) and volume 3 is for coolant area.

Mesh number	Volume1/cooper	Volume2/cooper	Volume3/tetrahedral	Sum of meshes
Mesh number 1	6<comma>182	17<comma>700	22<comma>780	46<comma>662
Mesh number 2	8<comma>480	25<comma>200	31<comma>593	65<comma>273
Mesh number 3	16<comma>530	41<comma>400	51<comma>442	109<comma>32

As seen in Fig. 4 which is plotted for temperature of central line and velocity of exhaust outlet for $T/460 \text{ N.m}$ and 1600 rpm, solution is approximately independent to mesh numbers.

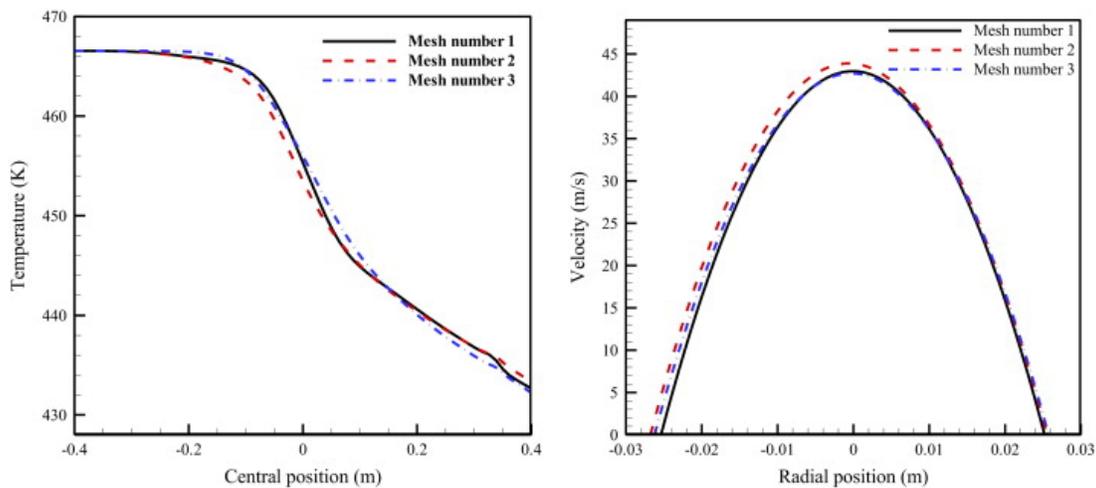


Fig.4 Graphs for different mesh numbers at different positions

To find the best viscous model among those of described in the previous section, problem is solved in the condition of different engine loads when engine speed is 1600 rpm. Outcomes for exhaust and water outlet temperatures are depicted in Fig. 5_ which confirms that RNG $k-\epsilon$ and SST $k-\omega$ has an acceptable accuracy compared to experimental outcomes.

Table 4. Comparison between experimental and SST k- ω model results								
T(N m)	T _{out} exhaust gases (K)				T _{out} water (K)			
Experimental	Minimum	Maximum	Average	Experimental	Maximum	Minimum	Average	Experimental
20	361.95	362.65	375.7	370.93	290.65	289.12	287.2	288.06
60	388.2	392.25	405.1	399.02	291.15	290.14	287.5	288.67
100	414.65	419.90	436.6	428.52	293.15	292.87	289.6	291.05

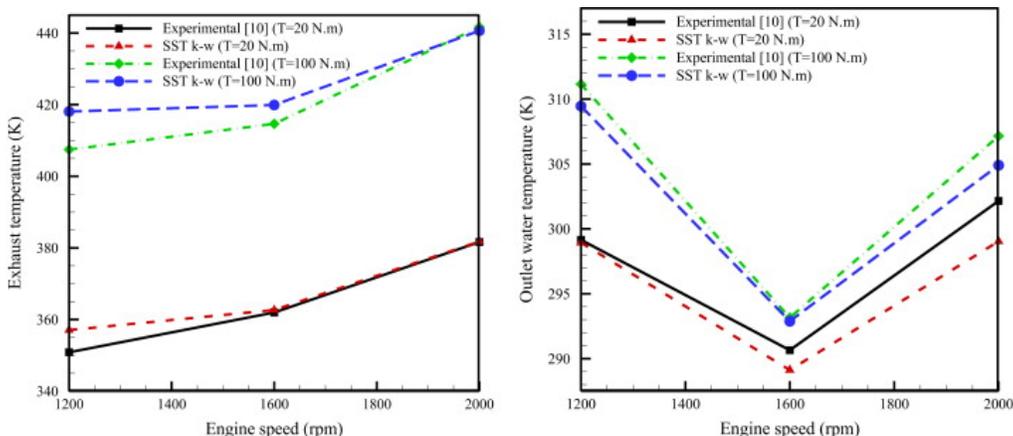


Fig.5 Graph for Engine speed vs Exhaust temp and water outlet temp

These figure confirm that RSM is not a suitable viscous model for these kind of the problems and although SST k- ω values is more close to experimental values, but its convergence is more difficult compared to RNG k- ϵ during the solution process. Contours of the Fig. 6 shows the temperatures in three engine loads in 1600 rpm. It is obvious that by increasing the engine torque, water outlet temperature increased due to higher exhaust temperature.

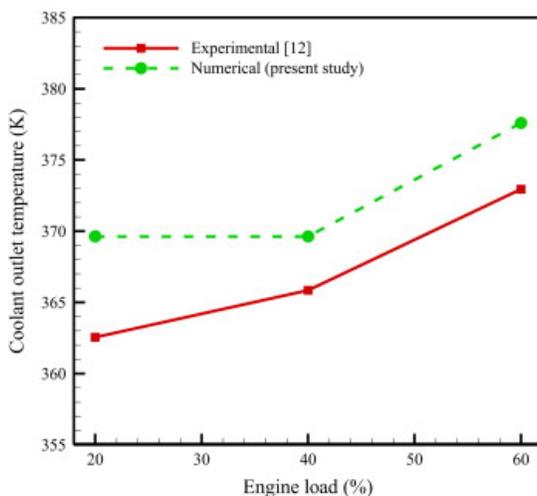


Fig.6 Temperature vs engine load graph

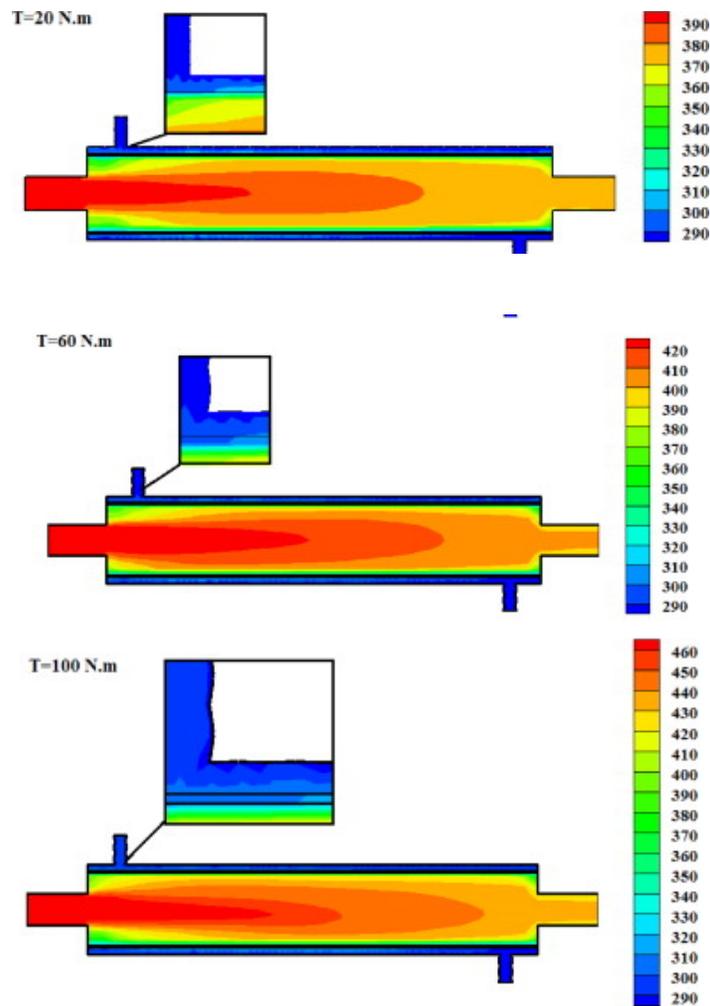


Fig.7 Temperature distribution contours for different torque values

In the zoomed areas of these contours, temperature distributions in the solid phase (pipe walls) and water are completely evident which is due to convection and conduction modeling. Maybe, one of the reasons of difference between outlet temperatures of experimental and numerical modeling is the location of thermocouples in the experiment. Because thermocouples measure just temperature of the one point, but in the numerical the average temperature is calculated while in each face, a maximum and minimum temperature occurs and thermocouples can sense each of them.

Table 4.Comparison between experimental and SST k- ω model results								
T(Nm)	Toutexhaust gases (K)			Toutwater (K)				
Experimental	Minimum	Maximum	Average	Experimental	Maximum	Minimum	Average	Experimental
20	361.95	362.65	375.71	370.93	290.65	289.12	287.21	288.06
60	388.2	392.25	405.19	399.02	291.15	290.14	287.53	288.67
100	414.65	419.90	436.60	428.52	293.15	292.87	289.69	291.05

Table 4 shows this matter and by choosing the nearest value point to experiment Fig. 7 is plotted which better results with experiments are observed.

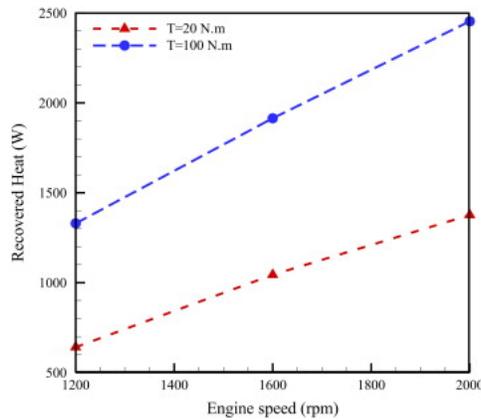


Fig.8 Recovered heat vs Engine speed Graph

Fig. 8 demonstrates the heat recovered amount in different engine load and speeds which its maximum is approximately 1400 W and occurs in 100 N m and 2000 rpm.

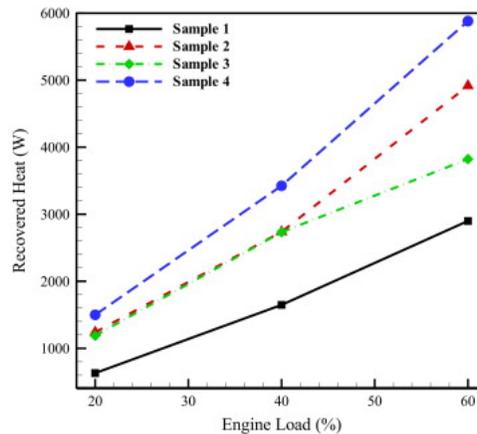


Fig.9 Recovered heat vs Engine load for different samples

In the second modeling (case 2), four samples from 18 experiment samples designed in is modeled. Samples 1, 8, 10 and 18 the data is from the published research and selected due to have the maximum and minimum efficiencies.

Table.5 Geometries of samples

Sample No.	Collant Flow direction	Fin Length (mm)	Fin Thickness (mm)	No. of Fins	Inner wall Thickness (mm)	Length of heat exchanger (mm)
Sample 1(1in[12])	Clockwise	10	1.5	10	2	18
Sample 2(8in[12])	Clockwise	20	2	20	3	18
Sample 3(10 in[12])	Counter clockwise	10	1.5	20	4	20
Sample 4(18 in[12])	Counter clockwise	20	2.5	15	2	20

Table 5 presents the complete geometries of these four samples. A mixture of 50% water and 50% ethylene glycol is considered for coolant which in samples 1 and 2 circulate clockwise while in samples 3 and 4 circulates counter clockwise. Type and number of generated meshes for these samples are presented through Table 6.

Table 6. Mesh numbers and construction for four samples of case 2 in Table 4				
Samples	Volume 1/cooper	Volume 2/tetrahedral	Volume 3/tetrahedral	Sum of meshes
Sample 1	84<comma>042	98<comma>639	95<comma>576	278<comma>257
Sample 2	76<comma>824	194<comma>326	169<comma>232	440<comma>382
Sample 3	112<comma>740	219<comma>038	154<comma>329	486<comma>107
Sample 4	82<comma>840	158<comma>682	180<comma>849	422<comma>371

Contours of Fig. 10 which are plotted for 20% load and 4500 rpm shows the effect of temperature distribution in the heat exchanger and zoomed areas clearly show the conduction heat transfer through the fins.

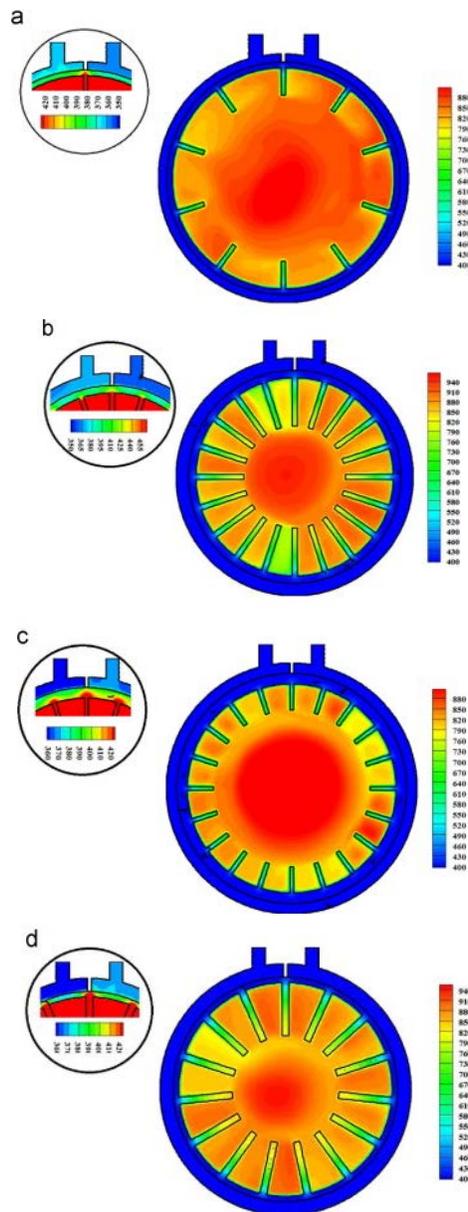


Fig.10 temperature distribution in heat exchanger

Comparisons of outlet cold fluid temperature for all samples with experimental results are shown in Fig. 11 (left) and for sample 4 (right) in different engine loads.

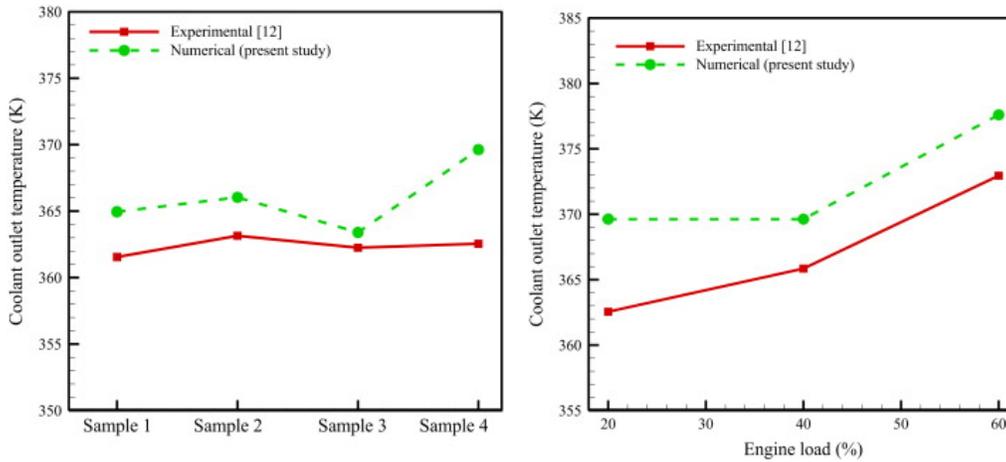


Fig.11 Comparison of experimental and numerical values for load and coolant temperature

As revealed Lee and Bae, it seems that samples 1 and 3 have the smallest effectiveness and samples 2 and 4 have the largest cooling effectiveness due to water outlet temperature. Because sample 4 has the maximum cooling performance, its temperature contours in different loads are shown in Fig. 12 in front and side view of the central plane.

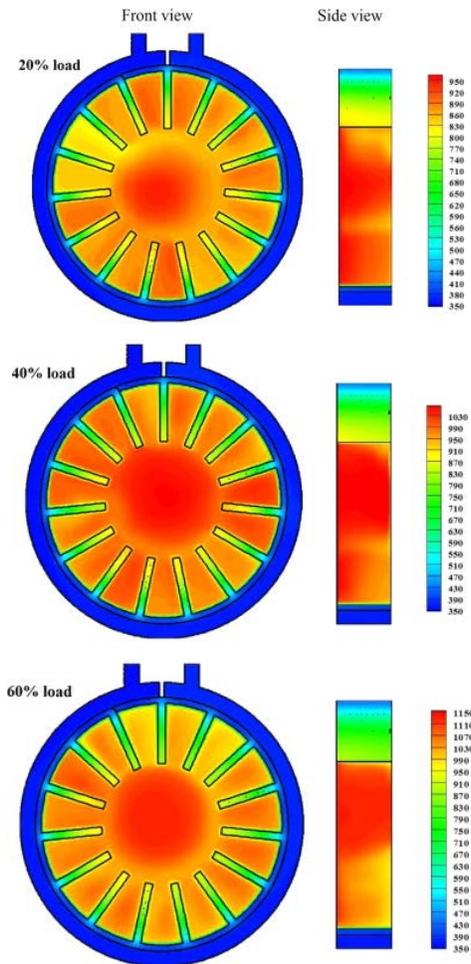


Fig.12 temperature contours for different loads

Finally by calculating the recovered heat amount, Fig. 13 is depicted for all four samples in different engine loads.

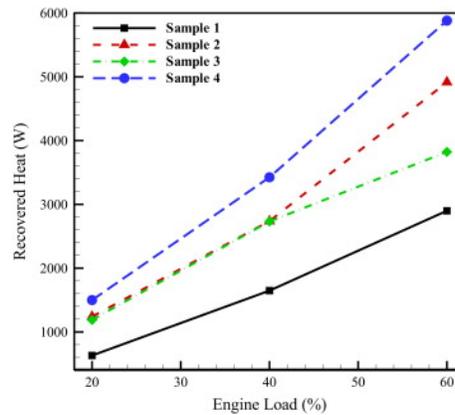


Fig.13 Recovered heat vs Engine load graph

As seen, maximum heat recovery is approximately 5900 W which occurs when engine speed is 4500 rpm and 100% load in sample 4 due to higher fin length, thickness and numbers.

IV. CONCLUSION

In this paper IC engines exhaust waste heat is recovered by using the double pipe heat exchange numerically. Heat recovery from exhaust gases using double pipe heat exchanger were modeled successfully and the transferred heat to cold fluid is calculated as the recovered heat. Results show that SST $k-\omega$ and RNG $k-\epsilon$ are suitable viscous models, but RSM has not good results compared to experimental outcomes. Also, graphs and contours reveal that recovered heat can be improved by increasing the fin numbers and length where maximum heat recovery occurs in high engine load and speeds.

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Sources of Inflation in Bangladesh: An Empirical Analysis

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Abstract- Inflation is one of the major problems of the economy of Bangladesh. The study analyzed the key determinants of inflation in Bangladesh using data for the period from 1987 to 2012. To explain the relationships a model is constructed with lagged independent variables and Ordinary Least Square (OLS) method has been used. Empirical results show that money supply and unemployment positively and significantly affect inflation. Results also indicate that exchange rate significantly and negatively influences over inflation rate. The explanatory variables accounted for 77 percent of the variation of inflation during the study period. This study suggests that money supply should be controlled to decrease inflation. Exchange rate is also an important tool to control inflation. A depreciation in the exchange rate raises inflation.

Index Terms- Inflation, Money supply, Exchange rate, Unemployment.

I. INTRODUCTION

In economics, inflation is a sustained raise in the general price level of goods and services in an economy over a period of time. When the general price level increases, each unit of currency buys less good and services. Consequently, inflation reflects reduction in the purchasing power per unit of money- a loss of real value in the medium of exchange and unit of account within the economy. That is why a fundamental macroeconomic purpose for a country to achieve price stability and the monetary authority to set policies accordingly to prevent any persistent rise in the general price level. By the Consumer Price Index (CPI) Inflation is measured. Policy makers always try to control price within the limit. The CPI dealings the prices of a fixed market basket of several thousand goods and services purchased by household.

During the last decade the rate of inflation in Bangladesh was restrained. Inflation rate in Bangladesh was 8.80 and food item inflation is 11.34 in FY 2010- FY2011. At present, the rate of inflation in Bangladesh is 9.73 percent (Bangladesh Economic Review, 2011 [1]). It is a matter of serious concern for the consumer of Bangladesh. Because it reduces the purchasing power of them. Since Bangladesh is not a high income country people have to adjust with purchasing power a lot. It is also a matter of worry for the policy makers because it tipples down the government of a country. This is why they have to keep in check some variables which have greater impacts on the inflation.

Inflation means a rising trend in the general price level of a country. Inflation is sustained

increase in the price level at least consecutive three years (Gills et al, 1996[2]). This is one reason for the reliance on monetary policy as a means of controlling inflation. The growth in money supply and its economic implications is therefore an issue to be thoroughly investigated. This subject has bordered the minds of Bangladeshi policy makers for decades. Despite the lacks of consensus among different schools of thought on its effectiveness as an instrument of monetary policy, the Central Bank of Bangladesh (Bangladesh Bank) relies on it as its major barometer for shaping economic activities. The design and shift of the monetary measures taken by the central bank in recent times have been either expansionary or contractionary. Expansionary policy tools have been used to increase money supply with the intent of increasing output. Contractionary policy tools have been used on the other hand to decrease money supply in the economy in order to discourage consumption thereby curtailing inflation.

Moreover, if there is depreciation in the exchange rate, this depreciation causes inflation to increase. Depreciation means the currency buys less foreign exchange, therefore imports are more expensive and exports are cheaper. Therefore we get – (1) imported inflation- The price of imported goods goes up because they are more expensive to buy from abroad. That is why policy maker must keep their eyes on exchange rate to control inflation. (2) Higher domestic demand. Cheaper exports increases demand for import of foreign country. Therefore there is an increase in domestic aggregate demand and we may get demand pull inflation. (3) Less incentives to cut cost. Manufacturer who export see an improvement in competitiveness without making any effort. Some argue this may reduce their incentive to cut costs, and therefore we get higher inflation in the long. For all these above reasons Policy makers of any country must keep their eyes on exchange rate to control inflation of an economy.

This study is an attempt to analyze the impact of money supply, exchange rate and unemployment on inflation in Bangladesh. The specific purposes of the study are as follows:

- To explain the relationship between inflation and money supply in Bangladesh.
- To examine the relationship between inflation and unemployment in Bangladesh.
- To discuss the relationship between inflation and nominal exchange rate in Bangladesh.

II. LITERATURE REVIEW

There have been ample literatures to examine the relationship between inflation and its determinants. But a few studies are found on empirical analysis of inflation and its

determinants in Bangladesh. This section provides a summary of the findings from the previous literature. And also some related findings of other countries will be included here.

Bangladesh Bank, IMF and CPD 2007 [3] explored that both demand and supply side factors constitute the relevant sources of inflation in Bangladesh. Among these are M2 growth, private sector credit growth, market capitalization growth, growth of government borrowing, remittance growth, exchange rate change, market syndicate.

Shamim and Mortoza 2005 [4] used the data from 1981 to 2005. They use time series analysis such as unit root and error correction mechanism. The result shows that there is a negative long run relationship between inflation and economic growth in Bangladesh.

Taslim, 1980 [5] used regression models for explaining the inflationary process of Bangladesh. He explored that one year lagged money supply had significant positive effect on inflation. However, the introduction of wage variable as an additional independent variable resulted in dramatic fall of statistical significance of coefficients of other variables in the regression model.

Khanam and Rahman, 1995 [6] examined the causative factors of inflation in Bangladesh during the period from 1972-73 to 1991-92 using Ordinary Least Square (OLS) method. Their results showed that growth rate of import prices and money wages, both considered as supply side variables, affect the inflation positively. They also found that all demand side variables have insignificant influence on the rate of growth of prices. In an analytical writing Ahmed and Das, 2007 [7] found that world food price and fuel price triggered inflationary pressure in Bangladesh. They also detected inflation inertia is another reason to sustain higher inflation.

Kibria, 2010 [8] also traced there is an upward trend in inflation as international commodity prices are showing signs of increase, excess liquidity prevailing in the domestic market, increased flow of remittance and its impact on Foreign Reserve and stagnancy in investment in Bangladesh.

Hossain and Islam, 2013 [9] on their economic analysis of the determinants of inflation in Bangladesh analyzed the relationship between inflation, money supply, interest rate, nominal exchange rate and fiscal deficit for the period 1990 to 2010 using the ordinary least square (OLS) method. Their findings showed that inflation is positively and significantly affected by money supply and a year lagged of interest rate. But when the same money supply was lagged by a year together with fiscal deficit, they significantly and negatively influenced inflation. Their study revealed that interest rate, fiscal deficit and nominal exchange rate have no significant relationship with inflation. They cautioned in their recommendation that wages and import of goods and services from abroad to be controlled, as well as the supply of money.

Yen Chee Lim and Siok Kun Sek, 2014 [10] in their publication which focused on two categories of countries – (High inflation group and Low inflation group) the use of the error correction model based on the auto regressive distributed lag (ARDL) to explain the short run and the long run relationship between inflation and other variables revealed that in low inflation countries, GDP growth and imports of goods and services in the long run have significant impact on inflation.

Whilst none of the variables were found to be significant determinants in the short run in high inflation countries.

Ashwani, 2014 [11] used a cointegration approach to identify the key determinants of inflation in India for the period 1981 to 2011. The study found the existence of a long run relationship among inflation, money supply, private and social spending and exchange rate. It was concluded that money supply, exchange rate and private final consumption expenditure contributed significantly to Indian's inflation at that time. It was recommended that there should be a balance between fiscal spending, money supply and exchange rate management for the maintenance of economic growth.

Cheng & Tan, 2002 [12] agreed that inflation in Malaysia was controlled well during recent financial crisis compared to other neighboring countries. In research done by Baghestani & Abu Al-Foul, 2010 [13] had analyzed that Federal Reserve gave the accurate information about inflation once the government forecast.

Agha and Khan, 2006 [14] have looked at the fiscal deficit and total bank borrowing by the government sector to explain inflation. Whereas Khan et al., 2007 [15] identified inflation expectations, private sector credit and imported inflation as the most significant explanatory factors. L. H. Cheng and P. Laura, 1997 [16] shows that high inflation is appeared in the Turkish economy since the 1970s. They found that monetary variables especially money supply and exchange rate play main role to the Turkish inflation process. Public sector deficit and depreciation also contribute to inflation in Turkey.

Methodology and Empirical model:

Here we used linear model to explain the impact of money supply, exchange rate and unemployment on inflation. The sample period for investigation is 1987 to 2012. The empirical study will employ annual, time series secondary data collected from different sources.

Reliability of data is a serious issue for any kinds of study. Since Bangladesh is a developing country the statistical data base system is not enough strong here. Despite this problem, Data is taken with intensive attention from different government institutions, concerned ministries, concerned corporate offices, research journals, statistics and various websites. All these sources of data are well recognized and widely accepted.

As the primary focus of this paper is to analyze the sources of inflation, the econometric model is specified to facilitate the test of hypothesis that whether explanatory variables cause inflation. In this model, the explanatory variables are money supply (M2), Exchange rate (Er) and unemployment (Un). The dependent variable is inflation. The model can be shown as follows:

$$\text{Inf}_t = \beta_1 + \beta_2 M2_{t-1} + \beta_3 Er_{t-1} + \beta_4 Un_{t-1} + \mu_t$$

Where, μ_t is an error term and it is indicating time, β_1 is the scalar parameter and β_3 and β_4 are the slope coefficient of the respective variable.

Variable definition and data sources:

1. Inf= represented by Consumer price index (CPI) in Bangladesh.

Source: Bangladesh Economic Review.

2. $M2 = \text{Money supply} = M1 + \text{time deposits} = (\text{Currency outside bank} + \text{deposit of financial institutions with Bangladesh Bank} + \text{demand deposits})$

Source: www.databank.worldbank.org

3. $Er = \text{Exchange rate}$

Source: Statistical yearbook of Bangladesh.

4. $Un = \text{Unemployment}$

Source: www.globaleconomy.com

Un(-1)	17.18616	6.210343	2.767344	0.0115
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Dependent variable: Inf

$R^2 = 0.772010$

S.E. = 17.7338

Durbin- Watson stat = 0.927288

F- statistic =

23.70303

Prob (F-statistic) = 0.000001

Expected Sign of the estimated coefficient

- $\beta_2 > 0$: As Bangladesh is a developing country, if money supply increases money supply is also increases.
- $\beta_3 < 0$: Exchange rate is negatively related with inflation.
- $\beta_4 < 0$: Inflation is negatively related with unemployment.

Empirical Analysis:

We took all variables by using an econometric program name Eviews7, and then we ran OLS (ordinary least square) method.

We use Augmented Dickey- Fuller (ADF) to know whether data is stationary or not. On the basis of ADF test, the impact of result shows that all variable's data non stationary at level. All the given variables are stationary at first difference.

Using Eviews7, We obtain the following multiple regressions:

$$Inf_t = 191.4992 + 0.581725 M2_{t-1} - 3.790343 Er_{t-1} + 17.18616 Un_{t-1} + \mu_t$$

Estimated results with ordinary least squares method as shown in appendix 1A is summarized in the following table:

Table 1:

Variables	Coefficients	Standard error	t-statistic	probability
M2(-1)	0.581725	0.116058	5.012382	0.0001
Er (-1)	-3.790343	0.999729	-3.791370	0.0011

Here, the table shows the result of the estimated equation. From the table we can say that estimated coefficients β_2 and β_3 have expected signs. But the sign for unemployment coefficient is not expected. But it is not impossible at all. Bangladesh economy experienced a lot of adverse supply shocks over the past few decades. In case of adverse supply shock inflation and unemployment move in the same direction.

Again, the results show that explanatory variable can explain about 77% change in the dependent variable as adjudged with the coefficient of multiple determinants. Here t-value of the coefficient of the money supply is 5.012382 which is statistically significant and clearly suggest that as money supply increases inflation also increases in the next period. Similarly t-value of the coefficient of the exchange rate is -3.791370 which clearly indicates that as exchange rate increases inflation decreases in the next period. The t-value of unemployment is 2.7673 which is statistically significant and clearly indicates that as unemployment rises inflation also rises.

Test for Multi co-linearity:

Multicollinearity is a statistical phenomenon in which two or more predictor variables in a multiple regression model are highly correlated, meaning that one can be linearly predicted from the others with a non-trivial degree of accuracy.

It is essentially a sample phenomenon, arising out of largely non-experimental data collected in the most social sciences. Although BLUE the OLS estimators have large variances and covariance's making precise estimation difficult in the presence of multicollinearity, We do not have one unique model to detect it or measuring its strength.

In this model, using Eviews7 and considering some rule of thumbs, results as shown in appendix (1.B) is summarized in table 2:

Table 2:

	M2	ER	UN
M2	1.000000	0.961269	0.788629
ER	0.961269	1.000000	0.843416
UN	0.788629	0.843416	1.000000

The table (2) indicates that there is 78% Multicollinearity between money supply and unemployment. It also indicates that there is 96% multicollinearity between money supply and exchange rate. And there is 84% multicollinearity between exchange rate and unemployment. So there is high multicollinearity. The remedial measure is shown below.

Remedial measure:

When we face with severe multicollinearity problem, one of the simple thing is to do is to drop one of the collinear variables. There is another remedy that sometimes simply increasing the size of the sample may attenuate the colinearity problem. Now, in our model we found multicollinearity problem. Therefore remedial measure may be called for.

Dropping collinear Variable:

Regression results from the appendix (1.C) are displayed in table 3:

Table 03

Variable	coefficient	Standard error	t-statistic	prob
M2(-1)	0.196686	0.071232	2.761203	0.0114
UN(-1)	4.861596	6.710015	0.724528	0.4764

$R^2 = 61\%$

From the table 3, we obtain following regression model:

$$\text{Inf}(-1) = 101.1348 + 0.196686 m2(-1) + 4.861596 un(-1) + u_i$$

From this we see that, estimated t-values for the entire variable are not significant. The t value of the coefficient of unemployment is 0.724528 which is statistically insignificant. Again in this model, $R^2 = 61\%$ where $R^2 = 77\%$ in the original model. So we can conclude that despite multicollinearity problem we can not drop exchange rate variable from the model because exchange rate is statistically significant variable.

It has been said that if the sole purpose of regression analysis is prediction or forecasting then multicollinearity is not a serious problem because the higher the R^2 , the better the prediction.

Again, the multicollinearity problem may be solved as we increase sample size of the model. This model is estimated by using data of 26 years. Though data processing is not much easy in Bangladesh and it is rare to found for large sample size we are unable to show that as sample size increases multicollinearity attenuates.

Test for Heteroscedasticity:

In Statistics, a collection of random variables is heteroscedastic if there are populations that have different variability's from others. The possible existence of Heteroscedasticity is a major concern in the application of regression analysis. We can detect the heteroscedasticity of error variance by using Eviews7. Here, White's Heteroscedasticity test is suitable in this model.

Table 4:

White heteroskedasticity-consistent standard errors & covariance				
Variable	Coefficient	Std. error	t-statistic	Prob.
M2(-1)	0.588736	0.058597	10.04714	0.0000
ER(-1)	-3.551574	0.570922	-6.220768	0.0000
UN(-1)	10.93636	4.66006	3.205226	0.0041
C	186.5536	17.82796	10.46410	0.0000

R-squared	0.763318	Mean dependent var	151.4296
Adjusted R-squared	0.731043	S.D. dependent var	34.93030
S.E. of regression	18.11523	Akaike info criterion	8.772022
Sum squared resid	7219.556	Schwarz criterion	8.965575
Log likelihood	-110.0363	Hannan-Quinn criter.	8.827758
F-statistic	23.65052	Durbin-Watson stat	1.238362
Prob(F-statistic)	0.000000		

Here calculated $R^2(n.R^2)$ value is =19.76

At 5% level of significance with 3 df the chi-square value is 7.81 and 1% level of significance with 3 df the chi-square value is 11.34. Since calculated chi-square value > critical chi-square value, on the basis of the white test we conclude that there is heteroscedasticity.

Remedial Measures:

Since heteroscedasticity does not destroy the unbiasedness and consistency properties of the OLS, but they are no longer efficient. This lack of efficiency makes the usual hypothesis testing procedure dubious value. Therefore, remedial measure

may be taken. There are two approaches of taking remedy- when σ_i^2 is known and when σ_i^2 is unknown.

When σ_i^2 is known:

The Weighted least square method is the simplest straightforward method of correcting heteroscedasticity. Estimators obtained by this method are BLUE.

When σ_i^2 is unknown:

Since the true σ_i^2 is rarely known there is way of obtaining consistent estimates of the variances and covariance of OLS estimators even if there is heteroscedasticity. Then we use HAC standard error and covariance test.

By comparing OLS and HAC estimation we can illustrate following result from appendix (1.A) and (1.E)-

Inf (-1) = 186.5531+ 0.588736 m2 (-1) -3.551574 er (-1) + 14.93636 un (-1)		
t= (7.12)	(5.01)	(-3.79)
(2.76)		
se= (26.86)	(0.11)	(0.99)
(6.2)		
HAC t= (8.90)	(8.58)	(-4.61)
(2.54)		
Se= (20.95)	(0.06)	(0.76)
(5.87)		

Proceeding results shows that HAC's heteroscedasticity standard errors are smaller than the OLS than the OLS standard error and estimated t-value are much smaller than OLS t-value. HAC standard error is not robust error. To be robust they need to fulfill both conditions. But they fulfill only t-value condition. It may be happened due to some specification error. Some other relevant variables need to be included in the model. Since inflation depends on many other variables expect money supply, exchange rate and unemployment, it is not possible to add all other variables due to time shortage and availability of data.

III. CONCLUSION AND POLICY IMPLICATION

Inflation is a serious issue for any economy. Policy maker needs to control inflation in order to achieve sustainable growth. There are several variables that affect inflation. Policy maker needs to control these variables to control inflation.

In this paper, we examined the effects of money supply, exchange rate and unemployment on inflation by OLS method using yearly data for a period 26 years. The explanatory variable can explain 77% of the dependent variable. The analysis reveals that there is a positive significant relationship between money supply at crrent period and inflation in the next period. And there is also negative significant relationship between exchange rate and inflation. Both the results are expected. But the analysis shows that there is positive relation between inflation and unemployment which is not much expected. But it's not impossible at all. This may be due to some adverse supply shocks that occured Bangladesh economy over the last few decades. The single equation model we developed in this study may suffer from a number of shortcomings. Therefore, some venues for future research may be considered. They are as follows:

- (1) This study uses yearly time series data, which may mask some important dynamic aspects of the short run behavior of inflation. An analysis based on quarterly or monthly data should certainly be more enriching.
- (2) Foreign currency reserve may be included in order to determine the inflationary effects of such reserve.

APPENDIX (1):

Appendix (1A)

Dependent Variable: INF(-1)

Method: Least Squares

Date: 10/28/14 Time: 20:49

Sample (adjusted): 1988 2012

Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	191.4992	26.86715	7.127635	0.0000
M2(-1)	0.581725	0.116058	5.012382	0.0001
ER(-1)	-3.790343	0.999729	-3.791370	0.0011
UN(-1)	17.18616	6.210343	2.767344	0.0115
R-squared	0.772010	Mean dependent var		152.9668
Adjusted R-squared	0.739440	S.D. dependent var		34.74145
S.E. of regression	17.73381	Akaike info criterion		8.734469
Sum squared resid	6604.247	Schwarz criterion		8.929490
Log likelihood	-105.1809	Hannan-Quinn criter.		8.788560
F-statistic	23.70307	Durbin-Watson stat		1.289867
Prob(F-statistic)	0.000001			

Appendix (1B)

	M2	ER	UN
M2	1.000000	0.961269	0.788629
ER	0.961269	1.000000	0.843416
UN	0.788629	0.843416	1.000000

Appendix (1C)

Dependent Variable: INF(-1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	101.1348	15.72434	6.431734	0.0000
M2(-1)	0.196686	0.071232	2.761203	0.0114
UN(-1)	4.861596	6.710015	0.724528	0.4764
R-squared	0.615951	Mean dependent var		152.9668
Adjusted R-squared	0.581037	S.D. dependent var		34.74145
S.E. of regression	22.48722	Akaike info criterion		9.175938
Sum squared resid	11124.85	Schwarz criterion		9.322203
Log likelihood	-111.6992	Hannan-Quinn criter.		9.216506
F-statistic	17.64215	Durbin-Watson stat		0.643292
Prob(F-statistic)	0.000027			

Appendix (1D)

Dependent Variable: INF

White heteroskedasticity-consistent standard errors & covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
M2	0.588736	0.058597	10.04714	0.0000
ER	-3.551574	0.570922	-6.220768	0.0000
UN	14.93636	4.660006	3.205223	0.0041
C	186.5536	17.82796	10.46410	0.0000
R-squared	0.763318	Mean dependent var	151.4296	
Adjusted R-squared	0.731043	S.D. dependent var	34.93030	
S.E. of regression	18.11523	Akaike info criterion	8.772022	
Sum squared resid	7219.556	Schwarz criterion	8.965575	
Log likelihood	-110.0363	Hannan-Quinn criter.	8.827758	
F-statistic	23.65052	Durbin-Watson stat	1.238362	
Prob(F-statistic)	0.000000			

Appendix (1E)

Dependent Variable: INF

HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 3.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
M2	0.588736	0.069032	8.528455	0.0000
ER	-3.551574	0.768819	-4.619521	0.0001
UN	14.93636	5.873870	2.542848	0.0185
C	186.5536	20.95044	8.904521	0.0000
R-squared	0.763318	Mean dependent var	151.4296	
Adjusted R-squared	0.731043	S.D. dependent var	34.93030	
S.E. of regression	18.11523	Akaike info criterion	8.772022	
Sum squared resid	7219.556	Schwarz criterion	8.965575	
Log likelihood	-110.0363	Hannan-Quinn criter.	8.827758	
F-statistic	23.65052	Durbin-Watson stat	1.238362	
Prob(F-statistic)	0.000000			

APPENDIX (2):

YEAR	M2	ER	UN	INF(CPI)
1987	56.45571	30.94983	1.2	113
1988	58.08339	31.73325	1	121
1989	61.90577	32.27	0.9	131
1990	62.7118	34.56881	3.1	136.4
1991	65.34484	36.59618	3.6	147.7
1992	69.51465	38.95076	3.3	154.4
1993	74.95924	39.56726	3.2	158.7
1994	84.38503	40.21174	3	163.9
1995	86.32229	40.27832	2.8	178.4
1996	89.80858	41.79417	2.5	100
1997	93.65727	43.89212	2.9	103.96
1998	97.14974	46.90565	2.5	112.96
1999	105.1374	49.0854	3.1	120.94

2000	120.939	52.14167	3.3	124.31
2001	166.8571	55.80667	3.4	126.72
2002	182.0961	57.888	3.4	130.26
2003	195.6199	58.15004	4.3	135.97
2004	211.1136	59.51266	4.5	143.9
2005	229.632	64.32748	4.3	153.26
2006	259.392	68.93323	4.2	164.21
2007	272.8316	68.87488	4.3	176.04
2008	289.0103	68.59828	4.4	193.54
2009	322.9526	69.03907	5	206.43
2010	363.3406	69.64929	4.5	210.65
2011	390.5483	74.1524	4.5	213.87
2012	392.657	81.86266	4.5	215.65

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Factors That Inhibit the Development of Tourism in Sierra Leone after the Rebel War

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Abstract: This paper attempts to investigate the factors that inhibit the development of tourism in Sierra Leone after the rebel war. Various studies have been done on the economic contributions of tourism to a country and little attention has been paid to this topic and particularly Sierra Leone. A tremendous effort has been made by both the public and private sectors after the ten year rebel war towards the development of tourism. Despite remarkable progress in this respect, the tourism sector in the country has been constrained by both internal and external factors such as human resource capacity, inadequate fund, implementations of tourism policy, poor marketing strategies etc. A survey was conducted among Ministries and Agencies who are directly and indirectly associated with tourism activities. One hundred (100) respondents were selected by a simple random method. Questionnaire, face to face interviews, discussions and external sources were the main research instruments. The Statistical Packages for Social Sciences (SPSS) was used to analysis the relevant data. It is recommended that the highlighted problems are to be addressed by the appropriate authorities in the country.

Index Terms: tourism, human resource, domestic tourism, infrastructures, marketing and policy

I. INTRODUCTION

Sierra Leone's devastating 11-year rebel war destroyed much of its infrastructure, and left its economy in disarray. In 2004, two years after the end of the war, Sierra Leone asked the Investment Climate (IC) Advisory Services of the World Bank Group to help create a better business and investment climate that would lay a foundation for the country's future economic growth. One focus area was to promote Sierra Leone as a vibrant and desirable location for business, particularly in one of the country's most promising sectors. Tourism in Sierra Leone, as in other developing countries, has become the most dynamic and fastest growing industry. It is an aggregate of many different industries and services, and is influenced by almost every facet of society. Many governments in developing countries including Sierra Leone expect economic and social benefits from tourism development such as:

- a) foreign exchange earning
- b) the development of areas with no other immediate possibilities of expanding economic activity
- c) creation of employment opportunities
- d) a boost for the local production of the goods and services consumed by the tourists
- e) more tax revenue for the State
- f) the integration of national cultures and societies and safeguarding of the national cultural identity from foreign culture influences
- g) reasonable returns on investment in the sector
- h) the promotion of the true image of the country to attract holidaymakers and foreign entrepreneurs as part of the drive to step up international political and economic cooperation
- i) encouraging fair distribution of national income and creating new markets for consumer goods
- j) providing additional infrastructure and amenities that will encourage and support the tourist industry as well as benefit local and national interests

After the declaration of the end of the rebel war in 2002. So many strategies such as incentives for indigenous Sierra Leoneans to import free of tax any goods in respect to tourism development which saw a massive construction of many hotels, restaurants, motels and guest houses in Freetown. As a result of this, there are more of these facilities available now as compared to before the war. The tables below show the contributions of travel and tourism to GDP, employment and growth up to 2014.

Table 1: describes the economic contribution of travel and tourism. Real 2014 Prices

Sierra Leone (SLL bn real 2014 prices)	2009	2010	2011	2012	2013	2014	2015E	2025F
1. Visitor exports	165.5	166.0	261.5	246.0	220.0	120.4	121.2	168.9
2. Domestic expenditure	506.2	530.0	571.3	541.0	562.0	548.8	546.7	1015.7

including government individual spending								
3.Internal tourism consumption	761.6	696.0	832.8	786.5	783.5	667.1	666.9	1174.6
4.Purchase by tourism providers including imported goods	-324.1	-295.5	-393.9	-352.3	-346.7	-292.5	-290.6	-510.9
5.Direct contribution of travel and tourism to GDP	437.5	400.6	438.9	434.3	436.8	374.6	376.3	663.7
Other final impacts(indirect induced)	216.6	238.7	261.5	258.7	260.2	223.2	204.5	395.4
6.Domestic Supply Chain								
7.Capital Investment	91.8	293.0	408.1	295.6	152.7	142.6	143.0	258.0
8.Government collective spending	33.4	34.5	35.7	42.1	42.0	45.0	46.5	84.6
9.Imported goods from indirect spending	-16.2	-33.3	-93.3	-65.8	-51.3	-50.4	-50.4	-83.7
10.Induced	203.6	214.0	187.8	198.9	180.0	152.2	148.8	282.2
11.Total contribution of travel and tourism to GDP	1,011.6	1,147.4	1,238.6	1,163.8	1,020.5	887.3	888.5	1,601.1
12.Employment Input(000) Direct contribution of Travel and tourism to employment	30.4	27.7	29.4	27.0	24.7	21.4	23.2	31.1
13.Total contribution of travel and tourism to employment	70.8	79.6	83.1	72.0	57.1	49.6	53.3	72.6
14.Other indicators. Expenditure on outbound travel	157.9	135.0	146.6	127.1	130.2	130.2	141.5	232.9

(Source: World Travel and Tourism Council 2015)

Table 2: Describes the economic contribution of travel and tourism. Nominal 2014 Prices

Sierra Leone (SLL bn real 2014 prices)	2009	2010	2011	2012	2013	2014	2015E	2025F
1.Visitor exports	89.4	106.6	197.0	207.6	205.6	120.4	132.1	288.5
2.Domestic expenditure including government individual spending	322.1	340.3	430.4	456.3	523.8	546.8	594.9	1,844.5
3.Internal tourism consumption	411.4	447.0	627.5	664.0	729.4	667.1	727.0	2,133.0
4.Purchase by tourism providers including imported goods	-175.1	-189.7	-296.8	-297.4	-322.8	-292.5	-316.8	-927.8
5.Direct contribution of travel and tourism to GDP	236.3	257.2	330.7	366.6	406.7	374.6	410.2	1,205.2
Other final impacts(indirect induced)	141.3	153.3	197.0	218.4	242.3	223.2	244.4	718.1
6.Domestic Supply Chain								
7.Capital Investment	49.6	188.1	307.5	249.5	142.2	142.6	155.9	470.3
8.Government collective spending	18.0	22.1	26.9	35.5	39.1	45.0	50.7	153.7
9.Imported goods from indirect spending	-8.8	-21.4	-70.3	-55.5	-47.7	-50.4	-54.9	-152.1
10.Induced	110.0	137.4	141.5	167.9	167.6	152.2	162.2	512.4
11.Total contribution of travel and tourism to GDP	546.5	736.8	933.2	982.4	950.2	887.3	968.5	2,907.6
12.Employment Input(000) Direct contribution of Travel and tourism to employment	30.4	27.7	29.4	27.0	24.7	21.4	23.2	31.7
13.Total contribution of travel and tourism to employment	70.8	79.6	83.1	72.0	57.1	49.6	53.3	72.6
14.Other indicators. Expenditure on outbound travel	85.3	86.7	110.5	107.3	121.3	130.2	154.2	422.9

(Source: World Travel and Tourism Council 2015)

Table 3: Describes the economic contribution of travel and tourism (Growth)

Sierra Leone Growth,(%)	2009	2010	2011	2012	2013	2014	2015E	2025F
1.Visitor exports	-20.7	0.3	57.5	-5.9	-10.2	-45.5	0.7	2.7
2.Domestic expenditure including government individual spending	15.0	-11.1	7.8	-5.4	4.1	-2.8	0.2	6.4
3.Internal tourism consumption	4.8	-8.6	18.5	-5.5	-0.4	-14.7	0.0	5.8
4.Purchase by tourism providers including imported goods	8.4	-8.8	33.3	-10.8	-1.6	-15.6	-0.6	5.8
5.Direct contribution of travel and tourism to GDP	2.2	-8.4	0.6	-1.1	0.6	-14.2	0.4	5.8
Other final impacts(indirect induced)	2.3	-8.8	0.6	-1.1	0.6	-14.2	0.4	5.8
6.Domestic Supply Chain								
7.Capital Investment	0.5	210.1	30.3	-27.6	-18.3	-6.6	0.3	6.1
8.Government collective spending	12.1	3.3	3.6	17.8	-0.1	7.0	3.4	6.2
9.Imported goods from indirect spending	5.6	0.9	34.6	-8.4	-5.0	-0.4	0.7	5.8
10.Induced	-3.5	5.1	-12.3	5.9	-0.5	-15.5	-2.2	6.6
11.Total contribution of travel and tourism to GDP	0.7	13.4	8.0	-6.0	-12.3	-13.1	0.1	6.1
12.Employment Input(000) Direct contribution of Travel and tourism to employment	2.7	-8.7	6.0	-8.0	-8.5	-13.5	8.3	3.0
13.Total contribution of travel and tourism to employment	0.8	12.0	4.4	-13.3	-20.8	-13.0	7.4	3.1
14.Other indicators. Expenditure on outbound travel	14.6	-14.5	8.6	-13.3	2.5	0.0	8.7	5.1

(Source: World Travel and Tourism Council 2015)

II. TOURISM DEVELOPMENT PROBLEMS

Tourism is a growth industry and its growth potential is likely to continue (NTB 2015). In the context of Sierra Leone, the tourism development is not without its problems. These problems can be identified in broad terms: external and internal.

2.1. External Problems

- a) **Cost:** Cost is the primary factor affecting the tourism industry. Domestic travel becomes increasing limited as price of petrol keep increasing. The casual road tripper may decide to stay at home rather than making that trip to Sierra Leone when gas prices are on the rise. As the price of gas increases, the price of flights goes up as well, negatively impacting long-distance and international travel. Additionally, international travel may be negatively affected by high rates of inflation and poor exchange rates. That is why many local people cannot afford to make international travel.
- b) **Weather:** Weather plays an important role in the tourism industry. As most travellers seek warm or mild temperatures with little rain while on vacation, areas that are prone to wet or cold weather do not thrive in the tourism economy. Rainy and cold seasons see decreased amounts of visitors throughout other countries and Sierra Leone is experiencing it too. Similarly, incidences of extreme weather and national disasters such flooding which disturb the capital Freetown in September every year is preventing many travellers from visiting certain areas, as safety becomes a primary concern during these times.
- c) **Safety:** Safety is a primary concern of travellers of all types. Safety becomes particularly important when traveling abroad and to developing countries. Widespread political unrest can cause even the most adventurous tourist to avoid visiting unstable countries. Outbreak of communicable diseases can also hinder tourism industries, especially because returning to home countries can be difficult during outbreaks. For instance, the Ebola outbreak from 2014 to 2015 stopped many people from traveling into the country as many airlines cancelled their flight. Domestically, the crime rate of tourist areas, specifically traffic safety and incidents of petty theft, negatively affect the tourism industry. For theme parks, the safety record can also be a negative factor.
- d) **Access to Amenities** Though every traveller arriving in Sierra Leone are with the expectation of experiencing different types of amenities, the lack of certain amenities could deter even the most adventurous traveller. For instance, easily attained transportation is a major concern for both the budget and the luxury traveller. If public transportation is difficult to understand, unreliable or dangerous, budget tourists travelling abroad may be deterred from visiting Sierra Leone. The same thing goes with private transportation for luxury travellers. Other amenities that affect tourism include clean water,

affordable food and housing, easy visa processes and access to reliable medical care are all difficult to access in Sierra Leone.

e) Relative Peace in the sub-region.

The rebel wars in Liberia, Ivory Coast and Guinea have ended and peace is now the order of the day. These countries have now embarked on massive tourism promotion to their colonial countries which have seen an increased in number of tourists visiting these countries more than before the rebel wars.

2.2. Internal problems

a) Inadequate infrastructures

Infrastructure refers to structures, systems, and facilities serving a country, city, or area, including the services and facilities necessary for its economy to function. It typically characterises technical structures such as roads, bridges, tunnels, water supply, sewers, electrical grids, telecommunications, and so forth, and can be defined as "the physical components of interrelated systems providing commodities and services essential to enable, sustain, or enhance societal living conditions and the development of tourism in a country. All of the above mentioned are challenging issues for the development of tourism in Sierra Leone. The few available ones are inadequate for both domestic and international tourist staying in Sierra Leone.

b) Weak human resource capacity

One of the major problems of developing tourism attractions in Sierra Leone is the inadequacy of competent and trained tourism personnel. The staff structure of the Ministry of Tourism and Cultural Affairs reveals that not up to two staff with a first degree in tourism management or related subjects. The rest are holders of first degree in Sociology, Culture and Art History. The National Tourist Board has one undergraduate and many other staff with Higher National Diploma and National Diplomas. The training of Tourism manpower will facilitate the development of these identified attractions in which will promote rural development. Thus, tourism attractions are usually located in the rural areas and by developing and promoting the tourism attractions; the rural areas will be also developed. This will hitherto, solve the problem of rural- urban migration of able youths to seek unavailable jobs in the urban centres.

c) Weak training institutions

A good number of training institutions in the country offering courses in Tourism and Hospitality Management lacks the human resource in this sector. Milton Margai College of Education and Technology being the leading institution has a Campus for such training but cannot boast of single undergraduate staff in Tourism Management or Hospitality Management. Majority of the staff are Higher National Diploma and National Diploma holders. The same applies to all other smaller institutions that recruit their staff from Milton Margai College of Education and Technology. Another aspect of the weakness lies with inadequate training facilities such as demonstration kitchen, Front office and Housekeeping. As a result of such, students graduating from these institutions lack the practical know how as these equipment used in hotels and other related industries were not made available to them during their training. This has caused a lot of establishments not being able to meet international standards as staff from these institutions cannot perform. This is having a negative impact on the tourism development. No matter if both the domestic and foreign investors can build hundreds of hotels, there is a need for trained and qualified staff to service these facilities. If they are not available, it will negatively affect the level of customer satisfaction which in turn will drive them away to other countries where better services are delivered.

d) Absence of a national carrier

Government of Sierra Leone in the past have indulged herself by running a national carrier called Sierra National Airlines irrespective of whether it was profitable or not. The reasons for this are many: government sees the potential of world tourism and wishes to take a slice of its revenue, having a national carrier is a source of pride to a country. Airline generates foreign exchange, create employment and promote tourism. For example, 'airlines owned by governments in other Africa like Kenyan are being seeing as major source of revenue and promote the Kenyan tourism wherever it flies to. The negative impact of Sierra Leone not having one airline has been experienced during the war and recently the Ebola outbreak. Owners of these foreign airlines left the country except for few. This did not only create difficulty in travelling but saw a huge increase in air fares for short distances. For Sierra Leoneans who were to travel to Ghana or within West Africa had to first go to Europe and board another flight to their destination. These foreign airlines operating in Sierra Leone main objective is to maximize profit and pay less attention to the promotion of the country tourism'

e) No strong linkage among the tourism developers, private sector and training institutions

Strong linkage among these players had helped in the development of tourism in so many countries. In the case of Sierra Leone, this has not been seeing as it is always government engaging the private sector to develop tourism leaving out the provider of the human resource in the engagement. Whether intentionally no one knows. The government is expected to create an enabling environment for the private sector to invest. With my 14 years lecturing at the Tourism Campus of the Milton Margai College of Education and Technology witnessed a meeting where these three bodies had engaged in strategizing ways to develop tourism in the country. Neither any proprietor wanting to construct a hotel engage the training institution to ascertain the quality of training they should provide to meet the standard of the proposed hotel. The situation in country is like dis-jointed efforts among the key players.

f) Dominance of foreigners in the tourism sector

The tourism sector in Sierra Leone is dominated by foreigners ranging from standard restaurants to hotels. The travel agency business is controlled by the Lebanese, airlines by foreigners from different countries and the hotels by the Chinese, Lebanese and other foreigners. The negative impact of this is seeing in monies paid by tourists visiting the country are being leaked out of the country through the personal savings of these foreigners operated in their home countries. Key positions in these establishments are for the foreigners and lower position for Sierra Leoneans. Socially, they had no regard for local staff as many complaints have

been heard of these foreigners abusing the local staff and nothing has been done to put a stop to it. All what is heard ' these people are here to help develop our tourism'

g) Low income earning of the local people

Low income of Sierra Leoneans has derived them from not enjoying tourism products in their own country. The cost of tourism products in the country is preventing local people to patronize these tourism facilities as their disposable income is not enough to provide them a plate of standard food in any restaurants in Freetown. Local food stuff like pawpaw, mango, pineapple, etc are not affordable by local people to make them have a fruit after meal. All of these deprivations are as a result of low income earning. There is no way tourism can be developed in any country where the local people do not fully participate.

h) Lack of strong marketing strategies

Marketing is being viewed as one of the various ways the country can communicate with consumers in and out of the country about her products. Many developed and developing countries had embarked on selling their products through advertising in the various media. A good number of foreign and local markets are not adequately informed about tourism products in Sierra Leone. Adequate information especially through website is a major challenge for the National Tourist Board, Ministry of Tourism and Cultural Affairs and the private sectors. Printed brochures that are to be distributed free in all our embassies in the world could also help to sell the country image in terms of tourism.

i) Lack of tourism policy

One of the principal objectives of establishing a tourism policy is to guarantee and safeguard the effective standardisation of processes and practices within the respective tourism industry in which the policy is implemented. This standardisation fosters uniformity and consensus regarding practices which can result in increased sustainability and an overall improvement in the quality of the tourism product. Furthermore, an appropriate use of environmental and human resources should take place as a result of the implementation of a tourism policy. As it relates to application and enforcement of Tourism policies, thorough assessment and analysis must take place in order to identify disparities and missteps, an essential step towards maintaining consensus. It is this analysis which allows the development of a tourism policy that is specifically tailored to a territory or region, thereby addressing issues that are indigenous to the respective area targeted. Another advantage of having a sustainable tourism policy is to facilitate government's heightened involvement in the activities of the tourism sector. If policies are implemented, leading to decrees and laws being entered into force, the result should be an increased effectiveness and efficiency of tourism activities. The absence of tourism policy for Sierra Leone poses a challenge for the Ministry of Tourism and Cultural Affairs.

j) Weak linkage with international organisations

World Tourism Organisation (UNWTO) is the most widely recognised and the leading international organisation in travel and tourism today. It is a specialised agency of the United Nations. It serves as a global forum for tourism policy and a practical source of tourism know-how. With its headquarters in Madrid, Spain the World Tourism Organisation plays a central and decisive role in promoting development of responsible, sustainable and universally accessible tourism, with the aim of contributing to economic development, international understanding, peace prosperity and universal respect for and observance of human rights and fundamental freedoms. Member states are expected to pay yearly subscription to enjoy the benefits from the organisation. Sierra Leone has not been able to meet her commitment to the UNWTO and therefore does not benefit from supports in terms of training, research and projects.

k) Cost and standard of living

With the current trends of things in Sierra Leone, increased tax on imported drinks will eventually cause business not to order for such items any longer. As a result, they will disappear from the local market because of low demand. When tourists realise that these items such as beer is not available in the Sierra Leone market and want to enjoy drinking it when they visit the country will eventually select another destination with these basic goods. The money which should have been derived as the result of tourism activities will now be in another destination. Restaurants, guesthouses, hotels will begin to have dropped in visitors which will have negative impact on the industry.

L) Absent of regional offices

Regional National Tourist Offices are national tourist organizations founded with a view to promoting and creating the identity, and to enhance the reputation of tourism at regional level. Their mission also includes the planning and implementation of a common strategy and the conception of its promotion, proposal and the performance of promotional activities of mutual interest for all subjects in tourism in the region, country and abroad, as well as raising the overall quality of the whole range of tourist services on offer in the region and country. Such has not been actualised in Sierra Leone as it is only the National tourist Board that is based in Freetown

III. RESEARCH APPROACH

3.1. Research Design

The research design of this project was a non-experimental or a survey, one which determined the factors that inhibit the development of tourism in Sierra Leone. The researcher gathered extensive data from employees of Ministry of Tourism and Cultural Affairs, National Tourist Board, hoteliers, carriers, travel agencies and tour operators. To this end, questionnaire covering the purpose of the research was prepared and used to collect data.

3.2. Study Area

The tourism industry is one of the biggest sectors that gives employment to the people of Sierra Leone. The industry comprises owners of hotels, guesthouses, restaurants, airlines, travel agencies, tour operators and tourist handling agents.

3.3. Sample

In designing the research study, the researchers took into consideration the need to make inferences from the sample of the population in order to answer the research questions and also meet the research objectives. A sample size of 10 respondents from

each sector ,25 from the Ministry of Tourism and Cultural Affairs and National Tourist Board and 25 from five training institutions offering courses in tourism and hospitality management from certificate to higher national diploma.

3.4. Sampling Technique

In order to get very accurate result for this study, employees and owners of these tourism establishments who are directly involved in the activities of tourism and hospitality were concerned, thus selected. The simple random sampling method was used to select the sample from the population.

3.5. Method of Data Collection

Many methods were available to gather information, and a wide variety of information sources were identified. The most important issue related to data collection is selecting the most appropriate information or evidence to answer the purpose of the study. Data was collected from both primary and secondary sources. Primary data were captured through the use of questionnaires and personal interviews. Secondary data was collected using journals, textbooks, handbooks and manuals, review articles and editorials, as well as published guides. Data on the internet were located using search tools. The World Wide Web was searched for information.

3.6. Data Collection Instrument

In view of the nature of the topic, it was realized that a questionnaire would be the main and the most appropriate instrument to use. Questionnaires are an inexpensive way to gather data from a potentially large number of respondents. The researchers gave a serious thought to the wording of individual questions. This was done to ensure respondents answer objectively to the questions in the questionnaire.

3.7. Data Analysis

The data analysis involved reducing the raw data into a manageable size, developing summaries and applying statistical inferences. Consequently, the following steps were taken to analyse the data for the study. The data were edited to detect and correct, possible errors and omissions that were likely to occur, to ensure consistency across respondents. The data were then coded to enable respondents to be grouped into a limited number of categories. The Statistical Package for Social Science (SPSS version 17.0) was used to process and analyse the raw data. The Data was presented in tabular form, graphical and narrative forms.

IV. CONCLUSION

Despite the multifaceted characteristics and attractions of tourism, the sector is not to develop. The developments of the sector depend purely on the peace and security of the country. The process of developing the sector requires good marketing, market research, interpretation, orientation and promotion if the sector is to be successful. It is perceived that, the sector development depends heavily on intervention of the private sector. This development requires infrastructural support from the public sector such as good transport, communication networks, and public services such as water and electricity supplies.

The foreign tourists especially from Europe could be the backbone of the development of tourism industry in Sierra Leone and thus help bring prosperity to the nation. To continue to increase overseas earnings from tourism means hard work, especially the public, private and training institutions. Thus the proposed strategies aim at a better utilisation of existing capacity, resources and agents in Sierra Leone .In the area of co-operation between the public sector and the private sector and training institutions, the government must create an enabling environment for the private sector in the management of the tourism industry. Whether or not the industry will regain its lost glory depends upon the depth of commitment from the tourism industry, and the lessons learned from the present problems.

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Practices related to foot care among type II diabetes mellitus patients who attend diabetes clinics in General Hospital Kurunegala, Sri Lanka

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Abstract- Introduction: Diabetic foot problems are one of the key areas of attention and if not treated properly can lead to life threatening consequences like amputations. It can be prevented by self-care practices, early diagnosis and proper management. Therefore, patient's self-practice regarding foot care remains a mainstay of management.

Objective: To describe the level of practice of foot care among patients with Type II diabetes.

Methodology: This descriptive cross sectional study was conducted by recruiting a group of patients having diagnosed with Type II diabetes (N=384) from diabetic clinics of Provincial General Hospital Kurunegala. Interviewer administered questionnaire was used for data collection. Patient's practices on diabetic foot care were inquired. A scoring system ranging from 0-36 was utilized to analyze the responses given for level of practice. Data were analyzed by using SPSS version 20. The study was approved by the Ethics Review Committee of Post Graduate Institute of Medicine, Colombo, Sri Lanka.

Results: Mean age of participants was 58.2 years (SD ± 10) and male to female ratio was 1:3. 57% of participants were practicing self-foot examination. Regarding foot care practices, the mean practice score was 12.5, SD = 3.57, 95% CI 12.22 - 12.94. The minimum and maximum practice scores were taken 05 and 23 respectively. 89.8% participants had scored <50% of total practice score. Thirty nine (10.1%) took the practice score >50% of total practice score. There is a significant association between foot care practice with cellulites and fungal infections.

Conclusion: According to results, practices on foot care were unsatisfactory. Therefore patient education on self-care practice of foot should be incorporated into the routine care of patients with diabetes both in the hospital clinic and in the day to day practice. Examination of foot by clinic team, counseling, providing information and education during clinic sessions would help to improve this situation.

Index Terms- Care, Diabetes, Foot, Practice, Type II

I. INTRODUCTION

Chronic non communicable diseases (CNCD) have been becoming a major health problem worldwide due to its high contribution to death and disability [1]. High prevalence of CNCDs was due to demographic and epidemiological transition with increase of risk factors resulting from social and economic changes. According to World Health Organization [1], the four main types of CNCD were cardiovascular disorders, cancers, chronic respiratory disorders and diabetes. Out of CNCD's, diabetes has been becoming a rising major cause of morbidity

and premature death worldwide [1]. According to international diabetes federation [2], 371 million people were living with diabetes around the world and the prevalence of diabetes was 8.3% among the adult population by 2014 in Sri Lanka. Medically diabetes was defined as series of metabolic conditions associated with hyperglycemia caused by defects in insulin secretion, sometimes complicated by defects in insulin action [3]. "The definition of diabetes from a social point of view can be described as the burden of disease on the economy, in terms of both its costly treatment and the premature morbidity and mortality. From the individual patient's point of view diabetes was a lifelong condition requiring daily attention to self-care practices and was associated with anxiety and repeated visits to healthcare providers" [4]. Exposure to chronic hyperglycemia due to inadequate control of diabetes may result in micro-vascular and macro-vascular complications. Among them, neuropathy and ischemia are the major contributors of diabetic foot [4]. The 'diabetic foot' term describes any pathology results directly from diabetes mellitus or its long term complications [5]. Self-care practices are the most important measure of preventing diabetic foot problems. Therefore the aim of conducting current study is to find out the self-care practices among type II diabetes (DT2) patients.

II. OBJECTIVE

Practices related to foot care among type II diabetes mellitus patients who attend diabetes clinics in Provincial General Hospital Kurunegala, Sri Lanka

III. METHODOLOGY

This study was a Hospital based descriptive cross sectional study. The study was conducted at Diabetes clinics in provincial General Hospital Kurunegala (PGHK), situated in North Western Province, Sri Lanka. The study was started at March of 2015 and it was continued up to January 2016. Data collection was done at August 2015. Patients aged more than 18 years, diagnosed with DT2 and followed up in diabetes clinics for more than one month in PGHK were included in to study. Staff members of the hospital were excluded as they may be having self-care practices different from other patients. Those who were not having ability to express their views and ideas rationally also excluded. Sample size was calculated using the standard formula [6]. The size of the final sample was 384. Systematic random sampling method was utilized to select the study subjects. Interviewer administered questionnaire used as a study instrument. Other data were collected by brief examination of the foot and referring

diagnostic cards and clinic books. The “Nottingham assessment of functional foot care questionnaire” [7] which was a validated instrument for foot care practice was used to assess the foot care practices. This contained some questions not relevant to the Sri Lankan social and cultural situation. Those questions were removed after a discussion with experts. The formulated questions covered the following, information on self-foot examination and barriers to do so, important practice areas regarding cutting toenails, wound care, foot-wear usage and self-care of foot. Practice score computed by allocating marks to each response of a particular question. Good foot care practice was included for participants who scored $\geq 50\%$ of total practice scores. Poor foot care practice was included for participants who scored $< 50\%$ of total practice scores [8]. Data was processed and analyzed by using statistical package for social sciences (SPSS version 20). The chisquare (χ^2) test was used to assess the associations of categorical variables. The mean, standard deviation (SD), standard error and confidence interval (CI) were used to assess some quantitative variables. The level of significance was taken as 0.05. The ethical clearance for the study was obtained from the Ethical Review Committee of the Post Graduate Institute of Medicine, University of Colombo, Sri Lanka.

IV. RESULTS

Socio - demographic characteristics.

Study sample was comprised of patients coming from different socio-demographic settings. Their practices of foot care may vary with socio-demographic characteristics.

1. Distribution of sex of the sample

Characteristic	No (%)
	N=384
Sex (Male : Female)	98:286 (1:3)

2. Distribution of age of the sample

Age group	No (%)
	N=384
≤ 60	210 (54.6)
> 60	174 (45.3)
Total	384 (100)

Mean	Minimum	Maximum	SD
58.2 years	23 years	86 years	10 years

3. Distribution of practice score

Characteristic	No (%) (N=384)
Foot care knowledge score	
Mean	12.5
Standard error	0.19
Standard deviation(SD)	43.57
95% confidence interval (CI)	12.22 – 12.94
Minimum	05
Maximum	23
$\geq 50\%$ of total score	39 (10.1)

$< 50\%$ of total score	345 (89.8)
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4. Distribution of common practices regarding foot care

Characteristic	No (%) - Yes (N=384)	No (%) - No (N=384)
Allocate adequate time to self-foot examination	371(96.6)	13(3.4)
Perform self-foot examination	220(57.3)	164(42.5)
Cut toe nails	376(97.9)	08(2.1)
Check shoes before put them on	190(49.5)	194(50.5)
Check shoes before take them off	60(15.6)	324(84.4)
Use footwear at home	79(20.6)	305(79.4)
Gradual usage of new shoes	65(16.9)	319(83.1)
Washing feet	384(100)	00
Make foot dry after washing	135(35.2)	249(64.8)
Put a dry dressing on graze, cut or burn when get one	250(65.1)	134(34.9)
Apply moisturizing cream on foot	56(14.6)	328(85.4)

5. Frequency of cut nails and walk outside with bare foot.

Characteristic	No (%)
Frequency of cutting toe nails (n=376)	
About once a week	170 (54.2)
About once a month	188 (50)
Less than once a month	18 (4.8)
Total	376 (100)
Frequency of walk outside bare foot (N=384)	
Often	109 (28.4)
Sometimes	88 (22.9)
Rarely	33 (8.6)
Never	154 (40.1)
Total	384(100)

6. Distribution of washing feet and gradual usage of new shoes

Characteristic	No (%)
Frequency of washing feet (N=384)	
More than once a day	364(94.8)
Once a day	20 (5.2)
Total	384 (100)

Gradual usage of new shoes	(n=65)
Always	31 (47.7)
Most of the times	23 (35.4)
Sometimes	06 (9.2)
Rarely	05 (7.7)
Total	65 (100)

Absent	26 (66.7)	287 (83.2)	df = 1
Total	39 (100)	345 (100)	P = 0.01

7. Distribution of information on drying foot after washing, footwear inspection, footwear use at home, put a dry dressing on graze, cut or burn.

Characteristic	Often No (%)	Sometimes No (%)	Rarely No (%)	Total No (%)
Frequency of feet is drying after washing	78 (57.8)	48 (35.6)	09 (6.7)	(n=135) 135(100)
Frequency of checking shoes before put on	115(60.5)	58(30.5)	17(8.9)	(n=190) 190(100)
Frequency of checking shoes before take off	35(58.3)	16(26.7)	09(15)	(n=60) 60(100)
Frequency of using foot wear at home	49(62.0)	21(26.6)	09(11.4)	(n=79) 79(100)
Frequency of put a dry dressing on graze, cut or burn when you get one	133(53.2)	78(31.2)	39(15.6)	(n=250) 250(100)

8. Association of foot care practice with age and sex.

There is no significant association between foot care practice with age and sex.

9. Associations of foot care practice with foot ulcers, cellulites and fungal infections

N=384

Characteristic	Practice of foot care		χ^2 df P
	Good Number (%)	Poor Number (%)	
Foot ulcers			
Present	05 (12.8)	29 (8.4)	$\chi^2= 0.85$
Absent	34 (87.2)	316 (91.6)	df = 1
Total	39 (100)	345 (100)	P = 0.36
Cellulites			
Present	10 (25.6)	28 (8.1)	$\chi^2= 12.06$
Absent	29 (74.4)	317 (91.9)	df = 1
Total	39 (100)	345 (100)	P = 0.001
Fungal infection			
Present	13 (33.3)	58 (16.8)	$\chi^2= 6.35$

There is a significant association between foot care practice with foot cellulites and fungal infections. But there is no significant association between foot care practices with foot ulcers.

V. DISCUSSION

Foot problems are disabling complication and common among people with DT2 [5]. It is crucial that diabetic patients should have good foot care self-management skills and foot care practice to prevent foot complications. The aim of conducting the current study was to find out the practices regarding foot care among DT2 patients. There were 384 diabetic patients from diabetes clinics in Provincial General Hospital Kurunegala, Sri Lanka were included into this hospital based descriptive cross sectional study. The main objectives of the current study were to describe, socio-demographic factors and practices related to diabetic foot care. Patients aged more than 18 years, diagnosed with DT2 and followed up in diabetes clinics more than one month in PGHK were included in to the study. Diagnosis should be confirmed by a clinician by written documents. This was improved the reliability of study. Interviewer administered questionnaire was used to collect data. Scoring system was used to formulate practice score. Level of significance used as 0.05. Chisquare test (χ^2) used to test associations between practice scores and selected variables. The important findings of the current study are as follows. Mean age of participants was 58.2 years (SD ± 10) and male to female ratio was 1:3. Regarding foot care practices, the mean score was 12.5. Majority of participants (89.8%) had scored <50% of total practice score. Strengths of the study were that sample was drawn by systematic random sampling method which is a probability sampling method and adequate sample size taken. Current study methodology was designed to achieve 100% response rate. Pretested Interviewer administered questionnaire was used as study instrument due to differences in comprehension of patients, as they were in different educational levels. Data were collected within short period of time. Therefore recall bias may be there due to that (Participants did not have adequate time to recall). It was possible to overcome this recall bias, if used a self-administered questionnaire instead of interviewer administered questionnaire. But it was impossible to take self-reported data at the busy clinic setting without disturbing routine clinic work and it may further cause information bias due to differences in educational levels of patients. According to current study results, Male to female ratio was 1: 3; mean age of study participants was 58.2 years. Majority of them were belong to >60 years age group. According to another study conducted in Sri Lanka, mean age of participants was 58.4 years and 70% of participants were belong to >50 years age group [9]. These findings are consistent with current study. Another study conducted in Sri Lanka revealed that male to female ratio was 1:9 which is not consistent with current study findings [10]. These high female ratios in this study population due to, clinics were conducted on weekdays while more male patients at work compared to females. Overall foot care practice

principles were unsatisfactory in current study sample. The mean practice score was 12.5. Majority of study sample (89%) had poor foot care practices. Study findings of Desalu et al. [11] also revealed that 89.8% of study sample had poor foot care practice, which is consistent with current study findings. A majority of study subjects (57%) said they inspected their feet one or more times a day. This finding is consistent with the study carried out by George et al. [8], where it was found that 71% of the participants take care of their feet regularly. About 94% of study sample was washing their feet once or more regularly. Washing feet with water and soap keeps them clean and gives good chance to do daily inspection. This is a common regular practice of most of the Sri Lankan settings. There were 35% dried feet after washing. This practice is unsatisfactory because if moisture stays especially in between toes, bacteria and fungus can grow, which can lead to infection. There were 65% study subjects put a dry dressing on graze, cut or burn to prevent possible contamination of wound. There are some more weaknesses as well as strengths in the practices regarding foot care identified from current study. While majority (79%) walked bare foot at home, only 60% of them walked barefoot at outside. Walking bare foot at home is a usual practice in most Sri Lankan households. Walking outside with bare foot is a more risky behavior than walking barefoot inside the home. Jayasinghe et al. [12] also confirmed that the link between foot ulceration and footwear usage by showing that barefoot diabetics had a risk ratio of 2.21 of foot ulcers, compared with footwear users. In a study done in India, 87.3% of study subjects said that they walked barefoot indoors [8]. This is consistent with current study findings. Majority of study subjects had poor shoe care practices. Of them 49% checked shoes before put them on. Only 15% checked shoes before takeoff. According to Desalu et al. [11], 61.4% of participants were unaware of inspecting inside shoes for foreign objects which is consistent with current study. On analysis of foot care practices presence of cellulites ($p=0.001$) and fungal infections ($p=0.01$) of foot were significantly associated with poor foot care practices which shows link between poor foot care practices with foot complications.

VI. CONCLUSIONS

This study was conducted on 384 DT2 clinic patients at Provincial General Hospital, Kurunegala. Of the study sample, majority was in >60 years age category. There was a female predominance. Presence of cellulitis and fungal infections was significantly associated with foot care practice, but foot care practice was not significantly associated with foot ulcers. Mean practice score was 12.5 ± 0.19 . $SD = 3.57$. 95% CI 12.22 - 12.94. The minimum and maximum practice scores were taken 05 and 23 respectively. Only thirty nine study subjects (10.1%) had a practice score of more than 50% of total practice score. When considering practices of foot care, 96.6% could allocate time for self-foot examination, but only 57.3% were performing self-foot examination. Majority (97.9%) cut their toe nails. Of them 50% were doing it once a month. Shoes were checked before put them on by 49.5%. Majority (84.4%) were not inspecting shoes before takeoff. There were 79.4% who barefoot at home. There were 40.1% never walk outside without footwear. There were minority (16.9%) using new shoes gradually. Whole study sample was

practicing washing of feet. Of them 94.8% were washing their feet more than once a day. There were 35.2% wiping foot after washing. Majority (65.1%) put a dry dressing when get a graze, cut or burn. There were 14.6% applying moisturizing cream on feet. Of them, another 16.1 % were applying moisturizing cream in between toes.

VII. RECOMMENDATIONS

The following recommendations could be made after understanding of the present study.

1. Current study shows practices regarding foot care are poor in most of the study areas in the clinic patients. These findings can be used as guidelines for health education program on foot care for people with diabetes. Emphasis should be paid on these deficient areas during health education programs.

2. The poor foot care practice may be due to lack of communication between the healthcare professionals and the patients. Poor counseling skills, lack of time allocation by the doctors and nurses as result of busy clinic schedule may be the reason for this. Therefore, patient education on self-care management of feet is important and should be incorporated into the routine diabetes care both in the clinic and in the community. Time must be allotted to counseling, providing information and education during clinic sessions.

3. Some factors elicited in this study could influence on some practice areas of foot care, such as foot wear usage and washing of feet. Health education programs should be conducted on targeting these areas.

4. The present study gives an opportunity for future researches in this area. It is better to conduct studies with larger study sample with comparative groups to compare this group with the normal population or another vulnerable group.

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Determinants of Loss to Follow-Up in Patients on Antiretroviral Treatment Attending Kipipiri Sub-County Comprehensive Care Clinic of Nyandarua County

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Abstract- Background: In Kenya the number of Human Immunodeficiency Virus (HIV) infected people eligible for initiation of antiretroviral Therapy (ART) is increasing. The national ART comprehensive care Clinic programmatic success requires that patients who are taking ART remain on treatment and are followed up regularly to ensure they adhere to treatment protocol and to reduce cases of drug resistance and arising toxicities. This study investigated factors associated with being lost to follow-up, in a cohort of patients enrolled in HIV comprehensive care clinic at Kipiripiri of Nyandarua county.

Methods: This was a retrospective observational cohort study performed at one of the Medunsa National Pharmacovigilance Centre's (MNPC) ART sentinel surveillance sites. Loss to Follow-up (LTFU) was defined as "a patient who had been followed up at the sentinel site, who had not had contact with the health facility for 180 days or more since their last recorded expected date of return or if there were 180 days or more between the expected date of return and the next clinic visit".

Results: Out of 51 patients, 65.5 % ($n = 390$) were female and 23.4 % ($n = 139$) were LTFU. The median time on ART before LTFU was 20.4 months (interquartile range: 12.9 – 34.7 months). The incidence rate of LTFU was 6 per 1000 person-years in the first year on ART and has increased to 8 per 1000 person-years in the 6th year of taking ART. Factors associated with becoming LTFU included not having a committed partner (Adjusted Hazard Ratio (aHR): 2.9, 95 % Confidence Interval (CI):1.19-6.97, $p = 0.019$), being self-employed (aHR: 13.9, 95 % CI:2.81 - 69.06, $p = 0.001$), baseline CD4 count > 200 cells/ml (aHR: 3.8, 95 % CI: 1.85-7.85, $p < 0.001$), detectable last known Viral Load (VL) (aHR: 3.6, 95 % CI:1.98 - 6.52, $p < 0.001$) and a last known World Health Organisation clinical stage three or four (aHR: 2.0, 95 % CI:1.22-3.27, $p = 0.006$). Patients that previously had an ART adverse event had a lower risk (aHR: 0.6, 95 % CI: 0.38 - 0.99, $p = 0.044$) of becoming LTFU than those that had not.

Conclusion: The incidence rate of LTFU increases with additional years on ART. Intensified measures to improve patient retention on ART must be prioritised with increasing patient time on ART and in patients that are at increased risk of becoming lost to follow-up.

Index Terms- Loss to follow-up Surveillance cohort Medunsa National Pharmacovigilance Centre Antiretroviral therapy

I. INTRODUCTION AND LITERATURE REVIEW

Lost to follow-up doesn't have consensus definition. Many research and programs have agreed that any patient who doesn't turn up for treatment for a period of over 30 days should be classified as lost to follow-up (Medecins Sans Frontieres, 2013)

The problem of LTFU (Lost To Follow-Up) among HIV/AIDS infected patients has become a contributing factor to increased death among all age groups that is especially among the productive young men and women around the globe (WHO Bulletin 2014). This has stimulated more researchers to dwell on the subject. In South Africa, a research done on "lost opportunities to complete CD4+ lymphocytes testing to HIV positive patients" revealed that a good number could not return after the initial CD4+ cell count which makes it difficult to initiate ART as early as practicable (WHO Bulletin 2008-pdf)

Infected individual transmit the disease from one partner to the next especially if he/she has several partners and refuse treatment. This therefore contributes to the high infection rate especially in the developing counties of the world (WHO 2010). Those who are mostly affected are the deprived of the society who live in slum and rural areas where most of them become LTFUs (PLHIV Nephark 2010).

A part from Diabetes and Hypertension, LTFU among HIV/AIDS patients contributed significantly to increased morbidity and mortality in the sub-county. The prognosis of people living with HIV/AIDS depends on how well they take their highly highly active antiretroviral therapy (HAART) and good nutrition (WHO 2010).

Previous Researches have focused on LTFU among patients on ART in other areas, this Research will attempts to investigate possible factors leading to an increasing Lost to follow-up among people Living with HIV and are receiving care in the Kipipiri sub-county hospital.

Recent reports from Kipipiri sub-county hospital indicate an increase in the rate of The Topic was selected because of some practical problem in implementing quality care to all HIV patients in the Health facilities within the Sub-County due to the increased rate of LTFU despite numerous supports from various Donors. According to Rebecca hodes (2010), patients default and become LTFU due to system failure. Methodology used in handling newly diagnosed clients in the facilities has a significant impact on the retention rate of clients. The consequence of LTFU are enormous, those who stop treatment risk death from HIV/AIDS complications and remain a huge

source of disease transmission to uninfected cohort. Conversely, those who properly adhere to their treatment regime have been known to survive period exceeding seven years (Global AIDS Epidemic 2006). The problem of LTFU among HIV patients therefore needs to be addressed if quality care in the sub-county is to be attained.

1.2 Problem Statement

There is a rising trend of lost to follow-up among HIV/AIDS clients in the world especially in the developing countries. This has contributed to the increase in death rates which currently stand at 39 million people, worldwide (Global Health Observatory Data 2016). Kenya, has experienced the problems of LTFUs in various health facilities including those in Kipipiri sub-county. The fact that this problem continue despite HIV services being rendered free is even more puzzling. Clients are accorded free services but still disappear from the program. There is need therefore to conduct a study on the prevalence and factors influencing LTFU for the purpose of recommending preventive strategies in the sub-county and beyond.

1.3 Purpose of the study

The purpose of this study is to establish the prevalence and the factors contributing to lost to follow-up among HIV/AIDS patients in the Sub-county Health Facilities.

1.4 Specific Objectives

The objectives of the research project are to:

1. Establish the prevalence of lost to follow up among HIV/AIDS patients in the sub-county hospital.
2. Identify factors influencing LTFU among HIV/AIDS patients in the sub-county.

1.5 Research questions

1. What is the prevalence of LTFU among HIV/AIDS patients in the Sub-County Health facilities offering ART services?
2. What are the factors responsible for LTFU among HIV/AIDS patients in the sub-county?

1.6 Significance of the study

The significance of the study will be to increase access to quality HIV care to all HIV positive patients in the Health Facilities and improve literature on LTFU among HIV/AIDS patients in Nyandarua County.

1.7 Limitation and Delimitation

1.7.1 Limitation

The researcher will have to control over the adequacy of the data available in the health facilities.

1.7.2 Delimitation

The researcher has chosen to do the study in selected hospitals only.

1.8 Definition of terms

LTFU : In this context means patients who is on treatment but has failed to turn up after six months of initial visits

WHO : World Health Organization responsible for health policy formulations and research

II. LITERATURE REVIEW

2.0 Introduction

Many research works around the world have been done on LTFU among HIV/AIDS patients in different programs. A study done in UCSF Medical Center in 2008 among 1631 HIV patients in Johannesburg, South Africa, showed that about 267 adults (16.4%) on HAART discontinued treatment and were lost to follow-up during the study period. About 75% of the Lost to follow-up complained of unemployed and cost of drugs. These findings were consistent with findings of a similar study conducted among adults on HAART at a Hospital in Nairobi Kenya, (UCSF 2008). According to Lessells et al (2011) the retention rate of HIV patients on HAART is high amongst the group with lower initial CD4 cell count compared to those with high CD4 cell count. This might be the case in Kipipiri sub-county but since no research has been done it cannot be ascertained.

There is a high rate of LTFU among children with HIV/AIDS in Kenya. According to Braitsein (2010), 18% of children being followed up in Moi Teaching and Referral Hospital were LTFU (paula Braitsein us, int. AIDS Conference 2010). This could be due to sickness or malnutrition which together contributes to high mortality in this age group.

2.1 Meaning of LTFU

A patient is considered as lost to follow - up when his /her last follow up visit occurred during the last 6 months after starting HAART. This period of 6 months interval was chosen to accommodate the longest interval between visits in participating programs. (WHO Bulletin 2015). Though the concept of LTFU appears straightforward, its precise definition remains controversial. In other places, 'Lateness' for scheduled appointments is often used to describe the phenomenon, but the actual time intervals employed vary greatly among programs. In Zambia patients were classified as 'Late' when they were more than 30 days past their last scheduled appointment date. Medicines Sans Frontiers (Doctors without Borders) defined loss to follow-up as being more than **2- months** late for a scheduled appointment. In Malawi, LTFU is defined as a three month absence from the last visit. Wools-Kaloustian define lost to follow- up in Western Kenya as patients who have missed appointment for more than 2 months (American Medical Journal 2009).

In most practices a patient considered as lost to follow-up if he/she has not come for ARVs refill or review for 3 consecutive months after the last appointment. They are confirmed as lost to follow up if efforts to trace them have failed (AMREF ART Hub et al 2014). Lost to follow-up therefore is a concept devoid of a standard definition. It is described differently by different institutions. Nevertheless, its core meaning encompasses a missed treatment dose or appointment for a certain period of time.

2.2 Reasons for LTFU

There are various reasons for LTFU; a study of 6411 patients enrolled on ART between March 2001 and June 2007 showed a total of 627 patients (9.8%) were LTFU, 85 (28.8%) of them had died within three months after their last clinic visits. The other reasons advanced for LTFU include; cost of treatment, stigma, deteriorated health, fear of side effects, and loss of hope in medication. Substance abuse and lack of money for transport and work or family responsibilities have also been cited as reasons for LTFU (Gilles et al 2008). In Malawi Julia Luebbert (2010) observed that long distances, death, transfer to another clinic and treatment holidays (where patients take treatment gap even though they had not run out of pills) contribute immensely to LTFU

According to World Health Organization volume (2008) Lost to Follow-up among HIV/AIDS clients above 16 years of age in Africa, Asia and South America showed it occurred in the 6 months after starting ART, about 3.8% (211) were not seen after ART initiation, 880(16.0%) were lost to follow-up later on and 141(2.6%) were known to have died in the first 6 months. The main reason for LTFU in these regions was mainly financial. (WHO Bulletin 2008).

In Kenya some of the reasons identified for LTFU were: self transferal where a patient decides to transfer from a clinic to another without transfer letter, another reason was death especially when their next of kin doesn't report to the caregiver of the incidence and denial. (AMREF ART Hub May 2011).

2.3 Effects of Lost to Follow-up

Lost to follow-up among HIV patients contribute significantly to the increase in death rate in majority of the health facilities offering HIV treatments and care (WHO 2010). HIV is responsible for over **39 million** deaths worldwide. Lost to follow-up leads to severe illness among those who abandoned their treatment. About 49, 752 HIV patients being followed up in Kenya, Uganda and Tanzania, 11 682 of them were LTFU, of whom 18.6% didn't return after their initial visit and 5.3% had died (UN Report 2010).

Lost to follow up impacts negatively on the provision of quality care to affected and exposes discordant couples to infection.

III. METHODOLOGY

3.0 Introduction

An overview of the methods to use in the study is presented in this section. These methods are as follow:

3.1 Research Design

This will be a cross-sectional study design.

3.2 Location of the study

Kipipiri Sub-County is found in Nyandara County in central region. It measures about 544 square kilometers. This sub-county was carved from larger Nyandarua south and gazetted in 2009. It has four wards namely wanjohi, kipipiri, Githioro and Geta

3.4 Target Population

The targeted population for the study

1. All HIV patients who are registered for follow-up in the Health Facilities, both active and LTFU.

3.5 Sampling Technique and Sample Size

All charts of the patients who have been registered for care at the facility from 2010 to 2015 will be interviewed for determination of success of follow-up.

3.6 Data Collection

Data will be obtained from patients charts available at the facility.

3.7 Data Collection Instruments

Observation checklist and structured questionnaires will be used to determine presence or absence of the variables of interest.

The researcher will use closed-ended questions to most of the structured ones and the respondents will be required to mark in the box that matches the correct answer. Other questions, however, will require respondents to give their opinions.

3.8 Data Analysis

Descriptive data will be analyzed using the aid of computer software program-the students package for social sciences.

4.1 Findings

The data of LTFU was obtained from five facilities which are offering HIV services in the sub-county. The researcher also compiled data of active PLHIV from the same facilities so as to get comparisons prevalence of clients who are not on care

4.2 Data Analysis

The following table shows the number of LTFU and Active HIV Clients from the various HIV treatment sites in Kipipiri Sub-county

Table I: Total number of LTFU and Active clients in the sub-county

Number		LTFU	ACTIVE	TOTAL
1	Manunga Health Centre	56	193	249
2	Wanjohi Health Centre	70	219	289
3	Geta Bush Health Centre	25	228	253

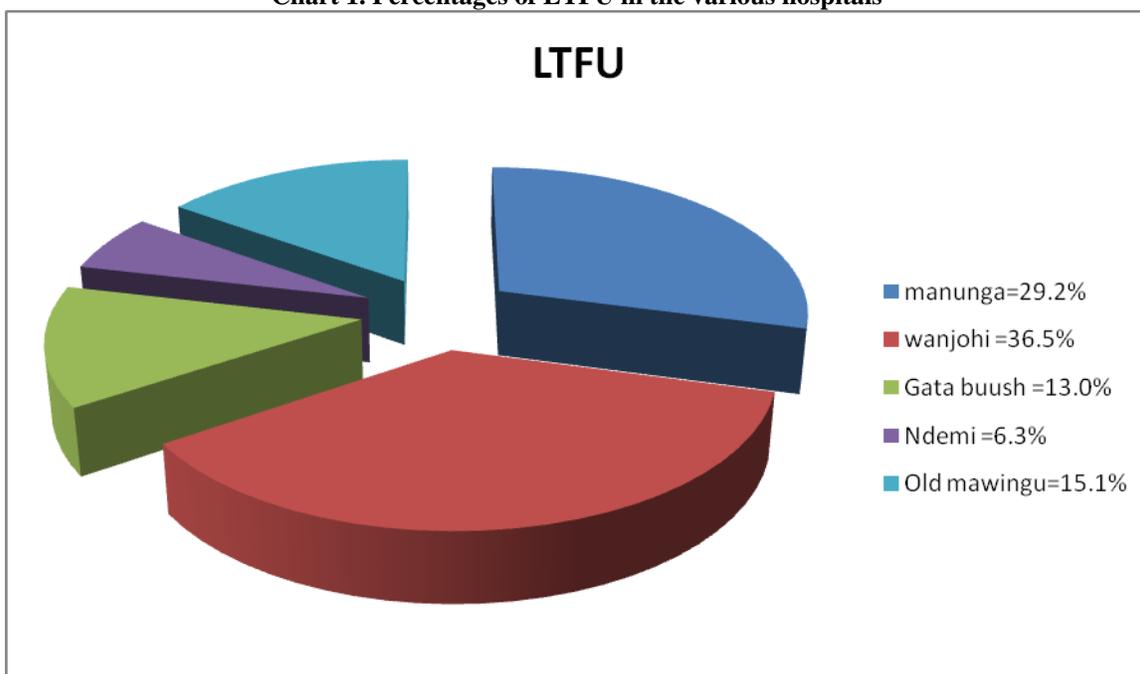
4	Ndemi Health Centre	12	43	55
5	Old Mawingu Health Centre	29	56	85
TOALS		192	739	921

These figures were obtained from clients data dated from the year 2011, a time when most of the HIV care clinics were started. The total numbers of LTFU from all the facilities as at April 2014 were 192 clients, translating to 20.84% of the total clients (n= 921). Wanjohi Health centre and Manunga Sub-county Hospital have the highest number of LTFU

IV. FINDINGS AND DISCUSSIONS

compared to the other facilities.

Chart 1. Percentages of LTFU in the various hospitals

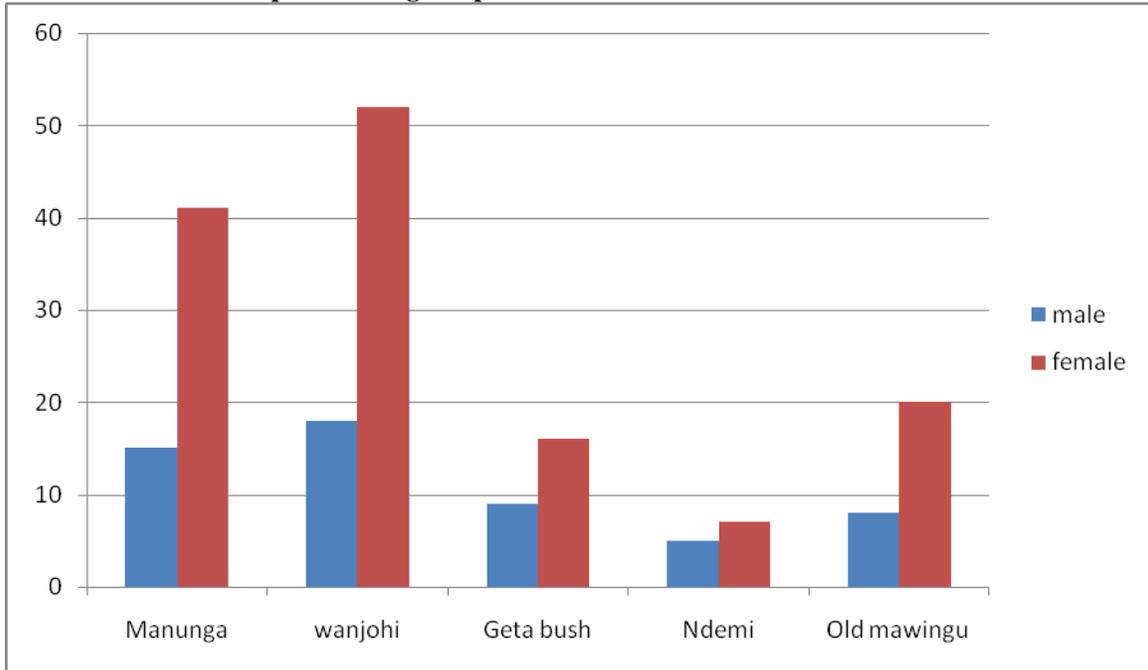


Number of LTFU can also be distributed according to age group and sex from the various facilities

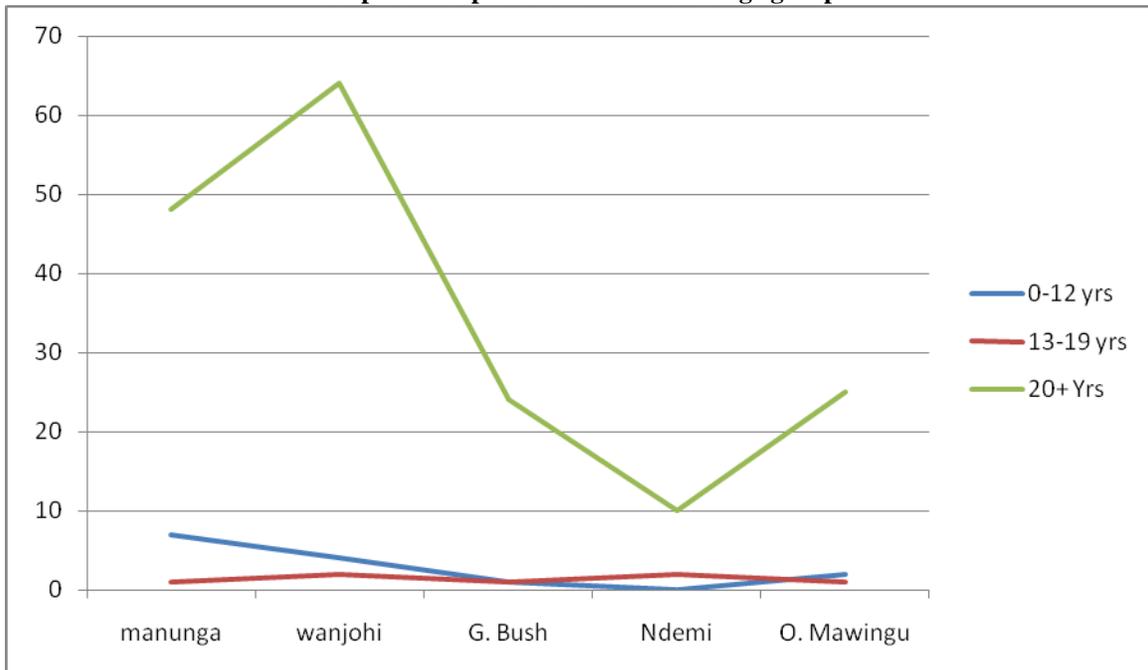
Table: 2 FACILITIES	0 -12 (children)		13 - 19 (Teenage)		+ 20 (Adults)	
	M	F	M	F	M	F
MANUNGA HC	4	3	0	1	11	37
WANJOHI HC	3	1	0	2	15	49
GETA BUSH HC	1	0	0	1	8	15
NDEMI HC	0	0	1	1	4	6
OLD MAWINGU	1	1	0	1	7	18

TOTAL	9	5	0	6	42	124
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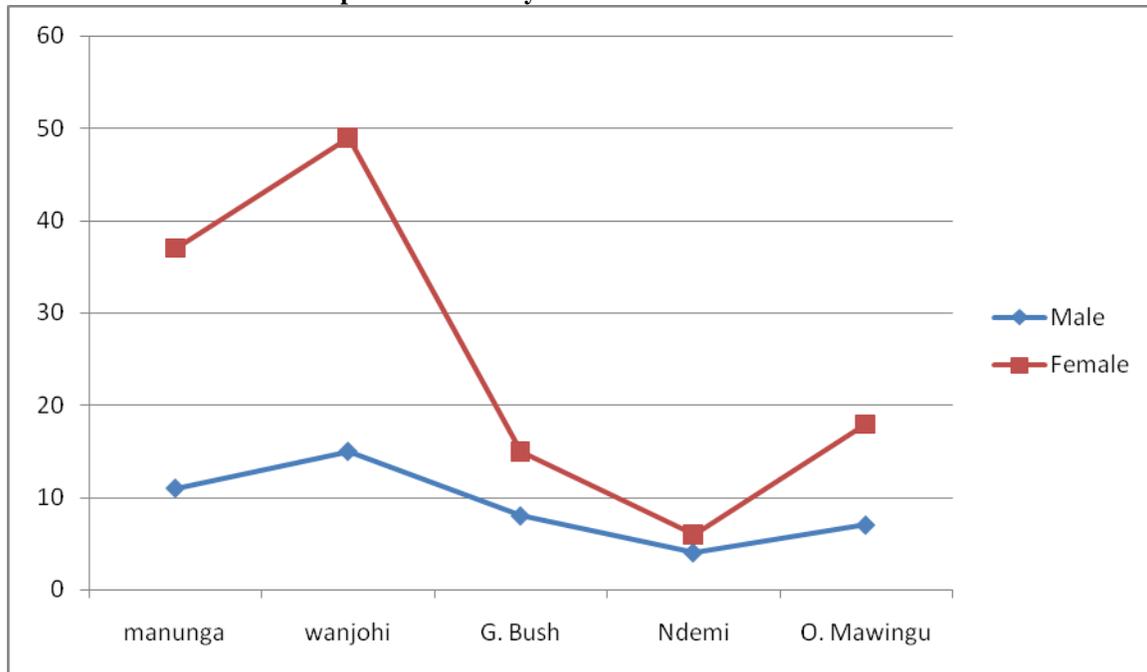
Graph.1 showing comparison between male and female LTFU



Graph 2: Graph of LTFU based on Age group



Graph:3 LTFU 20+ yrs distributions based on Sex



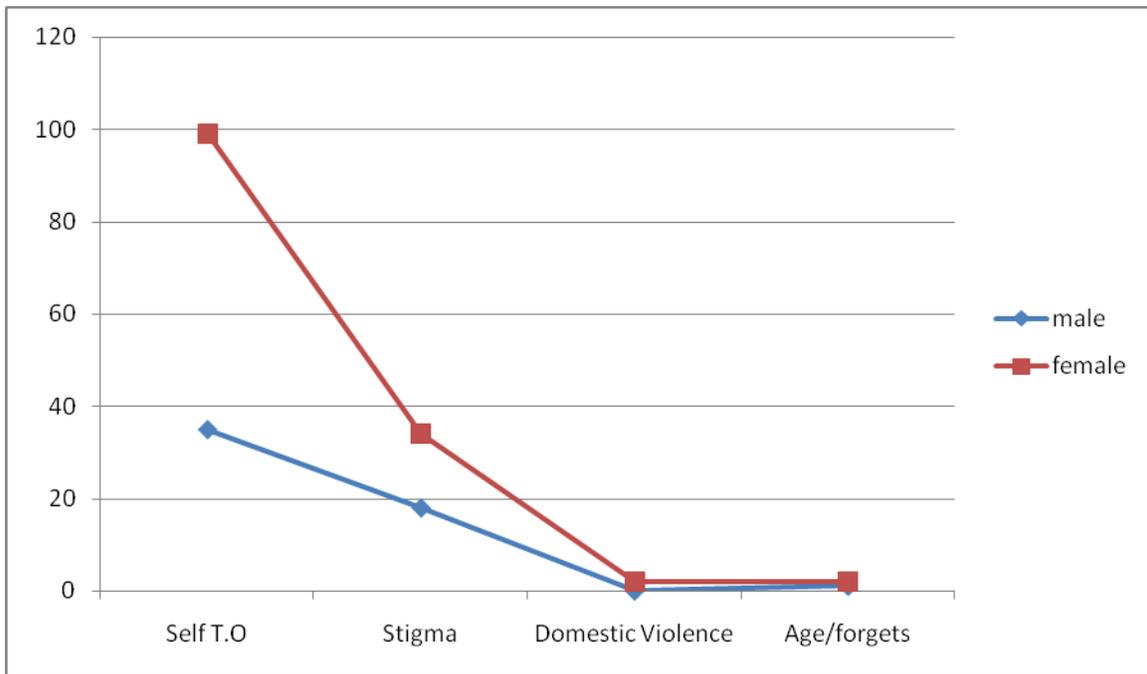
This graph shows more females were not in program compared to male of the same age set in all the facilities where data was taken.

There are various reasons which was given as contributing factors to LTFU among PLHIV in the facilities and tabulated as shown below.

Table: 3 Reasons for LTFU in comparison of male and female

Reasons For LTFU		Male	Female
Self Transfer (distance)	Manunga	12	41
	Wanjohi	9	29
	G/Bush	4	11
	Ndemi	3	3
	O/mawingu	7	15
Stigma	Manunga	3	0
	Wanjohi	9	23
	G/Bush	3	4
	Ndemi	2	4
	O/Mawingu	1	3
Domestic violence	Manunga	0	0
	Wanjohi	0	0
	Geta Bush	0	0
	Ndemi	0	0
	Old Mawingu	0	2
Forgets (Age)	Geta Bush	1	2

Graph.4 showing reasons of LTFU and Sex Mostly affected

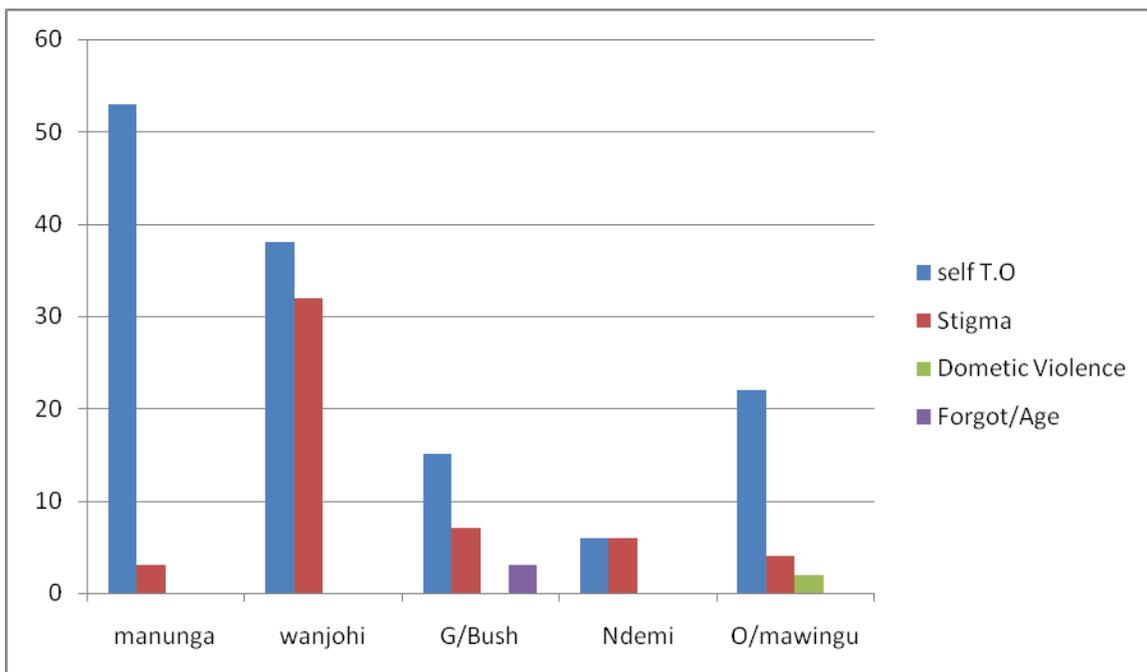


Most of the patients contacted through phone call had either transferred to nearest facilities of their choice and some were just at home claiming they were not sick. Those who were married didn't want their relatives to know their status and therefore opted not to come to their respective facilities where most of their relatives seek medication from common illnesses.

The few female clients who became LTFU claimed they had domestic quarrels with their partners when they turned HIV position during their antenatal care visits. They claimed for them not coming for HIV care could safe their marriage.

The few who forgot return dates were elderly who many times stay alone at their respective homes in the village.

Graph. 5 Bar graph comparing the findings in the facilities



Manunga sub-county hospital has the highest number of patients who transferred themselves to their hospitals of choice. The major reasons to why majority of the clients transferred sited

were distance from their village and some had gotten employment at Nairobi.

4.3 Discussion

The data obtained from the sampled facilities shows a prevalence of 20.84% (LTFU) with the highest percentage seen at Wanjohi health centre (36.5%). Ndemi health centre has the lowest prevalence of LTFU (6.3%) probably due to the lowest number of clients enrolled in care of which the peer educator is able to make follow-up of every client who miss appointment.

The major contributing factors to LTFU in the sub-county are self transfers standing at 134 = 67.8% (n=192) and stigma among clients, 52 = 27.1% (n=192). Cost of drugs or death plays minimal role if any, in the sub-county as ART are offered free to the clients. Most of deaths reported were not LTFU but had succumbed due to the chronicity of the infection and delay in diagnosis. Majority of the clients contacted through phone call claimed they had relocated and therefore seeking medication to the nearest health facilities and some claimed they were not sick and hence decided not to seek care. This is majorly due to stigma of disclosure.

The young and teenage clients who were LTFU either lacked support from the immediate care giver mainly the grandparents as they were orphans while some had relocated with their parents who were also not in care.

From the data, majority of clients who were LTFU were female, 138 (71.9%) against male 54(28.1%)

V. CONCLUSION AND RECOMMENDATIONS

5:0 Conclusions

What came out from the data obtained is that majority of patients become LTFU due to self transfer or stigma. Despite the ragged landscape, most of patients questioned didn't term it as a problem. Majority of the residence in the sub-county are farmers therefore get their livelihood from farm produce

There is no patient who claimed to have lacked money for fare that could have contributed to LTFU. This is because majority of them sell agricultural produce hence have sufficient funding

The prevalence of LTFU is relatively here in the sub-county and this therefore calls for more researches to look at the cause of self-transfer and how to reduce stigma among PLHIV

5.1 Recommendations

There is need to open more HIV care clinics in every dispensary in the sub-county so as to reduce the rate of LTFU. Some of those who transferred themselves claimed distance and some gave reason of employment.

There is need to improve counseling skills and involve partner testing for HIV. This will reduce stigma especially to the married couples and those who have sexual partners. Some of those who refused treated sited threats from their partners and fear of being known to have the virus. The elderly clients living with HIV need to stay with care takers who will be their

treatment supporter. This will properly improve adherence and reduce LTFU cases among such age group

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4.0 Budget

1. Review of Literature: Apart from available journals, the researcher will require approximately Ksh 3,000.00 for extracting literature from the internet.
2. Transport and lunch to the Health Facilities : kshs 4500
3. Typing and printing of the research findings:
 - a) Printing materials(one rim papaer) @Ksh 450.00
 - b) Pens (5) @Ksh 15.00
 - c) Pencils (Five) @Ksh 10.00 each
 - d) Scientific calculator @Ksh 250
 - e) White wash @Ksh150
 - f) Rubber (3) @Ksh 20.00 each

APPENDIX B

Time frame

February 2016 : Review of Literature

: Draft Literature review, agree research strategy with supervisor

March 2016 : Data collection from health facilities; compile, pilot and administer questionnaire
plus final collection of questionnaire

: Data analysis

April 2016 : Final writing of research project report

APPENDIX C

CONSENT FORM:

I.....the in-charge ofHealth Centre authorizes this day of2016, Christopher Garama Mramba to collect data of PLHIV in the clinic for the purpose of conducting research

Date..... Signature.....

CHECKLIST

1. County.....
2. Sub-county.....
3. Health facility name with comprehensive care clinic.....
4. Sex of clients
5. Age of the clients; 0-12..... 13-19 20+.....
6. Self Transfers out; male..... female.....
7. Those who became LTFU due to stigma.....
8. Those who forgot to return for care.....
9. Domestic violence.....
10. Other reasons which contributede to LTFU.....

APPENDIX E

KIPIPIRI SUB-COUNTY MAP, NYANDARUA COUNTY



Corruption in Sports in India

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Abstract- Corruption already existed at the time of the “good old” Olympic Games of the Antique Era.

And it continues to exist in modern competitive sport. Corruption plagues all major Indian sports, including cricket, hockey, weightlifting, and athletics. The 2010 IPL franchise bidding process also led to the resignation of Shashi Tharoor, Minister of State for External Affairs, whose friend and current wife, Sunanda Pushkar, was alleged to have received \$15 million in ‘sweat equity’ from one of the franchises. Appalled in the June 2010 by the Commonwealth Games corruption scandal, former Indian Olympians launched the Group of Clean Sports India to raise public awareness and fight corruption in sports. Women’s Hockey World Cup (New Delhi) was hit by a financial corruption scandal involving the Federation of International Hockey (FIH), Indian Olympic Association (IOA) and H. Suresh Kalmadi, the IOA chief, was again said to be involved in financial corruption during arrangements for the World Cup. IHF, too, was suspended in 2008 by the IOA over an alleged bribery for selection scandal. The Indian government is currently at loggerheads with a civil society movement spearheaded by veteran Anna Hazare, over the passing of the Jan Lokpal Bill 2011 for the creation of a Lokpal (Ombudsman). The Bill was aimed at fighting corruption in government offices and the judicial machinery, and also covers various sports bodies. In 2011, the Indian Government has proposed a National Sports Bill to curb corruption and ensure that all sport federations comply with the Olympics Charter by subjecting their offices to annual audits. The Bill provides for a Sports Ombudsman to resolve disputes in sports, prevent age and sex fraud and doping, and to make all sports bodies comply with the Right to Information Act, 2005.

Index Terms- Corruption, sports

I. INTRODUCTION

The first documented case of corruption in international sports is attributed to the athlete Eupolos of Thessalia who successfully bribed three of his competitors in the first combat tournament at the Olympic Games of 388 B.C. First of all, most accusations of corruption in sport should not be taken too seriously. When quickly arises, India has captured the world’s imagination with its dazzling economic growth athletes lose, they tend to look everywhere else for the blame rather than at themselves. Dishonest wheeling and dealings of their opponents, such as corruption and doping, may also be readily cited as an excuse. When fans see their team lose, the accusation of rigging always and rise in international affairs. Its global ascent is underpinned by a robust economy, growing at the rate of 9 percent and estimated to reach 10 percent during the next two years. However, this new found affluence has its flip side too, in

the form of horizontal and vertical corruption that has besieged the country. According to Transparency International’s Corruption Perceptions Index 2010, India ranks a dismal 87 out of 188 countries, falling three notches since 2009. It continues to plummet further, affecting all aspects of government functioning and public life, and sport is no exception.

Corruption is no stranger to India and its culmination in scale and magnitude during the 2010 Commonwealth Games subjected the government to global shame and scorn. The Indian government ended up spending 18-fold more than the \$400 million originally allocated in 2003 for the Games, an amount that supposedly could have funded three Olympic Games. It is deeply disturbing to find corruption of such magnitude in a country whose poverty line, according to World Bank figures (2005), is very low by international standards, and where 80 percent of the rural population lives below the median developing-country poverty line of \$2 a day. Several trillion dollars of unaccounted for money remains locked in Swiss banks which the Indian government is finding hard to retrieve. Post-Games, the first major action taken by the Government was to demand the resignation of two top officials, the Organizing Committee Chairman, Suresh Kalmadi, and Secretary General, Lalit Bhanot. Both Kalmadi and Bhanot have since been arrested, and are being interrogated by the investigation agencies. Today, corruption plagues all major Indian sports, including cricket, hockey, weightlifting, and athletics. The first major sporting scandal was reported during the 1990s, involving match-fixing by Indian cricketers through a Protean bookie, Mukesh Gupta. This scandal led to the fall from grace of cricketing demi-gods, namely, the then skipper Mohammad Azharuddin, Ajay Jadeja, Manoj Prabhakar, Nayan Mongia and Ajay Sharma. As the scandal unfolded, several international cricketers were also linked, including Hansie Conje (South Africa), Arjuna Ranatunga (Sri Lanka), Arvinda de Silva (Sri Lanka), Brian Lara (West Indies), Martin Crowe (New Zealand), Dean Jones (Australia), Mark Waugh (Australia), Shane Warne (Australia), Salem Malik (Pakistan) and Alec Stewart (England). The decision by the Board of Control for Cricket in India (BCCI) to ban Azharuddin for life and Ajay Jadeja for 5 years sent a strong message to Indian cricketers, and match-fixing scandals have reduced drastically. It should be noted, however, that BCCI’s own dubious record over the years has impeded its authority to be more forthright in checking corruption.

Now corruption has a new avatar, in the shape of a \$4 billion Indian Premier League (IPL), which has seen its former Commissioner, Lalit Modi, resign and flee to London over charges of gross financial irregularities. The 2010 IPL franchise bidding process also led to the resignation of Shashi Tharoor, Minister of State for External Affairs, whose friend and current wife, Sunanda Pushkar, was alleged to have received \$15 million in ‘sweat equity’ from one of the franchises.

In recent years, the BCCI has also been marred by financial irregularities and bitter turf wars between different lobby groups. Nonetheless, BCCI's mammoth financial clout has given it a dominating influence in the International Cricket Council (ICC) decision-making, much to the resentment of other international cricket boards. This influence is further augmented by the political weight that the BCCI holds nationally. It is currently headed by Sharad Pawar, a Minister and leading political heavy-weight in Indian politics, who is also President of the ICC.

In June 2010, appalled by the Commonwealth Games corruption scandal, former Indian Olympians launched the Group of Clean Sports India to raise public awareness and fight corruption in sports. In a short time-span, the group has enlarged its support base and campaigned hard to oppose politicians with no sports background from entering and contesting for executive positions in sports bodies. Recently the group succeeded in persuading Pallam Raju, Minister of State for Defense, to withdraw from the race for President of the Equestrian Federation of India. But in a setback for the group, the President of Clean Sports India, Pargat Singh, a former hockey skipper, lost to the 83 year old veteran Congress politician, Vidya Stokes, in the election for President of the Indian Hockey Federation; this example illustrates the extent of political hold on sporting bodies in India. However, the success of former cricketers with high credentials and reputation, Anil Kumble and Javagal Srinath, in getting elected to the Karnataka State Cricket Association augurs well for Indian cricket, and hopefully will lead to similar credible appointments in hockey.

In the meantime, the state of Indian hockey continues to be abysmal. Former world champions and Olympic gold medalist, India now struggles to even win Asian tournaments. Indian Hockey Federation (IHF) President, K.P.S. Gill, a former Indian police officer, has been officiating for many years. Gill's long-term appointment has divided the Federation, the hockey fraternity and players, and over time, has significantly affected the team's performance. The IHF is also involved in a fierce spat with the Women's Federation and Hockey India (HI) over the merger modalities. IHF's labeling of HI officials as 'highly corrupt' has caused a great deal of squabbling in the media. The 2010 Women's Hockey World Cup, held in New Delhi, was hit by a financial corruption scandal involving the Federation of International Hockey (FIH), Indian Olympic Association (IOA) and HI. Suresh Kalmadi, the IOA chief, was again said to be involved in financial corruption during arrangements for the World Cup. IHF, too, was suspended in 2008 by the IOA over an alleged bribery for selection scandal. In addition, sex scandals involving the coach of the women's hockey team, and favoritism and bribery for selection in the men's team, have tarnished the image of both the federations and brought Indian hockey to an all-time low.

In weightlifting, while India has produced world class lifters, the sport has also had its own share of scandals and controversies. In 2005, a bribe scandal surfaced over the selection of dope-tainted lifter, Shailja Pujari, in the Beijing Olympic squad. In July 2010, the Indian Weightlifting Federation had to suspend its coach, Ramesh Malhotra, over charges of sexually harassing junior lifters.

In July 2011, the Indian Sports Ministry sacked Yuri Ogorodnik, the Ukrainian coach of Indian Athletics, after six

female 400 meter runners, a female shot-putter and a male long-jumper all returned positive results in doping tests, marking the rapidly growing trend of banned substance abuse among Indian athletes.

During the Commonwealth Games, the lack of suitable legislation for the organization of mega sport events deeply affected India's objectives, in contrast to other international models, such as the Sydney Olympics 2000, Melbourne Commonwealth Games 2006, Glasgow Commonwealth Games 2014 and London Olympics 2012. These models enshrine appropriate Legislations to regulate the functioning of organizing committees and judicious dealing with key issues such as transport, ticketing, land acquisition, intellectual property, broadcasting and licensing rights.

Nevertheless, a look back to antique sport nevertheless demonstrates that the idea is far from new. In the classical Olympic Games, corrupt athletes were sentenced to stringent fines and were obliged to finance the construction of so-called "pillars of shame" ("zanes"), which were positioned at the entrance to the Olympic Stadium. These pillars were crafted from the finest materials by famous artists and cost a fortune, ensuring a high pecuniary penalty. If the athletes were unable to pay, their home town had to pay in their place. The pillars were built "for all eternity", and their remains can indeed still be seen in Olympia today. The Inscriptions contain the names of the corrupt athletes, their crimes and a moral lesson: in addition to the pecuniary loss, the delinquents bear a loss of reputation that tends towards the infinite. While the government fails in the first instance to weed out systemic corruption, the prospect of clean sports appears grim. The Indian government is currently at loggerheads with a civil society movement spearheaded by veteran social activist, Anna Hazare, over the passing of the Jan Lokpal Bill in 2011 for the creation of a Lokpal (Ombudsman). The Bill was aimed at fighting corruption in government offices and the judicial machinery, and also covers various sports bodies. On the policy front, in 2011, the Indian Government has proposed a National Sports Bill to curb corruption and ensure that all sport federations comply with the Olympics Charter by subjecting their offices to annual audits. The Bill provides for a Sports Ombudsman to resolve disputes in sports, prevent age and sex fraud and doping, and to make all sports bodies comply with the Right to Information Act, 2005.

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Coping styles, School Engagement and School Burnout: A comparison of Grade Levels in Secondary Schools in Kenya

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Abstract- The purpose of this study was to determine whether transition and examination pressure affect the lives of form ones and form fours respectively. The objectives of the study were to:- compare coping styles used by form ones and form fours, compare school engagement of form ones and form fours and to compare levels of school burnout between form ones and form fours. The study was guided by Lazarus and Folkman's Transactional theory, Work Engagement theory and Work Burnout theory. A descriptive survey research design was adopted for the study. The study population consisted of 9000 students. A sample size of 900 was selected based on Nkpa's formula. Stratified random sampling technique was used. Questionnaires were used for data collection. Reliability was computed using Cronbach's alpha:- 0.6 for coping style 0.8 for school engagement and 0.8 for school burnout. Face and content validity were ascertained by experts in the Department of Educational Psychology and the author respectively. Data was analyzed using descriptive statistics as well as inferential statistics. There were significant differences in both emotion focused coping style and problem focused coping styles. For school engagement there were significant differences in dedication and absorption. For Burnout, there were significant differences in reduced efficacy with form fours reporting higher levels than form ones. The study may be useful to teachers, counselors, administrators and parents who may be able to assist students reduce burnout. This research is also important for policy. The government may enforce school holidays devoid of tuition. It is recommended that programs be developed that enhance school engagement.

Index Terms- Coping Style, School Burnout, School engagement, Problem Focused Coping, Emotion Focused Coping,.

I. INTRODUCTION

Kenya follows the 8-4-4 system of Education. The students undergo eight years of primary school education followed by four years in high school and four years at the university. Form one therefore is a transition class and the focus is that students have just moved into secondary school or high school. Some of them may be grappling with adjustment issues but generally by third term most have acclimatized. Form four class on the other hand is a final year class in which students do the Kenya Certificate of Secondary Education Exam (KCSE) which determines college entrance. The form fours are therefore

stressed and academically engaged. It is against this backdrop that the author compared school engagement, burnout and coping styles used by form ones and form fours.

Grade Level and Coping Style

Coping style refers to the set of behaviors that an individual employs to successfully handle stressful experiences (Plotnik 2005). The present study examined problem focused and emotion focused coping styles. Problem focused coping means stress is decreased by solving the problem through seeking information, changing our own behavior, or taking whatever action is needed to resolve the difficulty. It tends to predominate when people feel that something constructive can be done (Plotnik, 2005). Emotion focused coping on the other hand means that we do things primarily to deal with our emotional distress, such as seeking support and sympathy or avoiding or denying the situation. It tends to predominate when people feel that the stressor is something that must be endured. The present study investigated coping styles used by form fours and form ones.

Grade Level and School Engagement

Salmela Aro have defined school engagement from the work engagement definition given below:-
.... a positive, fulfilling, work-related state of mind that is characterized by vigor, dedication and absorption. Rather than a momentary and specific state engagement refers to a more persistent and pervasive affective-cognitive state that is not focused on any particular object, event, individual, or behavior. Vigor is characterized by high levels of energy and mental resilience while working, the willingness to invest effort in one's work and persistence even in the face of difficulties. Dedication refers to being strongly involved in ones work and experiencing a sense of significance, enthusiasm, inspiration, pride and challenge. Absorption is characterized by being fully concentrated and happily engrossed in one's work whereby time passes quickly and one has difficulties with detaching oneself from work. (Schaufeli & Bakker 2003)

School engagement encompasses three areas: Behavioral, emotional and cognitive. Behavioral engagement includes participation in school related activities, involvement in academic and learning tasks, positive conduct and the absence of disruptive behaviours. Emotional engagement consists of relationships with teachers, peers and academics. Cognitive engagement consists of an investment in learning and a willingness to go beyond the basic requirements to master

difficult tasks. (Lappman & Rivers 2008). School engagement has been on the decline. Half the girls and 25% of the boys aged 14 – 15 were engaged in 1999. By 2002, these levels fell further: only 39% of girls and 20% of boys were reported by their parents to be engaged in school.

Brenneman (2016) pointed out that the Gallup student poll finds engagement in School dropping by grade level. In grade five engagement was at 75%, grade six 67%, grade seven, 55% grade and eight. 45 % . The descent continues with grade nine 41%, grade ten 33% grade eleven 32% and grade twelve 34%.

Besides according to UCLA engaging adolescents is difficult since academic motivation decreases steadily from the early grades of elementary school into high school.

The current study compared form four and form one school engagement in order to find out differences.

Grade Level and School Burnout

Burnout, is a work-related disorder, that has been applied in the school context. School burnout is described along three dimensions namely:- exhaustion due to school demands, cynical and detached attitude towards ones' school and feelings of inadequacy as a student (Salmela-Aro, Kiuru, & Nurmi, 2008).

Salmela-Aro et al (2008) conducted a longitudinal study comparing school burnout levels amongst ninth graders. They filled in questionnaires twice during their final term of comprehensive school and once after the transition to post comprehensive schooling. They found that the academic environments per se affected school burnout rather than transition. The current study used a cross-sectional approach and compared school burnout amongst form ones and form fours.

Schorn and Buchwald (2007) in their study student teachers burnout sampled 75 student teachers in an attempt to discover whether or not a specific personality structure was more susceptible to the onset of burnout at an earlier stage. They also investigated whether the length of study time affected burnout. They found that burnout was not affected by time ($p = .272$)

Limitations of the study

The stress that the students could be undergoing was overlooked.

II. METHODS

Population

The study population comprised of Form one and Form Four students in Kisumu East Subcounty. The target population was 9000 students. (Kisumu East Subcounty Education Office 2013).

Sample and Sampling Techniques

A sample constituting 10 % of the target population was used giving a total of 900 students. This was in line with Nkpa (1997) who points out that for populations that run in thousands, 5% to 20% samples may be drawn. However a total of 834 questionnaires were analyzed. Out of these 455 were boys and 379 were girls. A total of 12 schools were used in the study. The schools ranged from County schools to Subcounty schools to ensure that high achievers as well as low achievers were captured. Stratified sampling technique was used in this study.

Stratification was done by grade level and by type of school. According to Gall, Borg and Gall (2007), in stratified random sampling technique certain subgroups or strata are selected for the sample in the same proportion as they exist in the population. The advantage is that it increases the likelihood of representativeness.

Students' Questionnaire

In the current study, a students' questionnaire was used for data collection. The students' questionnaire consisted of three subscales:-

- A-COPE (Adolescent Coping Orientation for Problem Experiences)
- School Engagement
- School Burnout Inventory

Biographical data was used to get information on the students' background variables. Coping was measured using the ACOPE (Adolescent Coping Orientation for Problem Experiences).

The ACOPE Subscale has 54 items which are used to measure coping styles used by adolescents. It was developed by Patterson and McCubbin in (1987). The scale was chosen because it measures coping styles used by adolescents and hence was appropriate for the present study population. The scale consists of appraisal coping, emotion focused coping and problem focused coping. Problem focused coping involves using direct action to tackle the problem, appraisal coping involves changing the meaning of the stressor and emotion focused coping means managing the emotion and stress.

The School Engagement Subscale was derived from the Utrecht Work engagement scale which was originally developed by Schaufeli and Bakker (2003). The current study used the abbreviated student version developed by Salmela Aro (2008). It is further divided into three subscales which are:-

Vigor (eg when I study I feel that I am bursting with energy)
Dedication (eg I am enthusiastic about my studies)
Absorption (eg Time flies when I am studying).

The School Burnout Subscale was originally developed by Salmela Aro and Naatanen 2005. They derived it from the Maslach burnout scale (Maslach, Jackson & Leiter 1996). The scale consists of three dimensions which are:-

Exhaustion due to school demands (eg I feel overwhelmed by my schoolwork)

Cynical and detached attitude towards one's school (eg I feel that I am losing interest in my work and Feelings of inadequacy as a student.(eg I often have feelings of inadequacy in my school work)

Data Analysis

Data was analyzed using Statistical Package for Social Sciences (SPSS) version 20. Differences were compared using independent samples t-tests.

III. RESULTS AND DISCUSSION

Table 1 Problem Focused Coping Style

	Grade	mean	SD	t	df	Sig
Family Support	1	18.05	3.56	2.6	797	.009*
Spiritual Support	4	17.37	3.90			
Social Support	1	11.31	2.05	3.96	780	.000*
Self Reliance	4	10.70	2.35			
	1	19.78	3.42	-.266	831	.790
	4	19.84	3.62			
	1	19.62	3.12	2.17	831	.031*
	4	19.15	3.15			

Where SD – Standard Deviation

t – test statistic for t test

df – Degrees of freedom

Sig. - Significance

Table 1 shows that there were significant differences in the use of problem focused coping styles. Form ones used more problem focused styles than form fours

Emotion Focused Coping Style

	Grade	Mean	SD	t	df	Sig.
Diversions	1	10.40	2.76	-5.4	831	.000*
	4	11.47	2.90			
Ventilating	1	8.66	3.23	-1.27	831	.205
	4	8.95	3.20			
Avoid Problems	1	2.18	.80	-2.77	734.2	.007*
	4	2.36	1.02			

Specifically form fours sought more diversions and avoided problems more than form ones did.

This could be as a result of the national exams they are facing.

Disadvantages of using emotion focused coping styles are evident in Thuen (2007) study in which aggressive coping was

highly associated with emotional problems. Further MacCann et al, 2012 found that emotion focused coping style was significantly related to lower life satisfaction and negative feelings towards school.

Table 3 A Comparison of School Engagement Amongst Form Ones and Form Fours

	G	M	SD	t	df	sig.
Vigor	1	3.97	1.26	.654	766.9	.509
	4	3.90	1.47			
Dedication	1	5.06	1.33	-2.92	831	.004*
	4	5.32	1.20			
Absorption	1	4.86	1.27	-2.801	828.8	.005*
	4	5.09	1.18			
Engagement	1	9.16	1.22	-2.136	830	.033
	4	9.24	1.32			

Table 3 shows that there were significant differences between form ones and form fours in dedication and absorption. As stated earlier in the paper form fours were to sit for exams in two months time. They therefore became more dedicated to their

work and time nonetheless flew fast for them. This result is not in agreement with Gallup poll findings which indicate that the higher the grade the less the engagement.

Table 4 A Comparison Between School Burnout Amongst Form Ones and Form Fours

		M	SD	t	df	sig.
Exhaustion	1	3.57	1.15	-1.817	832	.070
	4	3.71	1.09			.069
Cynicism	1	2.60	1.12	1.586	832	.113
	4	2.48	1.11			.113
Reduced efficacy	1	3.00	1.10	-2.116	832	.035*
	4	3.16	1.05			.034*
Burnout	1	3.06	0.86	-1.008	832	.314
	4	3.12	0.82			.312

Table four shows that with regard to school burnout, there were significant differences in grade level in reduced efficacy. Specifically form fours had higher levels of reduced efficacy. Some of them may have been feeling that they couldn't improve very much as there was very little time left just before they commenced their national examinations. This finding is in agreement with Schorn and Buchwald who also found that the length of time of study did not affect school burnout.

IV. CONCLUSIONS AND RECOMMENDATIONS

It was found that form fours used more emotion focused styles whereas form ones used more problem focused styles. Students should be trained on their use of coping styles.

It was also found that form fours were more engaged than form ones which is a good sign for educationists in the country. It was also found that form fours experienced reduced efficacy as a result of the national exams they were facing. A repeat of the study probably in Term one January may clarify these findings.

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Environmental Knowledge, Attitude and Awareness of Farmers in Chencha Woreda, Gomo Gofa Zone, South Ethiopia

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Abstract- In different parts of Ethiopia, even though many studies have been conducted on environment and management of natural resources, the environmental literacy level of farmers is not utterly studied and analyzed. Therefore, this study was designed to assess the environmental knowledge, attitude and awareness of farmers at Chencha Woreda, Southern Ethiopia. Stratified and systematic samplings were applied to select target population. The primary data were gathered from 330 household heads by using standardized questionnaire. The analysis was undertaken by using quantitative methods [ANOVA, Tukey test, eta square, and T-test]. The study revealed that, nearly 50% of the respondents had medium level of environmental knowledge and awareness level. The statistical analysis displayed that educational status, age, & information accessibility had statistically significant influence on environmental knowledge, attitude and awareness of farmers. However, respondents' sex had no influence on their environmental behavior. Insufficient information, lack of organized training centers and poor environmental education provision were some of the constraints in improvement of environmental knowledge and behavior of farmers. Improving farmers' environmental knowledge, attitude and awareness is vital for conservation of Ethiopia's remaining natural resources and biodiversity. Therefore, all stakeholders must work jointly to improve the environmental behavior of farmers.

Index Terms- Environmental knowledge, Environmental awareness, Environmental attitude, Chencha

I. INTRODUCTION

Environmental degradation (ED) has become contested and debatable issue throughout the world. Environment has been highly degraded and deteriorated in many countries around the world. The problem is more severe in developing countries, due to ever growing population coupled with the expansion of ill defined investments and development technologies [1,2]. Natural resource degradation as the result of mismanagement threatens the livelihoods and living strategies of human beings. Soil erosion & forest degradation are major obstacles to improve agricultural productivity in many developing countries like Ethiopia. For example, the World Bank report estimates that, by 2000 up to 1 billion people in the world and 256 million people in developing countries were affected by soil erosion and land degradation due to deforestation, overgrazing, and inappropriate agricultural practices [3].

Currently, ED in Ethiopia has long been severe threat and tribulation that, ranging from very severe in rural areas to severe in urban areas [4]. ED refers to the temporary or permanent loss of natural resources as the result of human activities that impeding the capacity to contribute for food security, climate adaptation, fuel wood consumption, and other ecosystem benefits.

Ethiopian has been facing rapid and exhaustive degradation of forest and soil resources. The rapid population growth; increased crop cultivation in marginal areas and increased livestock grazing pressure; poor agricultural practices have resulted in exhaustive forest and soil degradation [5, 4]. Many studies have shown that deforestation is undoubtedly has increased from time to time and has occurred in the remaining forested areas of the country. The current rate of deforestation is estimated between 160,000 - 200,000 hectares (ha) per year [5]. Similar to this study, the finding of Earth trends show that, in 2003, Ethiopia had lost 400000 ha of forest between 1990 and 2000 corresponding to a deforestation rate of 40000 ha /year. On the other hand, the Ethiopian Forestry Action Plan [4] concluded that deforestation rate in Ethiopia was between 150,000 and 200,000 ha per year. This exhaustive clearing of forest land has been on process and will perpetuate until management plans are put in place which balance the consumption and regeneration capacity of forest land in the country [6].

High level of deforestation jointly with other factors has great impacts on the soil depletion in Ethiopia. Studies have shown that, Ethiopia has lost fertile top soil at an estimated rate of one billion cubic meters per year [5]. The organic content of soils is often low due to the widespread use of dung and crop residues for energy, which result in poor agricultural productivity and production. In 1990 alone, for instance, reduced soil depth caused by erosion resulted in a grain production loss of 57,000 (at 3.5 mm soil loss) to 128,000 tons (at 8 mm soil depth). It has been estimated that the grain production lost due to soil degradation in 1990 would have been sufficient to feed more than four million people. The availability of land suitable for agriculture has been shrinking, and the amount of land required to feed the growing population is steadily increasing [5, 6].

Therefore, in order to leave out from the revenge of ED and for the sustainable use of natural resource, understanding and taking in to consideration the local community's environmental

awareness, attitude and perception¹ play their own substantial roles. Farmers' environmental literacy level and behavior help the local community to actively participate in conservation of environment, to develop sense of ownership, and to make sound policies and strategies for responding the economic and social impacts of forest and land degradation [7]. Again for the application of bottom-approaches in environmental management, the environmental literacy level of local people plays the crucial role especially in developing countries, like Ethiopia. In different parts of the Ethiopia, environment degradation and their causes as well as the possible solutions have been studied indeed, however the community's environmental knowledge, attitude and awareness level as well as perception to environmental degradation and resources management have not yet well studied and documented. Thus, this paper was designed to examine the local community's [farmers] environmental knowledge, attitude, and awareness level in Chencha Woreda², Gamo Gofa zone, Ethiopia. The research was undertaken to answer the following basic questions: what is the environmental knowledge, attitude and awareness level of the farmers in Chencha Woreda?

II. RESEARCH METHODOLOGY

Profile of the study area

This study was conducted in Tegecha, Losha and Mafonazolo purposively selected kebeles³ of Chencha Woreda which is one of the 13 Woredas of Gamo Gofa zone (fig.1). Chencha Woreda is located about 530kms and 303kms far away from Addis Ababa, the capital city of the Ethiopia and Awasa, the capital city of Southern Nations and Nationalities and People Regional State (SNNPR) respectively. It is also located between 6°08'55" to 6°25'30"N and 37°29'57" to 37°39'36"E. Its elevation is found between 1300 and 3250 m above sea level. Currently the Woreda covers an estimated area of 445 km² and divided into 45 rural and 5 urban kebeles.

The Woreda is divided into two agroecological zones, Dega and Woina Dega, accounting for about 82% and 18% of the total area respectively. It has received bimodal rainfall regimes. The first is from March to April and the second round occurs June to August. The annual rainfall of the Woreda is between 900mm to 1200mm. And the minimum and maximum temperature records vary between 11 to 13°C and 18 to 23°C respectively.

Chencha Woreda is one of the most densely populated areas in SNNPR. The crude density is 382 persons/km². The total population of the Woreda was about 111,680 of which 51, 307 were men and 60, 373 were women with urban population of nearly 12 per cent [8]. Mixed high land farming is the farming system which is practiced by the community. Barley and Wheat are the dominant crops cultivated by the local farmers. Framers

¹ Perception is means by which people seek to understand environmental degradation, causes as well as its consequences to take responses.

² Woreda: governmental administration unit next to Kebele in Ethiopian context. Which is equivalent to district

³ Kebele: the lowest administrative unity in Ethiopia context

also have engaged in cultivation of Maize, Peas, Beans, Potatoes, Enset and tree cabbage.

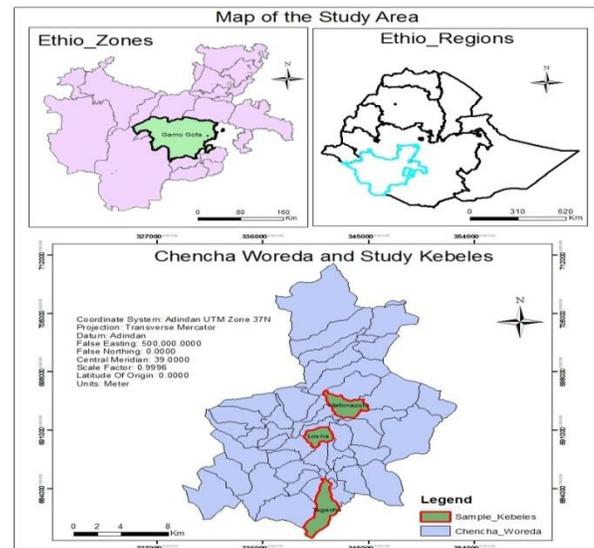


Figure 1. Map of the study area

METHODS

Respondents and Sampling Techniques

The participants of this study included the household heads (male and female) of the selected kebeles of the Woreda. The total household heads number and list were taken from the Woreda Agriculture bureau and the Kebele's administration office. The total number of the household heads was about 1085, of which Losha, Tegecha and Mafonazolo consisted 364, 331 and 390 household heads respectively. In order to determine the sample size from the entire household heads, the researcher used the following statistical formula [9].

$$n = n_0 * N / n_0 + (N - 1)$$

$$n_0 = (z/e)^2 pq$$

Where:-

n= Sample size

N= Total population

n₀ = Sample size of the pilot study

z= Value of the confidence level at **1.96 (95%)**

e= Sampling error at **0.05 (5%)**

p= Estimated value for the proportion of sample that will respond to pilot test

q= Estimated value for the proportion of sample that is not responded to pilot test (q= 1-p)

Based on the above sample size determination formula, 364 sample populations were taken from the three kebeles. Moreover, stratified sampling was applied to get proportional sample size from each kebele and sex of respondents:[111 from Tegecha, 122 from Losha and 131 from Mafonazolo sample population were taken]. Finally systematic sampling was implemented to contact the target population of the study.

Data Collection and Analysis instruments

In order to collect data from selected respondents, questionnaire

was used. The standardized items were adapted from previously conducted research and further revision and modification were made. The questionnaire had four parts; the first part included items about environmental knowledge, the second part items to measure environmental attitude and the third included items used to measure the environmental awareness of respondents. The last part consisted items about environmental information sources and the background information of respondents. The items included both local and global environmental issues. The global issues included pollutions, biodiversity and conservation, and climate change. Majority of the items constructed from local environmental issues: Agricultural activities, soil & soil conservation, deforestation and forest management, population growth and environment, and the roles of community in preservation and sustainable management of natural resources. Apart from statistical measures, the items were further reviewed by knowledgeable and experienced researchers from Geography and Environmental studies and Psychology department of ArbaMinch University. And based on the comments items reconstruction was undertaken for final usage. Furthermore, by using the revised items pretest/pilot study/ was also made. It was vital to evaluate the quality of the items and to include more local environmental issues. Finally, the final version was administered to 364 respondents. However, the analysis was undertaken by using 330 questionnaires which is about 91% of the sample populations. During screening time 28 incomplete and wrongly answered questionnaires removed [7 from Tegecha, 10 from Losha and 11 from Mafonazolo]. And 6 questionnaires were not returned back from respondents: 1 from Tegecha; 3 from Losha and 2 from Mafonazolo.

The respondents' knowledge, attitude and awareness level to environmental issues were measured by using the following adapted standardized items. To measure the respondents' environmental knowledge the researcher used items developed by [10], which was used to determine the environmental knowledge of different community groups in Florida. From the original document some items were modified and additional three items were added to consider the local environmental conditions and nature of respondents. The reliability of items in this study was about 0.76 (KR-21). Fifteen items [nine true/false and six multiple type items] were used to measure the environmental knowledge level. When the respondents selected the right answer they were given 1 and otherwise 0 was given for wrong answer. Based on the total score of fifteen items respondents were categorized into three knowledge levels. Respondents who scored 0- 5 and 6-10 points out of fifteen marks categorized under low and moderate level of knowledge respectively. Respondents scored 11-15; it was considered that, they have high level of environmental knowledge.

The environmental awareness of the respondents [farmers] was measured by using fifteen Likert type (5point) items. The standardized environmental awareness scale adapted from [11]. They found consistency with reliability of 0.72 (KR-21). In this current study, the researcher also found good reliability of Cronbach's alpha, $\alpha=0.78$ for the standardized environmental awareness items. For each statement 1 up to five points were given in scale. The maximum point (5) given for strongly agree and strongly disagree for positively and negatively stated items respectively, where as the minimum, 1 point weighted to strongly

disagree and strongly agree positive and negative statements respectively. When a respondent scored one point for all of all items the minimum point would be 15 and 75 being the maximum point while the respondent scored five for all statements. The researcher, therefore have assigned three levels: low, medium and high for respondents' environmental awareness [11], based on the mean scores. That is, high awareness level being , the mean scores is greater than three, the medium level of awareness represented by the mean score of three (slightly agree) and the low level represented by the mean scores of less than three.

Similarly, it was also attempted to assess the environmental attitude of the farmers by using standardized scale, which adapted from [12, 13]. For the current study, the adapted instrument included fifteen items which rated from 1 (strongly disagree) to 5 point (strongly agree) for positive statements and the vice versa is true for the negatively stated statements. And the reliability was $\alpha=0.85$. To determine the environmental attitude of respondents the mean scores were categorized into three: the mean scores greater than three representing favorable attitude category, undecided (apathetic) attitude described by mean scores of three and unfavorable attitude category comprising mean scores of less than three.

Finally the data were analyzed by using Statistical Package for Social Science: SPSS (version 20). Quantitative techniques: ANOVA, Tukey test/HSD/, eta square, T-test were applied for analyzing data and measuring of significance level. Generally, based on the result of study conclusions and recommendations were made.

III. RESULT AND DISCUSSION

Environmental Knowledge, Awareness and Attitude level of Respondents

As previously stated that the core intent of this study was to determine farmers' environmental behavior specially, attitude, knowledge and awareness level to environmental issues in Chenchaha Woreda, South Ethiopia. In Ethiopia, farmers' environmental literacy⁴ level has played crucial for the sustainable use of natural resources [land, forest, soil...]. Community's environmental knowledge, awareness, attitude and generally environmental behavior are very necessary for the development of community based and bottom-up natural resource management systems and strategies, especially in rural areas of the country. Environmental knowledge is a body of facts, and principles concerning environmental issues that accumulated by individual through study [14]. Meaning that, it is information about environmental problems, causes of the problems and consequences that have been accumulated by individual or group of community through personal observation, study and life experiences. In this study, respondents' environmental knowledge was measured by using

⁴ Environmental Literacy is a set of knowledge, understanding, skills, concerns, attitudes, and habits of mind that empowers people to relate their environment in a positive fashion, and participate in any environmental management activities as well as to establish environmentally sustainable economic and social activities.

standardized items. The result of study [about environmental knowledge] could be displayed in the following table (1). The table depicts that, 69.7% of the respondents categorized under high level of knowledge about environmental issues whereas

13% of them classified under low level of knowledge and the rest at medium level.

Table 1. Frequency of respondents' Environmental knowledge level

Level of category	frequency of respondents	
	No.	percent
High level of knowledge(11-15)	230	69.7%
Medium level of knowledge(6-10)	57	17.3%
Low level of knowledge(0-5)	43	13%
Total	330	100%

Source: field survey, 2016

For this enquiry, environmental awareness refers to: the attention, concern and sensitivity of the respondents to environmental problems, and natural resources conservation issues. The following table (2) presented the environmental awareness level of respondents. The data analysis revealed that nearly half of the respondents (56.1%) had high level of awareness about issues that related environment, environmental problems and conservation activities in the study area. On the

other hand 20% of 330 respondents mean scores showed that, they had low level of environmental awareness. Table (3) also displayed the environmental attitude of respondents. Environmental attitude refers to the acquisition of values, feelings, and motivations towards the environment, environmental problems, socio-economic and political issues that have association with management and conservation of natural resources.

Table 2. Environmental Awareness level of the respondents

Awareness level	Frequency of Respondents	
	No.	percent
High level of awareness (mean scores >3)	185	56.1%
Medium level of awareness(mean scores=3)	79	23.9%
Low level of Awareness (mean score <3)	66	20.0%
Total	330	100%

Source: field survey, 2016

As the survey analysis revealed that, out of the total respondents 238 of them had favorable attitude to environment, pro-environmental actions and conservation activities, whereas 33 respondents had unfavorable attitude. Consequently the

analysis showed that 33 participants had neither favorable nor non-favorable attitude about environmental issues, i.e. they were neutral or apathetic.

Table 3. Environmental Attitude of respondents

Attitude level(type)	Frequency of Respondents	
	No.	percent
Favorable (mean scores >3)	238	72.1%
Undecided (mean scores=3)	59	17.9%
Unfavorable attitude (mean score <3)	33	10.0%

Total 330 100%

Source: field survey, 2016

In general the study has shown that majority of the respondents in the study area had moderate and high level of knowledge, attitude and awareness about environment, environmental problems and pro-environmental activities and actions. Similar to this study some research findings [10, 12, 13, 14, 15, 16] showed that majority of the participants had good attitude, knowledge and awareness about global and local environmental issues as well as management systems & activities.

Comparison of Respondents’ Environmental Knowledge, Awareness and Attitude (KAA)

The difference in Environmental Knowledge, Awareness and Attitude (KAA) between genders

By assuming equal variance, there was no statistically significant difference in environmental knowledge result between male and female participants ($t(328)=-1.480, P=0.140, P>0.05$). The eta square, (η^2) value (0.0066) also reflected that there was very small relationship between the gender of respondents and their environmental knowledge, i.e their being male or female had about 0.66% effect on their score of environmental knowledge. The finding of [10] supported the current study result as gender had no significant impact on environmental knowledge. Regarding the environmental awareness level score of respondents, the two independent sample t-test revealed that, there was no statistically significant difference between female

and male participants ($n(t(328)=-1.492, P=0.137, p>0.05$). Similarly, the eta square (η^2) value showed that the gender of the respondents had very small effect on the awareness level of the respondents ($\eta^2=0.0067, 0.67%$). The study conducted on Iranian Students in Malaysian Universities found that, there was no significant difference observed in environmental awareness level between sex groups [12]. Moreover, [11] in their study concluded that gender is not a significant factor for environmental awareness level.

Also there was no statistically significant difference in environmental attitude scores between the genders ($t(328)=0.301, p=0.764, P>0.05$). Apart from the t-value, the eta square also showed that the effect of gender on respondents’ environmental attitude was very small ($\eta^2 = .0003$), among the total factors that affect the environmental attitudes of respondents. i.e., the gender of the respondents had merely 0.03% impact. In opposite of the result of this study, the research finding of [13] revealed that, girls had significantly favorable environmental attitudes than boys. Generally, from the analysis and t-test value we can conclude that, being male or female had no significant effect on the respondents’ score of knowledge, attitude and awareness level about environment, environmental problems and related issues.

Table 4. Independent sample test for comparing of environmental KAA* among gender group

Dependent variable	Sex	Mean	Std. Deviation	t-value	df	p-value
	F=36 m =294				328	
* Env. Knowledge	male	10.56	3.28			
	female	9.69	3.58	-1.480		0.140
Env. Awareness	male	49.01	11.93			
	female	45.86	12.27	-1.492		0.137
Env. Attitude	male	51.99	9.08			
	female	52.47	9.08	0.301		0.764

Evn. =environmental, KAA=Knowledge, Awareness and Attitude Source: field survey, 2016

Comparison of KAA between age groups

Age is one of the important factors that determine the environmental literacy and behavior of people in a particular area. In table (5) below one way ANOVA was used to determine the difference between age groups of respondents with respect to environmental knowledge, awareness and attitude. The analysis showed that there was statistically significant difference in environmental knowledge and awareness level among different age groups ($F(2,327)=9.132, P=0.000, P<0.01$) and ($F(2,327)=9.229, P=0.000, P<0.01$) respectively. The study undertaken [12] also showed that

there was a significant difference at the $p<0.05$ level in environmental awareness scores of respondents based on their age level [$F(2,491)=7.158, P =0.001$]. Regarding attitude, the study showed that there was no statistically significant difference in total score environmental attitude within the different age groups of respondents ($F(2,327)=0.660, P=0.518, P> 0.05$). This finding is found to be inconsistent with [12]; which showed very small statistical difference between environmental attitude within the different age groups of respondents ($F(2,513)=3.158, p=0.043$).

Table 5. ANOVA for comparing KAA between age group

Dependent Variables		Sum of Squares	Df	Mean Square	F	Sig.
Env. Knowledge	Between Groups	192.1298	2	96.0650	9.132	0.000*
	Within Groups	3440.004	327	10.51990		
	Total	3632.133	329			
Env. Awareness	Between Groups	2524.7960	2	1262.3980	9.229	0.000*
	Within Groups	44730.2009	327	136.7896		
	Total	47254.9969	329			
Env. Attitude	Between Groups	108.7419	2	54.371	0.660	0.518**
	Within Groups	26950.664	327	82.418		
	Total	27059.4060	329			

*P<0.01.

**P>0.05

Source: field survey, 2016

The Post-hoc multiple mean comparison by Tukey test (HSD) showed that, there was significant difference in total scores of environmental knowledge between the age groups 20-35(M=11.39, ±SD=3.147) and >55(M=9.18, ±SD=3.643), and 36-55(M=10.46, ±SD=3.127) and >55. Similarly, the HSD test also indicted that, there was significance difference in mean score of environmental awareness level along with different age groups of respondents except the age between 36-55 and >55 at 0.05 significance level. The respondents with in age 20-35(M=52.65) had better environmental awareness mean score than respondents that had age between 36-55 (M=47.85) and the age above 55(M=45.91). Generally, from the analysis one can conclude that the mean score environmental knowledge and level of awareness significantly affected by the age level of respondents. That is, the younger the respondents were better than the aged one in knowledge and awareness about of environmental problems, possible causes and responsibilities in

the conservation of environment/natural resources/ in the study area.

Comparison of KAA between different Educational groups of respondents

As many empirical research and scientific explanations have pointed that educational status plays very crucial and indispensable role on the environmental behaviour of people. Educational status of local community helps to understand and synthesis environmental problems, and associated causes from scientific point of view and to have interest (positive response) for environmental management activities as well as to use the environmental elements in a sustainable manner. The following table (6) displayed the effect of educational status of respondents on environmental knowledge, awareness and attitude.

Table 6. ANOVA for comparing KAA among different educational status of respondents

Dependent Variables		Sum of Squares	df*	Mean Square	F	Sig.
Env. Knowledge	Between Groups	810.464		270.155	31.212	0.000**
	Within Groups	2821.669		8.655		
	Total	3632.133				
Env. Awareness	Between Groups	3364.839		1121.613	8.331	0.002**
	Within Groups	43890.158		134.632		
	Total	4725.597				
Env. Attitude	Between Groups	841.243		280.414	3.487	0.016**
	Within Groups	26218.163		80.424		
	Total	27059.4060				

* df (3,326)

**P<0.05

Source: field survey, 2016

From the one way ANOVA in the above table (6), we could infer that educational status of the participants of this study had a statistically significant influence on respondents' level of environmental knowledge ($F_{(3,326)}=31.212, P=0.000, P<0.05$). Also the analysis was resulted in there was statistically significant difference for the total scores environmental awareness level ($F_{(3,326)}=8.331, P=0.002, P<0.05$) and environmental attitude ($F_{(3,326)}=3.487, P=0.016, P<0.05$) for different educational levels of respondents.

In order to determine the effect of each educational category level on respondents' environmental knowledge, attitude and awareness, HSD test was applied. Therefore, from the HSD test result one can conclude that, there was statistically significant difference in environmental knowledge among the educational categories: (illiterate ($M=9.05, \pm SD=3.485$) and elementary ($M=11.77, \pm SD=2.355$), illiterate and secondary ($M=13.52, \pm SD=1.662$), elementary and secondary, elementary and adult education ($M=8.41, \pm SD=3.242$). This indicates that, respondents, the higher in educational status were the more knowledgeable in environmental issues. However the analysis showed that, the adult education contribution was very small, even the illiterate individuals had better environmental knowledge than those who had adult education status. This might be due to, lack of integration and incorporation of environmental issues and education in the adult education curriculum and programs. It may be also the shortage of the allocated time and delivery problems. Generally, the analysis showed that environmental knowledge of the community highly affected by the respondents' educational status. The higher educational level of respondent was the better knowledgeable in environment, environmental problems and related issues.

The Post hoc analysis, HSD test pointed that the environmental awareness level of the respondents had significant difference among different educational categories of respondents. For example total mean scores of awareness level of respondents who had secondary school education ($M=59.05, \pm SD=7.645$) was significantly different from respondents who had elementary education ($M=49.76, \pm SD=10.884$) and adult education ($M=44, \pm SD=10.386$). From this we can understand that the respondents that had relatively higher educational status had good concern, interest and they were sensitive to environmental problem and related issues. Unlike knowledge and awareness level, there was no statistically significant difference in environmental attitude expect those who had secondary education with illiterate individuals.

The researcher also attempted to assess the difference in environmental literacy among respondents those had and didn't have access of information about environmental issues. The study revealed that, out of 330 samples, 62% of them had access of information from different sources [like kebeles' leaders, Development Agents, schools, radio and other informal sources], even though it was not sufficient. There was statistically significant difference on score of environmental knowledge among respondents had and had no access of information about environmental issues ($t(328)=4.523, P<0.01$). The mean score of those who had and had no access of information was 12.27 and 8.59 respectively. Similarly, there was significant difference in score of environmental awareness among the respondents who had and had no access of information ($t(328)=3.482, P<0.05$).

The mean score of respondents had access of information was 52.15 and 45.89 was the mean score of respondents that didn't have access. However, the independent T-test showed that, there was no significant difference in score of environmental attitude among respondents who had and didn't have access of environmental information ($t(328)=1.736, P>0.05$). In conclusion, the educational level of respondents and access to information had their own significant contribution on the environment knowledge, awareness in particularly and environmental behavior of respondents in general. Similarly, [14] conducted a survey to measure environmental perception, knowledge, awareness, and attitude of educated and community groups in Jakarta, Indonesia, and they concluded that educated groups demonstrated higher levels of knowledge, awareness, and attitudes regarding global and local environmental issues than the illiterate community.

IV. CONCLUSION AND RECOMMENDATION

Assessment of environmental literacy level of farmers is very crucial for sustainable use of natural resources; conservation of biodiversity and restoring of degraded lands in rural areas of Ethiopia. It can be also basic input to develop and implement participatory sustainable environmental conservation systems and campaigns. In line these; this study was carried out to measure the environmental knowledge attitude and awareness of farmers in Chench Woreda, South Ethiopia. The study revealed that more than half of the surveyed farmers had moderate and high level of knowledge and awareness and favorable attitude for environment and pro-environmental activities. The study also found that the socio-demographic variables had its own influence on respondents' understanding, belief and perception to global and local environmental issues. The younger and the educated respondents had better knowledge, and awareness about environment and related issues. Moreover, the accessibility of education and information had its own contribution to the environmental literacy of respondents. Respondents that had access of environmental information had better score in environmental knowledge and awareness than those who didn't have access. Accessibility and provision of quality environmental information or education has indispensable contribution to improve the environmental literacy of farmers. However, the respondents of this study had no access of sufficient information about environmental issues. It is assumed that, improving environmental literacy level of farmers is an effort for sustainable use of natural resources. Therefore to improve the community's environmental knowledge, attitude and awareness, the Government, Development Agents, NGOs and others should work together and support the provision of environmental education programs in the study area. In addition, efforts of all stakeholders should focus on improving the community's environmental education through training, conference, extension services, and mass Medias. Finally, environmental literacy level of farmers in Ethiopia has not yet studied and documented. Therefore, researchers are requested to conduct their research on these aforementioned issues in different part of the country.

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Blu-Tack[®] can stop transmission oil leaks

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Abstract- An internet search on the use of Blu-Tack[®], a flexible tacky polymer, as a possible transmission oil stop leak for defective or old gearboxes, showed that there was no evidence to support this hypothesis. Ten preliminary tests involved heating a piece of Blu-Tack attached to a stainless steel kettle for not less than 30 minutes at around 100°C each time. As the Blu-Tack retained the same rubbery and sticky properties it was then decided to investigate whether it can stop gearbox oil leaks on two cars: a relatively new car and an old one. A reasonable piece of Blu-Tack was worked into a long cylindrical strip and pressed firmly using the fingers onto the trouble area so as to form a flat strip approximately 1 cm wide thus covering completely the defective rubber seal or gasket. After ten months and more than 3,000 km of road testing, the putty remained intact and no oil smears were detected. On the much older car with cardboard gaskets, the same procedure was applied and Blu-Tack was again an effective, exterior stop leak. This study provides a platform for further scientific experiments on the use of Blu-Tack for stopping transmission fluid leaks. It is also recommended to investigation whether Blu-Tack can stop engine oil leaks.

Index Terms- Blu-Tack[®]; gasket; gearbox; polymer; rubber seal; stop leak; transmission fluid; transmission oil.

I. BACKGROUND INFORMATION ON BLU-TACK[®]

As a curious researcher, the author was fascinated with the reusable adhesive properties of Blu-Tack[®], a hydrocarbon polymer normally used to attach paper onto hard surfaces. It was a remarkable discovery when this tacky putty-like substance, whose chemical formula is kept secret, was invented (Wikipedia, 2016).

II. IDENTIFYING A MECHANICAL PROBLEM: TRANSMISSION OIL LEAK

Lately, another use for Blu-Tack was hypothesized and investigated; a use which has not been explored and documented – not even on YouTube. When a car was due for its second routine service and the mileage was only in the region of 5,000 km, transmission oil was already leaking very slowly from the manual gearbox. On average, excluding the time the vehicle was on the road, it was only leaking a drop of fluid every four weeks.

III. DRASTIC INTERVENTION SUGGESTED

When the source of the leak was inspected that is, between the extreme end of the engine and the transmission unit, there seemed to be a part which looked as having insufficient sealant.

The problem was discussed with the local agents for this car brand and their senior technician advised to book a repair job which would involve removing the gearbox and instil a new sealant, free of charge as the vehicle was still under warranty. However, as the leak was very slow, the idea of exposing a car to a drastic ‘surgery’ as the first line of treatment was not appealing.

IV. METHOD USED: LITERATURE SEARCH AND DOMESTIC EXPERIMENTATION USING BLU-TACK

The attention was turned onto Blu-Tack. Can this flexible material halt gearbox oil leaks? Although traditionally this comes in pale blue colour, the one used for this preliminary study was a white variant. A Google Scholar search using the keywords ‘Blu-Tack’, ‘transmission’, ‘gearbox’, ‘oil leak’ and ‘fluid leak’ was performed. However, no evidence to support the hypothesis could be found. As the chemical name for Blu-Tack is classified, this could not be used during literature searching.

A series of preliminary domestic tests were then conducted. A stainless steel kettle filled with water and carrying on it a piece of Blu-Tack was exposed to a temperature of around 100°C (boiling point of water) for over thirty minutes. After cooling, the putty was kneaded for 10 seconds and reheated through the same procedure for nine more times, always using the same piece of Blu-Tack. After it was subjected ten times to alternating temperatures and physical stress, it was found that it retained the same rubbery and sticky properties. Moreover, no particular odours were noted. Furthermore, as the kettle surface was highly polished, it indicated how well Blu-Tack can cling onto heated metal especially when it is not refined as are the lower parts of the aluminium composite gearbox.

The next step involved testing it on the vehicle. Any traces of oil and dirt from the suspected part that was leaking - where the engine component met the transmission unit - were thoroughly wiped off. A reasonable piece of Blu-Tack was worked into a long cylindrical strip and pressed firmly using the fingers onto the trouble area so as to form a flat strip approximately 1cm wide thus covering completely the defective rubber seal as illustrated in the photo (Figure 1).

V. RESULTS

Ten months passed since when the putty strap was applied and more than 3,000km of road testing were covered. The putty remained intact and no oil smears were found. This was further confirmed by gently wiping the Blu-Tack strap with a piece of clean, absorbent paper.

Concurrently, another test on a much older car with a mileage history exceeding 100,000 km was carried out. The

source of the leak was again the gearbox. However, the rate or volume of fluid loss was more substantial - one transmission oil drop per week - and this car's gaskets were made of cardboard. The same procedure was applied: wiped thoroughly clean, applied 1cm wide strip of Blu-Tack and left ten months pass by. The result was that Blu-Tack was again an effective, exterior stop leak.

VI. DISCUSSION AND CONCLUSION

The advantages of using Blu-Tack for sealing transmission fluid leaks are several. It is inexpensive, widely available and very easy to use (no tools are required). No hazardous records were reported with the normal use of Blu-Tack (Bostik Limited, 2013). According to this experiment, it also remained stable under mechanical running temperatures. Moreover, being only applied externally, it did not affect the car's warranty and unlike certain chemical stop leaks it posed no risks of any internal clogging and deterioration. A drawback with Blu-Tack is that it is sensitive to pressure and this would limit its use as a universal stop leak.

Although this is a small observational study, it provides a starting platform for further scientific experiments on the use of Blu-Tack as a possible transmission oil stop leak. One should also take this experiment to extreme conditions by exposing the gearbox to overheating temperatures exceeding 120°C. Further investigation on whether this synthetic rubbery compound can stop engine oil leaks is also recommended.

CONFLICTS OF INTEREST

The author has no competing interests to declare. The study was not industry-funded; a registered brand name was used throughout the text because its chemical formula is not freely known.

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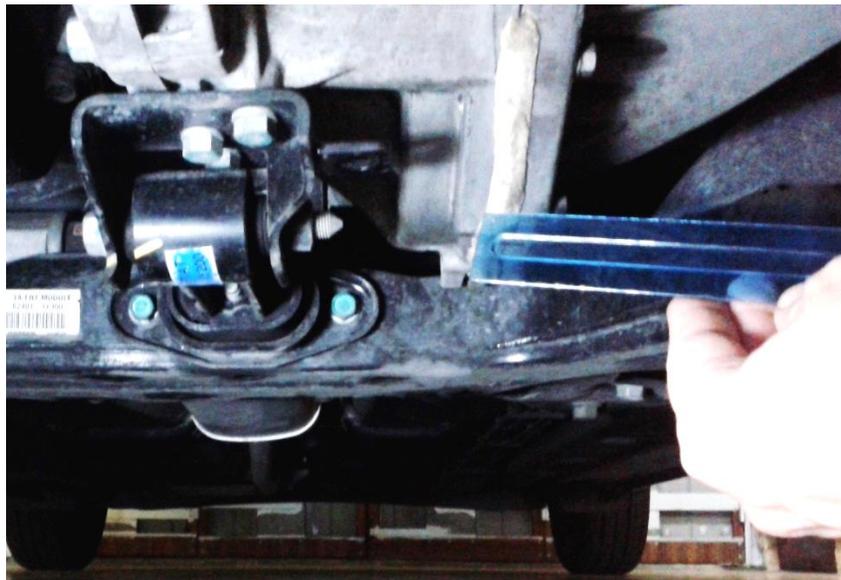


Figure 1: A strip of white Blu-Tack[®], 1 cm wide, attached onto a manual gearbox to stop transmission oil leak.

ANAEROBIC DIGESTION: AN INCREASINGLY ACCEPTABLE TREATMENT OPTION FOR ORGANIC FRACTION OF MUNICIPAL SOLID WASTE

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Abstract- Anaerobic Digestion has been used for decades, primarily in rural areas, for the production of biogas for use as a cooking and lighting fuel. Anaerobic digestion of organic fraction of municipal waste is a relatively new concept that only in the past 20-30 years has found application in pilot and full scale. While anaerobic digestion of organic fraction of municipal solid waste is yet to be widely applied in underdeveloped countries, it can be said to be well established in industrialised nations most especially Europe. This result is largely due to waste and energy policies in Europe (e.g., The Landfill Directive 1999). In Europe, investigation reveals that as at the year 2016 there are 224 anaerobic digestion facilities with an accumulative capacity of 7,750,000 tonnes/year treating over 5% of the biodegradable organic fraction of municipal solid waste. Netherland and Switzerland have the largest capacity installed per capita. The current study shows that anaerobic digestion has become a well-established and accepted treatment option for the organic fraction of municipal solid waste. It has become a good alternative to incineration or landfill disposal due to its lower environmental impacts.

Index Terms- Municipal Solid Waste, Anaerobic Digestion, Waste Composition, Hydrolysis, Digestible Material.

of energy production, into a multi-functional system that covers: treatment of organic waste and waste waters in a broad range of organics and substrate concentrations, improvement of sanitation and reduction of odours, energy production and utilization and production of high quality fertilizers.

Municipal solid waste (MSW) is the waste generated in a community with the exception of industrial and agricultural waste [6]. Hence MSW includes residential waste (households), commercial (e.g., from stores, markets, shops, hotels etc.) and institutional waste (e.g., schools, hospitals etc.). The organic fraction of MSW in most countries represents 70% of the waste composition and consists of paper, garden waste, food waste and other organic waste [7]. According to the World Bank by the year 2025 the world will annually generate about 201 million tonnes of municipal solid waste. [8]. Therefore, treatment of these wastes in a green and sustainable manner such as anaerobic digestion technology is crucial. The anaerobic decomposition of organic materials yields principally methane (CH_4), carbon dioxide (CO_2) and a solid compost material that can be used as soil conditioner. This paper examines in depth anaerobic digestion process as one of the treatment options for organic fraction of municipal solid waste and its future.

I. INTRODUCTION

Since it was established by Jan Baptista Van Helmont that flammable gases evolved from decaying organic matter in the 17th century and possible production of methane from cattle was demonstrated by Sir Humphry Davy in 1808 several advances and achievement has been made in applicability of anaerobic digestion (AD) processes in waste treatment [1]. According to Lusk and Moser, 1996, the Large scale application of anaerobic digestion began in 1859 with the first digestion plant established in Bombay, India [2]. The energy crisis of 1973 and 1979 triggered renewed interest in use of solid waste in methane production as an energy source with countries such as India responded to the crisis with marked expansion of anaerobic digestion with many community digesters using solid waste such as human, animal and kitchen waste to produce large volume of biogas.[3-5]. During the last years, anaerobic digestion of municipal solid waste has developed from a comparatively simple technique of biomass conversion, with the main purpose

II. ANAEROBIC DIGESTION OF ORGANIC FRACTION OF MUNICIPAL SOLID WASTE

Anaerobic biodegradation of organic fraction of municipal solid waste is the consequences of a series of metabolic interactions among various groups of microorganism. It occurs in three stages (hydrolysis, acidogenesis and methanogenesis) [9]. The first group of microorganism secretes enzymes that hydrolyses polymeric materials to monomers such as glucose and amino acids. These are subsequently converted by second group acetogenic bacteria to higher volatile fatty acids, H_2 acetic acid. At the last stage, the third group of bacteria, methanogenic, converts H_2 , CO_2 and acetate to CH_4 [9]. The sequence of anaerobic digestion is described in Figure 1.

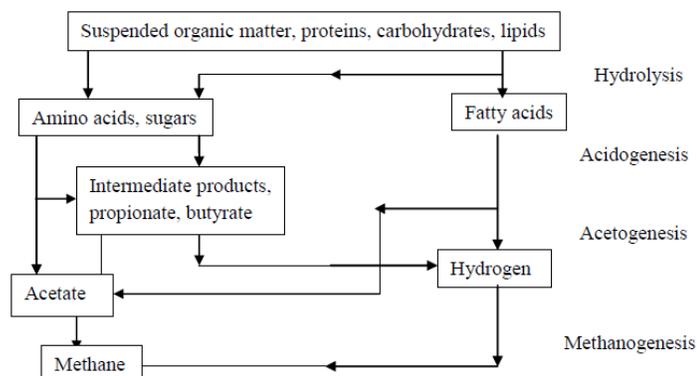


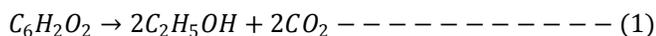
Figure 1. Steps and sequence of anaerobic digestion of organic fraction of municipal solid waste.

2.1 Hydrolysis/liquefaction

This is the first stage in anaerobic digestion of organic fraction of municipal solid waste (OFMSW). Fermentative bacteria convert the insoluble complex organic matter, such as cellulose, into soluble molecules such as sugars, amino acids and fatty acids. The complex polymeric matter is hydrolyzed to monomer, e.g., cellulose to sugars or alcohols and proteins to peptides or amino acids, by hydrolytic enzymes, (lipases, proteases, cellulases, amylases, etc.) secreted by microbes. [10, 11]. The hydrolytic activity is of significant importance in high organic waste and may become rate limiting. Some industrial operations overcome this limitation by the use of chemical reagents to enhance hydrolysis. The application of chemicals to enhance the first step has been found to result in a shorter digestion time and provide a higher methane yield [12].

2.2 Acetogenesis

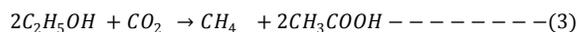
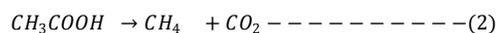
In the second stage, acetogenic bacteria, also known as acid formers, convert the products of the first phase to simple organic acids, carbon dioxide and hydrogen. The principal acids produced are acetic acid (CH₃COOH), propionic acid (CH₃CH₂COOH), butyric acid (CH₃CH₂CH₂COOH), and ethanol (C₂H₅OH). The products formed during acetogenesis are due to a number of different microbes, e.g., *syntrophobacter wolinii*, a propionate decomposer and *syntrophomonos wolfei*, a butyrate decomposer. An acetogenesis reaction is shown in equation (1).



2.3 Methanogenesis.

In the third stage (methanogenesis) methane is produced by bacteria called methane formers (also known as methanogens) in two ways: either by means of cleavage of acetic acid molecules to generate carbon dioxide and methane, or by reduction of carbon dioxide with hydrogen [7]. The methanogenic bacteria include *methanobacterium*, *methanobacillus*, *methanococcus* and *methanosarcina*. Methanogens can also be divided into two groups: acetate and H₂/CO₂ consumers. *Methanosarcina spp.* and *methanothrix spp.* (also, methanosaeta) are considered to be important in anaerobic digestion both as acetate and

H₂/CO₂ consumers. The methanogenesis reactions can be expressed as follows in equations (2), (3) and (4).



III. ANAEROBIC DIGESTION SYSTEM

Generally, the overall anaerobic digestion technology process can be divided into four stages: Pre-treatment, waste digestion, gas recovery and residue treatment. Most digestion systems require pre-treatment of waste to obtain homogeneous feedstock. According to De Baere, 2006, anaerobic technologies for treatment of organic fraction of municipal solid waste treatment can be categorise into: batch systems which can either exist as one or two stage system, one stage continuous system (low solids or high solids) and two stage continuous system (dry-wet and wet-wet). Batch reactors are used where the reactor is loaded with feedstock at the beginning of the reaction and products are discharged at the end of a cycle. The other type of reactor used, mostly for low solids slurries, is continuous flow where the feedstock is continuously charged and discharged. Batch reactors are loaded with feedstock, subjected to reaction, and then are discharged and loaded with a new batch. There are three types of batch systems - single stage batch system, sequential batch system and an Upflow Anaerobic Sludge Blanket reactor. Single-stage digesters are simple to design, build, and operate and are generally less expensive. The organic loading rate (OLR) of single-stage digesters is limited by the ability of methanogenic organisms to tolerate the sudden decline in pH that results from rapid acid production during hydrolysis. Two-stage digesters separate the initial hydrolysis and acid-producing fermentation from methanogenesis, which allows for higher loading rates but requires additional reactors and handling systems. Worldwide, about 90 percent of the installed AD capacity is from single-stage systems and about 10 percent is of two-stage systems.

3.1 Significant Operating Parameters in Anaerobic Digestion Process

In general, the optimal conditions for anaerobic digestion of organic matter are near-neutral pH between 6.8 –7.4, constant temperature (thermophilic 55°C - 70°C and mesophilic 37°C), and a relatively consistent feeding rate [13, 14]. Imbalances among the different microorganisms can develop if conditions are not maintained near optimum. The most common result of imbalance is the buildup of organic acids which suppresses the methanogenic organisms adding to even more buildup of acidity [15]. Acid buildup is usually controlled naturally by inherent chemical buffers and by the methanogens themselves as they consume acids to produce methane. These natural controls can break down if too much feed is added and organic acids are produced faster than they are consumed, if inhibitory compounds accumulate, or if the feed stream lacks natural pH buffers such as carbonate and ammonium.

Solid concentrations higher than about 40 percent total solid (TS) can also result in process inhibition, likely due to the reduced contact area available to the AD microorganisms. The TS content

of OFMSW typically ranges from 30-60 percent, thus some water may need to be added [16]. Higher temperatures result in faster reaction kinetics which, in practice, translates to smaller reactors needed to process a given waste stream. However, the micro-organisms themselves are adapted to relatively narrow temperature ranges. Mesophilic and thermophilic microbes are adapted to roughly 30 - 40°C and 50 - 60 °C respectively. The most important nutrients for bacteria are carbon and nitrogen, but these two elements must be provided in the proper ratio. Otherwise, ammonia can build up to levels that can inhibit the microorganisms. The appropriate carbon/nitrogen (C/N) ratio is highly important because it reflects the nutrients level of a digestion substrate [13]. It depends on the digestibility of the carbon and nitrogen sources; therefore, the appropriate C/N ratio for organic MSW may be different from that for other feedstocks such as manure or wastewater sludge. Information on typical C/N ratio of some digestible material is shown in Table 1.

Table. 1. Typical C/N ratio of some digestible material.

S/N	Raw material	C/N Ratio
1	Human excreta	8
2	Chicken dung	10
3	Pig dung	18
4	Sheep dung	19
5	Cow dung	24
6	Duck dung	8
8	Elephant dung	43
9	Goat dung	12
10	Maize straw	60
11	Rice straw	70
12	Wheat straw	90
13	Water hyacinth	25
14	Municipal solid waste	40
15	Saw dust	>200

Source :[17].

IV. PRESENT AND FUTURE TREND OF ANAEROBIC DIGESTION.

In recent times, developed nations came under pressure to explore AD market because of two significant reasons: High energy prices and stringent environmental regulations, especially controls on organic matter going to landfills as well as further expansion of landfills. Because of environmental pressures, many nations have implemented or are considering methods to reduce the environmental impacts of waste disposal. In developing countries, china and India are ahead. In India the family size biogas programme initiated by the National Biogas and Manure Management Programme (NBMMP) in 2009-2010 installed family size anaerobic digesters which helped in waste management and energy generation. Indian has over 12 million installed family AD digesters while Indonesia and Cambodia have smaller biogas programme which reflects in the less than 1000 system found in each of the country. Over 19 million anaerobic digesters are currently installed in china and more than 25 million household are currently using biogas the produced biogas [18, 19]. Figure 1 is a world distribution of AD systems.

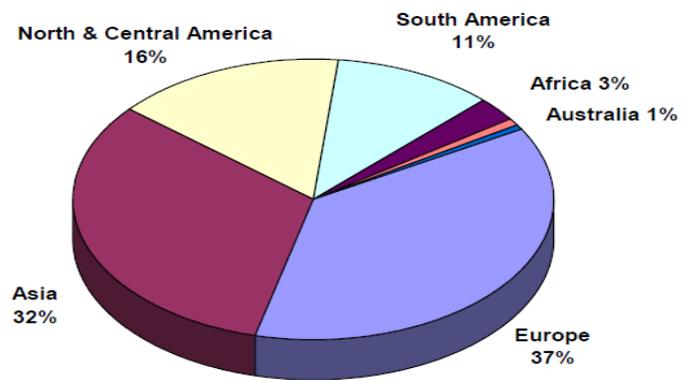


Figure 1. World geographical distribution of industrial anaerobic plants [20].

Europe leads in large centralized AD systems. The most commonly installed anaerobic digestion technology are Kompogas, Valorga, RosRoca, BTA, DRANCO, Citec and Linde. These technologies operate either in mesophilic or thermophilic temperature range. As at the year 2014, Cumulative percentage of mesophilic and thermophilic capacity are 67 and 33% respectively. Europe started AD with three plant with a total capacity of 120,000 tons per year in 1990 but presently, anaerobic digestion capacity in Europe is growing to a total of 290 plants and a digestion capacity of almost nine million tons per year in 2015. From 1990-2014, installed capacity of AD systems has increased in most European countries. Netherlands and Switzerland which are early starters in the application of AD technology have reached levels of 53,000 and 48,000 tonnes per year of installed capacity per million inhabitants respectively. other countries such as France and Spain have also recorded significant increase of installed capacity as indicated in Figure 2[21, 22].

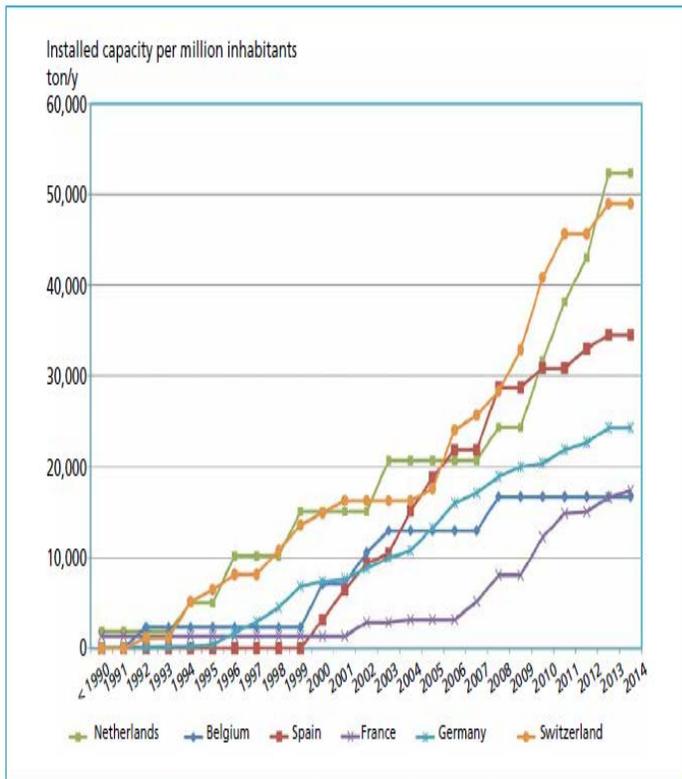


Figure 2: Increase in capacity per million inhabitants per country [21].

A large variation exists in the number of anaerobic digesters installed in Developing Countries. While the AD of organic fraction of municipal solid waste as centralised high technology will continue to increase in developed countries in coming years, the appropriate technology is still struggling in developing nations most especially in Africa. This is due to insufficient knowledge and information available on challenges, opportunities, technical and operational feasibility. If the applicability of AD must advance there is the need for necessary legal frame work that will drive it to the next level of advancement.

V. CONCLUSIONS

The anaerobic digestion of municipal solid waste is a rapidly growing field. The technology has become an increasingly acceptable way of managing organic fraction of municipal solid waste due to it several benefits to the environment which includes potential to reduce environmental impact of waste disposal while capturing biogas energy. While it's extend of applicability have reached advanced level in developed nations it is still a growing technology in developing nations. Nevertheless, it will continue to be an easy and environmentally friendly green technology for managing municipal solid waste.

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Productivity of MSEs: DEA Approach

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Abstract- Any production unit inspires efficiency, because it leads to profitability. The purpose of the study was to evaluate relative Efficiency and TFP of MSEs operating in three sample Towns in Buno Bedelle and Ilu Aba Bor Zones during the year 2013 and 2014. Three input variables - Plant Asset, intermediate variables and number of employee, and one output variable - Net Sales, were selected. Output-orientation DEA BCC-model was used to measure the relative technical efficiency and DEA-MPI to measure the productivity changes over time. The results revealed the average TE score of 0.492, which implies that the sample MSEs on average technically inefficient. It also indicates that the major source of inefficiency during the study period on average comes from pure technical inefficiency which meant primarily due to managerial inefficiency in selecting optimal selection of resource allocation. The study also reveals that the average TFP change is 0.836 during the year 2014 which implies productivity regress. Technical efficiency regress takes the most contributions to the loss of TFP. Regression in Technical efficiency indicates a great potential for the MSEs to increase productivity through effective utilization of resources and filling knowledge dispersion among managers through different capacity building mechanism.

Index Terms- Data Envelopment Analysis, relative efficiency and Total productivity index

I. INTRODUCTION

Efficiency leads production units to profitability, for this reason they inspire efficient production. However, efficient production can be achieved only through minimizing resource utilization and maximizing returns. Aubyn *et al.*, (2009), defined efficiency as a comparison between inputs used in a certain activity and produced outputs. An output-oriented measure of efficiency compares observed output with the maximum output possible given level of input whereas input-oriented measure of efficiency compares the observed input with the minimum level of inputs that could produce the observed level of output (Wheelock and Wilson, 1995).

Currently, entrepreneurship is growing all over the globe as a possibility for productive employment, means of helping youth, and women to assert themselves in the planet of work, and a way of improving both their economic and social status (Heilbrunn, S. *et al.*, 2011). MSEs have large potential to create such opportunities for low skilled and less educated workers (Raj, R., 2007). In addition, MSEs are the engine of economies for any country, especially for developing countries, because they use more of the resource what the country own and less of what it lacks, and they also provide backward linkages for medium and

large enterprises through supply of goods, services, information and knowledge (Charoenrat, T. *et al.*, 2013).

In Ethiopia, like in most developing countries, MSEs play a crucial role in providing productive employment; earning opportunities for the large number of the populations; activating computation by fairly distributing income - which in turn enhance productivity; and then alleviating poverty which has been stimulating economic growth of the country (CSA, 1997, FeMTI MSE strategy, 1997).

In response to the sector's socioeconomic role and its potential contribution to the country's economic development, the Ethiopian government designated small businesses as a priority sector in terms of policy formulation, direct support from own resources and in mobilization of external resources (FeMTI MSE strategy, 1997). To accomplish these policies and to achieve the planned development goal, the government established various responsible bodies in all regions of the country to give immediate response for the sector easily.

Even though the government of Ethiopia works hard to enjoy by the crucial role the sector played in employment and economic development, the progress achieved by sector is more debatable, especially in terms of transforming their capital to the next scale of enterprises (i.e. micro to small, small to medium and large enterprises).

A survey study conducted on four towns of study area by Tekalign, M. *et al.* (2013), for instance, reveals that from 2004 to 2012 only 44.24 percent transformed from Micro enterprises to Small and 3.54 percent transformed from Micro enterprises to Medium & Large scale enterprises. This is what motivates the author to conduct this research to evaluate productivity of manufacturing MSEs operating in these zones. Thus, the aim of this paper is to measure the relative technical efficiency and total factor productivity of MSEs currently on working in sampled towns using Data Envelopment Analysis approach.

1.1. STATEMENT OF THE PROBLEM

Ethiopian Government plan to steer the economy of the nation on a rapid growth path toward becoming a middle income country by 2025. This goal is expected to be accomplished by strengthening MSEs in a manner that unleashes the full growth potential of the sector into medium and large scale enterprises. To fulfill this development plan, the government established MSEs coordinating body at regional level to give immediate support and solution for problem faced by the sector (Entrepreneurship Development Programme in Ethiopia, 2012).

Accordingly, MSEs' development Agencies are set up in all regions, even sub branch offices at zone/district level. Further, the government also arranges the size of support to MSEs based up on the growth stage of the enterprises - providing large support for enterprises in the higher stage to be successful in their business activity. In response, MSEs have been on the

forefront in employment creations, poverty reductions, explosions of entrepreneurs and thus, economic development concurrently in the country (CSA, 2003; MoTI, 1997; GTP, 2010).

Despite the MSEs are playing initiative role in the country's economy in terms of the aforementioned factors of economic development, the sector is not achieving the expected level of growth and transformation in their capital to the next level of enterprises as planned. Surprisingly, some of them were failed to run their business at lower growth stage. Between the year 2003 and 2010, 1,765 (52%) of MSEs were failed to run their businesses in the study area by leaving 1,664 workforces unemployment (Tekalign, M. *et al.*, 2013).

Different researchers tried to shows the reasons of MSEs' failure, such as financial constraints, lack of fair support, lack of infrastructures, marketing problems, etc. (Brahne, T., 2014; Tekalign, M. *et al.*, 2013) and recommended as technology upgrading can be a solution to help MSEs to overcome these problems (Raj, R., 2007). However, advancing technology is proved very costly for developing countries like Ethiopia because of limited capital they possesses to help the sector. Therefore, the alternative way through which the MSEs operating in developing country could solve these problems is by improving their technical efficiency. Thus, this paper aims to evaluate the relative efficiency and productivity of MSEs operating in selected towns using DEA.

1.2. RESEARCH QUESTION

This study going to answer these questions: Are the sampled manufacturing MSEs technically efficient? If not, what are the necessary changes to be undertaken to bring the sector into relatively competent firm? Is there any change in TFP in manufacturing working in sample towns during the past two years?

1.3. OBJECTIVE OF THE STUDY

The main objective of the study is to evaluate technical efficiency of manufacturing MSEs operating in study area. The targeted specific objectives are:

1. To evaluate the relative efficiency and productivity of sample MSEs
2. To determine factor contributing for total factor productivity regress
3. To identify necessary enhancement for inept MSEs to become efficient.

1.4. SIGNIFICANCE OF THE STUDY

The study assess the manufacturing MSEs' relative technical efficiency and the sources of inefficiency that will provide a helpful insight to various government bodies with making decision related to the sector, management and employees of MSEs to take corrective measures to improve their internal efficiency and productivity and it also help the entrepreneurs and general society to help growth of the sector to enhance the general economic growth of the nation. That means, once the concerned body knows the source of inefficiency and factors affecting productivity; s/he can develop the necessary strategy to solve the inefficiency problem in the future. In addition, evaluating relative efficiency and TFP of manufacturing MSEs rectify the gap in literature about the sector.

1.5. DEFINITION OF TERMS AND CONCEPTS

For more clarity and understanding, it is better to have definitions of terms and concepts as used in this paper. These terms and concepts are derived from MoFED, and GTP, 2010 and stated as follows:

An *enterprise* can be defined as an undertaking engaged in production and/or distribution of goods & services for commercial benefits, beyond household consumption at the household level.

An enterprise can be defined as "*Micro Enterprise*" when the numbers of its employees (including the owner or family) are not greater than 5 and total asset is $\leq 100,000$ Ethiopian Birr for industrial sector and $\leq 50,000$ Ethiopian Birr for service sector. In a similar manner, an enterprise defined as "*Small Enterprise*" when the numbers of its employees (including the owner or family) are 6-30 and total asset is 100,001—1,500,000 Ethiopian Birr for industrial sector and 50, 0001—500,000 Ethiopian Birr for service sector.

II. METHODOLOGY

2.1. RESEARCH DESIGN

This study is a quantitative research approach. It tries to describe the relative technical efficiency of manufacturing MSEs using DEA. DEA approach is selected because it doesn't restrict weights or prices of inputs and outputs while specification of their functional relationships and also its ability to identify source of inefficiency, and showing required improvements.

2.2. SOURCE OF DATA AND COLLECTION METHOD

In this paper, two years quantitative panel data would be used because by nature DEA requires balanced panel data to measure TFP. Both primary and secondary sources of data were used. Primary data were collected through unstructured interviews; while secondary data were collected from periodic report prepared by sampled towns' woreda MSEs' agencies and the firm level financial performance, especially, cost components and gross sales of the sectors. Primary data were collected to support collecting and to strength secondary data analysis rather than analyzing separately.

2.3. SAMPLING AND SAMPLING TECHNIQUES

This study focuses on the manufacturing MSEs that have an ample potential to occupy higher employment opportunity and also have a highest potential to bring sustainable development in developing countries like Ethiopia. The study purposively select Bedelle, Yayo, and Bure as a sample area by assuming the sector is densely populated thereof. However, based on availability techniques, 23 MSEs were furnished for analysis to measure the relative technical efficiency and productivity change of the sector.

2.4. METHOD OF DATA ANALYSIS

The study employed DEA output-oriented – BCC model which assumes variable return to scale (VRS) to evaluate relative efficiency of MSEs. An output-oriented VRS measure of efficiency compares observed output with the maximum output possible given level of input assuming firms are not operating at

optimal scale efficiency due to many reasons such as government regulations, imperfect competition and financial restrictions (Coelli *et al.*, 2005; Cooper *et al.*, 2006; Amornkitvikai, 2011). Ethiopian government provide limited support for MSEs, even its amount and type is based on the usefulness and growth stage of an enterprise, so, the only way through which MSEs improving their growth and transformation to the next level of the growth is maximizing output from given input. Therefore, output-orientated could be an appropriate choice to evaluate their technical efficiency. The study used the DEAP version2.1 software tool to compute the technical efficiency and productivity scores.

2.5. SELECTION OF VARIABLES

Measuring efficiency of DMU requires selection of appropriate input and output variables. Based on prior studies in MSEs’ literature and the major cost components that Manufacturing MSEs in Ethiopia have been incurred, three input variables – (1) **Capital** – measured by the value of fixed assets of MSEs at the beginning of the survey year. (2) **Intermediate Variables** – real value of inputs such as raw materials and energy. Raw materials include expenditure on imported and domestic intermediate goods. Similarly, energy input includes expenditure on fuel, electricity, and wood and charcoal used for production. (3) **Labor** – the number of workers in the enterprises including owners. This is used because MSEs employed by owners and sometimes by relatives or family members. Thus, many of the time, MSEs pay zero cost for labor or very minimum cost and one output variable – (1) **Net Sales** - value of annual sales income of the enterprises. This variable selected because many of MSEs produce their product or services when ordered not for stock.

2.6. BCC-DEA MODEL SPECIFICATION

Theoretically, efficiency is determined by dividing the weighted sum of output by weighted sum of inputs. Assume that there are *n* MSEs, each with *m* inputs and *s* output, the relative technical efficiency score of a test MSE *p* is obtained by solving the following model proposed by Banker *et al.*, (1984):

$$\begin{aligned} \max \theta_p &= \sum_{r=1}^s u_{rp} - \theta_p \\ \text{Subject to:} & \\ \sum_{j=1}^m v_{jp} &= 1 \\ \sum_{r=1}^s u_{rp} - \sum_{j=1}^m v_{jp} - \theta_p &< 0 \end{aligned}$$

Ur, Vj ≥ ε, Up – free in sign

The dual form of this linear programming is expressed as:

$$\begin{aligned} \min \theta - \epsilon & \left[\sum_{j=1}^m S_j^- + \sum_{r=1}^s S_r^+ \right] \\ \text{Subject to:} & \\ \sum_{j=1}^m \mu_j x_{ij} + S_j^- &= \theta p x_{ip}, \quad i = 1, \dots, n \end{aligned}$$

$$\begin{aligned} \sum_{r=1}^s \mu_j y_{rj} - S_r^+ &= \theta p y_{rp}, \quad r = 1, \dots, s \\ \sum_{j=1}^m \mu_j &= 1, j = 1, \dots, m \\ \mu_j, S_j^+, S_r^- &\geq 0 \quad j = 1, \dots, m \end{aligned}$$

A decision making unit is BCC-efficient if and only if $\theta^* = 1$ and all slacks (S_j^- & S_r^+) are zero. The envelopment surface in BCC model is variable returns to scale and this is the result of the presence of the convexity constraint ($\sum_{j=1}^m \mu_j = 1$) in the dual and, equivalently, the presence of up which is an unconstrained variable, in the primal problem.

2.7. MALMQUIST PRODUCTIVITY INDEX

The Malmquist productivity index used to measure the productivity trends of DMUs over the given period of time and decomposed it to technical efficiency change and technological changes, according to the following equation (for detail see, Fare *et al.*, 1985)

$$M_{t+1}(x_{t+1}, y_{t+1}, x_t, y_t) = \sqrt{\frac{Dt(x_{t+1}, y_{t+1})}{Dt(x_t, y_t)} \frac{Dt+1(x_{t+1}, y_{t+1})}{Dt+1(x_t, y_t)}}$$

This decomposed into:

$$\begin{aligned} M_{t+1}(x_{t+1}, y_{t+1}, x_t, y_t) &= \frac{Dt+1(x_{t+1}, y_{t+1})}{Dt(x_t, y_t)} \\ &= \left[\frac{Dt(x_{t+1}, y_{t+1})}{Dt+1(x_{t+1}, y_{t+1})} * \frac{Dt(x_t, y_t)}{Dt+1(x_t, y_t)} \right] \\ &= \text{Technical efficiency change (Tech)} * \text{Technological change (Techch)} \end{aligned}$$

III. RESULTS AND DISCUSSIONS

The efficiency measures computed in this study are relative in nature. That means, technical efficiency of the MSEs is not assessed in an absolute manner, but it is compared with the best practice MSEs in the sample. The source of inefficiency can be decided by comparing the relative sizes of pure technical efficiency and scale efficiency measures. If pure technical efficiency is greater than scale efficiency, then inefficiency is caused highly by scale inefficiency.

As revealed in table 3.1, in the year 2013, five MSEs are TE, ten MSEs are PTE and six MSEs are SE. Enterprises that are efficient both in PTE and SE are those operating on most productive scale size (MPSS). In contrast, the remaining MSEs are technically inefficient. That means, out of the total of 23 MSEs, 18(78%) are technically inefficient during the 2013.

Furthermore, it also reveals that the annual average TE of 0.529. This reflects that averagely, the sampled MSEs are technically inefficient. By decomposing technical efficiency into PTE and SE, the results revealed that the annual average PTE was 0.633 and average SE was 0.0.848. Thus, the source of technical inefficiency during the period is PT inefficiency which implies management inefficiency in allocating resources optimally.

Moreover, from the technically inefficient MSEs, nine of them are experiencing increasing return to scale (i.e. they operates at the declining portion of long-run average cost curve). This implies that an increase in the amount of employed inputs is most likely to contribute to a greater proportional increase in

their production output. Hence, these enterprises can enhance their efficiency gain by increasing their scale of operations/resource allocation. In contrast, seven MSEs are experiencing decreasing return-to-scale (i.e. operates at the rising portion of long-run average cost curve). This implies that they

have supra-optimal scale size and thus, downsizing their inputs is needed for achieving efficiency gains. And the remaining MSEs operating on constant return to scale or operating on most productive scale size.

Table3.1: BCC Model Relative Efficiency Summary

2013					2014			
Firm	TE	PTE	SE	Types of Scale	TE	PTE	SE	Types of Scale
1	0.833	1.000	0.833	IRS	0.643	0.999	0.644	IRS
2	1.000	1.000	1.000	-	1.000	1.000	1.000	-
3	1.000	1.000	1.000	-	1.000	1.000	1.000	-
4	0.749	0.863	0.868	DRS	0.653	0.685	0.953	IRS
5	0.824	1.000	0.824	IRS	0.360	0.423	0.851	DRS
6	0.812	1.000	0.812	IRS	0.773	0.797	0.969	DRS
7	1.000	1.000	1.000	-	0.316	0.409	0.772	IRS
8	0.102	1.000	0.102	IRS	0.165	1.000	0.165	IRS
9	1.000	1.000	1.000	-	1.000	1.000	1.000	-
10	0.313	0.487	0.644	DRS	0.301	0.479	0.628	DRS
11	0.445	0.514	0.866	DRS	0.558	0.699	0.798	DRS
12	0.594	0.658	0.903	DRS	0.988	1.000	0.988	DRS
13	0.161	0.172	0.937	IRS	0.104	0.107	0.973	IRS
14	0.187	0.207	0.906	DRS	0.132	0.146	0.898	DRS
15	0.206	0.219	0.940	IRS	0.146	0.146	1.000	-
16	0.183	0.183	1.000	-	0.102	0.117	0.869	DRS
17	1.000	1.000	1.000	-	1.000	1.000	1.000	-
18	0.207	0.240	0.863	IRS	0.082	0.0892	0.889	DRS
19	0.291	0.292	0.999	-	0.239	0.255	0.935	IRS
20	0.173	0.247	0.698	DRS	0.223	0.301	0.740	DRS
21	0.130	0.199	0.652	DRS	0.136	0.180	0.753	DRS
22	0.681	1.000	0.681	IRS	0.247	0.392	0.629	IRS
23	0.283	0.288	0.983	IRS	0.271	0.320	0.848	DRS
Mean	0.529	0.633	0.848		0.454	0.546	0.839	

Source: Author computation 2016

Note:

- ✓ *TE = Technical efficiency from CRS DEA*
- ✓ *PTE= Pure technical efficiency*
- ✓ *SE= Scale efficiency = TE/PTE*
- ✓ *Irs – increasing return to scale*
- ✓ *Drs – decreasing return to scale*

In the year 2014, the four MSEs were technically efficient, whereas 5 MSEs and 6 MSEs were scale efficient and pure technical efficient respectively. That means, 19(83%), 17(74%) and 18(78%) MSEs are technically, pure technically and scale inefficient respectively with the average technical efficiency score of 0.454, average pure technical efficiency of 0.546 and average scale efficiency of 0.839. From this one can understand that even if the number of both relatively technically efficient and scale efficient Enterprises remain constant during the study period, the number of pure technical efficient entity shows detrimental. In addition the average efficiency score of the sector were decreased during the year 2013 when compared with the year 2014 (from 52.9% to 45.4%).

Moreover, out of the relatively technically inefficient MSEs, seven of them are experiencing increasing return-to-scale. This means an increase in the amount of employed inputs is likely to contribute to a greater proportional increase in their production

output. In other words, these MSEs are lie below the optimal scale of operations (operating at sub-optimal scale size) and therefore, they would improve their TE by expanding the scale of operations. Hence, these enterprises can enhance their efficiency gain by increasing their scale of operations/resource allocation. In addition, eleven MSEs are experiencing decreasing return to scale. This implies that they have supra-optimal scale size (i.e. operates at the rising portion of long-run average cost curve) and thus, downsizing their inputs is needed for achieving efficiency gains.

Despite, five MSEs are found to be operating at most productive scale size (MPSS) and experiencing constant return to scale (CRS). This means, these enterprises are operate at a flatter portion of long-run average cost curve. In other word, the relatively efficient MSEs are operating on the most productive scale size and experiencing constant return to scale (CRS). Further, when we come to the source of inefficiency, the results

revealed that pure technical inefficiency takes the higher contribution (36.8%) than scale inefficiency (34.2%).

Table3.2: Average Annual TE, PTE and SE

	2013	2014	Average
Technical Efficiency	0.529	0.454	0.492
Pure Technical Efficiency	0.633	0.546	0.590
Scale Efficiency	0.848	0.590	0.719

Source: Authors calculations, 2016

Table 3.2 describes the average estimates of TE and VRS components of TE of MSEs by year. The average annual TE for MSEs during the study period were 0.529 in the year 2013 and 0.454 in the year 2014 with an overall mean over the two years equal to 0.492. This implies that the average MSEs in the sample could have reduced the level for inefficiency approximately 50.8% to produce the same level of output. Similarly, the average PTE score was 0.633 in the year 2013, and 0.546 in the year 2014, with an overall mean over the two years equal to 0.590. This indicates that the PTE during the study period ranges between 36.7% and 45.4% and to be PTE in every year of the study, on average the MSEs had reduce their level of inefficiency by 41%.

Furthermore, the average SE ranges between 0.848 in the year 2013 and 0.839 in the year 2014, with an overall mean over both period equal to 0.719. This implies to be SE in each year of the study period, MSEs' scale inefficiency had reduced on average by 16.2%.

Finally, when compared overall annual mean efficiency of PTE with that of SE, there is indication which SE contributes more towards efficiency during both years of study and therefore, the source of inefficiency is attributed to pure technical inefficiency (managerial inefficiency) rather than scale inefficiency. These results are against to Soetanto and Ricky (2011) which stated that technical efficiency scores obtained under VRS (PTE) are higher than scale efficiency (SE) and thus, the cause of inefficiency is scale inefficiency rather than pure technical inefficiency.

3.1. POTENTIAL IMPROVEMENT SUMMARY

The potential improvement is calculated for each variable as percentage of the movement from the actual value. Zhu (2000) argued that in DEA, if the DMU's all input and output slacks are equal to zero, then DMU is defined to be Constant Return to Scale efficient, otherwise; the DMU is defined to be Constant Return to Scale inefficient and could improve its efficiency by either reducing its input levels or increasing its output levels. Input slacks represent the input excess used that are required to reduce and the output slack represents the output which is under produced by the DMUs (Collie, 1996). Technically inefficient MSEs become relatively efficient either by decreasing their excess level of inputs without changing their outputs or increases further the level of outputs without altering their level of inputs.

Table3.3. Potential Improvement summary

Variable	Original value (in million birr)	Potential Improvement	
		Amount (in million birr)	Percentage
Net Sales	3,521.86	2,716.186	77.12
Capital	8,580.51	-1,276	14.87
Labor	253.00	-65.000	25.69
Intermediate Inputs	2,218.52	-255.240	11.51

Source: Author computation, 2016

Table 3.3 shows the amount and percentage of potential improvement for each input and/or output variables during the study period. This is achieved by aggregating the potential improvement per each variable per year together and dividing the aggregate by total actual value for each variable. As shown in the table, the potential improvement needed for the input variables are; Capital should reduced on average by 1,276(14.87%), Labor should reduced on average by 65(25.69%) and Intermediate Inputs should reduced on average by 255.240(11.51%), whereas for the output variable, Net Sales should increased further on average by 2,716.186 (77.12%) to reach the target output level.

3.2. MALMQUIST INDEX SUMMARY OF FIRM MEANS

The Malmquist index evaluates the productivity changes over time. In the non-parametric framework, it is measured as the product of recovery and innovation terms, both coming from the DEA technologies. The recovery term relates to the degree that a DMU attains for improving its efficiency, while the innovation term reflects the change in the efficient frontiers surrounding the DMU between the two time periods (Cooper, *et al.*, 2004).

Table3.4 shows Malmquist Productivity Index Summary of Firm Means. The MPI evaluates the productivity changes over time which is measured as the product of technical efficiency change (Tech) and technological change (Techch). The findings of the average TFP change and its components of MSEs during the study period reveals that Tech of 5(22%) MSEs increased, whereas that of 14(61%) MSEs declined. It also revealed that in 16(70%) MSEs technological progress has been observed. In contrast, in 6(26%) MSEs the result shows technology deterioration during the period. Moreover, the results also show that, on average, the TFP change is 0.836 which is less than unity; and indicates a 16.4% regress from 2013 to 2014. The loss in TFP has been mostly due to technical efficiency regress.

Furthermore, the mean technical efficiency change of MSEs is equal to 0.810 implying averagely, technical efficiency decline by 19% during the study period. Decline in technical efficiency is due to PTE regress averagely by 19.5%. Nevertheless, the average technological change of sector is 1.032 implying the technological progress of 3.2% during the study period

Table3.4: Malmquist Index Summary of Firm Means

Firm	Tech	Techch	Pech	Sech	Tfpch
1	0.771	1.107	0.999	0.773	0.854
2	1.000	1.001	1.000	1.000	1.001
3	1.000	1.234	1.000	1.000	1.234
4	0.872	1.010	0.794	1.098	0.881
5	0.437	1.219	0.423	1.032	0.532
6	0.951	1.137	0.797	1.193	1.081
7	0.316	1.000	0.409	0.772	0.316
8	1.613	1.010	1.000	1.613	1.629
9	1.000	1.018	1.000	1.000	1.018
10	0.961	0.905	0.985	0.976	0.870
11	1.254	0.838	1.361	0.922	1.052
12	1.663	0.732	1.520	1.094	1.218
13	0.648	1.331	0.625	1.038	0.863
14	0.704	0.948	0.709	0.992	0.667
15	0.712	1.196	0.669	1.064	0.852
16	0.556	1.338	0.640	0.869	0.744
17	1.000	0.677	1.000	1.000	0.677
18	0.395	1.063	0.383	1.031	0.420
19	0.819	1.010	0.875	0.935	0.827
20	1.291	1.157	1.217	1.060	1.493
21	1.048	1.172	0.908	1.155	1.229
22	0.363	1.003	0.392	0.924	0.364
23	0.958	0.953	1.111	0.862	0.913
Mean	0.810	1.032	0.805	1.006	0.836

Source: Author computation 2016

[Note that all Malmquist index averages are geometric means]

IV. CONCLUSIONS

In current dynamic and competitive world issue, measurement is the way of managing the situations and achieving improvement for success. Such conditions necessitate the detail understanding of technical efficiency of DMUs. Thus, it is helpful to compute technical and productive efficiency of MSEs which entertain moderate competition when compared to other sectors working in Ethiopia since they are large in number and employing non-educated labor forces to more professional entrepreneurs. Therefore, the aim of this paper is to investigate the relative TE of MSEs operating in Buno Bedelle and Ilu Aba Bor Zones using DEA. By applying data availability technique 23 MSEs observed from three purposively selected towns of the zones for the two years study period, 2013 and 2014. After reviewing previous MSEs' literatures in different country and based on local MSEs' cost components three input variables and one output variables were selected for the study. The input variables are capital, intermediate variables and number of employees, whereas the output variable is net sales.

The results show a substantial level of dispersion of TE between entities within the sample during the study period. The estimated results revealed that only 4 MSEs are technically efficient in both years under investigation. It is also found that the annual average TE of 0.529 during the year 2013 and 0.454 during the year 2014. This indicates that the overall level of technical inefficiency in sample MSEs operating in sample towns, ranges from a minimum 47.1% to a maximum 54.6%.

Furthermore, it is also found that the average PTE was 0.633 in the year 2013 and 0.546 in the year 2014, whereas the average SE scores was 0.848 in year 2013 and 0.839 in the year 2014. This implies that deviation of management efficiency in allocating resource optimally ranges from 36.7% to 45.4% and deviation of actual scale of production from the most productive scale size range between 17.6% and 14.9% during the study period.

Moreover, out of 46 observations, the results of 16(35%) observations show increasing return-to-scale, hence, can enhance their efficiency gain by increasing their scale of operations/resource allocation. In contrast, the results of 18(39%) observations show decreasing return-to-scale, means they are working at a increasing portion of long-run average cost curve (i.e. they have supra-optimal scale size). So, these MSEs can improve their efficiency score by downsizing their scale size.

When we estimate the annual average efficiency scores of MSEs, the overall mean TE of sample MSEs over the study period was 0.492 which indicates the MSEs could have increase their output on average by 50.8% by using the same level of inputs. This implies that sample MSEs on average relatively technically inefficient. Further, the overall mean PTE and SE were 0.554 and 0.838 respectively. Hence, the source of technical inefficiency among sample MSEs, on average, is due to PT inefficiency.

Based on the MPI, the findings of the two years average TFP change and its components of MSEs reveal that in 14 (37%) MSEs decrease in annual TE and in 5(22%) MSEs, progress in annual TE has been observed. It also revealed that in 16(70%)

MSEs technological progress has been observed. In contrast, the results of 6(26%) MSEs show deterioration in technology during the relevant period. In addition, the results also show that, on average, the TFP change is 0.836 which is less than unity; and it indicates a 16.4% regress over the two years. The loss in TFP has been mostly due to technical efficiency regress in the sample firms.

As described in the results of average changes in all sampled MSEs' TFP and its components by year, the average annual TE of MSE is equal to 0.810 implying averagely, TE decline by 19% during the study period. This decline in TE is the result of PTE regress averagely by 19.5% and proceeding in scale efficiency averagely by 0.6%. Nevertheless, the average technological change of sector is 1.032. This implies that technological progress of 3.2% during the study period. Regression in Technical efficiency indicates a great potential for the MSEs to increase productivity through effective utilization of resources and filling knowledge dispersion among managers through different capacity building mechanism.

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Productivity of MSEs: DEA Approach

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Abstract- Any production unit inspires efficiency, because it leads to profitability. The purpose of the study was to evaluate relative Efficiency and TFP of MSEs operating in three sample Towns in Buno Bedelle and Ilu Aba Bor Zones during the year 2013 and 2014. Three input variables - Plant Asset, intermediate variables and number of employee, and one output variable - Net Sales, were selected. Output-orientation DEA BCC-model was used to measure the relative technical efficiency and DEA-MPI to measure the productivity changes over time. The results revealed the average TE score of 0.492, which implies that the sample MSEs on average technically inefficient. It also indicates that the major source of inefficiency during the study period on average comes from pure technical inefficiency which meant primarily due to managerial inefficiency in selecting optimal selection of resource allocation. The study also reveals that the average TFP change is 0.836 during the year 2014 which implies productivity regress. Technical efficiency regress takes the most contributions to the loss of TFP. Regression in Technical efficiency indicates a great potential for the MSEs to increase productivity through effective utilization of resources and filling knowledge dispersion among managers through different capacity building mechanism.

Index Terms- Data Envelopment Analysis, relative efficiency and Total productivity index

I. INTRODUCTION

Efficiency leads production units to profitability, for this reason they inspire efficient production. However, efficient production can be achieved only through minimizing resource utilization and maximizing returns. Aubyn *et al.*, (2009), defined efficiency as a comparison between inputs used in a certain activity and produced outputs. An output-oriented measure of efficiency compares observed output with the maximum output possible given level of input whereas input-oriented measure of efficiency compares the observed input with the minimum level of inputs that could produce the observed level of output (Wheelock and Wilson, 1995).

Currently, entrepreneurship is growing all over the globe as a possibility for productive employment, means of helping youth, and women to assert themselves in the planet of work, and a way of improving both their economic and social status (Heilbrunn, S. *et al.*, 2011). MSEs have large potential to create such opportunities for low skilled and less educated workers (Raj, R., 2007). In addition, MSEs are the engine of economies for any country, especially for developing countries, because they use more of the resource what the country own and less of what it lacks, and they also provide backward linkages for medium and

large enterprises through supply of goods, services, information and knowledge (Charoenrat, T. *et al.*, 2013).

In Ethiopia, like in most developing countries, MSEs play a crucial role in providing productive employment; earning opportunities for the large number of the populations; activating computation by fairly distributing income - which in turn enhance productivity; and then alleviating poverty which has been stimulating economic growth of the country (CSA, 1997, FeMTI MSE strategy, 1997).

In response to the sector's socioeconomic role and its potential contribution to the country's economic development, the Ethiopian government designated small businesses as a priority sector in terms of policy formulation, direct support from own resources and in mobilization of external resources (FeMTI MSE strategy, 1997). To accomplish these policies and to achieve the planned development goal, the government established various responsible bodies in all regions of the country to give immediate response for the sector easily.

Even though the government of Ethiopia works hard to enjoy by the crucial role the sector played in employment and economic development, the progress achieved by sector is more debatable, especially in terms of transforming their capital to the next scale of enterprises (i.e. micro to small, small to medium and large enterprises).

A survey study conducted on four towns of study area by Tekalign, M. *et al.* (2013), for instance, reveals that from 2004 to 2012 only 44.24 percent transformed from Micro enterprises to Small and 3.54 percent transformed from Micro enterprises to Medium & Large scale enterprises. This is what motivates the author to conduct this research to evaluate productivity of manufacturing MSEs operating in these zones. Thus, the aim of this paper is to measure the relative technical efficiency and total factor productivity of MSEs currently on working in sampled towns using Data Envelopment Analysis approach.

1.1. STATEMENT OF THE PROBLEM

Ethiopian Government plan to steer the economy of the nation on a rapid growth path toward becoming a middle income country by 2025. This goal is expected to be accomplished by strengthening MSEs in a manner that unleashes the full growth potential of the sector into medium and large scale enterprises. To fulfill this development plan, the government established MSEs coordinating body at regional level to give immediate support and solution for problem faced by the sector (Entrepreneurship Development Programme in Ethiopia, 2012).

Accordingly, MSEs' development Agencies are set up in all regions, even sub branch offices at zone/district level. Further, the government also arranges the size of support to MSEs based up on the growth stage of the enterprises - providing large support for enterprises in the higher stage to be successful in their business activity. In response, MSEs have been on the

forefront in employment creations, poverty reductions, explosions of entrepreneurs and thus, economic development concurrently in the country (CSA, 2003; MoTI, 1997; GTP, 2010).

Despite the MSEs are playing initiative role in the country's economy in terms of the aforementioned factors of economic development, the sector is not achieving the expected level of growth and transformation in their capital to the next level of enterprises as planned. Surprisingly, some of them were failed to run their business at lower growth stage. Between the year 2003 and 2010, 1,765 (52%) of MSEs were failed to run their businesses in the study area by leaving 1,664 workforces unemployment (Tekalign, M. *et al.*, 2013).

Different researchers tried to shows the reasons of MSEs' failure, such as financial constraints, lack of fair support, lack of infrastructures, marketing problems, etc. (Brahne, T., 2014; Tekalign, M. *et al.*, 2013) and recommended as technology upgrading can be a solution to help MSEs to overcome these problems (Raj, R., 2007). However, advancing technology is proved very costly for developing countries like Ethiopia because of limited capital they possesses to help the sector. Therefore, the alternative way through which the MSEs operating in developing country could solve these problems is by improving their technical efficiency. Thus, this paper aims to evaluate the relative efficiency and productivity of MSEs operating in selected towns using DEA.

1.2. RESEARCH QUESTION

This study going to answer these questions: Are the sampled manufacturing MSEs technically efficient? If not, what are the necessary changes to be undertaken to bring the sector into relatively competent firm? Is there any change in TFP in manufacturing working in sample towns during the past two years?

1.3. OBJECTIVE OF THE STUDY

The main objective of the study is to evaluate technical efficiency of manufacturing MSEs operating in study area. The targeted specific objectives are:

1. To evaluate the relative efficiency and productivity of sample MSEs
2. To determine factor contributing for total factor productivity regress
3. To identify necessary enhancement for inept MSEs to become efficient.

1.4. SIGNIFICANCE OF THE STUDY

The study assess the manufacturing MSEs' relative technical efficiency and the sources of inefficiency that will provide a helpful insight to various government bodies with making decision related to the sector, management and employees of MSEs to take corrective measures to improve their internal efficiency and productivity and it also help the entrepreneurs and general society to help growth of the sector to enhance the general economic growth of the nation. That means, once the concerned body knows the source of inefficiency and factors affecting productivity; s/he can develop the necessary strategy to solve the inefficiency problem in the future. In addition, evaluating relative efficiency and TFP of manufacturing MSEs rectify the gap in literature about the sector.

1.5. DEFINITION OF TERMS AND CONCEPTS

For more clarity and understanding, it is better to have definitions of terms and concepts as used in this paper. These terms and concepts are derived from MoFED, and GTP, 2010 and stated as follows:

An *enterprise* can be defined as an undertaking engaged in production and/or distribution of goods & services for commercial benefits, beyond household consumption at the household level.

An enterprise can be defined as "*Micro Enterprise*" when the numbers of its employees (including the owner or family) are not greater than 5 and total asset is $\leq 100,000$ Ethiopian Birr for industrial sector and $\leq 50,000$ Ethiopian Birr for service sector. In a similar manner, an enterprise defined as "*Small Enterprise*" when the numbers of its employees (including the owner or family) are 6-30 and total asset is 100,001—1,500,000 Ethiopian Birr for industrial sector and 50, 0001—500,000 Ethiopian Birr for service sector.

II. METHODOLOGY

2.1. RESEARCH DESIGN

This study is a quantitative research approach. It tries to describe the relative technical efficiency of manufacturing MSEs using DEA. DEA approach is selected because it doesn't restrict weights or prices of inputs and outputs while specification of their functional relationships and also its ability to identify source of inefficiency, and showing required improvements.

2.2. SOURCE OF DATA AND COLLECTION METHOD

In this paper, two years quantitative panel data would be used because by nature DEA requires balanced panel data to measure TFP. Both primary and secondary sources of data were used. Primary data were collected through unstructured interviews; while secondary data were collected from periodic report prepared by sampled towns' woreda MSEs' agencies and the firm level financial performance, especially, cost components and gross sales of the sectors. Primary data were collected to support collecting and to strength secondary data analysis rather than analyzing separately.

2.3. SAMPLING AND SAMPLING TECHNIQUES

This study focuses on the manufacturing MSEs that have an ample potential to occupy higher employment opportunity and also have a highest potential to bring sustainable development in developing countries like Ethiopia. The study purposively select Bedelle, Yayo, and Bure as a sample area by assuming the sector is densely populated thereof. However, based on availability techniques, 23 MSEs were furnished for analysis to measure the relative technical efficiency and productivity change of the sector.

2.4. METHOD OF DATA ANALYSIS

The study employed DEA output-oriented – BCC model which assumes variable return to scale (VRS) to evaluate relative efficiency of MSEs. An output-oriented VRS measure of efficiency compares observed output with the maximum output possible given level of input assuming firms are not operating at

optimal scale efficiency due to many reasons such as government regulations, imperfect competition and financial restrictions (Coelli *et al.*, 2005; Cooper *et al.*, 2006; Amornkitvikai, 2011). Ethiopian government provide limited support for MSEs, even its amount and type is based on the usefulness and growth stage of an enterprise, so, the only way through which MSEs improving their growth and transformation to the next level of the growth is maximizing output from given input. Therefore, output-orientated could be an appropriate choice to evaluate their technical efficiency. The study used the DEAP version2.1 software tool to compute the technical efficiency and productivity scores.

2.5. SELECTION OF VARIABLES

Measuring efficiency of DMU requires selection of appropriate input and output variables. Based on prior studies in MSEs’ literature and the major cost components that Manufacturing MSEs in Ethiopia have been incurred, three input variables – (1) **Capital** – measured by the value of fixed assets of MSEs at the beginning of the survey year. (2) **Intermediate Variables** – real value of inputs such as raw materials and energy. Raw materials include expenditure on imported and domestic intermediate goods. Similarly, energy input includes expenditure on fuel, electricity, and wood and charcoal used for production. (3) **Labor** – the number of workers in the enterprises including owners. This is used because MSEs employed by owners and sometimes by relatives or family members. Thus, many of the time, MSEs pay zero cost for labor or very minimum cost and one output variable – (1) **Net Sales** - value of annual sales income of the enterprises. This variable selected because many of MSEs produce their product or services when ordered not for stock.

2.6. BCC-DEA MODEL SPECIFICATION

Theoretically, efficiency is determined by dividing the weighted sum of output by weighted sum of inputs. Assume that there are *n* MSEs, each with *m* inputs and *s* output, the relative technical efficiency score of a test MSE *p* is obtained by solving the following model proposed by Banker *et al.*, (1984):

$$\begin{aligned} \max \theta_p &= \sum_{r=1}^s u_{rp} - \theta_p \\ \text{Subject to:} & \\ \sum_{j=1}^m v_{jp} &= 1 \\ \sum_{r=1}^s u_{rp} - \sum_{j=1}^m v_{jp} - \theta_p &< 0 \end{aligned}$$

Ur, Vj ≥ ε, Up – free in sign

The dual form of this linear programming is expressed as:

$$\begin{aligned} \min \theta - \epsilon & \left[\sum_{j=1}^m S_j^- + \sum_{r=1}^s S_r^+ \right] \\ \text{Subject to:} & \\ \sum_{j=1}^m \mu_j x_{ij} + S_j^- &= \theta p x_{ip}, \quad i = 1, \dots, n \end{aligned}$$

$$\begin{aligned} \sum_{r=1}^s \mu_j y_{rj} - S_r^+ &= \theta p y_{rp}, \quad r = 1, \dots, s \\ \sum_{j=1}^m \mu_j &= 1, j = 1, \dots, m \\ \mu_j, S_j^+, S_r^- &\geq 0 \quad j = 1, \dots, m \end{aligned}$$

A decision making unit is BCC-efficient if and only if $\theta^* = 1$ and all slacks (S_j^- & S_r^+) are zero. The envelopment surface in BCC model is variable returns to scale and this is the result of the presence of the convexity constraint ($\sum_{j=1}^m \mu_j = 1$) in the dual and, equivalently, the presence of up which is an unconstrained variable, in the primal problem.

2.7. MALMQUIST PRODUCTIVITY INDEX

The Malmquist productivity index used to measure the productivity trends of DMUs over the given period of time and decomposed it to technical efficiency change and technological changes, according to the following equation (for detail see, Fare *et al.*, 1985)

$$M_{t+1}(x_{t+1}, y_{t+1}, x_t, y_t) = \sqrt{\frac{Dt(x_{t+1}, y_{t+1})}{Dt(x_t, y_t)} \frac{Dt+1(x_{t+1}, y_{t+1})}{Dt+1(x_t, y_t)}}$$

This decomposed into:

$$\begin{aligned} M_{t+1}(x_{t+1}, y_{t+1}, x_t, y_t) &= \frac{Dt+1(x_{t+1}, y_{t+1})}{Dt(x_t, y_t)} \\ &= \left[\frac{Dt(x_{t+1}, y_{t+1})}{Dt+1(x_{t+1}, y_{t+1})} * \frac{Dt(x_t, y_t)}{Dt+1(x_t, y_t)} \right] \\ &= \text{Technical efficiency change (Tech)} * \text{Technological change (Techch)} \end{aligned}$$

III. RESULTS AND DISCUSSIONS

The efficiency measures computed in this study are relative in nature. That means, technical efficiency of the MSEs is not assessed in an absolute manner, but it is compared with the best practice MSEs in the sample. The source of inefficiency can be decided by comparing the relative sizes of pure technical efficiency and scale efficiency measures. If pure technical efficiency is greater than scale efficiency, then inefficiency is caused highly by scale inefficiency.

As revealed in table 3.1, in the year 2013, five MSEs are TE, ten MSEs are PTE and six MSEs are SE. Enterprises that are efficient both in PTE and SE are those operating on most productive scale size (MPSS). In contrast, the remaining MSEs are technically inefficient. That means, out of the total of 23 MSEs, 18(78%) are technically inefficient during the 2013.

Furthermore, it also reveals that the annual average TE of 0.529. This reflects that averagely, the sampled MSEs are technically inefficient. By decomposing technical efficiency into PTE and SE, the results revealed that the annual average PTE was 0.633 and average SE was 0.0.848. Thus, the source of technical inefficiency during the period is PT inefficiency which implies management inefficiency in allocating resources optimally.

Moreover, from the technically inefficient MSEs, nine of them are experiencing increasing return to scale (i.e. they operates at the declining portion of long-run average cost curve). This implies that an increase in the amount of employed inputs is most likely to contribute to a greater proportional increase in

their production output. Hence, these enterprises can enhance their efficiency gain by increasing their scale of operations/resource allocation. In contrast, seven MSEs are experiencing decreasing return-to-scale (i.e. operates at the rising portion of long-run average cost curve). This implies that they

have supra-optimal scale size and thus, downsizing their inputs is needed for achieving efficiency gains. And the remaining MSEs operating on constant return to scale or operating on most productive scale size.

Table3.1: BCC Model Relative Efficiency Summary

2013					2014			
Firm	TE	PTE	SE	Types of Scale	TE	PTE	SE	Types of Scale
1	0.833	1.000	0.833	IRS	0.643	0.999	0.644	IRS
2	1.000	1.000	1.000	-	1.000	1.000	1.000	-
3	1.000	1.000	1.000	-	1.000	1.000	1.000	-
4	0.749	0.863	0.868	DRS	0.653	0.685	0.953	IRS
5	0.824	1.000	0.824	IRS	0.360	0.423	0.851	DRS
6	0.812	1.000	0.812	IRS	0.773	0.797	0.969	DRS
7	1.000	1.000	1.000	-	0.316	0.409	0.772	IRS
8	0.102	1.000	0.102	IRS	0.165	1.000	0.165	IRS
9	1.000	1.000	1.000	-	1.000	1.000	1.000	-
10	0.313	0.487	0.644	DRS	0.301	0.479	0.628	DRS
11	0.445	0.514	0.866	DRS	0.558	0.699	0.798	DRS
12	0.594	0.658	0.903	DRS	0.988	1.000	0.988	DRS
13	0.161	0.172	0.937	IRS	0.104	0.107	0.973	IRS
14	0.187	0.207	0.906	DRS	0.132	0.146	0.898	DRS
15	0.206	0.219	0.940	IRS	0.146	0.146	1.000	-
16	0.183	0.183	1.000	-	0.102	0.117	0.869	DRS
17	1.000	1.000	1.000	-	1.000	1.000	1.000	-
18	0.207	0.240	0.863	IRS	0.082	0.0892	0.889	DRS
19	0.291	0.292	0.999	-	0.239	0.255	0.935	IRS
20	0.173	0.247	0.698	DRS	0.223	0.301	0.740	DRS
21	0.130	0.199	0.652	DRS	0.136	0.180	0.753	DRS
22	0.681	1.000	0.681	IRS	0.247	0.392	0.629	IRS
23	0.283	0.288	0.983	IRS	0.271	0.320	0.848	DRS
Mean	0.529	0.633	0.848		0.454	0.546	0.839	

Source: Author computation 2016

Note:

- ✓ *TE = Technical efficiency from CRS DEA*
- ✓ *PTE= Pure technical efficiency*
- ✓ *SE= Scale efficiency = TE/PTE*
- ✓ *Irs – increasing return to scale*
- ✓ *Drs – decreasing return to scale*

In the year 2014, the four MSEs were technically efficient, whereas 5 MSEs and 6 MSEs were scale efficient and pure technical efficient respectively. That means, 19(83%), 17(74%) and 18(78%) MSEs are technically, pure technically and scale inefficient respectively with the average technical efficiency score of 0.454, average pure technical efficiency of 0.546 and average scale efficiency of 0.839. From this one can understand that even if the number of both relatively technically efficient and scale efficient Enterprises remain constant during the study period, the number of pure technical efficient entity shows detrimental. In addition the average efficiency score of the sector were decreased during the year 2013 when compared with the year 2014 (from 52.9% to 45.4%).

Moreover, out of the relatively technically inefficient MSEs, seven of them are experiencing increasing return-to-scale. This means an increase in the amount of employed inputs is likely to contribute to a greater proportional increase in their production

output. In other words, these MSEs are lie below the optimal scale of operations (operating at sub-optimal scale size) and therefore, they would improve their TE by expanding the scale of operations. Hence, these enterprises can enhance their efficiency gain by increasing their scale of operations/resource allocation. In addition, eleven MSEs are experiencing decreasing return to scale. This implies that they have supra-optimal scale size (i.e. operates at the rising portion of long-run average cost curve) and thus, downsizing their inputs is needed for achieving efficiency gains.

Despite, five MSEs are found to be operating at most productive scale size (MPSS) and experiencing constant return to scale (CRS). This means, these enterprises are operate at a flatter portion of long-run average cost curve. In other word, the relatively efficient MSEs are operating on the most productive scale size and experiencing constant return to scale (CRS). Further, when we come to the source of inefficiency, the results

revealed that pure technical inefficiency takes the higher contribution (36.8%) than scale inefficiency (34.2%).

Table3.2: Average Annual TE, PTE and SE

	2013	2014	Average
Technical Efficiency	0.529	0.454	0.492
Pure Technical Efficiency	0.633	0.546	0.590
Scale Efficiency	0.848	0.590	0.719

Source: Authors calculations, 2016

Table 3.2 describes the average estimates of TE and VRS components of TE of MSEs by year. The average annual TE for MSEs during the study period were 0.529 in the year 2013 and 0.454 in the year 2014 with an overall mean over the two years equal to 0.492. This implies that the average MSEs in the sample could have reduced the level for inefficiency approximately 50.8% to produce the same level of output. Similarly, the average PTE score was 0.633 in the year 2013, and 0.546 in the year 2014, with an overall mean over the two years equal to 0.590. This indicates that the PTE during the study period ranges between 36.7% and 45.4% and to be PTE in every year of the study, on average the MSEs had reduce their level of inefficiency by 41%.

Furthermore, the average SE ranges between 0.848 in the year 2013 and 0.839 in the year 2014, with an overall mean over both period equal to 0.719. This implies to be SE in each year of the study period, MSEs' scale inefficiency had reduced on average by 16.2%.

Finally, when compared overall annual mean efficiency of PTE with that of SE, there is indication which SE contributes more towards efficiency during both years of study and therefore, the source of inefficiency is attributed to pure technical inefficiency (managerial inefficiency) rather than scale inefficiency. These results are against to Soetanto and Ricky (2011) which stated that technical efficiency scores obtained under VRS (PTE) are higher than scale efficiency (SE) and thus, the cause of inefficiency is scale inefficiency rather than pure technical inefficiency.

3.1. POTENTIAL IMPROVEMENT SUMMARY

The potential improvement is calculated for each variable as percentage of the movement from the actual value. Zhu (2000) argued that in DEA, if the DMU's all input and output slacks are equal to zero, then DMU is defined to be Constant Return to Scale efficient, otherwise; the DMU is defined to be Constant Return to Scale inefficient and could improve its efficiency by either reducing its input levels or increasing its output levels. Input slacks represent the input excess used that are required to reduce and the output slack represents the output which is under produced by the DMUs (Collie, 1996). Technically inefficient MSEs become relatively efficient either by decreasing their excess level of inputs without changing their outputs or increases further the level of outputs without altering their level of inputs.

Table3.3. Potential Improvement summary

Variable	Original value (in million birr)	Potential Improvement	
		Amount (in million birr)	Percentage
Net Sales	3,521.86	2,716.186	77.12
Capital	8,580.51	-1,276	14.87
Labor	253.00	-65.000	25.69
Intermediate Inputs	2,218.52	-255.240	11.51

Source: Author computation, 2016

Table 3.3 shows the amount and percentage of potential improvement for each input and/or output variables during the study period. This is achieved by aggregating the potential improvement per each variable per year together and dividing the aggregate by total actual value for each variable. As shown in the table, the potential improvement needed for the input variables are; Capital should reduced on average by 1,276(14.87%), Labor should reduced on average by 65(25.69%) and Intermediate Inputs should reduced on average by 255.240(11.51%), whereas for the output variable, Net Sales should increased further on average by 2,716.186 (77.12%) to reach the target output level.

3.2. MALMQUIST INDEX SUMMARY OF FIRM MEANS

The Malmquist index evaluates the productivity changes over time. In the non-parametric framework, it is measured as the product of recovery and innovation terms, both coming from the DEA technologies. The recovery term relates to the degree that a DMU attains for improving its efficiency, while the innovation term reflects the change in the efficient frontiers surrounding the DMU between the two time periods (Cooper, *et al.*, 2004).

Table3.4 shows Malmquist Productivity Index Summary of Firm Means. The MPI evaluates the productivity changes over time which is measured as the product of technical efficiency change (Tech) and technological change (Techch). The findings of the average TFP change and its components of MSEs during the study period reveals that Tech of 5(22%) MSEs increased, whereas that of 14(61%) MSEs declined. It also revealed that in 16(70%) MSEs technological progress has been observed. In contrast, in 6(26%) MSEs the result shows technology deterioration during the period. Moreover, the results also show that, on average, the TFP change is 0.836 which is less than unity; and indicates a 16.4% regress from 2013 to 2014. The loss in TFP has been mostly due to technical efficiency regress.

Furthermore, the mean technical efficiency change of MSEs is equal to 0.810 implying averagely, technical efficiency decline by 19% during the study period. Decline in technical efficiency is due to PTE regress averagely by 19.5%. Nevertheless, the average technological change of sector is 1.032 implying the technological progress of 3.2% during the study period

Table3.4: Malmquist Index Summary of Firm Means

Firm	Tech	Techch	Pech	Sech	Tfpch
1	0.771	1.107	0.999	0.773	0.854
2	1.000	1.001	1.000	1.000	1.001
3	1.000	1.234	1.000	1.000	1.234
4	0.872	1.010	0.794	1.098	0.881
5	0.437	1.219	0.423	1.032	0.532
6	0.951	1.137	0.797	1.193	1.081
7	0.316	1.000	0.409	0.772	0.316
8	1.613	1.010	1.000	1.613	1.629
9	1.000	1.018	1.000	1.000	1.018
10	0.961	0.905	0.985	0.976	0.870
11	1.254	0.838	1.361	0.922	1.052
12	1.663	0.732	1.520	1.094	1.218
13	0.648	1.331	0.625	1.038	0.863
14	0.704	0.948	0.709	0.992	0.667
15	0.712	1.196	0.669	1.064	0.852
16	0.556	1.338	0.640	0.869	0.744
17	1.000	0.677	1.000	1.000	0.677
18	0.395	1.063	0.383	1.031	0.420
19	0.819	1.010	0.875	0.935	0.827
20	1.291	1.157	1.217	1.060	1.493
21	1.048	1.172	0.908	1.155	1.229
22	0.363	1.003	0.392	0.924	0.364
23	0.958	0.953	1.111	0.862	0.913
Mean	0.810	1.032	0.805	1.006	0.836

Source: Author computation 2016

[Note that all Malmquist index averages are geometric means]

IV. CONCLUSIONS

In current dynamic and competitive world issue, measurement is the way of managing the situations and achieving improvement for success. Such conditions necessitate the detail understanding of technical efficiency of DMUs. Thus, it is helpful to compute technical and productive efficiency of MSEs which entertain moderate competition when compared to other sectors working in Ethiopia since they are large in number and employing non-educated labor forces to more professional entrepreneurs. Therefore, the aim of this paper is to investigate the relative TE of MSEs operating in Buno Bedelle and Ilu Aba Bor Zones using DEA. By applying data availability technique 23 MSEs observed from three purposively selected towns of the zones for the two years study period, 2013 and 2014. After reviewing previous MSEs' literatures in different country and based on local MSEs' cost components three input variables and one output variables were selected for the study. The input variables are capital, intermediate variables and number of employees, whereas the output variable is net sales.

The results show a substantial level of dispersion of TE between entities within the sample during the study period. The estimated results revealed that only 4 MSEs are technically efficient in both years under investigation. It is also found that the annual average TE of 0.529 during the year 2013 and 0.454 during the year 2014. This indicates that the overall level of technical inefficiency in sample MSEs operating in sample towns, ranges from a minimum 47.1% to a maximum 54.6%.

Furthermore, it is also found that the average PTE was 0.633 in the year 2013 and 0.546 in the year 2014, whereas the average SE scores was 0.848 in year 2013 and 0.839 in the year 2014. This implies that deviation of management efficiency in allocating resource optimally ranges from 36.7% to 45.4% and deviation of actual scale of production from the most productive scale size range between 17.6% and 14.9% during the study period.

Moreover, out of 46 observations, the results of 16(35%) observations show increasing return-to-scale, hence, can enhance their efficiency gain by increasing their scale of operations/resource allocation. In contrast, the results of 18(39%) observations show decreasing return-to-scale, means they are working at a increasing portion of long-run average cost curve (i.e. they have supra-optimal scale size). So, these MSEs can improve their efficiency score by downsizing their scale size.

When we estimate the annual average efficiency scores of MSEs, the overall mean TE of sample MSEs over the study period was 0.492 which indicates the MSEs could have increase their output on average by 50.8% by using the same level of inputs. This implies that sample MSEs on average relatively technically inefficient. Further, the overall mean PTE and SE were 0.554 and 0.838 respectively. Hence, the source of technical inefficiency among sample MSEs, on average, is due to PT inefficiency.

Based on the MPI, the findings of the two years average TFP change and its components of MSEs reveal that in 14 (37%) MSEs decrease in annual TE and in 5(22%) MSEs, progress in annual TE has been observed. It also revealed that in 16(70%)

MSEs technological progress has been observed. In contrast, the results of 6(26%) MSEs show deterioration in technology during the relevant period. In addition, the results also show that, on average, the TFP change is 0.836 which is less than unity; and it indicates a 16.4% regress over the two years. The loss in TFP has been mostly due to technical efficiency regress in the sample firms.

As described in the results of average changes in all sampled MSEs' TFP and its components by year, the average annual TE of MSE is equal to 0.810 implying averagely, TE decline by 19% during the study period. This decline in TE is the result of PTE regress averagely by 19.5% and proceeding in scale efficiency averagely by 0.6%. Nevertheless, the average technological change of sector is 1.032. This implies that technological progress of 3.2% during the study period. Regression in Technical efficiency indicates a great potential for the MSEs to increase productivity through effective utilization of resources and filling knowledge dispersion among managers through different capacity building mechanism.

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A Systematic Study of “Estimation of Ionospheric Delay Errors in GPS”

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Abstract- The precision of the GPS navigation solution is affected by several types of error factors, in which the GPS signal delay by the ionosphere is the greatest after the omission of selective availability. This delay can be approximated by using one of the Ionospheric error correction models i.e. Klobuchar Algorithm, which estimate ionospheric time delay up to 50% or more, on a Root Mean Square (RMS) basis which is crucial to give the appropriate user position for single frequency GPS receivers. By using the Klobuchar algorithm, ionospheric range delay, the ionospheric time delay and Total Electron Content of ionosphere are estimated. In this paper the estimation of different ionospheric delay errors are presented after a systematic study of different parameters involved in this estimation.

Index Terms- GPS, Ionospheric Error Correction, Total Electron Content,

I. INTRODUCTION

The Ionosphere is the zone of the terrestrial atmosphere that extends itself from about 60 kilometres until more than 2000 kilometres in high. As it names says it contains partially ionized medium, as a result of the X and UV rays of solar radiation and the incidence of charged particles. The propagation speed of the electromagnetic signals in the ionosphere depends on its electronic density which is typically driven by 2 main processes during the day. Sun radiation causes ionisation of neutral atoms producing free electrons and ions. During the night; the recombination process prevails, where free electrons are recombined with ions to produce neutral particles, which leads to a reduction in the electron density medium where the angular frequency ‘w’ and the wave number ‘k’ are most proportional is a dispersive media, that is, the wave propagation speed and hence the R.I depends on the frequency. This is the case with the Ionosphere where W and K are related,

$$W^2 = c^2k^2 + w_p^2(1) \text{ [Crawford, 1968]}$$

where ‘c’ is the velocity of light /signal in the vacuum.

$$\begin{aligned} W_p &= 2\pi f_p \\ f_p &= 8.98\sqrt{N_e} \end{aligned} \quad (2)$$

where N_e = electron density in e^-/m^3

Equation (1) is named as the relation of dispersion of Ionosphere and signal with $w > w_p$ will cross through the plasma [Davies, 1989]. The electron density in the Ionosphere changes with the height having a max of $N_e \approx 10^{11} - 10^{12} e^-/m^3$. According to equation (2), electromagnetic signal with $f > f_p \approx 10^6$ Hz will be able to cross the ionosphere. This is the case of GNSS signals whose frequencies are at order of 10^9 Hz. Radio

frequency signals whose frequency under f_p will be reflected in the Ionosphere.

From equation (1), $w = 2\pi f$

From the definition of phase and group velocity,

$$V_p = \frac{w}{k}, \quad V_g = \frac{dw}{dk} \quad (3)$$

$$V_p = \frac{c}{\sqrt{1 - (\frac{f_p}{f})^2}} \quad (4)$$

$$\text{Hence, } n_p = \text{ and } n_g = \frac{c}{v_g} \quad (5)$$

The phase refractive index of the Ionosphere can be approximated as:

$$\begin{aligned} n_p &= \frac{c}{v_p} = \sqrt{1 - (\frac{f_p}{f})^2} \\ &= 1 - \frac{1}{2} (\frac{f_p}{f})^2 \\ &= 1 - (\frac{40.3}{f^2}) N_e \end{aligned} \quad (6)$$

Given that for each point $f_p^2 = 80.6N$ Hz² is valid (N is density of electrons in $\frac{e^-}{m^3}$)

At the frequency of GNSS signals, the equation (6) accounts for more than 99.9% of the refractory, that is, less than 0.1% error, it can be assumed

$$n_p = 1 - (\frac{40.3}{f^2}) N_e \quad (7)$$

Differentiating equation 1, with respect to ‘k’ and taking into account 3, 5 and the approximation

$$(1 - \mathcal{E}^2)^{-1/2} = 1 + \frac{1}{2}\mathcal{E}^2, \text{ yields the group R.I,}$$

$$n_g = 1 + (\frac{40.3}{f^2}) N_e \quad (8)$$

Hence, phase measurements suffer advance when crossing the ionosphere i.e a negative delay, and the group/code measurements suffer a positive delay. n_p, n_g are called phase and code ionospheric refraction and the integral is defined as the slant TEC (STEC).

$$n_p = 1 - 40.3 \cdot \frac{N}{f^2} \quad (9)$$

$$n_g = 1 + 40.3 \cdot \frac{N}{f^2} \quad (10)$$

The electromagnetic distance measured between the satellite and the receiver can be written as:

$$S = \int_{\text{satellite}}^{\text{Receiver}} nds. \quad (11)$$

Substituting equation (9) in (11) then,

$$\begin{aligned} S &= \rho - 40.3 \cdot \frac{1}{f^2} \int_{\text{Satellite}}^{\text{Receiver}} Nds \\ &= \rho - 40.3 \cdot \frac{TEC}{f^2}. \quad (12) \end{aligned}$$

Where TEC is Total Electron Content, i.e. integrated electron density along the signal path given in the TEC units (1 TEC = $10^{16} \frac{1}{m^2}$), ρ is Right distance. The equivalent equation for modulated signal is given as:

$$S = \rho + 40.3 \cdot \frac{TEC}{f^2}. \quad (13)$$

Equation (12) and (13) shows that signal during the passage through the ionosphere, phase of the carrier wave will accelerate (12), the distance S is shorter than the actual distance ρ and the modulated signal will be delayed (13), the distance S is longer than the actual distance ρ .

The true distance from satellite to the receiver is given as ρ , the remaining part of the equations (12) and (13) represents the error caused by signal propagation through the ionosphere, known as ionospheric signal delay.

$$d_{ion} = 40.3 \cdot \frac{TEC}{f^2}. \quad (14)$$

The ionospheric refraction depends on the geographical location of the R_x , the hour of day and the solar activity.

II. IONOSPHERE EFFECTS ON ELECTROMAGNETIC WAVE PROPAGATION

When radio waves, such as those emitted from GPS satellites pass through the ionized path, there are two effects: the trajectory of the beam is bent and the signal comes to a destination with a delay [3]. The free electrons in the ionosphere are the wrong doing for this phenomenon, due to the effect called refraction. Refraction of beam is defined by Snell-law. However, the behaviour of waves in the ionosphere cannot be described with this relatively simple equation only. To adequately describe the behaviour of radio waves passing through the ionosphere, it must be borne in mind that the ionosphere is only partially ionized, spherically stratified plasma with a broad spectrum of unevenly spaced irregularities, which extends along the uneven magnetic field, which is distorted in itself due to the disorder that arises as a

result of the occurrence of solar winds. The signal beamed from satellites must pass through the ionosphere on their way to earth. Free electrons, as the most massive particles in the ionosphere affect the propagation of the signal, changing their speed, direction and shape of the signal path (figure 1). Positioning error that occurs due to this effect is called the ionospheric delay. Sun radiation causes ionisation of neutral atoms producing free electrons and ions. During the night; there combination process prevails, where free electrons are recombined with ions to produce neutral particles, which leads to a reduction in the electron density.

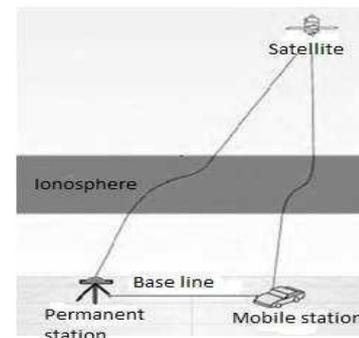


Figure 1. Appearance of signal path while passing through the ionosphere

The parameter that most affects the propagation of GPS signal is called total electron content or abbreviated TEC. Knowing the parameters of TEC, estimation of errors and calculation of corrections can be made.

III. ESTIMATION OF RANGE EQUATION

The Range delay from the incoming GPS signal is estimated as [2]

$$p = \rho + c(dt - dT) + d_{ion} + d_{tro} + \epsilon$$

where

“ p ” is measured pseudo range

“ ρ ” is geometric or true range

“ c ” represents speed of light

“ dt ” and “ dT ” are offsets of satellite and receiver clocks.

“ d_{ion} ”, “ d_{tro} ” are the delays due to ionosphere and troposphere.

“ ϵ ” represent effects of multipath and receiver measurement noise.

Here the delay due to $d_{tro}, c(dt - dT), \epsilon$ are negligible

when compared to d_{ion} , so neglecting those three errors, the Range equation can be reduced and is given by

$$p = \rho + d_{ion}$$

The Range delay due to ionosphere d_{ion} is estimated using **Klobuchar Algorithm**.

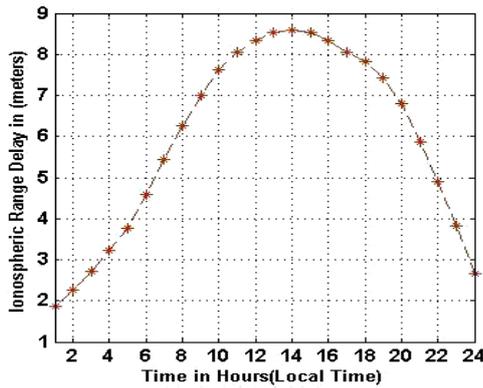


Figure 2. Model graph for Ionospheric Range delay for a complete day

IV. ESTIMATION OF ELEVATION ANGLE AND AZIMUTH ANGLE

According to the Klobuchar model, the ionospheric layer is assumed at 350 km above earth surface and the satellite at 20,200km above earth surface the LOS between satellite and the GPS ground receiver is intersected at a point called Ionospheric Pierce Point (IPP) on ionosphere layer. It is necessary to calculate the elevation angle and azimuth angle for the estimation of Slant TEC in Ionosphere [4].

The Elevation Angle and Azimuth Angle can be calculated using the equations given below:

$$E = \arctan \left[\frac{\cos(G) \cos(L) - 0.1512}{\sqrt{1 - \cos^2(G) \cos^2(L)}} \right]$$

where $G = S - N$

$$A = 180 + \arctan \left[\frac{\tan(G)}{\sin(L)} \right]$$

'E' is the Elevation Angle of antenna in degrees

'L' is the Site Latitude in degrees

'N' is the Site Longitude in degrees

'A' is the Azimuth Angle of antenna in degrees

'S' is the Satellite Longitude in degrees.

V. IONOSPHERIC TIME DELAY ESTIMATION USING KLOBUCHAR ALGORITHM

1. The Earth-centered angle is calculated using the Elevation angle of the satellites with respect to the ground station GPS receivers. [4]

$$\Psi = \frac{0.0137}{(E+0.11)} - 0.022 \quad (\text{semicircles}) \quad (1)$$

"Ψ" is the Earth-centered angle units in semicircles

"E" is the Elevation Angle (convert degrees in to semicircles)

2. Then Compute the sub-ionospheric latitude value using azimuth angle, earth-centered angle and the geodetic latitude

$$\phi_I = \phi_U + \psi \cos A \quad (\text{semicircles}) \quad (2)$$

where $\phi_U = 17^\circ$ (degrees).

which is the geodetic latitude value of NGRI (Ground station GPS receiver).

If $\phi_I \geq 0.416$, then $\phi_I = 0.416$.

If $\phi_I \leq -0.416$, then $\phi_I = -0.416$.

" ϕ_I " is the Sub-Ionospheric Latitude units in semicircles.

" ϕ_U " is the Geodetic Latitude (convert degrees in to Semicircles).

"A" is the Azimuth Angle (convert degrees in to semicircles).

3. Compute the sub-ionospheric longitude value using Geodetic longitude, Geodetic latitude, Azimuth angle, Earth-centered angle.

$$\lambda_I = \lambda_U \left[\frac{\sin(A)}{\cos(\phi_I \times 3.14)} \right] \quad (3)$$

where $\lambda_U = 78^\circ$ (degrees).

This is the geodetic Longitude value of NGRI (Ground station GPS receiver).

' λ_I ' is the sub-Ionospheric Longitude units in semicircles.

' λ_U ' is the Geodetic Longitude (convert degrees in to semicircles).

4. Then Find the geomagnetic latitude of the sub-ionospheric location looking toward each GPS satellite. It is shown below [1]

$$\phi_m = \phi_I + 0.064 \cos[(\lambda_I - 1.617) \times 3.14] \quad (\text{semicircles}) \quad (4)$$

' ϕ_m ' is the geomagnetic latitude units in semicircles

5. Find the local time, at the sub-ionospheric point and here we have to use the GPS time value in seconds. [1]

$$t = 4.32 \times 10^4 \lambda_I + \text{Time}_{GPS} (\text{seconds}) \quad (5)$$

' Time_{GPS} ' is the GPS time value in seconds.

't' is the local time in seconds.

If $t > 86400$ use $t = t - 86400$

If $t < 86400$ use $t = t + 86400$

6. Compute the slant factor [1]

$$SF = 1 + 16(0.53 - E)^3 \quad (6)$$

'SF' is the Slant factor.

7. Period of the model is [1]

$$PER = \sum_{n=0}^3 \beta_n \phi_m^n \quad (7)$$

Expanded form of equation (7) is shown in equation (8)

$$PER = \beta_0 \times \phi_m^1 + \beta_1 \times \phi_m^1 + \beta_2 \times \phi_m^2 + \beta_3 \phi_m^3$$

$$PER = \beta_0 + \beta_1 \phi_m^1 + \beta_2 \phi_m^2 + \beta_3 \phi_m^3 \quad (8)$$

if $PER < 72000$ then $PER = 72000$

"PER" is the period of the model.

" β^n " is the Klobuchar coefficient.

8. Phase of the model is [1]

$$x = \frac{2\pi(-50400)}{PER} \quad (9)$$

'x' is the phase of the model which is (max at

14hours=50400sec) local time.

9. Amplitude of the model is[1]

$$AMP = \sum_{n=0}^3 \alpha_n \phi_m^n \quad (10)$$

$$AMP = \alpha_0 \times \phi_m^0 + \alpha_1 \times \phi_m^1 + \alpha_2 \times \phi_m^2 + \alpha_3 \times \phi_m^3$$

$$AMP = \alpha_0 + \alpha_1 \phi_m^1 + \alpha_2 \phi_m^2 + \alpha_3 \phi_m^3 \quad (11)$$

If $AMP < 0$ then $AMP = 0$.

“AMP” is the amplitude of the amplitude.

10. If $x > 1.57$ then use [1]

$$T_{iono} = SF \times (5 \times 10^{-9}) \quad (12)$$

Otherwise use

$$T_{iono} = SF \times \left[(5 \times 10^{-9}) + AMP \times \left(1 - \frac{x^2}{2} + \frac{x^4}{4} \right) \right] \quad (13)$$

‘ T_{iono} ’ is the ionospheric time delay.

11. The range delay can be calculated using ‘ T_{iono} ’ value[1]

Where $C = 3 \times 10^8$ m/ sec

$$Rd_{iono} = T_{iono} \times C \quad (14)$$

‘ Rd_{iono} ’ is the ionospheric range delay in meters.

‘ C ’ is the velocity of light.

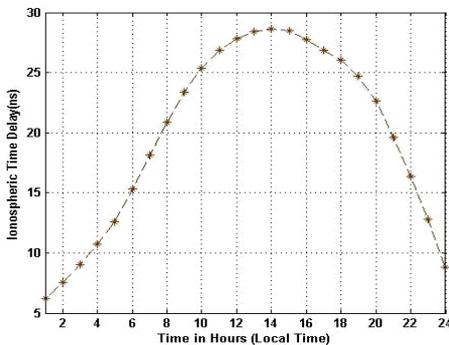


Figure 3. Model graph for Ionospheric Time delay for a complete day

12. Using, Rd_{iono} the TEC can be estimated[1]

$$Rd_{iono} = \left[\frac{40.3}{f_1^2} \right] \cdot TEC \quad (15)$$

$$TEC = \frac{Rd_{iono} \times f_1^2}{40.3} \quad (16)$$

' f_1 ' Represents the L_1 frequency = 1575.42 MHz
 TEC Values are often represented in terms of Total Electron Content Units (TECU).

Where $1TECU = 10^{16} \text{ el} / \text{m}^2$

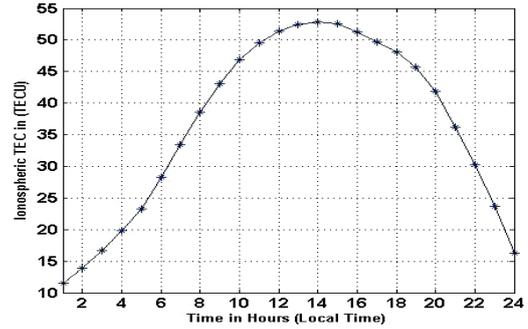


Figure 4. Model graph for Ionospheric TEC for a complete day

VI. CONCLUSION

In this paper, by estimating the azimuth angle and elevation angle of satellites with respect to the GPS receiver antenna location and by using Klobuchar algorithm Ionospheric time delay is estimated and then by using Ionospheric time delay value range delay and TEC of ionosphere are calculated for any day. Estimation of Ionospheric delay is important as it causes a delay in ranging measurements which in turn cause an error in navigation solution. This work can be extended further by eliminating the ionospheric range delay from the ranging measurements, which it is possible to obtain more precise navigation solution for GPS users.

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Evaluation of Oxidative Stress (MDA) and some Immunological Markers in Immune Response in Patients with Rheumatoid Arthritis at Al Nasiriya City, Iraq

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Abstract- Objective: This study aimed to determine the level of serum indicators of cellular oxidative stress and the antioxidant the relevance with inflammations parameters, establishing the inflammatory profile in patients with rheumatoid arthritis.

Method: The sample of the study take in 50 patients with RA. They were confirming the dealings of the 2007 American College of Rheumatology, also the sample of the study include fifty person seemingly healthy volunteers were included in this study. We determined the plasmatic levels of malondialdehyde, compare with the inflammatory parameters such as CRP, ESR, RF, calculation of total WBC and diffraction numerous of WBC. In addition, the phagocytosis processes.

Results: in comparison to controls, patients with rheumatoid arthritis presented high concentrations of lipid peroxidation products (determined by plasmatic levels of malondialdehyde, as well as the study shown high signification between the studied groups according the immunological markers

Conclusion: our results indicate the presence of molecular damage determined by oxygen free radicals in patients with rheumatoid arthritis and this is play main role in immune response of patients with RA.

Index Terms- C-reactive protein, free radicals ROS, MDA, neutrophil, phagocytosis, rheumatoid arthritis.

I. INTRODUCTION

Rheumatoid arthritis (RA) is a chronic persistent systemic inflammatory polyarthritis of unknown cause, mainly affected synovial membrane of multiple joints, principally the peripheral joints in a symmetrical fashion such as those of fingers, resulting in cartilage destruction, bone erosion and joints deformities. Rheumatoid arthritis (RA) that causes inflammation and deformity of the joints. Other problems throughout the body (systemic problems) may also develop, including inflammation of blood vessels (**vacuities**), the development of bumps (called rheumatoid nodules) in various parts of the body, lung disease, blood disorders, and weakening of the bones (**osteoporosis**) (Christen *et al.*, 2007)

Moreover, RA is a common chronic inflammatory and destructive arthropathy that cannot be cured and that has substantial personal, social, and economic costs. The long-term prognosis is poor: 20 percent of affected patients are disabled after 20 years (Pany G.1996). The median life expectancy of

persons with RA is shortened by 3 to 7 years (Braunwald *et al.*, 2001).

Diagnosis of rheumatoid arthritis

The diagnosis of RA is based on recognition of certain clinical and laboratory features which have been set out as revised by American Rheumatoid Association criteria. These criteria are developed by the American College of Rheumatology in 2007, (Geirson A.J. & Sturfelt G 1987). Diagnosis of RA is made with four or more of the following:

- Morning stiffness (> 1 hour)
- Arthritis of three or more joint areas.
- Arthritis of hand joints.
- Symmetrical arthritis.
- Rheumatoid nodules.
- Rheumatoid factor.
- Radiological changes.

Prognosis

About 15% of all RA patients will have symptoms for a short period of time and will ultimately get better, leaving them with no long-term problems. A number of factors are considered to suggest the likelihood of a worse prognosis. These include:

- race and gender (female and Caucasian).
- more than 20 joints involved.
- extremely high erythrocyte sedimentation rate.
- extremely high levels of rheumatoid factor.
- consistent, lasting inflammation.
- evidence of erosion of bone, joint, or cartilage on xrays.
- poverty.
- older age at diagnosis.
- rheumatoid nodules.
- other coexisting diseases.

Oxidative stress

Oxidative stress is carry out on cells as a result of one of three factors the first is an increase in oxidant generation, the second is a decrease in antioxidant protection, and the third which is a failure to repair oxidative damage. Cell damage is induced by reactive oxygen species (ROS). The main source of ROS in vivo is aerobic respiration, although ROS are also produced by peroxisomal β -oxidation of fatty acids, microsomal cytochrome P₄₅₀ metabolism of xenobiotic compounds, stimulation of phagocytosis by pathogens or lipopolysaccharides, arginine metabolism, and tissue specific enzymes. (Fiers W. *et*

al., 1999; Schafer, Buettner 2001). Under normal condition, ROS are cleared from the cell by the action of superoxide dismutase (SOD), catalase, or glutathione peroxidase (Hayes *et al.*, 1999).

The main damage to cells results from the ROS-induced alteration of macromolecules such as polyunsaturated fatty acids in membrane lipids, essential protein, and DNA. Additionally, oxidative stress and ROS have been implicated in disease states, such as rheumatoid arthritis (Hitchon CA, El-Gabalawy HS.) Alzheimer's disease (Christen Y. 20000, Parkinson's disease) and the pathologies caused by diabetes.

Malondialdehyde MDA

Malondialdehyde is an aldehyde (3 carbon molecules with two aldehyde group) (Cighetti *et al.*, 2001) It is considered to be the terminal compound and the most important marker for monitoring lipid peroxidation and oxidative damage induced by reactive oxygen species (ROS) (Kose K, Yazici, & Assioglu, 2001) It is also considered as a thio- barbituric acid reactive substance – Hong, Y. Yeh S. & Hu M. (2000).

Accumulation of oxygen-derived free radicals (oxidative stress)

Cell injury induced by free radicals, particularly reactive oxygen species, is an important mechanism of cell damage in many pathologic conditions, such as chemical and radiation injury, ischemia-reperfusion injury (induced by restoration of blood flow in ischemic tissue), cellular aging, and microbial killing by phagocytes. Free radicals are chemical species that have single unpaired electron in an outer orbit. Energy created by this unstable configuration is released through reactions with adjacent molecules, such as inorganic or organic chemical – proteins, lipids, carbohydrate, nucleic acids – many of which are key components of cell membranes and nuclei. Moreover, free radicals initiate autocatalytic reactions, whereby molecules with which they react are themselves converted into free radicals, thus propagating the chain of damage. Reactive oxygen species (ROS) are a type of oxygen – derived free radical whose role in cell injury is well established. ROS are produced normally in cells during mitochondrial respiration and energy generation, but they are degraded and removed by cellular defense systems. Thus, cells are able to maintain a steady state in which free radicals may present transiently at low concentrations but do not cause damage. When the production of ROS increases or the scavenging systems are ineffective, the result is an excess of these free radicals, leading to a condition called oxidative stress. Oxidative stress has been implicated in a wide variety of pathologic processes, including cell injury, cancer, aging, and some degenerative diseases such as Alzheimer disease. ROS are also produced in large amounts by leukocytes, particularly neutrophils and macrophages, as mediators for destroying microbes, dead tissue and other unwanted substances. Therefore, injury caused by these reactive compounds often accompanies inflammatory reactions, during which leukocytes are recruited and activated. (Davidson 2007)

In the following section, we discuss the generation and removal of ROS, and how they contribute to cell injury. The properties of some of the most important free radicals.

Generation of Free Radicals. Free radicals may be generated within cells in several ways. The reduction-oxidation

reaction that occurs during normal metabolic processes. During normal respiration, molecular O₂ is reduced by the transfer of four electrons to H₂ to generate two water molecules. This conversion is catalyzed by oxidative enzymes in the ER, cytosol, mitochondria, peroxisomes, and lysosomes. During this process small amounts of partially reduced intermediates are produced in which different number of electrons have been transferred from O₂, these include superoxide anion (O₂⁻, one electron), hydrogen peroxide (H₂O₂, two electrons), and hydroxyl ions (OH⁻, three electrons).

Absorption of radiant energy (e.g., ultraviolet light, x-rays). For example, ionizing radiation can hydrolyze water into OH and hydrogen (H) free radicals. Rapid bursts of ROS are produced in activated leukocytes during inflammation. This occurs by a precisely controlled reaction in a plasma membrane multiprotein complex that uses NADPH oxidase for the redox reaction. In addition, some intracellular oxidases generate O₂.

Enzymatic metabolism of exogenous chemicals or drugs can generate free radicals that are not ROS but have similar effects (e.g., CCl₄ can generate CCl₃. Transition metals such as iron and copper donate or accept free electrons during intracellular reactions and catalyze free radical formation, as in the Fenton reaction (H₂O₂+Fe²⁺→Fe³⁺+OH+OH⁻). Because most of the intracellular free iron is in the ferric (Fe³⁺) state, it must be reduced to the ferrous (Fe²⁺) form to participate in the Fenton reaction. This reduction can be enhanced by O₂, and thus sources of iron and O₂ may cooperate in oxidative cell damage.

Nitric oxide (NO), an important chemical mediator generated by endothelial cells, macrophages, neurons, and other cell types, can act as a free radical and can also be converted to highly reactive peroxynitrite anion (ONOO⁻) as well as NO₂ and NO₃

Removal of Free Radicals. Free radicals are inherently unstable and generally decay spontaneously. O₂, for example is unstable and decays (dismutates) spontaneously into O₂ and H₂O₂ in the presence of water. In addition, cells have developed multiple non enzymatic and enzymatic mechanisms to remove free radicals and thereby minimize injury.

Antioxidants either block the initiation of free radicals. Examples are the lipid-soluble vitamins E and A as well as ascorbic acid and glutathione in the cytosol.

As we have seen, iron and copper can catalyze the formation of ROS. The levels of these reactive metals are minimized by binding of the ions to storage and transport proteins (e.g., transferrin, ferritin, lactoferrin, and ceruloplasmin), thereby minimizing the formation of ROS.

A series of enzymes acts as free radical-scavenging systems and breaks down H₂O₂ and O₂. These enzymes include the following:

1- Catalase, present in peroxisomes, decomposes H₂O₂ (2H₂O₂→O₂+2H₂O).

2- Superoxide dismutases (SODs) are found in many cell types and convert O₂ to H₂O₂ (2O₂+2H⁺→H₂O₂+O₂). This group includes both manganese –SOD, which is localized in mitochondria, and copper-zinc-SOD, which is found in the cytosol.

3- Glutathione peroxidase also protects against injury by catalyzing free radical breakdown (H₂O₂+2GSH→GSSG (glutathione homodimer) + 2H₂O, or 2OH+ 2GSH→

GSSG+2H₂O). the intracellular ratio of oxidized glutathione (GSSG) to reduced glutathione (GSH) is a reflection of the oxidative state of the cell and is an important indicator of the cell's ability to detoxify ROS.

Pathologic Effect of Free Radicals. The effects of ROS and other free radicals are wide-ranging, but three reactions are particularly relevant to cell injury:

Lipid peroxidation in membranes. In the presence of O₂, free radicals may cause peroxidation of lipids within plasma and organelle membrane. Oxidative damage is initiated when the double bonds in unsaturated fatty acids of membrane lipids are attacked by O₂-derived free radicals, particularly by OH. The lipid-free radical interactions, yield peroxides, which are themselves unstable and reactive, and an autocatalytic chain reaction ensues (called propagation), which can result in extensive membrane damage. Oxidative modification of proteins. Free radicals promote oxidation of amino acid side chains, formation of protein-protein cross-linkages (e.g. Disulfide bonds), and oxidation of the protein backbone. Oxidative modification of proteins may damage the active sites of enzymes, disrupt the conformation of structural protein, and enhance proteasomal degradation of unfolded or misfolded proteins, raising havoc throughout the cell.

Lesions in DNA. Free radicals are capable of causing single and double strand breaks in DNA, cross-linking of DNA strands and formation of adducts. Oxidative DNA damage has been implicated in cell aging (discussed later in this chapter) and in malignant transformation of cells

The traditional thinking about free radicals was that they cause cell injury and death by necrosis, and in fact, the production of ROS is a frequent prelude to necrosis. However, it is now clear that free radicals can trigger apoptosis as well. recent studies have also revealed a role of ROS in signaling by a variety of cellular receptors and biochemical intermediates. In fact, according to one hypothesis, the major actions of O₂ stem from its ability to stimulate the production of degradative enzymes rather than direct damage of macromolecules. It is also possible that these potentially deadly molecules serve important physiologic functions. (Robbin *et al.*, 2011)

Malondialdehyde is a naturally occurring product of lipid peroxidations, it is a highly reactive three carbon dialdehyde product as byproduct of poly unsaturated fatty acid peroxidation (Janero, 1990) and also during arachidonic acid metabolism for the synthesis of prostaglandin (Marnett, 1999). MDA can be generated during cyclooxygenase (COX) catalysis in human platelets, forming from prostaglandin endoperoxide (PGH₂) catalyzed by thromboxane synthase (Diczfalussy *et al.*, 1977) and in liver cell (Plastaras *et al.*, 2000) by breakdown of (PGH₂).

Phagocytes. Phagocytes (eating cells) are specialized cells which ingest and kill microorganisms. scavenge cellular and infectious debris and produce inflammatory molecules which regulate other components of the immune system. they include neutrophils, monocytes and macrophages, and are crucial for defense against bacterial and fungal infections.

Phagocytes express a wide range of surface receptors that allow them to identify microorganisms. these pattern recognition receptors include the toll like receptors and mannose receptors. they recognize generic motifs not present on mammalian cells. such as bacterial cell wall components

Bacterial DNA and viral double-stranded RNA while phagocytes can recognize microorganisms through pattern recognition receptors alone

Engulfment of microorganisms is greatly enhanced by opsonisation. Opsonins include acute phase proteins such as C-reactive proteins, antibodies and complement. they bind both to the pathogen and to phagocyte receptors. Acting as a bridge between the two and facilitating phagocytosis. (Davidson 2007)

Neutrophils

Neutrophils, also known as polymorphonuclear leucocytes are derived from the bone marrow and circulate freely in the blood. they are short-lived cells with a half-life of 6 hours and are produced at a rate of 10 cells daily. Their function is to kill microorganisms directly, facilitate their rapid transit of cell through tissue, and nonspecifically amplify the immune response. this is mediated by enzymes contained in granules which also provide an intracellular milieu. for infected cells trigger the local production of inflammatory molecules and cytokines. these stimulate the production and maturation of neutrophils in bone marrow. the neutrophils are recruited to the site by chemotactic agents and by changes in the activated local endothelium. the transit of neutrophils through the blood stream is responsible for the rise in leucocyte count that occurs in early infection. once within infected tissues, activated neutrophils through seek out and engulf invading microorganisms

These are initially enclosed within membrane-bound vesicles which fuse with cytoplasmic granules to form the phagolysosome. within this protected compartment, killing of organisms occurs through combination of oxidative and non-oxidative killing, oxidative killing also known as the respiratory burst, is mediated by the NADPH oxidase enzyme complex, which converts oxygen into reactive oxygen species such as hydrogen peroxide and superoxide that are lethal to microorganisms. Combined with myeloperoxidase, hypochlorous ions (HOCl), analogous to bleach – are produced which are highly effective oxidants and antimicrobial agents (Davidson 2007)

Non-oxidative (oxygen-independent) killing occurs through the release of bacterial enzymes and lactoferrin. each enzyme has a unique antimicrobial spectrum, providing broad coverage against bacteria and fungi.

The process of phagocytosis depletes neutrophil glycogen reserves, and is followed by neutrophil cell death. as the cells die, their contents are released and lysosomal enzymes degrade collagen and other components of the interstitium, causing liquefaction of closely adjacent tissue. the accumulation of dead and dying neutrophils result in the formation of pus which, if extensive, may result in abscess formation. (Robbin *et al.*, 2011)

Monocyte and macrophage

Monocytes are precursors of tissue macrophages. they are produced in the bone marrow and exported into the circulation. where they constitute about 5% of leucocytes. after 7-10 hours in the blood stream, they migrate to peripheral tissues where they differentiate into tissue macrophages and reside for long periods. specialized populations of tissue macrophages include Kuffer cells in the liver, alveolar macrophages in the lung, meningeal cells in

the kidney, and microbial cells in brain. macro-killing of microorganism but also play important role in the amplification and regulation role of in inflammatory response unlike neutrophils macrophage do not die after killing pathogens. (Davidson 2007)

Acute inflammatory

Acute inflammatory is the result of rapid and complex interplay between the cells and soluble molecules of the innate immune system .the classical external sign include heat .pain ,swelling .inflammatory processes is initiated by local tissue injury or infection , with early infiltration of phagocytic cells and in increase in enzymes with in the inflamed tissue such as cyclo-oxygenase and inducible nitric oxide synthase .as result there is release of leucocyte ,prostaglandin histamin,kinins,anaphlyo toxins,and nitric oxide the effect is vasodilation and increasing local vascular permeability thereby increasing flow of fluid and cells to the affected tissue .in in addition pro-inflammatory cytokines produced at the site of injury have profound systemic effect IL-1,IL6-TNF .act on hypothalamus to raise the temperature set-point stimulate the production of acute phase proteins by the liver (Davidson 2007)

Acute phase protein

Acute phase proteins are product by liver in response to inflammatory stimuli and have a wide range of activities, C-reactive proteins (CRP)and serum amyloid A may be increase 1000-fold, contributing to host defense and stimulating repair and re generation.some of the chemical components role play in pro-inflammatory cascade to control of inflammation.by neutralizing the enzyme produced by activity neutrophils preventing widespread tissue destruction .in addition antioxidant, superoxide dismutase scavenges for oxygen free radicals, while increase level of iron -binding proteins such as transferrin and ferritin andlactoferrin which represented decrease in iron. at last the acute phase proteins increase in often the chronic phase.(Rubbinetal., 2011)

Material and methods

Patients Group: This group includes 50 patients with RA, who fulfilled four or more of the 2007 ACR criteria. These patients attended the rheumatology Department of Al- Hussein Teaching Hospital during the study period. The diagnoses of

those patients were performed by the rheumatic disease consultant staff.

Their ages ranged between (17-68) years, 15 males and 25 females. Subjects suffered from any disease such as diabetes mellitus, hypertension, hypothyroidism, cardiovascular disease, oral contraceptive use, and liver disease which interferes with the data obtained, were excluded.

Control Group

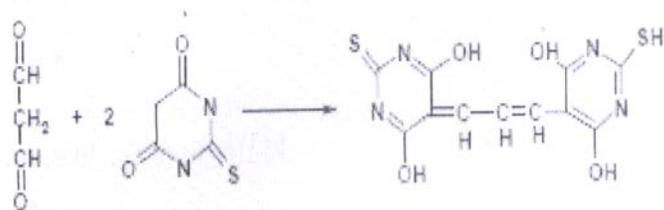
Fifty person apparently healthy volunteers were included in this study. They were matched in their sex and age with the patients groupincluded 50 33female and 17 male

malondialdehyde concentration in serum

The level ofmalondialdehydewas determined by modified procedure described by (Guidet,B.andShah, S.V.,1989)

Principle:

The test is based on the reaction of MDA withthiobarbituricacid (TBA); forming an MDA-TBA₂product that absorbs strongly at 532 nm as follows:



Determination of C-reactive protein(CRP)

The latex reagent is a suspension of polystyrene latex particles of uniform size with the IgG fraction of an anti-human CRP specific serum according to Ward and cooper,1975.

Biostatistician analysis

The results were expressed as mean ± standard deviation (M±SD) of mean. Statistical analyses were achieved by using Student's t-test. Significant variation was considered when p-value was less than 0.05. The correlation coefficient was used to study various analyses

Result

Table 1:Demographic and some clinical and laboratory characteristics of RA patients

parameter	treatment	Control	p-value
Age (years)	45.8_+9.2	42.7_+4.8	NS
Gender female/male	38/12	33/17	NS
Body max index	24.5±1.4	25.3±1.9	NS
Duration of disease (years)	9.6 ± 6.3	8.1 ±7.5	NS
Morning stiffness (minutes)	34.7 ± 33.6	17.8 ± 23.5	0.004*
Tender joint count	5.7 ± 5.2	2.8± 3.3	0.007*

*p<0.01, NS: No significant.
Body mass index (BMI) kg/m

Table 2: parameters and inflammatory characteristics of RA patients and control group.

parameter	treatment	Control	P value
Hemoglobin(gm/dl)	11.35±1.57	14	HS
ESR mm/hr	56.7	20±0.006	HS
WBC total count	7.21±3.35	4.65± 1.76	HS
differential lymph	26.6± 4,55	19.07±1.4	HS
neutrophil	69.7±4.55	59.25±9.87	S
Monocyte	4.11±2.26	2.94± .45	S
Platelet	313.3±73	219±.12.75	S
RF	86.4±4,6	2.1±0	HS
CRP	26.4±6.6	1.4±0.6	HS
MDA concentration	1.72±0.05	1.228 ± 0.0259	HS

Table 3: Malondialdehyde (MDA) concentration (µM) in serum of patients with RA and healthy control

Control	Patient with RA	Group	
17	15	n	Male
1.28016 ± 0.0201	1.9092 ± 0.0397	Mean ± SD	
33	35	n	Female
1.2023 ± 0.0252	1.6813 ± 0.0408 **	Mean ± SD	
50	50	n	Total
1.228 ± 0.0259	1.7952 ± 0.0402 **	Mean ± SD	

ANOVA: Patientsvs control; **= p<0.001, Femalevs male; ** = p<0.001

Table 4: CRP percent as $a^{(+/-)}$ value concentration ($\times 6mg / L$) in serum of patients with RA and normal control

Control	Patient with RA	Group		
2	14	n	+Ve	Male
11.1%	93.3%	%		
15	1	n	-Ve	Male
88.9%	607%	%		
4	33	n	+Ve	Female
12.5%	91.7%	%		
19	3	n	-Ve	Female
87.5%	8.3%	%		
6	47	n	+Ve	Total
12.2%	92.2%*	%		
29	4	n	-Ve	Total
87.8%	7.8%	%		

ANOVA: patients Vs. control; * = p<0.01, +Ve ≥ 6 mg/L-Ve< 6 mg/L

II. DISCUSSION

Rheumatoid arthritis (RA) is a chronic systemic inflammatory disease. The sample of the study includes 50 patients with RA. They were achieved the criteria of the 2007 American College of Rheumatology. These patients entered the Al Husain Teaching Hospital at al Nasiriya city during the period between march 2016 and mid-April 2016. The diagnosis of these

patients were performed under supervision of group of rheumatologists. The sample of the study include fifty person apparently healthy volunteers were included in this study. The objective of the study is the evaluation of Malondiladehade (MDA) concentration change. level of significant at (0.001>P at revealed a significant decrement level in sera of the patients compare with those of the malondialdehyde in the control group, and we show increase of total count of WBC especially

neutrophil and macrophage .as result of damage cell of oxidative B beta fatty acid and the formation of free radicals, which is secondary to the production of reactive oxygen species, is part of the process of aerobic metabolism. In this manner, cellular metabolism produces free radicals in physiological conditions. These active radicals, in turn, can be very useful.

More over the level of ESR is higher in RA patients than control group, (table 1) though it cannot be given absolute conclusion for this result, since ESR is not specific test and it may increase significantly in so many pathological disorder. As well as we can show in result which described in table 1 were explain increase in total number of WBC, monocytes, neutrophils, lymphocytes and platelets. This result goes in correspondence with phagocytes (eating cell) are specialized cell which ingest and kill microorganisms. scavenge cellular and infectious debris and produce inflammatory molecules which regulate other component of immune system. they include neutrophils, monocytes and macrophage, and are crucial for defense against invading organism, cellular debris and injury damage of collagen tissue.

According to the table provided was demonstrated that high level of RF with high difference of significant. The group of RFs is among the only autoantibodies clearly shown to be involved in disease pathogenesis. RF can be detected in 60-80% of RA patients and in up to 15% of healthy individuals this results goes with Al-Salih 2014 and Abdullah 2010.

Regarding both groups, the prevalence of RA among females (patients group) was (70%) while in male group of RA is (30%). This frequency is higher to some extent than that of local previous studies in Iraq mentioned by Tofiq (2007) (80.85%). While Al-Haidary (2003) and Abdul-Abbas (2007) noticed the lower percentage which reached to (70.7%) and (79.7%) respectively. However, it is clear that there is a gradual elevation in this frequency in the last years. This elevation may be due to environmental conditions beside the psychological situation of Iraqi people which result in high stress that enhance RA development. The prevalence of disease varies from one person to person and from time to time (Abdullah 2010).

The mean \pm SD of serum MDA are described in (Table 3) There was a statistically significant increase in serum MDA in female group ($p < 0.001$) level in patients with rheumatoid arthritis in comparison with the control group with percent of (59.86%), while the level of serum of male ($p < 0.001$) significantly decreased in these patients compared to the control group with percent of (58.3%).

In the present study the lipid peroxidation product MDA level has been increased significantly in sera of the patients with rheumatoid arthritis. The rise in MDA could be attributed to the increased generation of reactive oxygen species (ROS) owing to the excessive oxidative damage generated in these patients. These oxygen species in turn have the ability to oxidize many other important biomolecules including membrane lipids (Surapneni & Chandrasada Gopan, 2008) Similar reports of elevated MDA level have been reported in patients with rheumatic disease. In contrast to these results Kajanachumpol *et al.*, 2000 reported that there are insignificant changes in MDA levels in patients with rheumatoid arthritis when compared to control group (Ozkan *et al.*, 2006).

That is indicated a significant decrease in the levels of serum GSH (non enzymatic anti-oxidant) in patients with rheumatoid arthritis can be observed when compared to the control group. The decrease in the levels of this non enzymatic antioxidant parameter may be related to the increased turnover, for preventing oxidative damage in these patients suggesting an increase defense against oxidant damage in rheumatoid arthritis (Surapneni & Chandrasada Gopan, 2008). Similar reports of elevated MDA level have been reported which were consistent with the current result (Ozkan *et al.*, 2006).

Deficiency as well as excess of MDA concentration has been associated with neutrophil activation, and that will affect modulation of immune responses and susceptibility to infection, which considered as a cause in generation of free radicals (Naeem *et al.*, 2015)., stimulation of phagocytosis by pathogens or lipopolysaccharides, arginine metabolism, and tissue specific enzymes. (Fiers, W. *et al.*, 1999). Under normal condition, ROS are cleared from the cell by the action of superoxide (Hayes *et al.*, 1999). Data present in table (3) show that the mean \pm SD of MDA concentration in serum of males and females RA patient were ($1.9092 \pm 0.0397 \mu\text{M}$) and ($1.6813 \pm 0.0408 \mu\text{M}$) respectively, while the Mean \pm SD of MDA concentration in serum of control males and Females were ($1.28016 \pm 0.0201 \mu\text{M}$) and ($1.2023 \pm 0.0252 \mu\text{M}$) respectively.

The results in table (3.2) showed that there is a significant elevation ($p < 0.001$) in serum MDA concentration of RA patients ($1.7952 \pm 0.0402 \mu\text{M}$) compared with healthy controls ($1.228 \pm 0.0259 \mu\text{M}$). These results of present study indicate higher oxidative stress in Rheumatoid arthritis patients, either due to increased extent of lipid peroxidation or due to decreased levels of antioxidants (Paredes *et al.*, (2002). On the other hand, the results in this study showed a significant elevation ($p < 0.001$) in the concentration of MDA in serum of male RA patients as compared with female patients, and also a significant elevation in serum MDA concentration ($P < 0.001$) in male control as compared with female control. The increase of MDA concentration in male may be due to the difference in age. There were positive correlations between MDA levels and age. This finding show that peroxidative damage increases with the aging processes (Naeem *et al.*, 2015). Specific content of MDA product of lipid peroxidation was increasing with age (Naeem *et al.*, 2015) and in male patient with RA and control.

Relevance of oxidative stress to rheumatoid arthritis

Oxidative stress has a role in the pathogenesis of RA. Epidemiologic studies have shown an inverse association between dietary intake of antioxidants and RA incidence (Cerhan *et al.*, 2000), and inverse associations between antioxidant levels and inflammation have been found (Paredes *et al.*, 2002). Tissue injury releases iron, which is catalytic for hydroxyl radical production from hydrogen peroxide, is present in RA synovial tissue and is associated with poorer prognosis [66%-86%]. And increased oxidative enzyme activity along with decreased antioxidant levels in RA sera and synovial fluids

[66%-87%-66%-91%]. Because of the highly reactive nature of ROS, it is difficult to directly demonstrate their presence in vivo. It is considerably more practical to measure the 'footprints' of ROS and RNS, such as their effects on various lipids, proteins, and nucleic acid [66%-92%-66%-95%]. Increase production of ROS in RA patients has been suggested by raised level of lipid peroxidation products degradation of hyaluronic acid by free radical mechanisms oxidized low-density lipoproteins and increased carbonyl groups reflective of oxidation damage to proteins []. Oxidative damage to cartilage, extracellular collagen, and intracellular DNA. Oxidative stress has been shown to induce T cell hypo responsiveness in RA through effects on proteins and proteosomal degradation

Data in (table 4) showed the negative and positive values of CRP between RA patients and healthy control.

The result showed a significant elevation ($p < 0.01$) in concentration of CRP in patients RA. These results are in agreement with (PooleRobin ,2000) and contrary with (Elisteigefest ,2005). The high concentration of CRP in patients with RA compared with healthy control may be due to the systemic inflammatory feature in RA which demonstrated by small but significant elevation of serum CRP (Sharifetal,1997; Al-Salih 2014)

III. CONCLUSIONS

From the present study can conclude that:

1. High levels of MDA in sera of male with RA, as compared with female of RA.
2. High levels of MDA in sera of RA patient, while remaining within normal level IN control group.
3. A significant elevation in the activity of neutrophil and total WBC OF RA patients.
4. A significant decrease in HP and increase in ESR value and RF concentration of RA serum
5. A great increase in concentration of CRP in RA serum. These results are
6. in contrast to plasma total protein as main factor in inflammatory of RA

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RFID & GSM Based Toll Tax System

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Abstract- This Paper proposes a approach for the toll Collection at toll booths which is automatized using RFID & GSM technology in order to reduce the time consumption. RFID Tag will be held in each Vehicle which contains unique identification number assigned. The identification is done with the help of radio frequency. RFID Tag will be held in each Vehicle which contains unique identification number assigned. All basic information & the amount that has been paid in advance will be stored in accordance with the number. The RTO or traffic governing authority will do the assigning process & the reader will be strategically placed at toll collection center. The tax amount will be deducted from the prepaid balance, whenever the vehicle passes the toll booth and the new balance will be updated. SMS messages is sent to the mobile owner regarding the balance information. As vehicles don't have to stop in a queue, this translates to reduced Traffic congestion at toll plazas and helps in lower fuel consumption. This is very important advantage of this system.

Index Terms- Global System for Mobile communication, RFID Reader, RFID Tag.

I. INTRODUCTION

The main idea behind implementing RFID BASED TOLL COLLECTION SYSTEM is to automate the toll collection process their by reducing the long queues at toll booths using the RFID tags installed on the vehicle[4]. The need for manual toll based systems is completely reduced in this method and the tolling system works through RFID. A complete RFID system consists of a transponder (tag), reader/writer, antenna, and computer host. The transponder, better known as the tag, is a microchip combined with an antenna system in a compact package[3]. The microchip contains memory and logic circuits to receive and send data back to the reader. These tags are classified as either active or passive tags. Active tags have internal batteries that allow a longer reading range, while passive tags are powered by the signal from its reader and thus have shorter reading range. Passive RFID have no internal power source and use external power to operate. These tags are powered by the electromagnetic signal received from a reader. The RFID tag is used as a unique identity for account of a particular user. When a vehicle drives through the toll plaza, its driver is prompted to scan his RFID tag. If the identity (serial number of the tag) is matched with the one already stored in the system, the toll amount is deducted from his account. After this, the vehicle gets immediate access to drive through. This RFID based toll system also has some additional features. A new user can register him with the system. Also an old user can recharge his account balance. The amount for recharge can be entered in the system. In beginning, the user is prompted to scan his tag or ID. The serial code of the tag is

identified by the reader module and is sent for comparison with stored data. If the ID is matched by the microcontroller, the toll amount is deducted from user's balance and user gets to drive through the plaza. On the contrary, if the tag is not identified then image of car is captured by camera. A new user needs to register himself after which his identity is verified with RFID tag. The new record is then stored by the microcontroller to grant future access. Meanwhile, for the toll authorities also get the benefits mentioned below[4]. The benefits for the motorists include:

1. Fewer or shorter queues at toll plazas by increasing toll booth service turn around rates.
2. Faster and more efficient service (no exchanging toll fees by hand).
3. The ability to make payments by keeping a balance on the card itself.
4. The use of postpaid toll statements (no need to request for receipts).
5. Lowered toll collection costs.
6. Better audit control by centralized user account and
7. Expanded capacity without building more infrastructures.

II. EXISTING SYSTEM

Three systems of toll roads exist: open (with mainline barrier toll plazas); closed (with entry/exit tolls) and all-electronic toll collection (no toll booths, only electronic toll collection gantries at entrances and exits or at strategic locations on the mainline of the road)[3]. On an open toll system, all vehicles stop at various locations along the highway to pay a toll. While this may save money from the lack of need to construct tolls at every exit, it can cause traffic congestion, and drivers may be able to avoid tolls by exiting and re-entering the highway. With a closed system, vehicles collect a ticket when entering the highway. In some cases, the ticket displays the toll to be paid on exit. Upon exit, the driver must pay the amount listed for the given exit. Should the ticket be lost, a driver must typically pay the maximum amount possible for travel on that highway. Short toll roads with no intermediate entries or exits may have only one toll plaza at one end, with motorists traveling in either direction paying a flat fee either when they enter or when they exit the toll road. In a variant of the closed toll system, mainline barriers are present at the two endpoints of the toll road, and each interchange has a ramp toll that is paid upon exit or entry. In this case, a motorist pays a flat fee at the ramp toll and another flat fee at the end of the toll road; no ticket is necessary. In an all-electronic system no cash toll collection takes place, tolls are usually collected with the use of a transponder placed before the Gate as soon as the vehicle reaches near the Transponder the amount is deducted and the gate will be opened customer account which is debited for each use of the toll road. On some roads automobiles and light trucks without transponders

are permitted to use the road a bill for the toll due is then sent to the registered owner of the vehicle by mail; by contrast, some toll ways require all vehicles to be equipped with a transponder. Modern toll roads often use a combination of the three, with various entry and exit tolls supplemented by occasional mainline tolls. Open Road Tolling (ORT), with all-electronic toll collection, is now the preferred practice being more efficient, environmentally friendly, and safer than manual toll collection.

III. DRAWBACKS OF EXISTING SYSTEM

The above mentioned methods for collecting toll tax is time consuming method[3]. Chances of escaping the payment of toll tax are there. It leads to queuing up of following vehicles. Suppose the manual toll collection system is very efficient then for one vehicle to stop and pay taxes total time taken is 50 seconds. And suppose 200 vehicles cross the toll plaza. Then, time taken by 1 vehicle with 60 second average stop in a month is: $50 \times 30 = 1500$ seconds yearly total time taken = $1500 \times 12 = 18000$ seconds = 5.0 hours. On average each vehicle that passes through the toll plaza has to wait 5.0 hours in engine start condition yearly. The figure is staggering if on an average we take 200 vehicles pass through the toll plaza each day, then yearly 72000 vehicles. pass through the toll plaza. And each year 72000 vehicles just stand still for 5.0 hours in engine start condition thereby aiding pollution and wasting fuel and money. This study is if the system is very efficient but what if the vehicle has to wait for 5 minutes? This is a figure considering one toll plaza. If considering 50 toll systems the above figure will drastically increase and the wastage of fuel, money will increase and pollution will also increase.

IV. 4.1 RFID RADIO-FREQUENCY IDENTIFICATION (RFID)

It is an automatic detection method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. A single RFID reader can cover up to 30,000 square feet of floor space[9]. The technology requires some extent of cooperation of an RFID reader and an RFID tag. An RFID tag is an object that can be applied to or incorporated into a product, animal, or person for the purpose of identification and tracking using radio waves. Some tags can be read from several meters away and beyond the line of sight of the reader. Most RFID tags contain at least two parts. One is an integrated circuit for storing and processing information, modulating and demodulating a radio frequency (RF) signal, and other specialized functions. The second is an antenna for receiving and transmitting the signal. There are generally two types of RFID tags: active RFID tags, which contain a battery, and passive RFID tags, which have no battery. This project uses passive tags. Read-only tags are typically passive and are programmed with a unique set of data (usually 32 to 128 bits) that cannot be modified. Future chip less RFID allows for discrete identification of tags without an integrated circuit, thereby allowing tags to be printed directly onto assets at a lower cost than traditional tags. Currently (2008) none of the chip less concepts has become operational. Today, RFID is used in enterprise supply chain management to improve the efficiency of inventory tracking and

management. Radio-frequency identification (RFID) is the use of a wireless non-contact system that uses radio-frequency electromagnetic fields to transfer data from a tag attached to an object, for the purposes of automatic identification and tracking. Some tags require no battery and are powered by the electromagnetic fields used to read them. Others use a local power source and emit radio waves (electromagnetic radiation at radio frequencies). The tag contains electronically stored information which can be read from up to several meters (yards) away. Unlike a bar code, the tag does not need to be within line of sight of the reader and may be embedded in the tracked object. RFID tags are used in many industries. An RFID tag attached to an automobile during production can be used to track its progress through the assembly line. Pharmaceuticals can be tracked through warehouses. Livestock and pets may have tags injected, allowing positive identification of the animal. RFID identity cards can give employees access to locked areas of a building, and transponders mounted in automobiles can be used to bill motorists for access to toll roads or parking. Since RFID tags can be attached to clothing, possessions, or even implanted within people, the possibility of reading personally-linked information without consent has raised privacy concerns.



Fig 1: RFID Card

4.2 RFID Reader

In order for an RFID system to function, it needs a reader, or scanning device, that is capable of reliably reading the tags and communicating the results to a database. A reader uses its own antenna to communicate with the tag. When a reader broadcasts radio waves, all tags designated to respond to that frequency and within range will respond. A reader also has the capability to communicate with the tag without a direct line of sight, depending on the radio frequency and the type of tag (active, passive, or semi passive) used. Readers can process multiple items at once, allowing for increased read processing times. They can be mobile, such as handheld devices that scan objects like pallets and cases, or stationary, such as point-of-sale devices used in supermarkets.

EM-18 RFID Chip



Figure 2: RFID Reader chip

Features of RFID Chip EM-18

RF Transmit Frequency : 125 KHz
Supported standards : EM4001 64-bit RFID Tag
Compatible

Communications Protocol	: Specific ASCII
Communications Parameter	: 9600 bps, 8,N,1
Power Supply	: 4.6V-5.5V DC +/- 10% regulated.
Current Consumption	: 50mA<10mA at power down mode.
Communications Interface	: TTL Serial Interface, weigand output.
Reading Distance	: Up to 100mm,depending on tag.
Antenna	: Integrated
Size(L*W*H)	: 32*32*8mm

V. PROPOSED SYSTEM

This work is a standalone Automatic two door interlock control system for toll tax using AT89S52 microcontroller. Primarily, the two main components involved in a Radio Frequency Identification system are the Transponder (tags that are attached to the object) and the Interrogator (RFID reader). Communication between the RFID reader and tags occurs wirelessly and generally doesn't require a line of sight between the devices. RFID tags are categorized as either active or passive. This project uses passive tags. Read-only tags are typically passive and are programmed with a unique set of data (usually 32 to 128 bits) that cannot be modified. The reader has three main functions: energizing, demodulating and decoding. The antenna emits radio signals to activate the tag and to read and write data to it. the RFID module reader typically contains a module (transmitter and receiver), a control unit and a coupling element (antenna). This module is interfaced with the micro controller and when the card is brought near to the RFID module it reads the data in the card and displays on the LCD. RFID reader, tags are used in this project to identify the entry or exit of the vehicle. The RFID reader is placed at the toll tax collecting area and each and every vehicle is provided with a RFID card. Each and every time when we place the RFID card on the reader the current value (in Rs) in the card has to be stored in the EEPROM. Once we pay the tax through RFID card the value of the card get decremented which can shown on 16X2 LCD. Initially the gate is closed. Whenever any vehicle comes in front of the entry gate, the reader detects the RFID card owned by the vehicle owner and certain value of amount is detected automatically which will be displayed on 16X2 LCD. By using serial communication the data will be processed by the microcontroller and opens the entry gate by rotating the DC motor. After some delay, the gate will be closed. The user places the RFID card in the RFID reader for collecting the tax, then. Then the exit gate opens for the vehicle to leave. The microcontroller closes the gate only after the vehicle exits out .If certain amount is not there in the card then he/she can renewal the RFID card. Once the amount is successfully deducted from RFID card only the gate opens. And again the RFID reader will be waiting for the next vehicle to enter. A GSM modem is also interfaced to the controller to send the SMS

VI. METHODOLOGY

A radio-frequency identification system uses *tags*, or *labels* attached to the objects to be identified. Two-way radio transmitter-receivers called *interrogators* or *readers* send a signal to the tag and read its response. The readers generally transmit their observations to a computer system running RFID software or RFID middleware. The tags information is stored electronically in a non-volatile

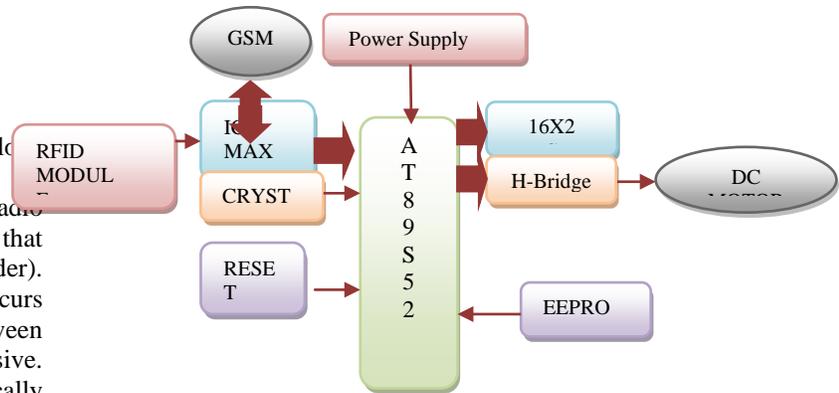


Figure 3: Block diagram of the proposed system

memory. The RFID tag includes a small RF transmitter and receiver. An RFID reader transmits an encoded radio signal to interrogate the tag. The tag receives the message and responds with its identification information. This may be only a unique tag serial number, or may be product-related information such as a stock number, lot or batch number, production date, or other specific information. RFID tags can be either passive, active or battery assisted passive. An active tag has an on-board battery and periodically transmits its ID signal. A battery assisted passive (BAP) has a small battery on board and is activated when in the presence of a RFID reader. A passive tag is cheaper and smaller because it has no battery. Instead, the tag uses the radio energy transmitted by the reader as its energy source. The interrogator must be close for RF field to be strong enough to transfer sufficient power to the tag. Since tags have individual serial numbers, the RFID system design can discriminate several tags that might be within the range of the RFID reader and read them simultaneously. Tags may either be read-only, having a factory-assigned serial number that is used as a key into a database, or may be read/write, where object-specific data can be written into the tag by the system user. Field programmable tags may be write-once, read-multiple; "blank" tags may be written with an electronic product code by the user. RFID tags contain at least two parts: an integrated circuit for storing and processing information, modulating and demodulating a radio-frequency (RF) signal, collecting DC power from the incident reader signal, and other specialized functions; and an antenna for receiving and transmitting the signal. Fixed readers are set up to create a specific interrogation zone which can be tightly controlled. This allows a highly defined reading area for when tags go in and out

of the interrogation zone. Mobile readers may be hand-held or mounted on carts or vehicles.

WORKING PROCEDURE

1. The RFID reader is operated with +5v power supply. As soon as you give supply, the reader indicates the user that it is ready.
2. After giving supply to the reader, connect the serial cable of the reader to the DB-9 Connector of the MAX 232 IC.
3. After the above connections are over, a message is displayed on the LCD as “**Welcome to RFID reader**”.
4. After some delay, a message is displayed as “**Starting system**” with a **led blinking** for Sometime till the message is appeared on the LCD.
5. Then again a message is displayed as “**System Ready**” with a second **led blinking** till the message is appeared.
6. Now, a message will be continuously appearing as “**Place the Card**” till we place the card into the reader with a simultaneous led blinking.
7. After placing the card near the reader, the reader indicates with an buzzer that a card has been accepted.
8. Next if the data is matched with the data existing in the card and stored in the code memory then it displays a message as “**Authorized**” in the first line of the LCD and “**Wineyard welcomes**” in the second line of the LCD.
9. When it is matched then a message is again displayed as “**Gate Opens**” along with the DC motor rotating in Clockwise direction.
10. After the door is opened a message is displayed as “**Plz Get In...**”.
11. Then after some time, a message is displayed as “**Gate closes**” along with a DC motor rotating in an anti-clockwise direction.
12. Hence in this way we are providing security.

6.1 SOFTWARE USED

Software used is Proload. Proload is a software which accepts only hex files. Once the machine code is converted into hex code, that hex code has to be dumped into the microcontroller placed in the programmer kit and this is done by the Proload. Programmer kit contains a microcontroller on it other than the one which is to be programmed. This microcontroller has a program in it written in such a way that it accepts the hex file from the keil compiler and dumps this hex file into the microcontroller which is to be programmed. As this programmer kit requires power supply to be operated, this power supply is given from the power supply circuit designed above. It should be noted that this programmer kit contains a power supply section in the board itself but in order to switch on that power supply, a source is required. Thus this is accomplished from the power supply board with an output of 12volts or from an adapter connected to 230 V AC.

VII. RESULTS

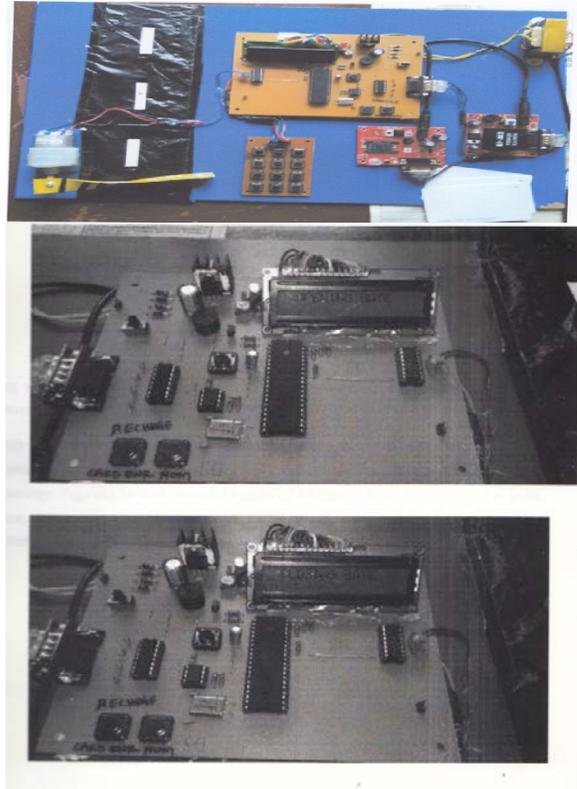


Figure 4: Experimental Result

VIII. CONCLUSION

RFID is increasingly used with biometric technologies for security. Hence this work can be very useful and can be implemented in real time applications, eg.for recording the attendance. This system makes travelling more convenient, reduces travel times, savesfuel, reduces auto emissions, and increases highway capacity.

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Assessing the Seasonal Variation in Global Solar Radiation of Lagos State, Nigeria

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Abstract- The knowledge of the seasonal variation in global solar radiation reaching a location on the earth is an important information for Agriculturists, water sector personnel, electrical power sector, environmentalists, etc. The objective of this work is to determine how global solar radiation of Lagos state varies with dry seasons.

Hargreaves-Samani model of global solar radiation prediction was used for this work, making use of minimum and maximum air temperature data adopted from the website of Weather Online limited for the months of January and August 2016, with January representing the dry season and August representing the rainy season data. The result shows that there is variation in global solar radiations in the two seasons, with dry season having radiation than rainy season.

Index Terms- Agriculture, Hargreaves-Samani Model, Maximum Temperature, Seasonal Global Solar Radiation.

I. INTRODUCTION

A knowledge of spectral irradiance (direct and diffuse) arriving at the earth's surface is important for the design of many solar energy applications [S. O. Falodun and E. O. Ogolo, 2007].

The amount of global solar energy depends on the location, time of the year, and atmospheric conditions [Helena Mitsova *et al*, 2011]. In other words, the amount of solar energy available in a place or location depends on the time of the year; that is; rainy and dry season, and thus there is need for such a research to be carried out in a megacity such as Lagos state, Nigeria. Research outcomes on studies of global solar radiation have facilitated improvement in agronomy, power generation, environmental temperature controls, etc. [Ugwu, A. I. and Ugwuanyi, J. U., 2011].

Also, the amount of solar radiation over a place determines the type of crops that can survive in such a place as some crops have less resistance to hot environment.

The objective of this work is to assess the seasonal variation in global solar radiation of Lagos state, Nigeria, and it employs Hargreaves-Samani model.

Hargreaves-Samani (1985) model accounts for solar radiation using only temperature. Although relative humidity is not explicitly contained in the equation, it is implicitly present in the difference in maximum and minimum air temperature [Ugwu, A. I. and Ugwuanyi, J. U., 2011].

In some parts of the country, similar works have been carried out by various scientists and researchers. In 2015, Adedoja, O.S. Ayantunji, B.G. Saleh U.A. and Jatto. S.S carried out a work in Anyigba (7.486N, 7.1836E), Nigeria using Campbell automatic weather station. In their work, "Diurnal and Seasonal Variation of Global Solar Radiation at Anyigba, North-Central Nigeria", it was observed that solar activity was peak in February, which is dry season and low in months of rain.

S. O. Falodun and E. O. Ogolo in 2007 did similar work in Akure entitled "Diurnal and seasonal variation of Global Solar Radiation at Akure , South-Western Nigeria". It was also observed by them that there is seasonal variation in global radiation, and that the dry months have comparably larger values than wet months.

II. METHODOLOGY

i Study area: Lagos state is located in the South-Western Nigeria. The study location is between latitude 6.413N and 6.694N, and longitude 2.705E and 4.356E. Because water is the most topographical feature of Lagos state, water and wetlands cover 40% of the total land area [Albert Osei *et al* 2006]. The state is bounded from the West by the Republic of Benin, North and East by Ogun state, and South by the Atlantic Ocean. It has two seasons; (rainy and dry seasons) due to its tropical savanna climate. The rainy season is from April to September, but the intense rain is from April to July, and the dry season is from October to March. Lagos state has an average temperature of 27⁰c.

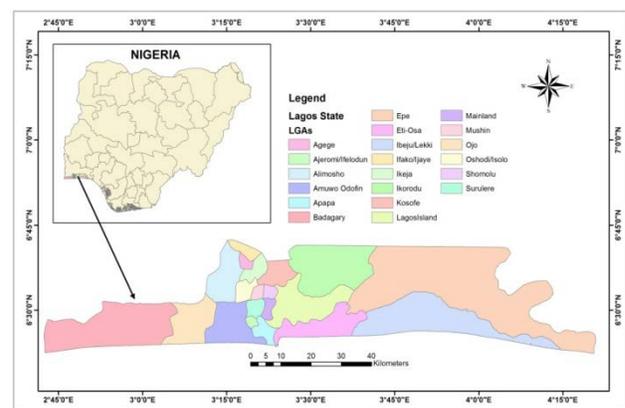


Fig. 1: Map of Nigeria showing the study area

ii. Data acquisition: This study makes use of maximum and minimum temperature of Ikeja, Lagos state, Nigeria, for the months of January (dry season) and August (rainy season) for 2016. The data was obtained from the website (<http://www.weatheronline.co.uk/weather/>) of weather online limited.

ii. Method: In this work, the method used is Hargreaves-Samanni model of global solar radiation predictions. The model equation makes use of the maximum and the minimum temperature of the study area to predict the global solar radiation of the location. The Hargreaves-Samanni equation is given as:

$$R_s = K_{RS} \left(\sqrt{T_{max} - T_{min}} \right) R_a \quad \text{----- 1}$$

Where T_{max} is the maximum temperature, T_{min} is minimum temperature, R_a is the extraterrestrial solar radiation of the area and K_{RS} is adjustment coefficient. It has different values for 'interior' and 'coastal' regions. For 'interior' locations, where land mass dominates and air masses are not strongly influenced by a large water body, it is approximately 0.16 and for 'coastal' locations, situated on the coast of a large land mass and where air masses are influenced by a nearby water body, its value is approximately 0.19. In this design, the value of K_{RS} used is 0.19. because of the closeness of the study area to water body. Various parameters including the global solar radiation were calculated using Microsoft excel computations. Graphs were also plotted using excel worksheet as in figures 3-4.

Parameters for Global Solar Radiation

The parameters calculated before finding the global solar radiation of an area based on Hargreave-Samanni method are:

a. Solar Radiation Declination (δ): It is the angle made between a ray of the sun, when extended to the centre of the earth and the equatorial plane. The solar radiation declination is calculated using the expression give as;

$$\delta = 23.44 \cos \left\{ \left(\frac{360}{365} \right) * (J + 10) \right\} \quad \text{-----2}$$

Where J is the number of the day in the year between 1 (1 January) and 365 or 366 (31 December) and δ is solar radiation declination in degree.

Equation 3 represents the solar radiation declination in radians. That is;

$$\delta_{rad} = \frac{\delta \times \pi}{180} \quad \text{----- 3}$$

b. Sunset Angle (ω_s): It is defined as the angle of the daily disappearance of the sun below the horizon due to the rotation of the earth. Sunset time is the time in which the trailing edge of the sun's disk disappears below the horizon. The sunset angle of a location is calculated using the formula given as;

$$\omega_s = \cos^{-1} \left(-\tan(\phi) \tan(\delta) \right) \quad \text{----- 4}$$

Where ω_s is sunset angle in radian, δ is the solar radiation declination in radian, and ϕ is latitude angle of the location.

c. Inverse Relative Distance Earth-sun (d_r): Inverse relative distance earth-sun is the inverse distance of the sun relative to the earth at the location. It is calculated using the expression given as;

$$d_r = 1 + 0.033 \cos \left(\frac{2\pi J}{365} \right) \quad \text{-- 5}$$

d. Extraterrestrial Solar Radiation (R_a): Extraterrestrial solar radiation is the intensity or power of the sun at the top of the earth's surface. It is the solar radiation outside the earth's atmosphere. The extraterrestrial radiation is calculated using the formula;

$$R_a = \frac{24(60)}{\pi} G_{sc} d_r \left[\omega_s \sin(\phi) \sin(\delta) + \cos(\phi) \sin(\omega_s) \right] \quad \text{----- 6}$$

Where R_a is extraterrestrial radiation, d_r is the inverse relative earth-sun distance, ϕ is the latitude angle, ω_s is the sunset angle, and G_{sc} is solar constant given as 0.0820 MJ m⁻² min⁻¹ (or 1367wm⁻²).

e. Global Solar Radiation: Global solar radiation is the total amount of solar energy received by earth's surface. It is the addition of the direct, diffuse and reflected solar radiations. It is calculated using the formula given as;

$$R_s = K_{RS} \left(\sqrt{T_{max} - T_{min}} \right) R_a \quad \text{----- 7}$$

Table 1: Temperature data for the month of January 2016

s/n	T _{max} (°c)	T _{min} (°c)
1	35	23
2	35	22
3	34	20
4	36	21
5	34	22
6	35	22
7	37	21
8	34	21
9	34	24
10	35	25
11	35	25
12	34	26
13	34	25
14	35	25
15	30	25
16	35	26
17	34	26
18	34	26
19	31	26
20	34	24
21	34	24
22	36	25
23	35	25
24	34	26
25	34	22
26	33	22

27	33	20
28	34	22
29	34	21
30	34	20
31	35	20

Source: Weatheronline.co.uk/weather/

Table 2: Temperature data for the month of August 2016

s/n	T _{max} (°c)	T _{min} (°c)
1	29	24
2	29	24
3	29	23
4	31	23
5	30	24
6	29	24
7	29	24
8	29	23
9	28	23
10	30	23
11	30	23
12	29	24
13	30	23
14	30	24
15	30	25
16	28	24
17	30	24
18	30	23
19	29	24
20	29	23
21	27	24
22	29	24
23	30	24
24	29	24
25	30	24
26	28	25
27	29	24
28	25	23
29	30	23
30	28	24
31	30	23

Source: Weatheronline.co.uk/weather/

Tables 1 and 2 show the temperature data (minimum and maximum) for the months of January (dry season) and August (rainy season), 2016 obtained from the websites of weather online limited (<http://www.weatheronline.co.uk/weather/>).

III. RESULTS AND DISCUSSIONS

a. Results

Location parameters: Latitude, $\phi = 6.4$ N, Longitude = 3.35E, $K_{RS} = 0.19$ (Coastal area), Month = January, Year = 2016

Table 3: Global Solar Radiations for January

J	Ws (rad)	R _a (KWH)	K _{RS}	T _{max} (°c)	T _{mi} _n (°c)	Rs (KW H)
1	1.57158	41.992	0.19	35	23	27.638
2	1.57158	41.979	0.19	35	22	28.758
3	1.57158	41.965	0.19	34	20	29.834
4	1.57157	41.950	0.19	36	21	30.870
5	1.57157	41.934	0.19	34	22	27.600
6	1.57157	41.915	0.19	35	22	28.714
7	1.57156	41.896	0.19	37	21	31.841
8	1.57156	41.875	0.19	34	21	28.687
9	1.57155	41.853	0.19	34	24	25.147
10	1.57155	41.829	0.19	35	25	25.132
11	1.57155	41.804	0.19	35	25	25.117
12	1.57154	41.778	0.19	34	26	22.451
13	1.57154	41.750	0.19	34	25	23.798
14	1.57154	41.721	0.19	35	25	25.067
15	1.57153	41.690	0.19	30	25	17.712
16	1.57153	41.659	0.19	35	26	23.745
17	1.57153	41.625	0.19	34	26	22.370
18	1.57152	41.591	0.19	34	26	22.351
19	1.57152	41.555	0.19	31	26	17.655
20	1.5714	41.518	0.19	34	24	24.945
21	1.5714	41.479	0.19	34	24	24.922
22	1.5714	41.439	0.19	36	25	26.113
23	1.5714	41.398	0.19	35	25	24.873
24	1.5714	41.356	0.19	34	26	22.225
25	1.5714	41.312	0.19	34	22	27.191
26	1.5714	41.267	0.19	33	22	26.005
27	1.5714	41.221	0.19	33	20	28.23

	4					9
28	1.5714 3	41.174	0.19	34	22	27.10 0
29	1.5714 2	41.125	0.19	34	21	28.17 3
30	1.5714 1	41.075	0.19	34	20	29.20 1
31	1.5714 1	41.024	0.19	35	20	30.18 9

Location parameters: Latitude, $\phi = 6.4$ N, Longitude = 3.35E, $K_{RS} = 0.19$ (Coastal area), Month = August, Year = 2016

Table 4: Global Solar Radiations for August

J	Ws(rad)	R _a (KW H)	K _{RS}	T _{ma} (°C)	T _{min} (°C)	Rs (KWH)
214	1.57019	33.450	0.19	29	24	14.211
215	1.57020	33.499	0.19	29	24	14.232
216	1.57021	33.549	0.19	29	23	15.614
217	1.57022	33.600	0.19	31	23	18.057
218	1.57023	33.652	0.19	30	24	15.662
219	1.57024	33.706	0.19	29	24	14.320
220	1.57025	33.760	0.19	29	24	14.343
221	1.57026	33.815	0.19	29	23	15.738
222	1.57027	33.872	0.19	28	23	14.391
223	1.57028	33.929	0.19	30	23	17.056
224	1.57029	33.988	0.19	30	23	17.085
225	1.57030	34.047	0.19	29	24	14.465
226	1.57031	34.108	0.19	30	23	17.146
227	1.57032	34.169	0.19	30	24	15.902
228	1.57033	34.232	0.19	30	25	14.543
229	1.57035	34.295	0.19	28	24	13.032
230	1.57036	34.359	0.19	30	24	15.991
231	1.57037	34.425	0.19	30	23	17.305
232	1.57038	34.491	0.19	29	24	14.653
233	1.57039	34.558	0.19	29	23	16.083

234	1.57040	34.626	0.19	27	24	11.395
235	1.57042	34.694	0.19	29	24	14.740
236	1.57043	34.764	0.19	30	24	16.179
237	1.57044	34.834	0.19	29	24	14.799
238	1.57045	34.905	0.19	30	24	16.245
239	1.57047	34.977	0.19	28	25	11.511
240	1.57048	35.050	0.19	29	24	14.891
241	1.57049	35.123	0.19	25	23	9.438
242	1.57050	35.197	0.19	30	23	17.693
243	1.57052	35.272	0.19	28	24	13.403
244	1.57053	35.347	0.19	30	23	17.769

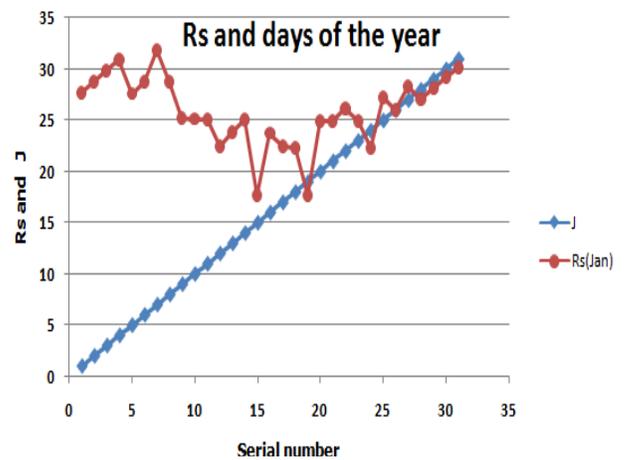


Fig. 2: Graph of January Global Solar Radiation and the days of the year.

($R_{s(Jan)}$) = Global solar radiation for the month of January, 2016 and J = Days of the year, i.e 1-31 for January)

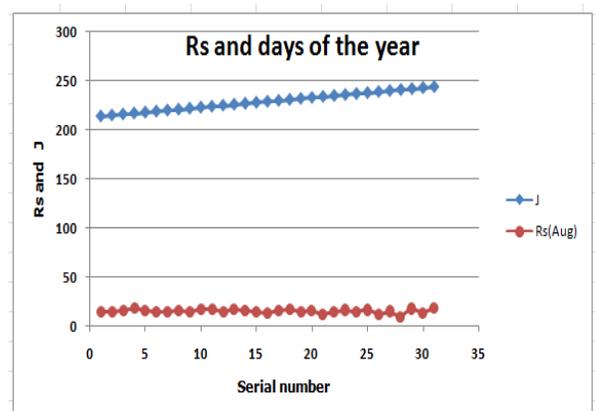


Fig. 3: Graph of August Global Solar Radiation and the days of the year.

$(R_{s(\text{Jan})})$ = Global solar radiation for the month of August, 2016 and J = Days of the year, i.e. 214 -244 for August)

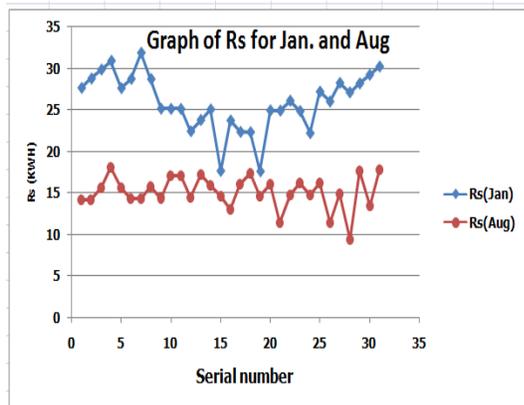


Fig. 4: Graph of Global Solar Radiations for the months of January and August.

$(R_{s(\text{Jan})}$ is the Global solar radiation for January and $R_{s(\text{Aug})}$ is the Global solar radiation for August)

b. Discussions

Hargreaves-Samani model of global solar radiation estimation was used to determine the global solar radiation for both the rainy (August) and dry (January) seasons using the maximum and minimum temperature data obtained from the achieve of weather online limited from their website - <http://www.weatheronline.co.uk/weather/>. The data for the two months are shown in tables 1 and 2. The computations for various parameters were carried out using MS EXCEL package. Graphs were also plotted in the ms excel worksheet. Some of the parameters calculated are shown in tables 3 and 4.

The result shows that there is clear variation between the global solar radiation during rainy and dry seasons. It shows that global solar radiation is very high in dry season (January) than in rainy season (August) [Fig. 4]. The global solar radiation in January was seen to be generally high though oscillating, the behavior which is also observed in that of August, except at the middle of January which shows some deviation from its general trend. The sharp lowest values at two points in January solar radiation may be attributed to sudden change in weather conditions such as rainfall, humidity, or harmattan haze (that can affect air temperature) on those two days.

The maximum global solar radiations are 31.831kwh for January and 18.0057 kwh for August, with the average radiations of 25.926kwh and 5.0933kwh in January and August respectively. The minimum values are 17.655kwh and 9.438kwh in January and August respectively. In other words, even the minimum value for dry season is greater than the maximum value for rainy season. Although the global solar radiations for both rainy and dry seasons were oscillating, the correlation value of 0.06648 (6.65%) between the two shows that there is no relationship between the two (rainy and dry season). This is as shown in figure 3.

This information will be very important for irrigation farmers on the need to have manageable size of farm which can be taken care of carefully than having a large one without proper attention. In as much as irrigation is going to make water

available to the crops, crops species that can withstand such solar radiation would be preferred. Solar power personnel will also find this information, (clear variation between the radiations in dry and rainy season) valuable especially that of the rainy season in which the average global solar radiation was 5.0933kwh. There will be need for more number of solar arrays for effective energy capturing which can be used for charging the batteries or powering the required appliances as the case may be. Furthermore, this difference between the radiation of rainy and dry seasons in which that of dry season (31.831kwh) almost doubles that of rainy season (18.0057 kwh) should be a thing of concern for environmentalists and water sectors personnel as many plants in the environment may not be able to adjust quickly to such as a sharp difference, hence the extinction of many species. Many ground waters such as ponds may likely dry up during the dry season; proper planning for future occurrence is to be put in place by respective bodies.

IV. CONCLUSION

From the results using Hargreaves-Samani model with the minimum and maximum temperature data which was adopted from Weather Online Limited, it can be observed that variation occurs between solar global radiation in rainy season and dry season, with the global solar radiation higher in dry season (January in this case) than in rainy season (August in this case). This is in accordance with the work by S. O. Falodun and E. O. Ogolo (2007), at Akure, South-west, Nigeria, in which it was stated that there is seasonal variation of global radiation, and that the dry months have comparably larger values than wet months. It can also be conclusively stated that although, the global solar radiations for both rainy and dry seasons change in almost the same trend, there is no significant relationship between the radiations in the two seasons especially with reference to their correction of 6. 65% gotten.

V. RECOMMENDATIONS

Although the result of this work using the data adopted from weather online limited (<http://www.weatheronline.co.uk/weather/>) conforms with related works already carried out especially that by S. O. Falodun and E. O. Ogolo (2007), the data for other geographical zone of Nigeria should be used for this similar work.

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Knowledge Attitude and Practice of Diet and Exercise among Diabetic Patients for Normal Plasma Glucose Level

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Abstract- Objective: Identify the Knowledge, Attitude and practice regarding diet and exercise for normal glucose level among diabetic patients.

Method: A descriptive cross sectional study was conducted among diabetic patients of KPK in tertiary care hospitals of Peshawar. Participants were selected through convenient sampling technique. The data was collected through a semi-structured questionnaire. The autonomy and confidentiality was assured through a well-defined informed consent.

Result: Out of 60 participants the gender distribution was 50% each. The Mean knowledge level of patients regarding diet and exercise for normal plasma glucose control was $61.17\% \pm 27.62\%$. Percentages of both Practice and positive attitude were also calculated. The Means and Standard deviations were $53.33\% \pm 23.68\%$ and $56.67\% \pm 23.33\%$ respectively. Gender and positive attitude has significant relation with $P\text{-value}=0.026$, knowledge was significant with practice through $P\text{-value}=0.019$.

Conclusion: the result of the study shows deficit in Patients' Knowledge and practice and also lack of positive attitude toward diabetic diet and exercise for maintaining normal plasma glucose level, so there is a great need of producing awareness among diabetic patients regarding the importance of both diet and exercise and to improve their compliance and changes their attitude.

I. INTRODUCTION

Diabetes mellitus is a group of metabolic diseases characterized by increased levels of glucose in the blood (hyperglycemia) resulting from defects in insulin secretion or insulin action or both, American Diabetes Association, 2009 (1). The common effect of uncontrolled diabetes over time causes many complications especially the nerves and blood vessels. In 2012, diabetes was the direct cause of 1.5 million deaths and high blood glucose was the cause of another 2.2 million deaths worldwide WHO, Geneva, 2016 (2).

Diabetes Mellitus is now a leading cause of morbidity and mortality throughout the world, it is associated with high rates of hospitalization, blindness, renal failure and non-traumatic amputation. The World Health Organization (W.H.O.) has estimated that the global number of people with diabetes will be more than double over the next 25 years and the developing world would tolerate an increasingly larger burden of disease in that period (2). Control of diabetes and prevention of complication is associated with maintaining normal level of

plasma glucose. This level is achieved by pharmacological approaches such as anti-diabetic drugs as well as non-pharmacological management like diabetic diet and exercise etc.

Diet and exercise play an important role in maintaining normal blood glucose level and prevention of complications in diabetic patients. Most of the diabetic patients do not have enough knowledge about their diet plan and exercise which play an important role in controlling normal blood sugar level. A diabetic diet simply means, eating the healthiest food in moderate amounts at regular mealtimes. It is naturally rich in nutrients and low in fat and calories, the key elements are fruits, vegetables and whole grains, fish, chicken and eggs etc. In fact, a diabetes diet plan is the best eating plan for every diabetic patient (1).

A study about the knowledge, attitude and practice of exercise for plasma blood glucose control among patients with type-2 diabetes at Nigeria, in 2016 shows that patients demonstrated good knowledge of exercise for plasma blood glucose control but reported negative attitude and poor practice of exercise; where, 49.5% had good knowledge of exercise while 90.0% had negative attitude to exercise, Less than third, 27.4% were engaged in exercise practice for plasma blood glucose control (3). Another study about dietary behaviors among patients with type-2 Diabetes mellitus in Yogyakarta, Indonesia shows that Dietary behaviors was at a moderate level (4). A study conducted at Saurashtra region shows that Dietary modifications were relied more than exercises among the studied patients (5). For most people with T2DM, weight loss can also make it easier to control blood glucose and it can be achieved by a proper diabetes diet plan (1). A study conducted at faculty of Pharmacy in University of Baluchistan shows that 83% of the study participants believed that sugar should be avoided in food (6).

This study is about the knowledge, attitude and practice of diabetic diet and the importance of exercise in maintaining normal blood sugar level among patient in tertiary care hospital of Peshawar. It also identifies the associated factors, and further it will help the health department for making policies regarding education of diabetic patients with their diet and exercise. It will also provide a base for further research studies in Pakistan.

II. METHODS

A descriptive cross sectional study was performed the Knowledge, attitude and practice of Diet and Exercise among diabetic patients in a tertiary care hospital of Peshawar. The

study setting was the medical and surgical ward of hospital, for sample selection convenient sampling technique was used, sample size was calculated by Rao-soft software online, with .05 level of significance and 10% nonresponse rate the calculated sample size was 60. The inclusion and exclusion criteria for participant was quite clear.

Inclusion criteria:

- The entire admitted patient with diagnosed diabetic status.
- The conscious patients.

Exclusion Criteria:

- Patients with Neurological problems (mentally retarded).
- Patients with language barrier.
- Patients on ventilator.
- Children less than 10 years.

A semi-structured questionnaire was used as data collection tool. The questions for the questionnaire was compiled from combining questionnaire of from ' The Australian diabetes, obesity and lifestyle study (7) and diabetes knowledge questionnaire and nutrition, 2015 by Smith, J et'al (8) . The questionnaire was applied on 15% patients of the sample size as pilot testing to identify its reliability.

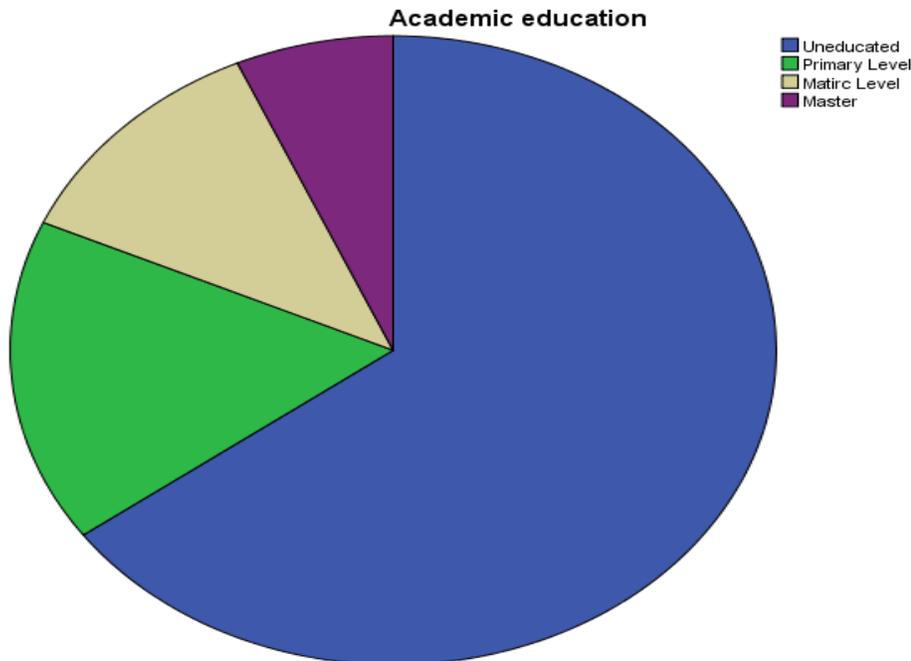
Keeping in view the ethical consideration of the study, a well-defined informs consent was presented and explained to patient to get his/her agreement as participant. Their autonomy and confidentiality was assured throughout the study.

For data analysis in descriptive statistic, percentages and frequencies were calculated for nominal and ordinal data, while Mean and Standard Deviation were calculated for scale data. In inferential statistic independent T-test and one-way ANOVA with post Hoc Tukey Test were applied for continues variable, while chi- square were applied on categorical variables.

III. RESULT

The sample was comprised of 50% male and 50% female patients. The Mean duration of diabetes among diabetic patients was 11.45 years \pm 7.28 years. 65% of the participants were uneducated, 16.7% had primary level, 11.7% had matric level and 6.7% had master level as far as education is concerned. . 63.3% of the participants were unemployed, 6.7% were government employed, 26.7% were self-employed, and 3.3% were private employed. Family history of diabetes among the participants was 68.3%. Among the participants 65.0% had complication from diabetes. The overall graphical representation of education is showed in chart 1.1.

Pie-Chart: 1.1



The Mean knowledge level of patients' regarding diet and exercise for normal plasma glucose control was 61.17% \pm 27.62 %. Graphical representation is given in chart-3.2. Percentage of Practice and attitude regarding diet and exercise were also calculated. The Mean and Standard deviation of patients'

practice was 53.33% and 23.68% respectively, Graphical representation is given in chart-3.3. While the Mean and Standard deviation of patients' Attitude was 56.67% and 23.33% respectively, Graphical representation is given in chart-1.2-4

Chart: 1.2

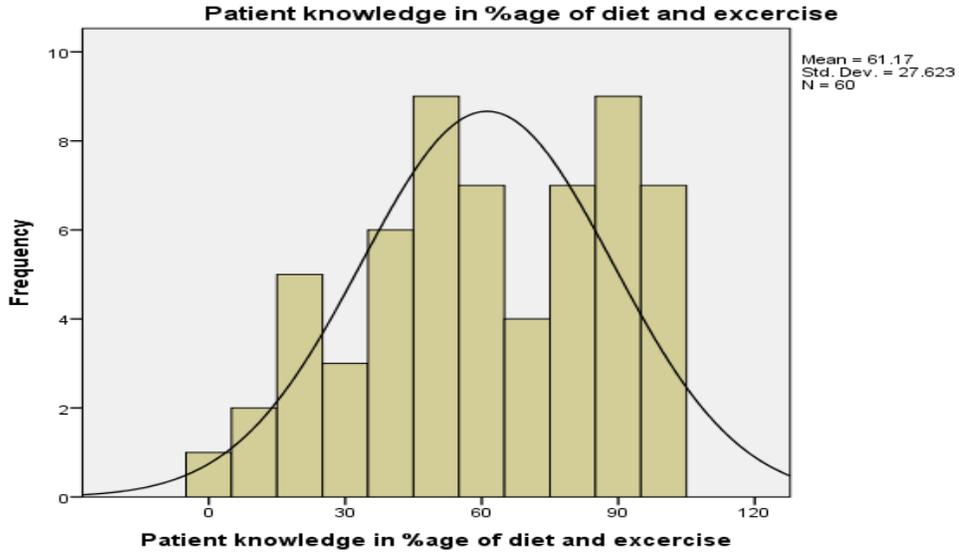


Chart: 1.3

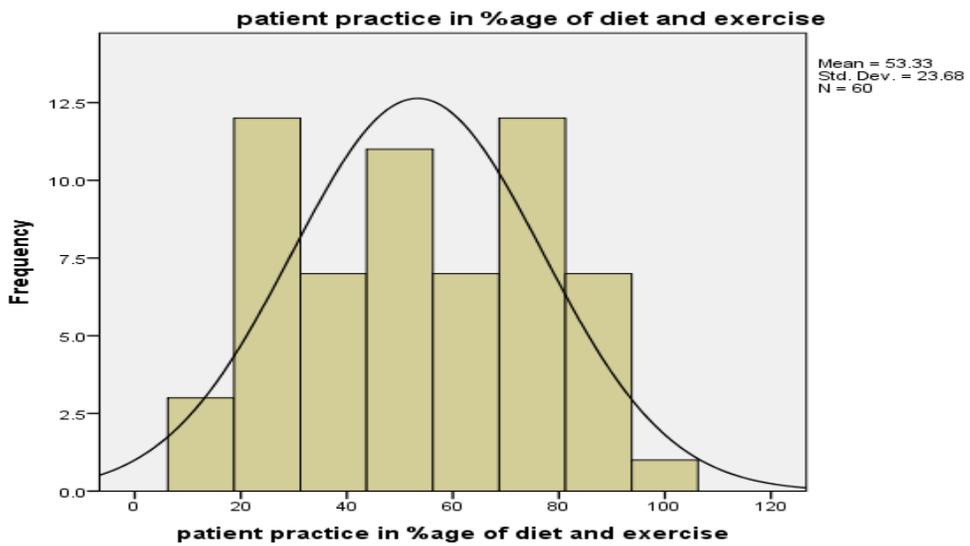
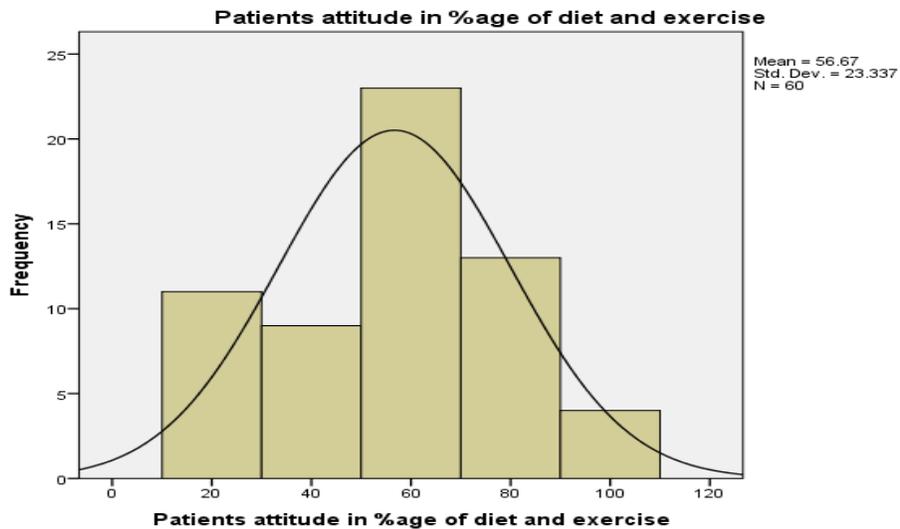


Chart: 1.4



The overall percentage of questions regarding knowledge, Attitude and Practice are given in table-3.1, table-3.2 and table-3.3 respectively.

Table-1.1:

S No.	Questions regarding knowledge	Yes	No	Don't Know
1	Sugar level can be controlled with exercise:	65%	13%	21%
2	Diet plays an important role in controlling blood sugar level:	76.7%	6.7%	16.7%
3	Diabetes can cause a number of complications:	46.7%	21.7%	31.7%
4	A food rich in carbohydrate may cause hyperglycemia:	61.7%	5.0%	33.3%
5	Taking low amount of carbohydrate may cause hypoglycemia:	61.7%	5.0%	33.3%
6	A frequent and small amount of food is necessary for plasma sugar control:	70.0%	18.3%	11.7%
7	Sedentary life style may worsen condition:	83.3%	10.0%	6.3%
8	Exercise can prevent complication:	68.3%	11.7%	20.0%
9	Protein in diet is good for diabetic patient:	35.0%	23.3%	41.7%
10	low carbohydrate and low fat diet is good for diabetic patient:	41.7%	13.3%	45.0%

Table-1.2

S No.	Question regarding Attitude	Yes	No
1	Do you like eating sweets?	76.7%	33.7%
2	Are you getting bored of sugar free diet	53.3%	46.7%
3	Adaptation with diet plan is easy for you:	46.7%	53.3%
4	Do you enjoy exercise?	35.0%	65.0%
5	Would you like to advice for exercise to other diabetic patients?	75.0%	25.0%

Table-1.3:

S No.	Questions regarding Practice	Yes	No	
1	Have you ever visited a dietitian for your diet plan?	43.3%	56.7%	
2	Do you have any meal plan?	65.0%	35.0%	
3	Do you strictly follow your diet plan?	36.7%	63.3%	
4	Have you been told to follow any diet restrictions?	50.0%	50.0%	
5	Do you take any anti-diabetic medications?	91.7%	8.3%	
6	Do you take vitamin or herbal supplements?	30.0%	70.0%	
7	Do you use any meal products such as, (Ensure, Glucerna)?	30.0%	70.0%	
8	Any change in your weight during last year:	83.3%	16.7%	
		Never	Sometime	Usually
9	How often you use sweets in your diet?	40.0%	58.3%	1.7%
10	How would you describe your appetite?	40.0%	26.7%	33.3%
11	How often you go for exercise?	43.3%	41.7%	15.0%

Furthermore; independent sample T-test was applied to identify the association of gender with patients' knowledge, attitude and practice. Gender had significant association with patient positive attitude with p-value =0.026.

One-way ANOVA showed significant association with p-value =0.019. Between patients' educational level and their practice of diabetic diet and exercise for normal plasma glucose control.

IV. DISCUSSION

Literatures were searched on published work about patients' knowledge, attitude and practice (KAP) regarding diet and exercise. A number of studies were found in different countries of the world. There were some studies in Pakistan on the stated topic, a limited literature might be found about studies in KPK.

A study was conducted by Jain, Pavan Kumar, 2012 in Pune city showed that 43.42% patients had poor knowledge regarding diabetic diet, exercise and foot care. 47.41% has average

knowledge regarding Exercise, whereas in the current study the mean Knowledge is $61.17\% \pm 27.62\%$. (9).

A study conducted by Iral.N.Shah,2009 shows that most of the patients believed in self-care in diabetes, the Practice of taking herbal drugs identified in 40% of patients. The percentages of Practice regarding diet and exercise were calculated in current study's result. The Mean and Standard deviation of patient practice was $53.33\% \pm 23.68\%$, respectively (10).

A study conducted by Gregory Joseph, et'al, 2010, about the knowledge, attitude and practice with type-2 diabetic patients showed that the overall mean percentage of knowledge among 156 diabetic patients was 43% (11). According to Naila Akbar et'al, 2014 shows that 83% of diabetic subjects believe that sugar cannot be used at any cost and 68% believed that special diabetic food is used in diabetes(5). This result is a bit different form the current study where 40% of the patients said that they never take sweets in their diet, 58% of the participants use sweets rarely, were as 1.7% use sweets in their diet regularly. The overall Mean patients' positive Attitude was $56.67\% \pm 23.33\%$.

V. CONCLUSION

The study shows that the patients knowledge about the diet and exercise for normal blood glucose level is not up to the mark, furthermore the lack of positive attitude and noncompliance to practice might causes complications for diabetic patients, and might increase the burdened of disease on population.

VI. RECOMMENDATION

The tool used in the study may help for researchers in future. This study is not confined so, further studies should be conducted that might help in producing awareness among diabetic patients regarding the importance of diet and exercise for normal plasma glucose level. Government and non-government organizations should made policies for health education reading sugar control. Special dietitians department should be established in all public and private hospitals for preparing diet plans and providing health education regarding the importance of diet and exercise for diabetic patients for prevention of diabetic related complications. Print and electronic media might be used for creating awareness regarding the importance of diet and exercise for diabetic patients.

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Design and Development of a Far Infrared Rice Flour Gelatinizer

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Abstract- A far infrared continuous type rice flour gelatinizer was developed and tested. At present rice flour is roasted in batch process using electricity or firewood in industry. The existing batch type conduction heating roasters are labor intensive and energy inefficient. Radiation heating is more effective compared to conduction and convection in food processing. At present, there are no far infrared heating continuous type rice flour roasters for industrial use. An auger was used to mix and move flour in the machine. At the top and the bottom of the auger, far infrared heaters were established to supply radiation heat. The industrial requirement was to get gelatinized rice flour at the rate of 300kg/h. To achieve required rpm, heater height and temperature and retention time were considered. Driving mechanism was developed to rotate the auger at 28 rpm. Control system was developed using 16F684 microprocessor to control the heaters' temperature and auger by modulating pulse width to achieve the maximum gelatinization of rice flour while maintaining the required output. One thermocouple and three LM35 sensors were used to automate the system. Styrofoam and wood boards were used to insulate the machine. Rice flour was added from the rice mill at a rate of 300kg/h to the gelatinizer. Maximum input flour temperature from the mill was 75°C and output temperature from the gelatinizer was 90°C. Machine's inner surface temperature was maintained at 100°C. Outer surface temperature was 66°C. Moisture content at the output was 11.30% wet basis and viscosity was 350Mpa/s. Machine power consumption was 4.8kW/h. Moisture was removed at a rate of 0.24 L/h.

Index Terms- Far infrared radiation, Gelatinization, 16F684 Microprocessor, Pulse width modulation

I. INTRODUCTION

Rice is the staple food in Sri Lanka and usually consumed as whole grain. Rice flour based foods are also common in local diet, and has gained a remarkable market interest in recent past. The raw rice flour has relatively short shelf life and poor in desirable qualities for further processing. Roasting is one of the methods to increase the quality and the shelf life of rice flour for decades. Roasted rice flour has good keeping quality and pasting properties compared to the non-roasted rice flour. Dry roasting is a process by which heat is applied to dry foodstuffs without the use of oil or water as a carrier and usually the product is stirred while roasting to ensure even heating. Roasting usually causes caramelization or Maillard browning of the surface, which is sometime considered as flavor enhancement.

Gelatinization of flour is the main objective of roasting. Starch gelatinization is a process that breaks down the intermolecular bonds of starch molecules in the presence of water and heat. The process begins with the native starch granules absorbing water and swelling (Richard *et al.*, 1998). Gelatinization improves the availability of starch for amylase hydrolysis. Schirmer *et al.* (2015) has studied the common gelatinization pattern of rice flour. Gelatinization of rice flour starts at 60°C and maximum gelatinization occurs at 90 to 110 °C in rice flour. The optimum gelatinization percentage is reached at 110 °C and the retention time required is 12 seconds (Abiram *et al.*, 2012.). Viscosity change is one of the indicators used to identify the level of gelatinization and rice flour shows maximum viscosity at 110 °C. The flour should be retained in this temperature at least for 12 seconds to achieve the required percentage of gelatinization. The quality of roasted rice flour depends on the percentage of gelatinization. When gelatinization does not occur properly, the texture, taste and color of the flour varies and subsequently the expected quality of the final product cannot be obtained. Therefore it is necessary to get the correct gelatinization to preserve the quality of roasted rice flour.

Infrared radiation is the part of the electromagnetic spectrum lying between ultraviolet and microwave energy. It is normally classified into three regions near, mid and far infrared corresponding to the spectral ranges of 0.78 to 1.4, 1.4 to 3, and 3 to 1000 μm respectively. Infrared radiation drying is fundamentally different from convective drying since the material is dried directly by absorption of infrared energy rather than transferring heat from the air (Das and Bal, 2009). The danger of product overheating is low in this method because of rapid heating, which requires exact condition control (Shakai and Hanzawa, 1994). Some of the other benefits are uniformity of drying, reduced quality losses due to absence of solute migration in food material, versatile, simple, compact equipment, environmentally clean operation, ease of automation, efficient heat transfer which reduces the processing time and energy costs. Air in the equipment is not heated by infrared; consequently, the air temperature may be kept at normal levels. Because of these features, infrared heating has been accepted as an important means of cooking, drying, roasting, baking, blanching, and pasteurization of food and agricultural products (Lloyd *et al.*, 2003; Rajan *et al.*, 2002; Sharma *et al.*, 2005;

Staacket *et al.*, 2008). Combinations of infra-red heating with microwave heating and other common conductive and convective modes of heating has been evaluated by Krishnamurthy *et al.*, (2008).

At present the industry uses batch type conduction/convection roasting methods to gelatinize rice flour. The batch type machines are time consuming, high energy consuming and labor intensive. The industry requires a fast and energy efficient, continuous type rice flour roasting method. Designing a continuous rice flour gelatinizer is important which avoids the demerits of batch type roasting machines. Therefore the objective of this study was to design and develop a far-infrared (FIR) rice flour gelatinizer with a capacity of the 300 kg/h for industrial use.

II. METHODOLOGY

Continuous type far infrared rice flour gelatinizer was designed and fabricated with a capacity of 300 kg/h for industrial use. The degree of gelatinization basically depends on temperature and moisture content and, the quality of roasted rice flour depends on the percentage of gelatinization. Therefore a special attention has been given to the factors of temperature, moisture content and mixing of flour in the design. The top and frontviews of the designed rice flour gelatinizer are illustrated in the Figures 1 and 2.

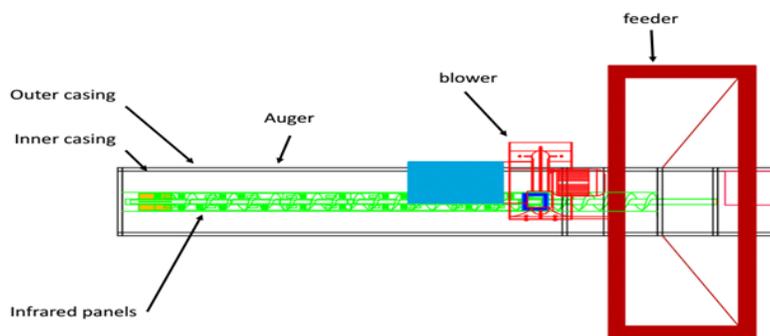


Figure 1: Top view of the gelatinizer

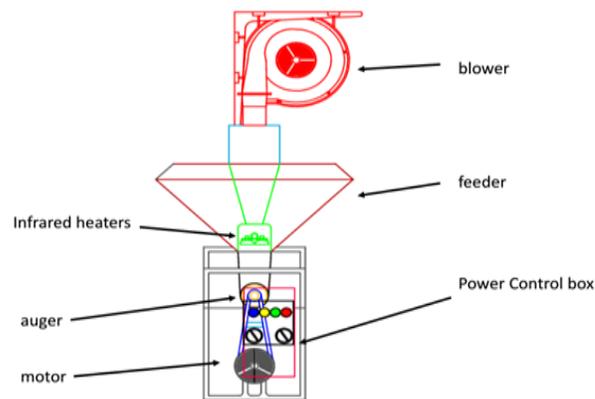


Figure 2: Front view of the gelatinizer

Design of the auger and mixing mechanism

The auger and the casing was made out of iron plates and the length of auger was 1.7m (Figure 3). Auger was mount on two roller bearings at the ends and the gap between auger and the casing was 0.01 cm. Mild steel plate connected between screws was used to mix rice flour to get uniform heating. The plates move up and down while rotating the auger to remove flour in the casing. Sprocket wheels and chain were used to drive the auger. The motor speed was reduced by six time and the auger speed was maintained at 28 rpm. A blower was used to remove air on top of the auger in counter current way.

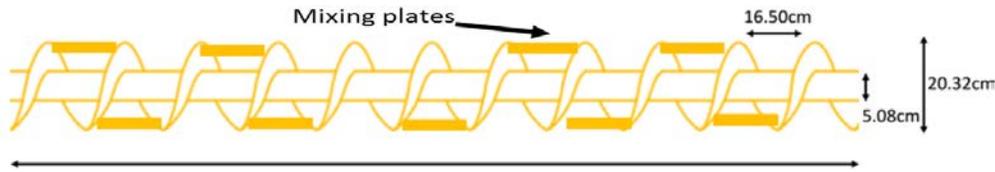


Figure 3: Auger after attaching the plates

Design of FIR heating mechanism

A total of 14 far infrared panels (black, ceramic, 240×60mm, 1000W) were used for the design. Nine panels were mounted on an iron plate and fixed at the top of the auger (Figure 4). The gap between auger and infrared panels was 0.1 m. A top cover was used to cover the IR panels. Five IR panels were established to heat auger from the bottom and an iron cover was used to cover the heaters. All wires used to connect the heaters and motor with the control box were insulated using heat resistant casings and flexible aluminum tubes. Machine required three phase power supply since it contains 14 far infrared heaters of 1000W. Styrofoam and wood boards were used for insulation. In between two wood boards 0.05 m thick Styrofoam sheet was placed. The outer surface was covered with mild steel sheets.

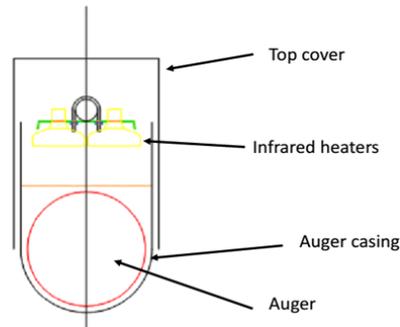


Figure 4: Arrangement of the FIR heaters

Development of the control system

System was automated using a microcontroller (16F684) based control system with semiconductor type temperature sensors (LM35, Texas instruments, USA). Heater power was controlled by a pulse width modulated power supply with a duty cycle of 50% to avoid rising the surface temperature of the heaters above 350 °C. Surface temperature of the heaters were controlled to minimize the risk of fire during operation. Three phase power meter was used to measure the power consumption of the machine. The surface temperature of the auger housing was controlled at 100 °C using the same 16F684 microcontroller by switching ON/OFF heaters by sensing the surface temperature using semiconductor temperature sensors (LM35). Heaters were switched on and off using Solid State Relays (SSR).

Provision was given for selecting the operation modes “Manual” and “Auto” using a toggle switch. In the auto mode the set temperature of 100 °C was achieved automatically. In the Manual mode there was a provision to change the duty cycle by changing on time and off time using variable resistors. A programming port was fixed to the microcontroller to change the program at any time as required. A gap of 0.01 m was maintained between the heaters and auger to avoid the risk of fire.

Measurement of temperature and moisture content

The rice flour is directly fed to the gelatinizer after milling. The flour input and output temperatures were measured using thermocouples (K type) and an infrared thermometer (Fluke 572-2) at 5 minutes intervals. The machine's outer surface temperature was measured at three places at 5 minutes intervals. (T1: closer to the inlet of the machine, T2: middle of the machine, T3: closer to the outlet of the machine). The moisture content of raw rice, input and output flour to the gelatinizer, and the flour after sieving was measured using moisture meter (Ohaus, MB45).

Viscosity of rice flour

During the gelatinization, rice flour starch granules start to swell. As a result the diameter of the starch granules will increase and the shape of the granule changes, hence viscosity changes. Viscosity of the flour paste was measured to study the effectiveness of the developed FIR gelatinizer. For measurement of viscosity a slurry of starch was made by adding 100 ml of water to 55 g rice flour. Then the slurry was transferred to a 500 ml beaker and placed in a water bath at 30 °C to maintain the constant temperature

throughout the measurement. Temperature was recorded after reaching the equilibrium. Viscometer (Tokimac, BL) with Spindle (No 2) was used to measure the viscosity in triplicates.

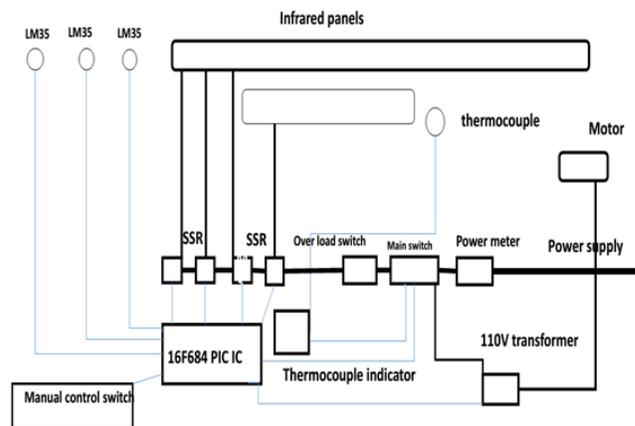


Figure 5: Diagram of the main controlling system

III. RESULTS AND DISCUSSION

The designed and fabricated rice flour gelatinizer was tested for its performance. The temperature variations of flour and the machine, the moisture content of flour and viscosity of flour were measured for evaluation of the machine. The Figure 6 shows the rice flour temperature variation at the flour input and the output. The auger does not rotate until inside surface temperature reaches 60 °C. That was the reason for having starting temperature of rice flour at 60 °C. The temperature of the flour coming out from the mill was at 50°C and gradually increased to 75°C. After passing through the FIR gelatinizer, the flour temperature reached 80 to 85 °C. It took 170 min to reach to this temperature and by changing the feeding rate of grains to the mill the flour output temperature increased up to 80 °C and the gelatinizer flour output temperature reached 95 °C.

The machine' inner surface temperture reached 100 °C after 150 min of operation and heaters automatically switched OFF (Figure 7 (a)). Machine's outer surface temperature variation was measured at three places on the outer surface. The Figure 7(b) shows the variation of outer surface temperature. T1 and T3 values varied in the range of 60 to 65 °C. T2 value vary around 75 °C.

The moisture content of raw rice was 14.2%wb. The input rice flour to the gelatinizer contained 12.1%wb moisture. It was 11.3%wb once flour was gelatinized and the moisture content of rice flour after sieving was 10.1%wb. According to results 0.24 L moisture removed in one hour from 300 kg of rice flour. The amount of heat loss to the environment was 0.91488 kW within one hour.

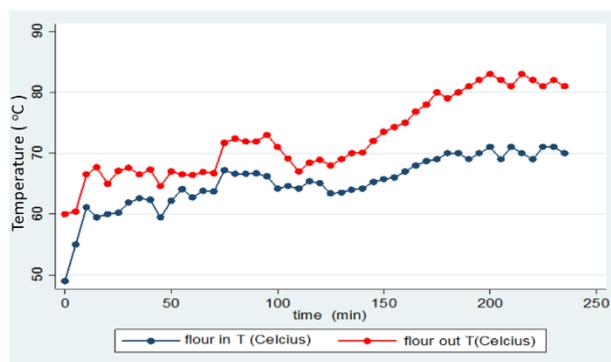


Figure 6: Rice flour temperature variation at the flour input and output of the FIR gelatinizer

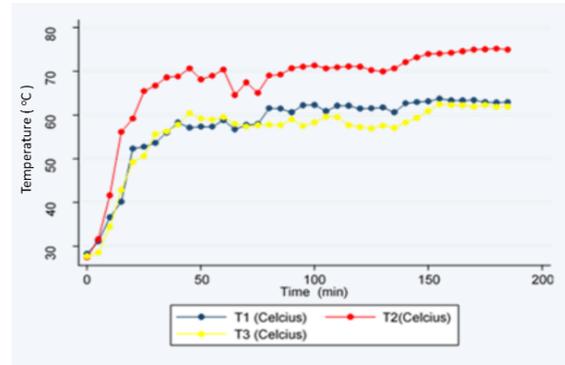
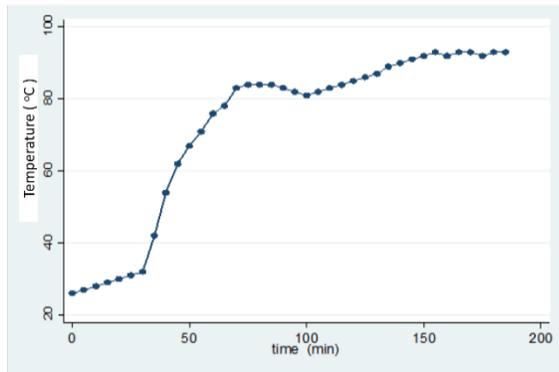


Figure 7 (a): Machine inner surface temperature variation Figure 7 (b): Machine outer surface temperature variations

IV. CONCLUSION

Based on the results, the flour temperature was maintained between 80 to 85 °C and at the same time the inner surface temperature of the FIR roaster was maintained at 100 °C. The outer surface temperature of the FIR gelatinizer was 66 °C. Flow rate of the rice flour through the roaster was 300 kg/h. Viscosity of the flour roasted in the FIR roaster was 350Mpa/s. Moisture content of the flour at the output of the machine was 11.3 % wb. Power consumption of the machine was 4.8 kW/h. Convection heat loss of the FIR roaster to the environment was 0.915 kW/h. According the results the developed FIR rice flour roaster can be introduced to the industry.

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Physical and chemical properties of home made Dates syrup(molasses) from middle Iraq cities

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Abstract- The study was conducted to evaluate physiochemical properties of dates syrup samples which selected from some middle cities of Iraq. Various physiochemical properties of dates syrup were analyzed and compared to some producing countries of date syrup (molasses).. Dates syrup quality and determination of Viscosity , Density, Specific gravity , Refraction index, Conductivity and Acidity. Statistical analysis of data revealed that there is no significant difference between results of collected samples and compared the results obtained with some producing countries which implies good quality dates syrup.

I. INTRODUCTION

The date palm (phoenix dactylifera L) is one of major fruits trees in Arabic world , especially in Iraq^[1,2].The world production of dates has increased during near the past years, according to FAO statistical data in 2010^[3].The date palm has played an important role in the production of date syrup (molasses) that thick liquid extracted from date palm , a solution made since ancient times and in different ways. It considered to be of economic value and food task , since it has a high concentration of sugars , mineral elements and vitamins such as vitamin A and B^[4,5]. Date syrup easy to save for long periods without any additives colors or preservatives reagents^[6],it is a high energy food rich in saccharides that been used as raw material of some traditional and industrial foods^[2,7,8,9].Physiochemical analysis is important tool to monitor the quality of product, So research aimed to identify the characteristics and qualities of Iraqi molasses by collecting samples of molasses (date syrup) from the Iraqi central provinces and compared the results obtained with some producing countries of date syrup (molasses).

II. METHODS AND MATERIALS

Dates syrup homemade type samples were selected from some Iraq cities :Najaf, Hela and Karbalaa during October 2015. 100g dates syrup sample was taken from each supplier for satisfying analysis in laboratory .

Analytical Methods:

1. pH values measurement was made using a digital pH-meter (Hanna instrumentals)
2. Viscosity : to determine the viscosity using Ostwald viscometer .
3. Density : measurement by using Pyknometer
4. Electrical conductivity : determine by using a digital conductometer
5. Refraction Index : measurement by using Abee Refractometer .

III. RESULT AND DISCUSSION

1- pH values:

In the samples of Iraq dates syrup we found that pH values between 4.5 – 5 and the maximum mean 4.751 as shown in table 1. The high level of acidity in syrups contributed to its stability against microorganisms. In a study by the Egyptian researcher^[6] on date syrup (molasses) found that the values of the pH equal(4.8). In other studies for Saudis researchers^[2,10] found that pH range between (4.55-4.91). As for one of the Iranian researchers^[11] have said the pH value of date syrup of the product in Iran is (4.20).

And comparing the resulting values of the pH of Iraqi dates syrup are indicate that within the range of the pH values that have been analyzed in some producing countries of date syrup (molasses).

Table 1: pH value of analytical molasses samples

Analysis	Range		mean	Deviation SD±
	Minimum	Maximum		
pH	4.57	5.01	4.751	0.118
producing countries	4.20	4.91	4.55	0.35

2- Viscosity :

Viscosity designates the resistance offered by a liquid in motion or when a solid object is moved within the liquid. The unit of viscosity is the poise or the centipoises (1 poise = 100 centipoises (cp) = 1,000,000 micropoises). The poise is defined as the viscosity which requires a force of 1 dyne to bring about a relative displacement at the rate. The viscosity of individual dates syrup depends on the temperature and the water content.

From Table 2, we find that the lowest value for the for Iraqi dates syrup samples that have been studied are (14.63 cp) and the highest value is (36.98 cp), When compared with the viscosity of the syrup for some producing countries of date syrup (molasses) note that value within the range of the viscosity of the syrup to these countries^[6,10,12].

Table 2: viscosity value of analytical molasses samples

Analysis	Range		Mean	Deviation SD±
	Minimum	Maximum		
Viscosity (cp)	14.63	36.98	27.73	15.4
Producing countries	15.03	28.1	21.56	6.54

3- Specific Gravity (SG):

Specific gravity means the ratio of the mass of a sample at (t C°) to that of an equal volume of distilled water at (t C°).

Specific gravity of date syrup^[13] at 25 °C were experimentally measured a 50 ml volumetric glass pycnometer in the temperature and weight in sensitive balance , the density of samples were calculated using the following equation:

$$\rho = \rho_w \cdot ((m_s - m_v) / (m_w - m_v))$$

where ρ is date syrup density (gm/cm³), ρ_w is water density at date syrup temperature , m_s sample mass (gm) , m_w mass of water (gm) , m_v pycnometer mass(gm). specific weight values of analytical date syrup samples were also be found in the table (3), and when compared with some a major date-producing countries ,found it comparable values^[6,11,12].

Table 3: SG value of analytical molasses samples

Analysis	Range		Mean	Deviation SD±
	Minimum	Maximum		
SG (g/cm ³)	1.294	1.468	1.364	0.04
Producing countries	1.112	1.368	1.240	0.128

4- Refraction Index (n) :

Refractive index of the date syrup were experimentally measured,Refractive index of the date syrup were higher. This is principle due to the high level of sugars and relatively low moisture content^[13].

Table 4: Refraction Index value of analytical molasses samples

Analysis	Range		Mean	Deviation SD±
	Minimum	Maximum		
Refractive index	25	27	26	2

5- Electrical conductivity (EC):

Conductivity is one of the important physical properties of the liquid food, a quality index for fluids, The electrical conductivity value refer to containing of cation and anion ion of salts and proteins.

Table 5: EC value of analytical molasses samples

Analysis	Range		Mean	Deviation SD±
	Minimum	Maximum		
EC (mS/ cm)	0.067	0.1169	0.102	0.02

IV. CONCLUSIONS

The date syrup(molasses) Iraqi industry and export it depends mainly on the unification of the Iraqi molasses specifications in terms of the physical and chemical properties and develop them in accordance with international standards, and this works to increase the production of vital product and increase the number of modern factories in this field.

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Local People's Constraints to Participation in Forestry Activities (White Nile State. Central Sudan)

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Abstract- The weakness of local people's participation in forestry activities in the White Nile State stays as a major constraint to achieve any progress and development in the area. Poor peasants are strongly tied to their local traditions and beliefs. Participation is a major issue to be discussed and investigated in such communities. This study attempted to point out the most common constraints that influence the locals from adopting any kind of activity aimed at their own benefit.

A random questionnaire was taken to cover most of the target groups found in the area to avoid bias in the results. The study revealed a general lack of enough education in matters related to forestry. Further, ecosystem degradation and restoration measures are not in the radar screen of the locals, which led to a lesser positive and active participation in remedial activities. This is coupled with a minimal adoption of modern afforestation activities and energy tools compared to other development activities. However, major constraints in expected successes were attributed to two reasons: First, the weak and unprofessional extension messages that were either imprecisely aimed or handled by nonspecialized personnel with no expertise. Second, the short duration of the projects in the impacted areas and the rush to quick ecological results that realistically requires time and patience due to the nature of such ecological remedial measures.

The study concludes that strengthening the existing extension units and creation of new ones in the impacted areas is of a vital importance, to influence peasants and assure them of the great beneficial return. Moreover, extension messages should be bound to forestry activities, taking into consideration softening the stiff relation between the people and forestry authority and designing long-term forestry projects in the area. This for sure will help in exerting a positive impact upon the local knowledge and pushing development in rural areas ahead.

Index Terms- Community, Constraints, Participation, White Nile, Forestry

I. INTRODUCTION

Local communities have been living in harmony with their environment and maintaining an ecological equilibrium balance, however due to rapid growth of population and their higher expectations in their lives and the use of forests' products resulted in complete forests razed to the ground. Sudan is regarded as one of the poor countries in Africa, its entire population depend upon the natural resources, particularly forests. Heavy cut of trees and inefficient management systems led to deterioration of agricultural lands and death of live stock

[1]. Introduction of afforestation programs jointly with or by foreign agencies and local people remain the solution and possible action for government to mitigate the deteriorating situation.

Participation recognizes peoples' central role in directing their own lives. They will voluntarily work towards removing those constraints and consequently better their lives [2]. Rural communities and forest users, who depend on trees and forest products, for their survival and for economic development are the primary beneficiaries of community forestry activities. [3], [4]. Rural communities rarely have common interests to participate in activities related to a society affect the basis of community participation projects activities [4].

Deterioration of the natural resources, in the area during the early eighties, was a severe one. It was coupled with negative consequences affected the lives of local communities. Lack of food, lack of fodder, animal high mortality rate, and low productivity of agricultural lands, were the major consequences resulted in hard or mostly impossible conditions of life. The government together with, foreign organizations launched forestry programs to stop or minimize natural resources deterioration. Participation was a major objective for local societies in all kinds of activities. Past participation as well as the participation in the ongoing projects proved to be remarkably lagging behind ambitions and expectations of genuine participation in forestry activities and adoption of the projects' ideas/ innovations and strategies to solve the environmental problems. Still projects in extension activities needed for better success and higher perception percentages amongst farmers. The existing situation truly calls for better sustainable management of the forests through local people's participation.

Government and non-governmental organizations (NGOs) contributed to mitigation environmental deterioration through locals' participation. Such participation is assessed in this study to achieve the following:

The objectives of this study were:

- 1- The role of forestry projects, with regard to environment conservation.
- 2- Explore factors that hinder participation of local inhabitants.
- 3- Explore factors that can support local people's perception of innovations and new ideas and participation in forests management.

II. MATERIALS AND METHODS

This study was carried out in the White Nile state. Five villages were selected in the state for this study, namely these villages are; Ja'Alyeen(1), Al-Halba(2), Wad-Jabur(3), At-Tajammo(4) and As-Sayal(5). The area covered by this study almost is a circle of one hundred kilometer in diameter. The necessary information needed for this study was collected by using two types of data: primary and secondary data. The primary data was collected using a questionnaire that investigates the willingness of adoption of community forestry through extension efforts, and the level of perception of the people in forestry activities.

Secondary information was collected from reports of the forests national corporation (FNC) offices, as well as from personal observations and knowledge of elder inhabitants in the area. Statistical analysis was commenced through exploratory manipulations of the data obtained in the study area. This process was accomplished by critically examining the data through the

use of simple techniques of analysis. The main tools are the construction of simple tables and selected cross-tabulation which allows tentative answers for many of the questions being asked in the survey.

III. RESULTS AND DISCUSSION

A: Benefits of trees as viewed by respondents:

It was found that benefits of forests or even that of trees within the forests, amongst rural poor people are not the same anyhow. Some of the people don't believe in such a benefit at all, while others believe in different kinds of benefits. The benefits accruing from forest plantations are long term benefits and environmental. Table 1 shows these variations. Protection was found to be the most important in the area; it records up to 54%. Income generating activities and increase in agricultural production stay as low as 10% for each.

(Table 1): Benefits of trees as viewed by respondents:

Village	N	Benefits of Trees	Types of Benefits of Trees %				
			Income	Agric. Production	Protection	Fuel wood	Others
1.	21	13	1	1	14	1	5
2.	32	25	3	3	18	4	12
3.	16	12	1	5	8	3	4
4.	14	9	4	0	6	1	1
5.	17	13	1	1	8	6	3
Total	100	72	10	10	54	15	25

N: Number of respondents.

Peasants in the area usually bound to the daily need supply works, so they pay more attention to activities which generate more income. Other activities always stay in the second priority. Fuel wood supply recorded only 15% which marks a small percentage for the locals. Therefore, participation in activities related to trees or forests is traditionally kept very low.

B: Participation in projects' activities:

Participation recognizes people's central role in directing their own lives. In many cases the proposed programs, are hardly accepted by aid agencies unless the involvement of people is guaranteed ([5],[6]. In the study area a good proportion of the respondents (76%) participated in the projects activities (Table 2). The projects were able to recruit the local inhabitants through different methods. Meetings were the main method for encouraging people's participation as ted by (36%) of the

respondents followed by mass media (31%). Illiteracy in the study area may restrict the possibility of using other methods like posters and written instructions. Rural communities and forest users who depend on trees and forest resources for their survival and for economic development are the primary beneficiaries of community forestry activities [3]. Only 9% of the respondents showed their keenness to participate in the projects activities irrespective of the extension method for recruiting the local inhabitants. This percentage is very low compared to the challenges that threaten the study area, like desertification and erosion. This clearly reflects the poor perception of the local inhabitants to the environmental issues and automatically necessitates intensification of the extension efforts to make positive change in the attitudes and awareness of the local people.

(Table 2): Participation in projects in the study area:

Village	N	Participation in Proj. Act.	Channels for Drawing Participation		
			Meetings	Mass Media	Voluntary
1.	21	18	7	8	3
2.	32	27	11	13	3
3.	16	12	8	4	0
4.	14	8	4	1	3
5.	17	11	6	5	0

Total	100	76	36	31	9
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N: Number of Respondents.

It is worthy here to mention the difference between genuine participation and passive participation. The former the local people participate physically, mentally and emotionally, while in the latter is deprived from such traits. According to the findings of the results discussed earlier in this chapter, it seems that the participation of the local people is passive because it was not reflected in a tangible development in the field of environment.

C: Constraints to people participation in forestry activities in rural areas.

There are different factors that hinder commitment to genuine participation as viewed by the respondents. Participation is a voluntary contribution that is people’s share in establishment of community forestry [7]. The people are engaged in some activities that make it difficult for them to participate in projects activities. [8] Stated that the local people of the region are not capable of managing their local woodland resources rationally and sustainably. About 45% stated that their priorities were directed to agriculture and animal rearing (Table 3).

(Table 3): Obstacles to Participation in Projects Activities:

No of Respondents	Obstacles to Participation in Projects Activities %				
	Land Scarcity	Mistrust	Other Priorities	Contribution unimportant	Others
100	7	18	45	13	17

This fact is further supported by 13% of respondents who stated that it is not important to participate in forestry activities. Moreover, the rural people are suspicious towards outsiders. Local institutions are weak and slow in activities and sometimes have no power to exert upon the community members [9]. In addition to 18% who stated that they mistrust the project initiatives. Those factors mentioned above could sum up to 76% of the respondents. On the other hand this may reflect the weakness of the extension units that fail to reveal the ambiguities and follow the process inducement, awareness, and reflection to act which are important in combating mistrust and suspiciousness.

IV. CONCLUSIONS AND RECOMMENDATIONS

- 1- Existence of an effective extension unit is a top priority to attain fruitful achievements in the field of rural development.
- 2- Adoption of woodlots, agro-forestry and farm forestry activities will mitigate reliance on natural resources for fuel wood.
- 3- FNC should strengthen its relation with the local community for conservation of the natural resources.
- 4- Expanding community forestry is an essential objective to be practiced by FNC.

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Action research on e-assessment using tools MoodleCloud, QuestBase in mathematics and its impact on assessment for learning on students

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Abstract- The traditional mode of teaching and assessing mathematics in Indian schools has made this subject dull and boring for many students. This disinterest could be easily seen among them while assessments. Students who rely mostly on factual domain of cognitive memory, prefer to memorize the things rather than to understand, apply, analyze and evaluate the knowledge. This weakens the reasoning and analytical memory skills of students. With the help of formative and summative assessments a teacher can always evaluate a learner's progress. This research study is comparing and drawing the line of inferences between the techniques of e-assessment of a learning management system (LMS) and the traditional approach of assessment. Here I have tried to figure out the impact of e-assessment on students, and how it is beneficial to them. With help of these e-learning methodologies how well a student can cope up with mathematics concepts and how these e-assessment tools become useful for teachers as well as students. This research paper has stressed upon the use of cloud technique of e-assessment. Assessing and storing data at a cloud platform is always preferable than on a standalone desktop application. This is because in presence of data and network connectivity, cloud servers can be assessed anytime at anyplace over any medium like smart phones, tablets, desktops or laptops. We just need to have our login credentials with a WiFi network or LAN connectivity so the learning could never get hamper.

Index Terms- Cloud technique, e-assessment, Learning Management System (LMS), MoodleCloud, QuestBase

I. INTRODUCTION

This action research study discusses upon the benefits of e-assessment over any other means of customary assessments used in learning of mathematics. Here I have drawn the inferences with reference to cloud computing websites which are known to store data and produce results on clouds without actively depending upon server-client machine interaction. In this research paper I have chosen the cloud servers of MoodleCloud.com^[1] and QuestBase.com^[2]. MoodleCloud^[3] is web-service version of Moodle^[4] developed to significantly to host Moodle courses and Moodle mobile app. This cloud version has now made Moodle (The Standalone application in past) to get configure easily on web servers. Teachers and students can now easily communicate at any place, any point of time through their smart phones, tablets, laptops or desktops on these LMS. The best part is, the assessment can be easily conducted irrespective of time and place. Another E-learning tool is QuestBase.com^[5]. This website is very helpful for teachers in generating tests, quizzes, checklists, rating scales etc. This is purely based upon cloud computing helping the new era generation in grasping the abstract mathematical concepts very easily by generating immediate feedback.

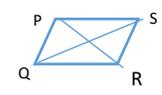
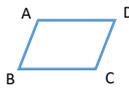
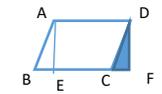
Here I have shown the radical study for learning evaluation on basis of assessment. This has given me the exposure and experience of introducing e-assessment technique for active learning. Which brings the blended learning environment and is found very useful over traditional assessment techniques. To serve this purpose I have designed the assessment quiz tests on basis of revised Anderson's and Krathwohl revised Taxonomy, 2001^[6] of assessment.

II. ASSESSMENT - METHODS, TECHNIQUES

As stated by Black, Paul, and Dylan Wiliam, in their book Inside the black box: Raising standards through classroom assessment. Granada Learning, 2006, "The 'assessment' includes all those activities undertaken by teachers, and by their students in assessing themselves, which provide information to be used as feedback to modify the teaching and learning activities in which they are engaged"^[7]. Also as stated by Angelo, Thomas A., and K. Patricia Cross, "Classroom Assessment is an approach designed to help teachers find out what students are learning in the classroom and how well they are learning it"^[8]. Thus following the Anderson's and Krathwohl Taxonomy Model, 2001 of cognitive domain for assessment in mathematics. Teacher needs to design the formative assessment to check student's progress based upon the structure of knowledge dimensions. To serve this purpose the table of

Anderson’s and Krathwohl Taxonomy Model^[4] can be constructed (see Table I). This is with respect to interactive tool from the Iowa State University^[9] provides some cross-disciplinary examples of what Anderson and Krathwohl’s taxonomy means in practice (Iowa State University, n.d.).

Table I: Anderson’s and Krathwohl Taxonomy for assessment in mathematics for topic quadrilaterals

		Cognitive Domain					
		Remember	Understand	Apply	Analyze	Evaluate	Create
Knowledge Dimension	Factual Knowledge	Definition and types of quadrilateral. Example : A Parallelogram	A quadrilateral with opposite sides parallel is called a parallelogram .	The opposite sides, angles of a parallelogram are congruent.	Diagonals of a parallelogram bisect each other.	 $m\angle Q = m\angle S$ Measure of opposite angles are congruent.	The knowledge of quadrilateral parallelogram is created to solve real life problems.
	Conceptual Knowledge	Formula for the area of a parallelogram.	How can we find area of a given parallelogram ? Area of square or Area of rectangle could be used to serve this purpose ?	Taking a piece of paper in the shape of parallelogram. Checking if it can form a rectangle? 	The area of a parallelogram can be determined by first calculating the height of a right angled triangle and then estimating the area of a rectangle.	 The area of rectangle = $l(AD) \times l(DE)$ Hence, the area of a parallelogram = $l(AD) \times l(DE)$	The knowledge created area of a parallelogram = base x height
	Procedural Knowledge	Remember the formula of parallelogram	How to apply the knowledge of formulas to estimate area.	Applied the formula knowledge of quadrilateral.	Analyze the different forms of quadrilateral and apply the required formula.	Calculate the result and evaluate it with real life problems solution.	The knowledge to solve any situation problem at given point of time.
	Meta-Cognitive Knowledge	Remembrance about knowledge of quadrilateral.	The concept of quadrilateral and related formulas.	Applying the understood knowledge at given problem.	Analyzing the situation best fits with understanding .	Final estimate of applied knowledge evaluated.	The concept of quadrilateral as whole is created.

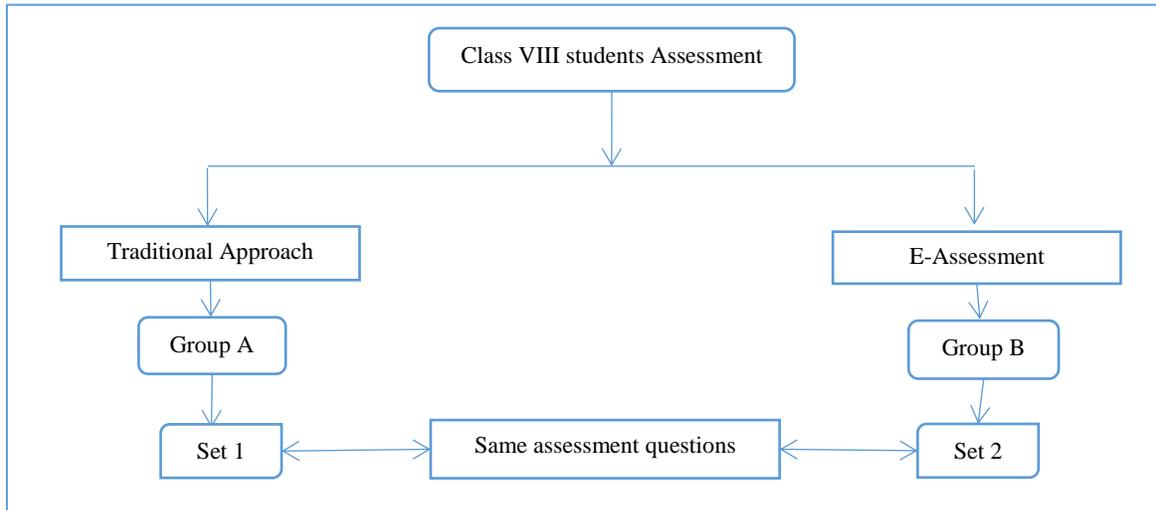
Thus on basis of above taxonomy for assessment, I have conducted two sets of assessments where I have divided the class VIII of 60 students into two groups. Group A and Group B of students. I have designed two sets of assessments with same set of questions. Set 1 of customary class test method on hard copies or printed test papers. Set 2 using cloud assessment tool. Again Set 2 has been divided into two subsets where, Set X of 15 students (Group B) assessed on MoodleCloud.com and Set Y of 15 students (Group B) assessed on QuestBase.com. The whole was conducted on two phases of assessments, Phase 1 of Test 1 and Phase 2 of Test 2 for formative

assessment in Sets A, Set B \supseteq X, Y. We have given students two-day time to self-assess, review and work upon weaker areas. After these phases of formative assessments, a summative assessment of Test 1 and Test 2 was conducted on both Groups A, B as a whole to compare and conclude the final statistics of traditional and e-assessment approaches.

III. RESEARCH STUDIES AND FINDINGS

Here is the findings for the qualitative research conducted on class VIII students. At first depicting the flow (Figure I) of assessment. Followed by the graph representation of average results scored.

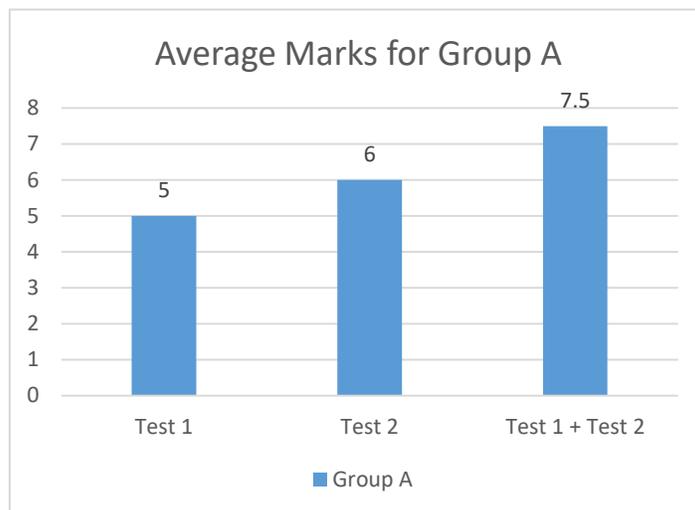
Figure I: Flow of assessment



A. Custom approach of assessment - Group A

In this approach we have taken assessment for Group A of 30 students in customary traditional approach of handouts of test papers. At first we have taken Test 1 at the beginning of class period, and provided them results at the end of class period. Given two days' time and conducted Test 2 with some different sets of question this time. Again after two days we conducted a summative assessment of Test1 and Test 2 and got this result, this is depicted in form of bar chart (Chart I).

Chart I: The average marks for topic quadrilateral in mathematics obtained after assessment using test papers



B. Use of Simulation software - E-Assessment using MoodleCloud and QuestBase Cloud Servers.

We have designed the same set of questions with the help of simulating online software. We created quizzes and conducted this on Group B. For this purpose, taking the technical specifications into consideration. We have opted out of school's computer laboratory having 20 computers, so this was meeting our requirement to conduct online exam of 15 students of Set X, $Y \subseteq$ Set B. Secondly we make sure that each of the PCs were having internet connectivity. Again taking the consideration of load shedding we have chosen the morning hours timing for our e-assessment. Here is the result of our finding.

Figure II: Data flow for E-Assessment

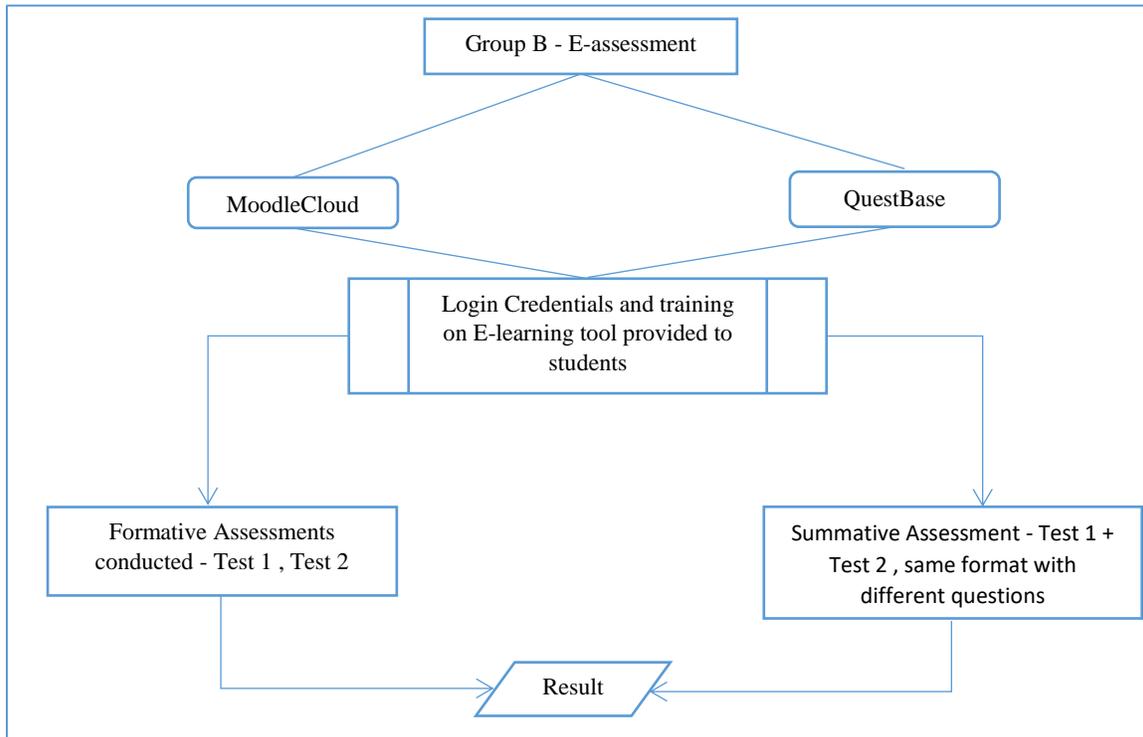
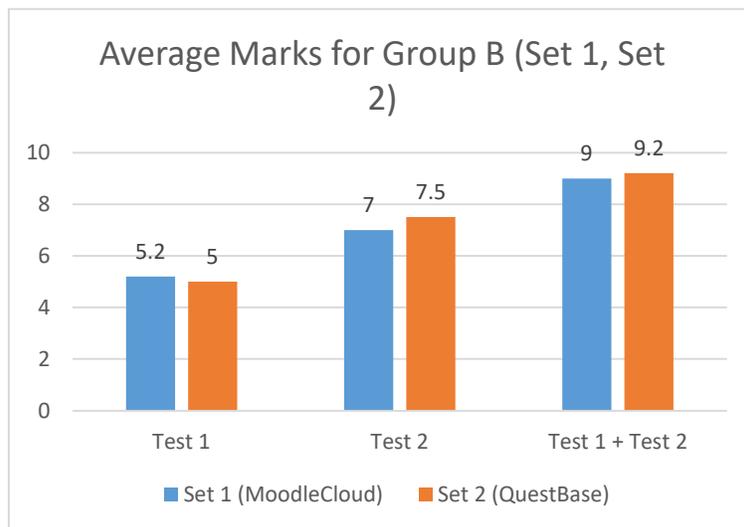


Chart II: The average marks for Set 1, Set 2 for Group B conducted with e-assessment.



C. Impact of e-assessment on students with respect to our action research:

Table II is given below briefing about some of the important highlights of this research. Here I have shown the possible outcomes obtained with specification parameters.

Table II: Highlights - Specifications of assessment performed on Group A and Group B

Specifications	Group A : Traditional mode of Assessment	Group B : E-assessment with help on online cloud servers MoodleCloud and QuestBase
Credentials	No authentic credentials are given. Students are provided result with their class roll numbers.	Yes, authentic credentials are given. Teacher first creates their admin account, and with that they can add students, and provide them with their respective usernames and passwords.
Time Constraint	Subjective questions are subjected for steps marking. Hence writing involved time constraint for students.	Objective questions were part of assessment, students were able to complete test on time, some of the students lacking concepts faced difficulty in solving problems.
Copy Attempt	Yes. Copy attempt was seen among students, by peeping other answer copies and open book cheating.	No. As students were given shuffled objective questions and were restricted with their computer monitors.
Test Result	Test results are not provided same time, as it depends upon the examiner to correct the answer copies in a time framework. Also sometimes the correction is influenced by other factors like events organized at school, health factor, work commitment etc.	Immediate test result is provided to the student after successful timely completion of test. This happens because the result is produced on the basis of pre-fetched marks for the question on the online server to calculate for correct response. It is independent of examiner and other factors.
Feedback to students	Teachers can provide feedback to students once the result is declared. Where students can clarify their doubts and interrogate with teacher.	Immediate feedback is provided to the students. One advantage here is that students are doing self-assessment of provided feedback. They can go through the attempted questions and check if their responses against marked questions were correct or not.
Accessibility to completed tests.	Students can access the test paper, only if they have provided handouts of test paper and answer copies along with them.	Students can access the completed papers at any time and from anywhere. As their notes, tutorial videos, attempted quizzes are present on cloud server. Thus in presence of network connection or WiFi student can anytime access to completed tests.
Concept clarity	Students are having opportunity to discuss the concepts with teachers face to face, thus concepts clarity is seen more and better ^[11] .	Concepts were found less clear with backward learners. Where it was seen that gifted learners were good at understanding concepts, but backward learners due to lack of doubt solving with peers and teachers found less apt with mathematical concepts.
Self Confidence	Students have shown substantial growth in self confidence after each formative assessment.	Students have exponential growth in self-confidence, they were found more confident after every formative assessment.
Re-Usability of test	The tests are conducted on hard copies, these hard copies after tests are of no use to be used second time. Thus it is	These tests or quizzes are created online with help of datasets . These datasets are dynamic

	not reusable. Here we can also see the wastage of lots of paper.	in nature and generate random numbers at run time. Hence the examiner whenever require can change the inputs, and pattern of the quizzes.
Summative Assessment Result	Substantial increase in performance rate is seen among students.	Exponential increase in performance rate is seen among students.

IV. CONCLUSION

In this research paper I have conducted an action research to present an analytical study between traditional assessment and e-assessment in mathematics. While doing my study on the group of students, I found that e-assessment approach in mathematics was very helpful to teachers and students. I found that in first assessment only pupil get to know about their weakness, they were able to check their results, the quiz and the questions from anywhere. The dependency on the schools were minimal. In second assessment the class who had appear before for e-assessment has shown much better results than the students who had appeared for customary assessment. In final summative assessment, it was found that students who were exposed and trained on E-learning LMS platform bring better results than others. Finally, I would conclude that use of any e-assessment tool^[13] is always a better option of assessment in mathematics. It provides a teachers learning and reusability of using the set of tests. Also it is very efficient and helps in time management.

APPENDIX

Keywords		
1	Learning Management Systems (LMS)	From Wikipedia, the free encyclopedia : A learning management system (LMS) is a software application for the administration, documentation, tracking, reporting and delivery of electronic educational technology (also called e-learning) courses or training programs.
2	Moodle	Moodle is an open source software serving as an E-learning tool at schools, universities and other work places. It is getting used widely for distance learning, virtual classrooms and blended learning.
3	QuestBase ^[5]	As per Fuentes, J. M., García, A. I., Ramírez-Gómez, Á., & Ayuga, F. COMPUTER-BASED TOOLS FOR THE ASSESSMENT OF LEARNING PROCESSES IN HIGHER EDUCATION: A COMPARATIVE ANALYSIS, "QuestBase is a free, cross-platform application to create and manage assessments, tests, quizzes and exams, both on-line and printed."

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Edward Syndrome (Trisomy 18): A Case Report

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Abstract- To assess a case of Edward's Syndrome (trisomy18). Review of literature shows only few series evaluating such cases stimulating us to publish this case. The data reviewed does not appear to have any adverse effect on the mother or fertility.

No history of any major medical or surgical illness.

Personal history: sleep and appetite are normal.
Bowel and bladder habits are regular.
No addictions.

Family history: not significant.

On examination: GC fair
P=92/min
BP= 120/80 mm of hg

No pallor/ no edema.
RS/CVS: NAD
P/A: uterus just palpable
Soft/no guarding/ no rigidity.
L/E: NAB.

I. INTRODUCTION

Edwards syndrome (also known as **Trisomy 18 [T18]**) is a genetic disorder caused by the presence of all or part of an extra 18th chromosome. This genetic condition almost always results from nondisjunction during meiosis. It is named after John Hilton Edwards, who first described the syndrome in 1960.^[1] It is the second most common autosomal trisomy, after Down syndrome, that carries to term.

Edwards syndrome occurs in around one in 6,000 live births and around 80 percent of those affected are females. The majority of fetuses with the syndrome die before birth. The incidence increases as the mother's age increases. The syndrome has a very low rate of survival, resulting from heart abnormalities, kidney malformations, and other internal organ disorders.

It occurs in 1 in 2500 pregnancies and 1 in 6000 pregnancies in the US. Reports say that a baby boy has higher still birth rates than a baby girl. Very small number of people with this condition live till 20's to 30's with multiple abnormalities.

Here we are presenting a case of a patient with fetus detected with Edward's Syndrome (Trisomy18).

III. INVESTIGATIONS

Hb= 12.1 gm%
TLC= 9200
PLT= 2.1 lac
S.Creat= 0.9
BT/CT= 1'20"/3'15"
Beta HCG= 10.65 mg/dl
TSH= 1.5
HIV/HBsAG/VDRL= Non reactive

II. CASE REPORT

Our patient 45 year female Gravida four, Para one, living one, abortions two with 14.3 weeks B/D and 15.0 weeks B/S with previous LSCS (i/v/o transverse lie) came for medical termination of pregnancy i/v/o fetal chromosomal anomaly that is trisomy18 as mentioned in the scan and referral notes.

Menstrual history: patient attained menarche at 14yrs of age which regular cycles in the past of around 28 to 30 days lasting for 4-5 days with moderate flow not associated with pain.
LMP: 26/07/13
EDD: 03/05/14

Obstetric history: G4P1L1A2

P1L1: Male baby/15yrs/LSCS i/v/o transverse lie.

A1: Two months/ spontaneous/ 14yrs back/ D and C done.

A2: Two months/ spontaneous/ 7yrs back/ D and C done.

G4 :Present pregnancy.

No history of contraception.

Past history: No history of diabetes mellitus, hypertension, bronchial asthma, tuberculosis or fever.

No history of blood transfusion.

FLUORESCENCE IN SITU HYBRIDIZATION(FISH) was performed on the interphase with uncultured cells of chorionic villi using the **Vysis AneuVysion DNA Probe kit** for chromosome 13, 18 and Y.

This test indicated a high risk for trisomy 13 and 18.

Our patient was explained about the risks and complications associated with this condition and the need for termination of pregnancy.

Patient was induced with tablet misoprost 400 microgram per vaginally at 12.30pm followed by 200 microgram per vaginally after six hours at 6.30pm. Patient delivered at 10.15 pm.

The abortus and the placenta together weighed around 125 gms.

IV. DISCUSSION

Humans are usually born with 46 chromosomes, which are arranged in 23 pairs. The chromosomes are numbered from 1 to 22 and the last pair, known as X and Y, determine whether we are a boy (XY) or a girl (XX). One of each pair of chromosomes comes from our mother in the unfertilized egg and the other of the pair comes from our father in the sperm. Very occasionally, a baby is born with an extra copy of chromosome number 18. This

condition is known as Edward's syndrome. Edward's syndrome happens more often in girls than boys, but it is not known why.

When Edward's syndrome is caused by an entire extra chromosome 18 this is called a "primary trisomy" (as shown opposite). This is a non-inherited version of Edward's syndrome. An alternative (but rare) cause of Edward's syndrome is an "unbalanced translocation". This happens when an extra portion of chromosome 18 is attached to part of another chromosome. This can occur because one of the baby's parents carries what is known as a 'balanced translocation'. This can be discussed in a genetics clinic.

It is possible to distinguish between the 2 causes of Edward's syndrome by looking at the chromosomes of the baby. This can be done during pregnancy, or after pregnancy by testing the baby's blood, or blood from the umbilical cord. If the baby's chromosomes have not been checked then it is possible to look at the chromosomes of the parents to see if either of them carries a balanced translocation.

About 1 in 3000 pregnancies/babies are diagnosed as having an extra copy of chromosome 18. Edward's syndrome is named after Dr. John Edwards who discovered that the extra chromosome causes the condition. The condition is also known as Trisomy 18 because there are 3 copies of chromosome 18.

Edward's syndrome is almost always caused by a primary trisomy and therefore it is very unlikely that a future pregnancy will have this condition. However some parents do choose to have a test in a future pregnancy to check the chromosomes of the baby. The need for testing and how this is carried out can be discussed at the genetics clinic.

Sometimes Edward's syndrome can be suspected during an ultrasound scan, where the main structures of the baby are looked at to pick up any potential problems. Detecting the condition early can help some parents to prepare themselves for how the condition will affect their lives. It also gives them the opportunity to make the personal choice of whether or not to continue with the pregnancy. There are many things that could be seen during an ultrasound scan that increase the baby's chance of having Edward's syndrome. Some of these signs would suggest serious abnormalities. Other signs are not actually harmful on their own but do occur more often in babies with conditions like Edwards.

Here are a few of the more common signs that suggest a baby has Edwards syndrome:

V. RAISED NUCHAL THICKNESS

A scan may be done at 12 to 14 weeks to look for a small collection of fluid on the back of the baby's neck. The thickness of this fluid filled area is measured ("nuchal translucency" or "nuchal thickness") and if it is larger than average ("raised") it suggests the baby might have a condition such as Edward's syndrome. In most cases, the extra chromosome is present due to a "genetic mistake" that occurred in either the egg or the sperm that went to make that baby. The parents usually have normal chromosomes themselves. It is not known why the "genetic

mistake" happens, but it is slightly more likely to occur in babies of older mothers. Edward's syndrome is a serious condition and affected babies/pregnancies can have a range of severe medical problems. Sadly, most babies with Edward's syndrome die before the end of pregnancy or are stillborn. Of the babies that are born alive, about half survive the first month of life and less than 10% live longer than a year. For the most part they require specialised nursing in a hospital or hospice. However there are some infants who can live at home and be cared for by their parents. Babies with Edward's syndrome tend to have a low birth weight, a small head ("microcephaly"), a small jaw. Mosaic Edward's syndrome is a rare form of the condition where some cells in the body have 2 copies of chromosome 18 and others have 3 copies of 18. Mosaic Edward's syndrome is very varied. Some babies are only mildly affected, while others have as many problems as babies with the "full" form. How a child/person is affected depends on how many cells have three copies of chromosome 18. If a couple have had one baby with mosaic Edward's syndrome, they are very unlikely to have another child with the same condition. ("micrognathia"), malformations of their heart and kidneys, clenched fists and malformed feet. They also characteristically have feeding and breathing problems in infancy and severe learning disability.

So here, we present rare case of Edwards Syndrome.

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Financial Performance Evaluation of Construction Industries

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Abstract

This study applies financial performance evaluation of Construction companies in India. Indian economy has been hit by various economic crises from last few years and the economic stagnation still continues. Experiences in various countries show that it is vitally important to encourage construction activities in order to get out of stagnation, as construction output directly affects other sectors. Current research introduces a performance evaluation model for construction companies in order to provide a proper tool for a company's managers, owners, shareholders, and funding agencies to evaluate the performance of construction companies. The model developed helps a company's management to make the right decisions. Financial, economical, and industrial data are collected from 100 Indian construction companies for five consecutive years (2011-2015). Firstly understand the principles underlying in the analysis of financial statements pertaining to the Indian construction organizations. Previous research has shown that there are about 21 financial ratios that are important for the construction companies. This, in turn, requires elimination of unrelated data. Factor analysis is a data reduction and classification technique, which can be applied in financial analysis. Factor analysis was thus applied to the financial data collected construction companies for a 5-year period in order to determine the financial indicators that can be used to analyze the financial trend of the industry. Seven independent factors, i.e. liquidity, Activity, profitability, long term solvency, Asset management, Inventory and Efficiency were identified to be sensitive to the economic changes in the country. The final outcome of this research is a performance grade, which provides the performance of a construction company and ranking the companies based of calculated performance grade and finally assessing the risk of bankruptcy by using Z-score model.

Keywords: Financial Ratios; Factor Analysis; Performance Grade; Performance Rating, Bankruptcy, Construction Industry.

1. Introduction

The constructions industries act an important role in strengthen the economic performance and the national benefit of a country. Construction sector contributes an average of 7%–9% of the gross domestic product (GDP) of developing countries (Bakar, 2002). In the Indian economy, the average annual contribution of the construction industry to GDP is only 5-8 %. Indian construction industries absolutely disappointing the share of construction over GDP is continuously decreasing recent years due to financial crises. Thus, the government should analyse the financial state of the construction industry urgently and undertake related action. The construction industry provides critical backward and forward linkages to support the development of other economic sectors Abdullah (1990). However, in terms of business survival the construction industry regularly facing comparatively high proportion of business failure compared to other industries (Yin, 2006). In the United States (US) construction industry, the average rate of failure from 1989–2002 was nearly 14% higher than the average rate of failure for all industries, the same phenomenon occurs in Malaysia, comparatively failure rate of Indian construction industries were less but maintaining low profits. Construction companies have been found to be highly fluctuating, to have weak financial positions and to be subject to large business cycle fluctuations. Consequently, share prices tend to overheat when the economy grows quickly, and then collapse when the economy goes into recession (Wagle, 2006). Performance evaluation of construction companies" get its importance from the fact that today's world is moving rapidly toward globalization. In this universal, many multinational companies are awarded business in other countries in which they are competing with local companies. Both multinational and local construction companies should

seriously look forward to improving their performance in order to maintain their international reputation. This evaluation is useful for owners, managers, shareholders, and funding agencies of a company because it clearly draws the correct position of the company, many models are developed for evaluate companies" performance, but some of them consider economical and industrial changes in their models. Therefore, the main objective of this study is to develop the performance index that evaluates a company"s financial current study is to develop the performance index that evaluates a company"s financial position within the construction industry considering the economical factors and company size. Financial ratios quantify many aspects of a business and are an important part of financial statement analysis. There are many standard ratios which are used to evaluate the overall financial situation of an organization. Financial ratios are used by managers within a firm, by potential stockholders of a firm, firm's creditors and business analysts to compare the strengths and weaknesses of various companies. position within the construction industry considering the economical factors and company size.

1. Relationship between the construction industry and growth of national income

The construction industry is an important contributor to the growth of any national economy and is directly affected by the government policies as governments usually regulate the economy by cutting back on public construction works during stagnation periods. Past experiences in various countries show that it is also important to encourage construction activities to get out of stagnation as construction directly affects about 200 other sectors. Indian economy was affected by the Asian crises in last year 2014 and still it continuing .The effect on the growth of construction industry is saviour we can observe values from below

table1.1. The growth of construction sector which is accounted for an average of 5-8% before year 2013 and it suddenly dropped to 4.5% in the year 2014 we can observe from Fig 1.2. Depression of Indian currency caused economical crises in the country in September 2014 and February 2015 affected all of the sectors seriously. Indian government seriously targeted the financial crises in presently coming budget planning mainly with low inflation rates, low -bank

credit rates so that government hopes to regain previous position as well. These economic factors provide us with a model to study the past trends to rate the performance and to compare our performance in the industry. Thus the innovative approach in mind for forecasting the performance of the industry, the perception of the performance of the construction industry is essential.

Table 1.1 Micro macro economic factors:

GDP Growth Vs Construction sector growth in India:	Micro economic factors :
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Year	Growth of GDP %	Growth of construction sector %	Interest Rates %	Inflation Rates %
2007-08	7.5	7.1	10.5	3.3
2008-09	9	7.4	11	7.65
2009-10	9.4	8	9.8	5.69
2010-11	9	8.4	11.5	5.25
2011-12	6.7	8.7	13	9.5
2012-13	8.2	8.9	11.5	10
2013-14	7.8	8	10.5	11.5
2014-15	6.9	4.8	9.8	7.5

Source: Ministry of Finance, Govt of India.

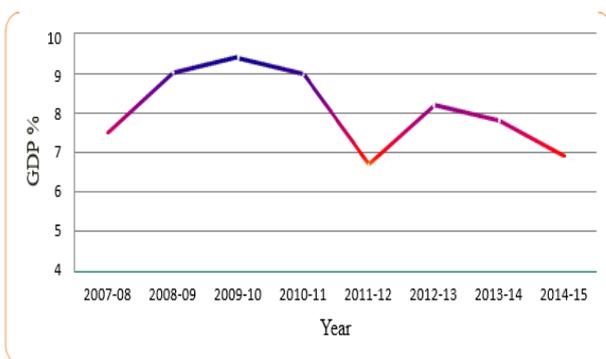


Fig 1.1 GDP growth rate

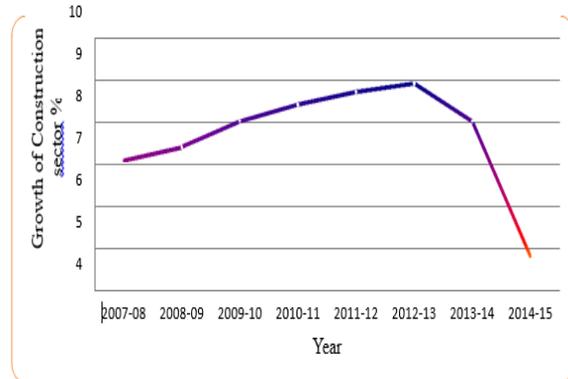


Fig 1.2 Construction growth rate

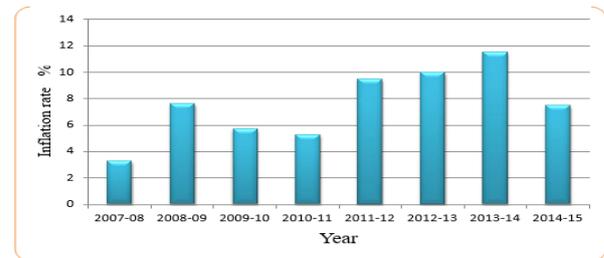


Fig 1.4 Inflation rates

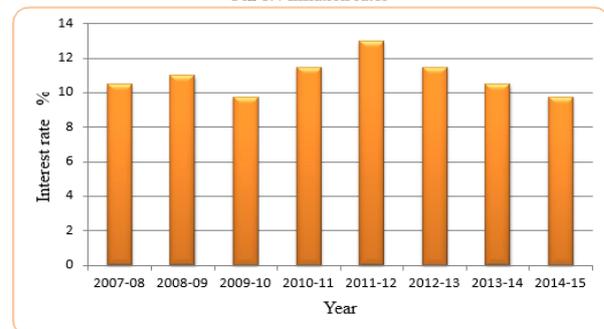


Fig 1.3 Interest rates

2. LITERATURE REVIEW

According to Moyer et al. (2011), financial ratio analysis is employed for three main purposes: (1) as an analytical tool to identify the strengths and weaknesses of a firm in order to assess its viability and to determine whether a satisfactory return will be earned from the risk taken (2) as a monitoring device to ensure that company objectives are compatible with its resources; and (3) as an effective tool in planning to achieve company goals.

Suberi (2011) tries to find out company financial health on Malaysian Construction firms by using financial ratios analysis relative comparison of company performance as well as comparison of performance across different companies for that he selected six construction companies find the 17 financial ratios for three years; secondly data collection involved interviews with representatives from six respondent companies. Finally a questionnaire was

designed. He concluded that the overall performance of the construction companies seems to be below industry average. With weak liquidity ratios, their cash and capital would be insufficient to finance their construction projects, and a strong indication that companies were undercapitalized and would experience financial problems in the future.

Singh et al. (2010) states that models evaluating construction companies' insolvencies, it can be concluded that financial ratio based models only give an indication, rather than a calculation of the future performance of companies, and that suitable financial models for construction companies remain undeveloped and unrealized.

Edmund (1994) had tried to introduce few financial principals for the management and founders of small firms. Project accounting is often a principle no tracking of project budgets takes place. The concept of accrual accounting is introduced. Also introduced the basis of ratio analysis for computation of overhead, billing ratio, and other key factors that allow comparison with other firms.

According to Moyer et al. (2011), financial ratios analysis is used to address three main purposes. First, it is used as an analytical tool in identifying the strengths and weaknesses of the firm as well as to assess its viability as an ongoing enterprise or to determine whether a satisfactory return can be earned for the risk taken. Second, financial ratios are useful as monitoring tools for ensuring the company objectives are compatible with its resources. Third, financial ratios play a very effective role in planning to achieve the company's goals. Financial ratio is a relationship that indicates a firm's activities. Financial ratios enable an analyst to make a comparison of a firm's financial condition over time or in relation to other firms.

Ocal et al. (2005) highlighted that financial ratios not only allow the comparison of a company's financial performance with its rivals within the same industry but also allow that of the industry itself over time.

James Clausen (2009), He state that the Ratio analysis of the income statement and balance sheet are used to measure company profit performance. He said the learn ratio analyses of the income statement and balance sheet. The income statement and balance sheet are two important reports that show the profit and net worth of the company. It analyses shows how the well the company is doing in terms of profits compared to sales. He also shows how well the assets are performing in terms of generating revenue. He defines the income statement shows the net profit of the company by subtracting expenses from gross profit.

Research Methodology:

The methodology in my research was carried out following these steps:

- A list of companies prepares which are actively participating in construction; determine qualification like Scope, job nature age of the company.
- Financial statements for 100 construction companies for five years 2011-2015 are collected.
- Calculate the financial ratios for above collected financial statements by using excel database.

- To conduct the factor analyses by using SPSS software for identify the significant ratios which contribute much to the growth of the organization.
- To develop the model for calculating the performance grade and ranking the companies based on performance grade, the flow of steps for model development shown in fig 1.4
- To classify the zone of discrimination of company by using Z-score bankruptcy prediction model.

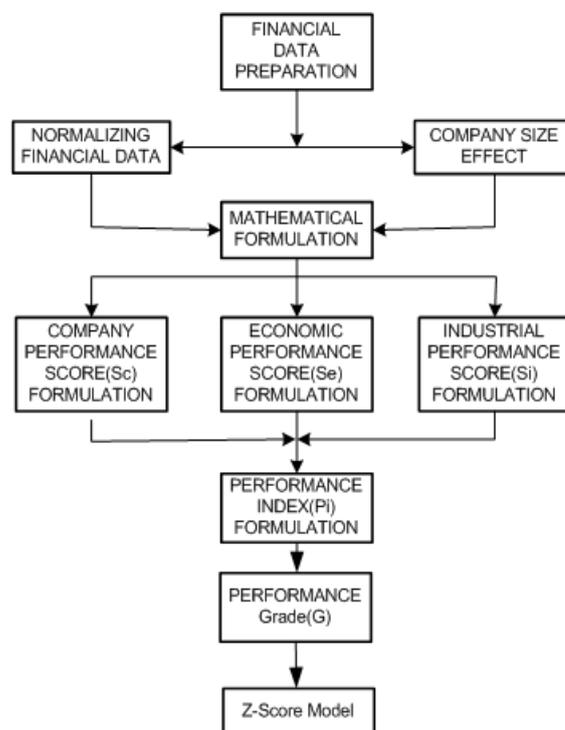


Fig 1.5 Flow chart of model creation process
Source: Elamany et al. (2007), ASCE, 133:8 (576)

3. DATA COLLECTION

I have selected the list of 100 companies which are in construction sector. www.fundoodata.com official website helpful for selecting the companies as per our requirements like type of Industry, location, company entity, turnover, type of sector etc. Financial statements for a 5 consecutive years (2011-15) were collect from companies official website or some of the companies not publishing in their website in that case companies data collected from NSE www.moneycontrol.com, <http://economictimes.indiatimes.com/> these websites helpful for collect the financial data (balance sheet, Profit & loss statement, cash flow statement) of companies with required period.

LIST OF COMPANIES

1	Acrow India Limited	26	Garnet Constructions Limited
2	Akruti Nirman Limited	27	Gayatri Projects Limited
3	Anant Raj Industries Limited	28	GMR Infrastructure Limited
4	Ansal Buildwell Limited	29	HB Estate Developers Limited
5	Ansal Housing & Construction Limited	30	Hindustan Construction Company Limited
6	Ansal Properties & Infrastructures Limited	31	Housing Development & Infrastructures Development
7	Arihant Foundations & Housing Limited	32	Iron International Limited
8	Artson Engineering Limited	33	ITD Cementation (India) Limited
9	Ashiana Housing & Finance (India)	34	IVR Prime Urban Developers Limited
10	Atlanta Limited	35	IVRCL Infrastructure & Projects Limited
11	B L Kashyap & Sons Limited	36	Jaihind Projects Limited
12	Bhagheeratha Engineering Limited	37	Jai Prakash Associates Limited
13	C & C Constructions Limited	38	JMC Projects (India) Limited
14	Consolidated Construction Consortium	39	Kamanwala Housing & Construction Limited
15	CCAP Limited	40	KEC Infrastructures Limited
16	Conart Engineers Limited	41	KCP Limited
17	D S Kulkarni Developers Limited	42	Lanco Infratech Limited
18	DCM limited	43	Lancor Holdings Limited
19	Dhurv Estates Limited	44	Larsen & Toubro Limited
20	DLF limited	45	Lok Housing & Constructions Limited
21	Eldoco Housing & Industries Limited	46	Madhucon Projects Limited
22	Elnet Technologies Limited	47	Mahindra Lifespaces Limited
23	Engineers India Limited	48	Marg Constructions Limited
24	Era Constructions (India) Limited	49	Martin Burn Limited
25	Gammon India Limited	50	Maruti Infrastructures Limited
51	MSK Projects (India) Limited	76	Ruchi Infrastructures Limited
52	Nagarjuna Construction Company Limited	77	SAAGRR Infrastructures Limited
53	Narendra Properties Limited	78	Simplex Infrastructures Limited
54	Navkar Builders Limited	79	Simplex Projects Limited
55	Nila Infrastructures Limited	80	Sobha Developers Limited
56	Noida Toll Bridge Company Limited	81	Soma constructions
57	Omaxe Limited	82	Sriniwas Shipping & Property Development Limited
58	Orbit Corporation Limited	83	Subhash Projects & Marketing Limited
59	Parsvnath Developers Limited	84	Regaliaa Realty Limited
60	Patel Engineering Limited	85	Tantia Constructions Limited
61	PBA Infrastructures Limited	86	Templex infraprojects Ltd
62	Peninsula Land Limited	87	Thackers Developers Limited
63	Petron Engineering Construction Limited	88	Trenchless engineering services pvt Ltd
64	Prajay Engineers Syndicate Limited	89	Trinetra infra ventures Ltd
65	Prathiba Industries Limited	90	Tribhuvan Housing Limited
66	Praveen Properties Limited	91	UB Holdings Limited (KingFisher Properties & Holdings
67	Prime Property Development Corporation	92	Uniquet infra ventures pvt Ltd
68	Punj Lloyd Limited	93	Unitech Limited
69	Puravankara Projects Limited	94	Unity Infra Projects Limited
70	Radhe Developers (India) Limited	95	Valecha Engineering Limited
71	Raghava Estates Limited	96	Viaton infrastructures pvt Ltd
72	Rainbow Foundations Limited	97	Victoria Enterprises Ltd
73	Rander Corporation Limited	98	Vijay Shanti Builders Limited
74	Reliance Industrial Infrastructures Limited	99	Vipul Infrastructure Developers Limited
75	Roman Tarmat Limited	100	Wirtgen India Pvt ltd

4. RATIO ANALYSIS

Financial analysts use financial ratios to compare the strengths and weaknesses in various companies. Financial ratios are useful indicators of affirms performance and financial situation. Most ratios can be calculated from provided by the financial statements. Financial ratios can be used to analyse the trends and to compare the firm’s financials to

those of other firms financial ratios are the microscope that allows us to see behind the raw numbers and find out what’s really going on. When analysing these ratios always, remember that no one ratio provides the whole story and that the standards for each ratio are different for every industry. In our case, 100 construction firms were short listed for carrying out the ratio analysis. Literature

study revealed that a five year database of financial ratios would sufficiently amount for the forecast prediction of the organization. Thus basic requirement is that these companies should take part at present in the economy building of the nation and also they should have a track record of five years in the industry. Using the advantage of the excel data base asses the ratios from companies financial statements. From these construction organizations, their 21 financial ratios were selected as follows:

LIQUIDITY RATIOS: Current ratio, Quick ratio, Cash ratio, Inventory ratio

SOLVENCY RATIOS: Debt Asset Ratio, Debt equity ratio, Debt to total equity, Cash flow coverage, Debt to total capital ratio, Inventory coverage ratio.

PROFITABILITY RATIOS: Pre tax profit ratio, Return on total assets, Return on Fixed Assets, Rate on Capital Employed, Dividend Payout Ratio, ROR on Total Shareholders Equity

EFFICIENCY RATIOS: T.A Turn over ratio, F.A Turn over ratio, Capital turn over, Working capital turn over, Finished goods inventory turn over.

4.2 HORIZONTAL & VERTICAL PROFILE ANALYSIS (HV ANALYSIS):

Financial details and ratio information varies across industries and size. It provides management information on which issues to address to improve the operation, and ultimately the financial performance, of any business. The two types of performing ratio analysis include horizontal analysis and vertical analysis.

The ratio analysis especially the horizontal and vertical analysis helps us in determining the strength and weakness of the business the ratios can be effectively used for finding

- Whether the business model is

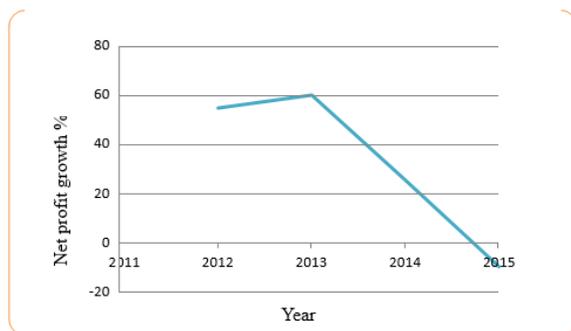


Fig 4.3.1 Net profit growth rate

Often, the Operating profit & Net profit of a business are mutually interlinked. The Graph shows that Larsen & Toubro Limited in from recent few years back struggling with marinating very low profit growth rates, there is sudden fall from year 2013 to 2015 main causes would be the weak national economic growth.

4.3.2 Earnings per share growth rate:

profitable?

- Whether we are using our resources and assets efficiently?
- Whether we are on the right track of growth?

Horizontal Analysis

Horizontal analysis expresses change between periods as percentages for each account in the financial statements. The basic formula for horizontal analysis is percentage change which is equal to the difference between the most recent period and previous period divided by the previous period.

Vertical Analysis

Vertical analysis expresses financial statements as percentages. On the balance sheet, total assets are assigned 100% and on the income statement, total revenues are assigned 100% and the various contributors to these ratios are analysed with respect to time.

4.3 Horizontal Analysis:

CASE STUDY: LARSEN & TOUBRO LIMITED

Let us consider the case of Larsen & Toubro Limited for our study and analyse their performance horizontally. The analysis is as follows,

4.3.1 Net profit growth rate

Often referred to as the bottom line, net profit is calculated by subtracting a company's total expenses from total revenue, thus showing what the company has earned in a given period of time. In business and finance accounting, net profit is equal to the gross profit minus overheads minus interest payable plus one off items for a given time period.

In simplistic terms, net profit is the money left over after paying all the expenses of an endeavour.

Earnings per Share (EPS) are defined as the net income of a company divided by the number of outstanding shares. EPS is the single most popular variable in dictating a share's price. EPS also indicates the profitability of a company.



Fig 4.3.2 Growth in earnings per share

It tells an investor how much of the company's profit belongs to each share of stock. This is significant because it allows analysts to value the stock based on the price to earnings ratio. The best way to value the company is to evaluate this trend with the other companies involved in the same business. This

would give us a clear picture of how the company had excelled. Fig 4.3.2 shows that the Larsen and Toubro limited share price growth is negative.

4.3.3 Sales growth rate

Predicting a company's top line growth is arguably the most important part of determining its performance. Companies with increasing sales and market share, growing profit margins, market growth and a rising P/E ratio are tomorrow's big winners on the business field.

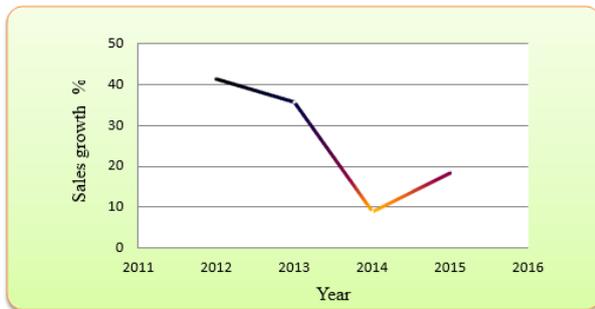


Fig 4.3.3 Total sales growth

The graph describes sales growth rate achieved by Larsen & Toubro Limited plugged down from 2013 to 2015 and sharp recover in next year main reason for terrible growth is having weak infrastructure growth in growing economies like India, China; the scope of business in the forthcoming years also expects slow growth rates. But theory states that, every growing company would pauses its growth due to the financial crises in recent years and this stagnation effect will continue some more years.

4.3.4 Operating profit growth rate:

Operating profit is the difference between revenue and the cost of making a product. Operating profit is an important guide to profitability. Given the growing sales rate, it is mandatory for the organization to maintain its operating profit margin, but the competition in today's construction business would make the process of maintaining the growth rate of operating profit tougher. Larsen & Toubro Limited operating profit growth rate was declining down constantly from year 2011.

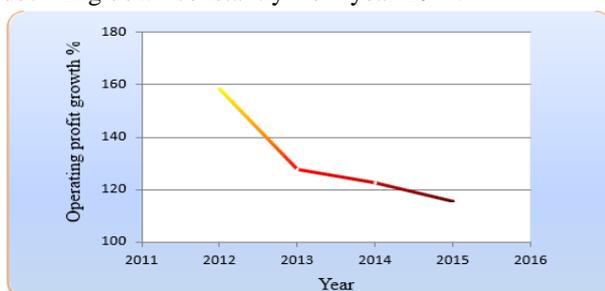


Fig 4.3.4 operating profit growth rate

4.3.5 Assets growth rate:

Total assets growth rate is an indicator to explain how dedicated the management is towards stretching the field of business. Hence forth, it is wise to invest in companies which show significant assets growth

rate. Larsen & Toubro Limited in this aspect shows sharp fall continuous years from 2011 line shows that it takes very huge period to regain.

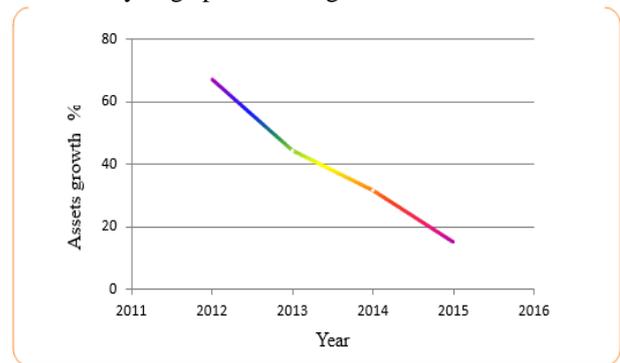


Fig 4.3.5 Total assets growth rate

4.4 VERTICAL ANALYSIS: CASE STUDY: LARSEN & TOUBRO LIMITED

Let us consider the case of Larsen & Toubro Limited for our study and analyses their performance vertically. The analysis is as follows,

4.4.1 EXPENSES INCURRED:

The area diagram indicates that the percentage of selling & administrative expenses and the percentage of the labour expenses out of the total expenditure had remained almost the same throughout the period of study.

The organization Larsen & Toubro Limited had been successful in reducing the percentage of the cost of power & fuel expenses to almost nil. And the percentage of the cost of manufacturing had increased its field showing the increase in the quantum spent. But the percentage of cost incurred in acquiring the materials had increased in the year 2012 and then had dropped down but this would depend upon the various other factors such as inflation, material cost, transportation cost, etc. But all these factors need to be considered and the best possible combination would drastically reduce down the total expenditure. Also this best possible combination would be different for various industries. Here, Larsen & Toubro Limited should factor in all these factors and arrive at the best proportion and this mix should be proposed to be implemented.

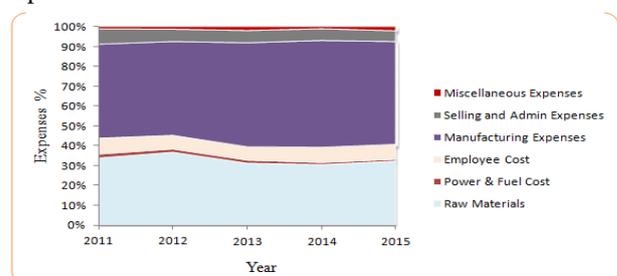
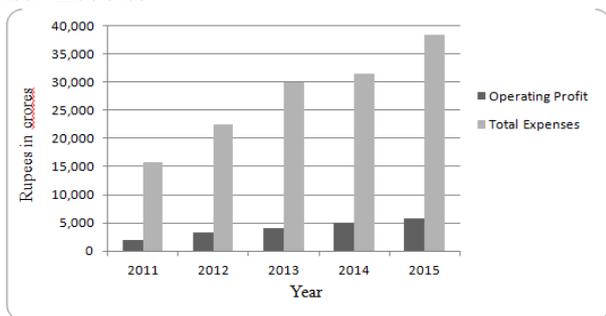


Fig 4.4.1 Breakdown of expenses incurred

4.4.2 EXPENSE Vs INCOME:

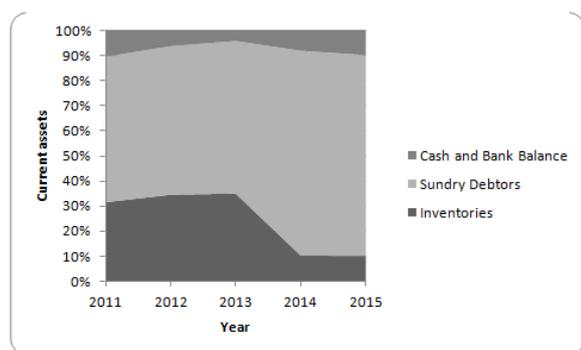


4.4.2 Expenses Vs income

The cost of expense and the income is shown in the area diagram as below. It shows how the operating profit of the organization Larsen & Toubro Limited has varied in the period of study. It would be better if the area of the operating profit can creep up and the cost of sales would come down. This should be the prime motto of the organization which the management should keep in mind before taking any of the policy decisions. Fig shows that the percentage of operating profit in cost of sales is quite low, growth of operating profit is almost nil in recent years.

4.4.3 CURRENT ASSETS:

The drastic change in the area diagram for the breakdown of current assets depicts that the company had worked out competitively in for reducing down the inventories and huge bank balances. Fig shows that the company disposing the retained inventories in recent periods and maintaining desirable bank balances. The area diagram clearly shows the managements inability to visualise the best proportion of the current assets.



4.4.3 Break down of current assets

4.4.4 LIABILITIES & EQUITY TO TOTAL ASSETS:

The area diagram shows that the shows that the percentage of the equity of the organization Larsen & Toubro Limited constantly growing with total liabilities of the company. As far as possible, the liabilities should be minimal for any organization because the equity fund may generate interest for that liability also.

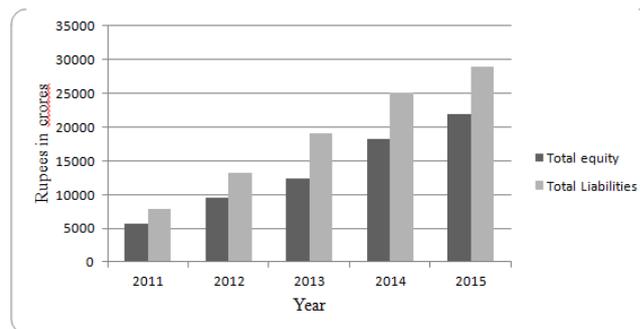


Fig 4.4.4 Liabilities & equity

The reasons which can be imagined for this may be as follows

- Rights issue to increase the outstanding number of shares
- Raising capital in foreign soil
- Raising debt funds, etc

5. FACTOR ANALYSIS

Factor analysis is used to find latent variables or factors among observed variables. In other words, if your data contains many variables, you can use factor analysis to reduce the number of variables. Factor analysis groups variables with similar characteristics together. With factor analysis you can produce a small number of factors from a large number of variables which is capable of explaining the observed variance in the larger number of variables. The reduced factors can also be used for further analysis.

There are three stages in factor analysis:

1. First, a correlation matrix is generated for all the variables. A correlation matrix is a rectangular array of the correlation coefficients of the variables with each other.
2. Second, factors are extracted from the correlation matrix based on the correlation coefficients of the variables.
3. Third, the factors are rotated in order to maximize the relationship between the variables and some of the factors.

FACTOR ANALYSIS RESULTS

The various statistical analyses required for this study, we have taken the help of statistical software, SPSS 19.0 version, at first, inter-correlation matrix amongst the variables has been derived. An Intercorrelation matrix is a k×k (k = the number of variables) array of the correlation coefficients of the variables with each other. With the help of this matrix, variables (financial ratios) with weak correlation (i.e. < ±0.5) with other variables are identified and excluded, i.e. out of 21 ratios 3 ratios were excluded. However, elimination is effected only after exercising domain knowledge to ensure that no important variable (financial ratio) is excluded from the study. After that, Factor Analysis with Principal Component extraction method is performed on the remaining set of variables. VARIMAX rotation is used to get better final results. Factor Analysis is conducted once again on the remaining 18 variables (21 minus 3),

that 18 variables have been categorized in 8 factors. Results of Factor analysis produced below as

6. FINANCIAL RATIOS

Financial ratios used for Initial solution:

List of variables:

Variable No.	Financial Ratios
1	Current ratio
2	Quick Ratio
3	Cash Ratio
4	Inventory Turnover
5	Debt Asset Ratio
6	Debt Equity Ratio
7	Debt to Total Equity
8	Cash Flow coverage
9	Debt to total capital Ratio
10	Inventory Coverage Ratio
11	Pre tax profit ratio
12	Return on Total Assets
13	Return on Fixed Assets
14	Rate on Capital Employed
15	Dividend Payout Ratio
16	ROR on Total Shareholders' Equity
17	T.A turnover Ratio
18	F.A turnover ratio
19	Capital Turn over
20	Working capital Turnover
21	Finished goods inventory turnover

Performance Evaluation:

A performance evaluation tool is very useful for both multi-national and local construction companies to assess their performance in order to maintain their competitiveness in any market. Also, this evaluation tool is very essential for Company Managers, owners, shareholders, and funding Agencies of the company, because it would clearly show its relative position in the market. Many models were developed to evaluate construction companies' performance, but non have incorporate economical and industrial variables together in their models. This study presents a performance evaluation model that does not only concentrate on financial Performance, but also on company size, macroeconomic, and industry related factors as well. It also considers the effect of company size, along with economical and industrial variables on its performance. The developed company performance model is generic and can be applied to any company in any market. Performance evaluation of construction company's gains its importance from the fact that today's world is moving rapidly toward globalization, in this environment, many multinational companies are awarded business in other countries in

follows.

which they are competing with local companies. Both multinational and local construction companies should seriously look forward to improving their performance in order to maintain their international reputation. Company performance measurement is a valuable tool in any business sector because it evaluates a company's current status and may help predict its future health. Traditionally, the evaluation of a firm's performance usually employs the financial ratio method, because it provides a simple description about the firm's financial performance in comparison, with previous periods and helps to improve its performance of management. Although there are many company performances measurement tools cited in the literature, the construction industry was slow to develop a complete performance measurement tool. They are dealing with this problem at three different levels (1) construction industry, (2) company and (3) project. Models at the construction industry level are used to measure the effect of economical, political, and social changes on the performance of the construction industry as a whole. Most performance evaluation models for construction companies are based on their annual financial statements. Different analytical

techniques have been used to develop these ratios:

(1) financial statement trend analysis (2) financial statement structural analysis; and (3) financial statement ratio analysis.

6.1 EFFECT OF COMPANY SIZE:

Comparing performance of a company with the overall industry average is inappropriate, because the financial composition and characteristics of small companies are different from those of well established, large firms to resolve this problem, a size factor (Z_i) is introduced into the model, is defined as the ratio of "financial ratio i of an

overall, average-size construction company in each group" over the "same ratio i of an average size company in the same size as the company under consideration. "To get the size factor (Z_i), procedure follows as well:

- 1) Sort the companies according to total Assets and divide them into 3 sectors,
- 2) Obtain the median of each sector, and median of the whole construction sector,
- 3) To obtain the Size coefficient divide the construction sector median by median of each sector

Table 6.1.1 Company size factor (Z_i):

Company size factor (Z_i):						
TOTAL ASSETS IN Cr	CURRENT RATIO	DEBT TO TOTAL EQUITY	PRETAX PROFIT RATIO	RETURN ON TOTAL ASSETS	FIXEDASSETS TURNOVER RATIO	WORKING CAPITAL TURNOVER RATIO
> 500 Cr	1.05	1	0.86	0.63	0.83	0.81
500-50 Cr	0.99	1.22	1	1.31	1.5	1.27
< 50 Cr	1.05	0.77	1.71	3.17	1.78	3.04

6.2 NORMALIZING THE FINANCIAL DATA:

Collected raw data cannot use directly for model building because some data have dissimilar units; these data should normalize first before proceeding, by using mathematical formulation. The financial ratios what we are calculated in terms of time others in terms of percentage so such type of ratios will result in bias to the larger values of ratios .in order to overcome this problem need to normalize the values and make them non bias .The process of Normalizing financial data as follows:

1. Develop the financial ratios,

2. Calculate the median of each ratio,
3. Divide the max median value by each median values of six ratios,
4. Round the resultant of division to get normalization coefficient(F_n) for each ratio,
5. Obtain the normalized value of each ratio using formulae,

Where: X_{ni} =Normalized value of financial ratio
 X_{si} =Standard value of ratio,
 F_{ni} =Normalization coefficient, S_i =Sign correction factor (set the value equal to -1 if X_{si} is negative, & +1 if X_{si} is positive),
 Z_i =Company size factor.

Table6.2.1 Normalization coefficients (F_{ni}):

	CURRENT RATIO	DEBT TO TOTAL EQUITY	PRETAX PROFIT RATIO	RETURN ON TOTAL ASSETS	FIXEDASSETS TURNOVER RATIO	WORKING CAPITAL TURNOVER RATIO
Median	1.78	0.11	0.06	0.23	2.89	1.81

Normalization coefficient (Fni)	2	26	48	13	1	2
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6.3 MATHEMATICAL FORMULATION:

The following mathematical formulations used for develop the company performance:

- Industrial performance score (Se)
- Economy performance score (Si)
- Company performance score (Sc)

6.4 Mathematical formulation for Industry performance score (Si): The industry performance score (Si) is developed by using Regression analysis.

- Performance Index (PI)
- Performance grade (PG)
- Z-score Bankruptcy test.

Regression analysis is used for develop the current model, by using statistical package software. The reason for using the regression analysis is simplicity, reliability, and suitability for the problem.

Macroeconomic and industry related variables are used for asses the industry performance score.

GDP Growth Vs Construction sector growth in India:			Micro economic factors :	
Year	Growth of GDP %	Growth of construction sector %	Interest Rates %	Inflation Rates %
2007-08	7.5	7.1	10.5	3.3
2008-09	9	7.4	11	7.65
2009-10	9.4	8	9.8	5.69
2010-11	9	8.4	11.5	5.25
2011-12	6.7	8.7	13	9.5
2012-13	8.2	8.9	11.5	10
2013-14	7.8	8	10.5	11.5
2014-15	6.9	4.8	9.8	7.5

Development of industry performance score (Si) include the following steps:

- Sort the values of Growth of construction sector in ascending order ,this is because of best situation for a company occurs when market demands exceeds the supply i.e. the growth of construction sector is positive.
- Assign the five values i.e. for five years equal to 100,50,0,-50,-100 for industry performance score (Si) respectively
- Using the regression analysis, develop the regression equation for Si

Where: Co=Regression constant, C1=Regression coefficient for X1, X1=Growth of construction

sector, Si=Industry performance score.

- Regression analysis developed the equation,
- Apply the above equation on values of economy variables
- Normalize the calculated values Si based on the above equation, by using following equation to be with in the range -100 to 100

Where:

Si mod =Modified industry performance score
Si=Industry performance score **Si max** =Maximum value of industry performance score
Si min =Minimum value of industry performance score

Table 6.8.2 Industry performance values:

Year	X1	Si	Si mod
2011	8.4	-24.96	-75.61
2012	8.7	-36.65	-90.24
2013	8.9	-44.45	-100.00
2014	8	-9.36	-56.10
2015	4.8	115.42	100.00

6.5 Mathematical formulation for Economical performance score (Se):

performance score (Se) includes the following process:

- Sort the economical variables Inflation and

Development of Economical

Interest rates in ascending order from the best to worst

□ Assign the five values i.e. for five years equal to 100,50,0,-50,-100 for economical performance score (Se) respectively

□ Using the regression analysis, develop the regression equation for Se

Where: C_0 =Regression constant, C_1 & C_2 =Regression coefficients for X_1 & X_2 respectively, X_1 =Inflation rate, X_2 =Interest rate, Se =Economical performance score.

Statistical analysis shows that excluding X_1 from above equation generate best results (Neter *et al.*,

1996; Lapin, 1983; Little, 1978).then the equation developed as follows

□ Regression analysis developed the equation,

□ Apply the above equation on values of economy variables

□ Normalize the calculated values Se based on the above equation, by using following equation to be with in the range -100 to 100

Where: Se_{mod} =Modified economical performance score Se =Economical performance score Se_{max} =Maximum value of economical performance score Se_{min} =Minimum value of economical performance score

Table 6.5.1 Economical performance score (Se):

Year	Interest Rates %	Inflation Rates %	Se	Se mod
2011	11.5	5.25	182.46	-6.25
2012	13	9.5	149.88	-100
2013	11.5	10	182.46	-6.25
2014	10.5	11.5	204.18	56.25
2015	9.8	7.5	219.38	100

6.6 Mathematical formulation for company performance score (Sc):

The company performance score (Sc) according to Kangari *et al.*(1992) is defined as “ a performance grading system for evaluate the position of a company within the overall construction industry and which is very difficult to be assigned a certain value”. The Sc method is applied by Goda (1999). The development of Company performance score includes following steps:

□ Divide the prepared Normalized ratios into Upper, median and lower quartile as shown in table

□ Preliminary values of 100,0,-100 are assigned to company performance score(Sc) for the upper ,median, lower quartile values respectively,

□ By using regression analysis develop the equation for Sc

where, S_c = Company performance score; C_0 =Regression constant $C_1... C_6$ = regression coefficients; and X_{ni} = Regression variable

represents the normalized value of standard ratio; calculated by using same earlier used equation

□ So, by substituting X_{ni} equation into Sc equation

□□Regression analysis developed equation is

□ By using above equation find the Sc values for all 100 companies year wise.

□ Assume that the company performance score (S_c) values for the whole construction sector under consideration follow a normal probability distribution. This normal distribution has 99.7 % of the area under curve falls within a distance = 3σ from the mean. Assuming the arithmetic mean and standard deviation of Sc values for the whole construction sector are μ and σ , respectively, the prediction interval for the company performance (S_c) would be calculated using the below equation.

□ Values of company performance score (Sc) falling outside the interval are excluded, while the other values are modified within the range -100 to +100 as shown in the below equation,

6.10.1 REGRESSION CONSTANTS AND COEFFICIENTS

Regression constant C_0	CR C_1	DER C_2	PPR C_3	ROTA C_4	FATR C_5	WCTR C_6
-59.035	18.439	-20.022	0.052	4.233	31.647	-3.494

6.10.2 QUARTILES OF FINANCIAL RATIOS:

YEAR	CURRENT RATIO	DEBT TO TOTAL EQUITY	PRETAX PROFIT RATIO	RETURN ON TOTAL ASSETS	FIXEDASSETS TURNOVER RATIO	WORKING CAPITAL TURNOVER RATIO
UPPER QUARTILE						
2011	2.974	0.815	3.263	3.393	3.551	4.826
2012	3.191	0.841	3.279	3.276	3.717	5.184
2013	3.343	0.978	3.496	3.775	3.746	6.595
2014	3.564	1.234	4.311	4.490	3.993	6.120
2015	2.824	1.445	3.308	4.970	4.295	4.493
MEDIANQUARTILE						
2011	1.831	1.520	1.504	1.865	1.654	2.164
2012	1.857	1.479	1.680	1.633	1.648	2.247
2013	1.897	1.709	1.795	1.841	1.953	2.596
2014	2.020	1.961	2.040	2.304	1.901	2.467
2015	2.023	2.668	2.043	2.480	1.895	2.019
LOWER QUARTILE						
2011	1.413	4.907	0.641	0.721	0.667	0.684
2012	1.528	3.791	0.739	0.724	0.668	0.921
2013	1.543	4.251	1.048	0.832	0.853	1.132
2014	1.564	4.792	1.249	1.110	0.912	1.141
2015	1.494	5.377	1.083	1.283	0.794	0.869

6.7 Development of Performance Index (PI):

For development of performance Index (PI) considered the effect of company, economy, and the industry related factors. These factors are represented in model using S_c , S_e , and S_i respectively. The grouping process were performed based on the Hasabo (1996) which reported that the responsibility of company failure was carried out by three major factors,

- Macroeconomic factors (35-40%)
- Industry related factors (10-15%)
- Company related factors (40-45%).

These factors are used for formulate the PI. Macroeconomic, industry, and company related factors are represented by the normalized values of S_e , S_i , and S_c respectively. The PI value can be determined from the below equation as follows,

Where, PI = performance index; S_c = company performance index; S_e =economy performance score and S_i =industry performance score.

When a company has the best S_c value ($S_c =$

6.8 Development of Performance grade (PG):

The performance grade (PG) is defined as the percentage of construction companies that have performance indexes lower than that of the company under consideration. Thus PG is equivalent to the cumulative distribution function of PI. In other words, PG is the integration of

+100) during a year that has the worst values of both S_e and S_i ($S_e = -100$ and $S_i = -100$), it will be assigned the best value for performance index grade (PI = +100). This company might have a good financial performance during fiscal year that has bad economical and industrial circumstances. In such a case, this company has good financial and managerial performance; however it is worth surviving in business. On the other hand, a company might have the worst S_c value ($S_c = -100$) during a year that has the best values of both S_e and S_i ($S_e = +100$ and $S_i = +100$). This company will be assigned the worst value of performance index (PI = -100). Therefore, a company had bad financial performance during a fiscal year that had good economical and industrial circumstances. Therefore, the company has weak financial and managerial performance that needs suitable remedial actions to survive in business.

the PI function from negative infinity to a company's performance index, multiplied by 100. The PI of a construction company should be compared to other companies in the same construction sector in order to know the relative situation of such a company within the industry. The models developed was sufficient to rate the performance of a particular company among the other companies in the industry. The value of the

performance grade (PG) mentioned in the following table, based on the performance grade of the company recommendations shall be given to the management for the corrective measures. These remedial actions taken shall rectify the errors in policy decisions of the management. Also, given appropriate regards to the look a head plan of the company, these corrective measures are to be taken. Managers might use these remedies to evaluate their company's financial position in relative to other construction companies Fig 6.12.1 shows comparison between Performance Index (PI) and Performance grade (PG) for all companies in

our study, observed that from fig according to the performance grade the pioneer position in construction Industry with only 40% of its companies have PI zero In table 6.12.1 shows the calculated values of company performance score, Industry performance score, Economical performance score, PI and PG for Larsen & toubro ltd, and the remaining companies scores can see in Appendix-III the variation of PG values for 5 consecutive year's period shown in Fig.6.12.2 Fig 6.12.3 shows the normal distribution of Performance Indexes of all selected companies includes PI of five consecutive year's period.

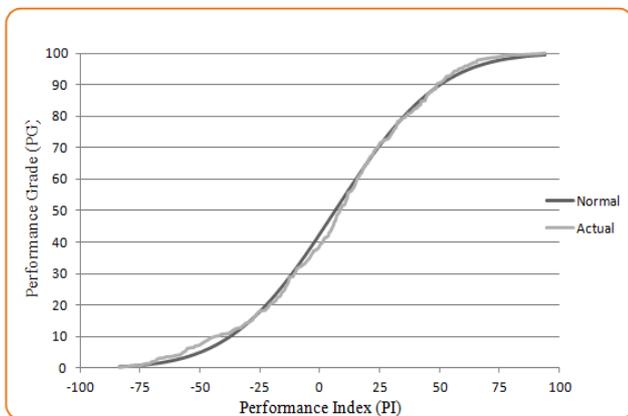


Fig 6.12.1 Performance grade Vs Performance Index

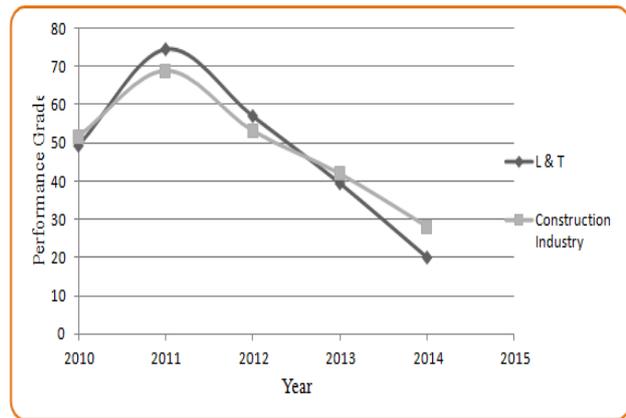


Fig 6.12.2 Performance grade comparison L&T Vs Total construction industry

Table 6.8.1 Performance grade (PG) for Larsen and Toubro Ltd:

YEAR	Sc	Se	Si	PI	PG
2011	-15.45	-6.25	-75.61	4.07	49.30
2012	0.08	-100.00	-90.24	48.82	74.49
2013	5.84	-6.25	-100.00	17.76	57.01
2014	1.24	56.25	-56.10	-13.46	39.44
2015	4.25	100.00	100.00	-47.88	20.06

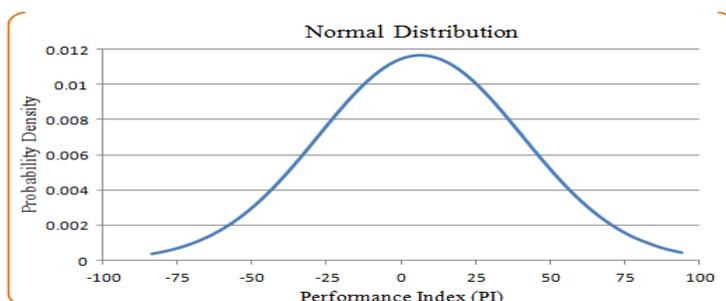


Fig 6.12.3 Performance Index (PI) Vs Probability density

6.9 RANKING OF THE CONSTRUCTION COMPANIES: Table 6.13.1 ranking the companies:

S.No	Name of the Company	PI	PG	Rank
1	TANTIA CONSTRUCTIONS LIMITED	38.16	100.00	1
2	THAKKERS DEVELOPERS LIMITED	37.16	98.40	2
3	PRAVEEN PROPERTIES LIMITED	29.78	86.58	3
4	NAVKAR BUILDERS LIMITED	28.14	83.95	4
5	TEMPUS INFRA PROJECTS PVT LTD	27.51	82.94	5
6	VIPUL LIMITED	26.67	81.60	6
7	RAINBOW FOUNDATIONS LIMITED	24.2	77.64	7
8	PRATHIBA INDUSTRIES LIMITED	22.14	74.34	8
9	ANSAL BUILDWELL LIMITED	19.53	70.16	9
10	RUCHI INFRASTRUCTURES LIMITED	19.12	69.50	10
11	HOUSING DEVELOPMENT & INFRASTRUCTURES LIMITED	18.11	67.88	11
12	PARSVNATH DEVELOPERS LIMITED	17.84	67.45	12
13	TRINETRA INFRA VENTURES LTD	17.76	67.32	13
14	UNIQUEST INFRASTRUCTURE LTD	16.91	65.96	14
15	OMAXE LIMITED	16.38	65.11	15
16	CCAP LIMITED	15.63	63.91	16
17	MSK PROJECTS (INDIA) LIMITED	15.44	63.61	17
18	SIMPLEX INFRASTRUCTURES LIMITE	14.27	61.73	18
19	HB ESTATE DEVELOPERS LIMITED	13.13	59.91	19
20	PENINSULA LAND LIMITED	13.01	59.71	20
21	ELDECO HOUSING & INDUSTRIES LIMITED	12.74	59.28	21
22	MARUTI INFRASTRUCTURES LIMITED	12.22	58.45	22
23	D S KULKARNI DEVELOPERS LIMITED	11.65	57.54	23
24	CONSOLIDATED CONSTRUCTION CONSORTIUM LIMITED	11.35	57.06	24
25	IVRCL INFRASTRUCTURES & PROJECTS LIMITED	10.8	56.17	25
26	RAGHAVA ESTATES LIMITED	10.76	56.11	26
27	ITD CEMENTATION INDIA LIMITED	9.92	54.77	27
28	SAAG RR INFRASTRUCTURES LIMITED	9.58	54.22	28
29	ARTSON ENGINEERING LIMITED	9.57	54.20	29
30	PETRON ENGINEERING CONSTRUCTION LIMITED	8.72	52.84	30
31	SUBHASH PROJECTS & MARKETING LTD	7.97	51.64	31
32	NAGARJUNA CONSTRUCTION COMPANY LIMITED	7.81	51.39	32
33	ORBIT CORPORATION LIMITED	7.52	50.92	33
34	TRIBHUVAN HOUSING LIMITED	7.38	50.70	34
35	PBA INFRASTRUCTURE'S LIMITED	7.22	50.44	35
36	JMC PROJECTS (INDIA) LIMITED	6.67	49.56	36
37	JAI PRAKASH ASSOCIATES LIMITED	6.42	49.16	37
38	SRINIVASA SHIPPING & PROPERTY DEV LIMITED	6.32	49.00	38
39	VIJAY SHANTI BUILDERS	6.32	49.00	39
40	LOK HOUSING & CONSTRUCTIONS LIMITED	5.49	47.67	40
41	GAYATHRI PROJECTS LIMITED	5.32	47.40	41
42	SIMPLEX PROJECTS LIMITED	5.32	47.40	42
43	IVR PRIME URBAN DEVELOPERS LIMITED	4.88	46.69	43
44	PURAVANKARA PROJECTS LIMITED	4.38	45.89	44
45	BHAGHEERATHA ENGINEERING LIMITED	4.13	45.49	45
46	ARIHANT FOUNDATIONS & HOUSING LIMITED	3.97	45.23	46
47	B L KASHYAP & SONS LIMITED	3.73	44.85	47
48	IRCON INTERNATIONAL LIMITED	3.27	44.11	48
49	LANCER HOLDINGS LIMITED	2.87	43.47	49
50	PATEL ENGINEERING LIMITED	2.69	43.18	50
51	ANSAL PROPERTIES & INFRASTRUCTURES LIMITED	2.6	43.04	51
52	NARENDRA PROPERTIES LIMITED	2.48	42.85	52
53	ASHIANA HOUSING & FINANCE (INDIA) LIMITED	2.06	42.18	53
54	LARSEN & TOUBRO LIMITED	1.86	41.85	54
55	PUNJ LLOYD LIMITED	1.61	41.45	55
56	RELIANCE INDUSTRIAL INFRASTRUCTURES LIMITED	1	40.48	56
57	CONART ENGINEERS LIMITED	0.53	39.72	57
58	SOBHA DEVELOPERS LIMITED	0.45	39.60	58
59	C & C CONSTRUCTIONS LIMITED	0.4	39.52	59
60	VIATON INFRASTRUCTURE LTD	-0.15	38.64	60
61	KAMANWALA CONSTRUCTION & HOUSING LIMITED	-0.17	38.60	61
62	ENGINEERS INDIA LIMITED	-0.43	38.19	62
63	ROMAN TARMAT LIMITED	-0.76	37.66	63
64	PRAJAY ENGINEERS SYNDICATE LIMITED	-1.4	36.63	64
65	ERA CONSTRUCTIONS (INDIA) LIMITED	-1.65	36.23	65
66	DLF LIMITED	-1.72	36.12	66
67	ANSAL HOUSING & CONSTRUCTION LIMITED	-1.78	36.02	67
68	KCP LIMITED	-2.59	34.73	68
69	GAMMON INDIA LIMITED	-2.88	34.26	69
70	UNITY INFRA PROJECTS LIMITED	-2.94	34.17	70
71	ORIENT LIMITED	-3.02	34.04	71
72	TRENCHLES ENGINEERING SERVICES	-4.47	31.72	72

73	HINDUSTAN CONSTRUCTION COMPANY LIMITED	-4.53	31.62	73
74	MAHINDRA LIFE SPACES LIMITED	-5.02	30.83	74
75	ANANT RAJ INDUSTRIES LIMITED	-5.16	30.61	75
76	MADHUCON PROJECTS LIMITED	-5.47	30.11	76
77	GMR INFRASTRUCTURES LIMITED	-5.9	29.42	77
78	PRIME PROPERTY DEVELOPMENT CORPORATION LIMITED	-5.92	29.39	78
79	MARG CONSTRUCTIONS LIMITED	-6.17	28.99	79
80	GARNET CONSTRUCTIONS LIMITED	-7.37	27.07	80
81	DCM SHRIRAM CONSOLIDATED LIMITED	-7.55	26.78	81
82	ATLANTA LIMITED	-7.59	26.72	82
83	UNITECH LIMITED	-8.7	24.94	83
84	LANCO INFRA TECH LIMITED	-8.86	24.68	84
85	MARTIN BURN LIMITED	-9.17	24.19	85
86	RADHE DEVELOPERS (INDIA) LIMITED	-9.18	24.17	86
87	KEC INFRASTRUCTURES LIMITED	-9.21	24.12	87
88	VICTORIA ENTERPRISES LTD	-9.21	24.12	88
89	DHURV ESTATES LIMITED	-10.08	22.73	89
90	WIRTGEN INDIA PVT LTD	-10.5	22.06	90
91	UNITED BREWERIES (HOLDINGS) LIMITED	-12.2	19.33	91
92	AKRUTI NIRMAN LIMITED	-12.69	18.55	92
93	ACROW INDIA LIMITED	-12.82	18.34	93
94	RANDER CORPORATION LIMITED	-12.88	18.24	94
95	NILA INFRASTRUCTURES LIMITED	-13.62	17.06	95
96	JAIHIND PROJECTS LIMITED	-14.01	16.43	96
97	NOIDA TOLL BRIDGE COMPANY LIMITED	-15.52	14.02	97
98	VALECHA ENGINEERING LIMITED	-17.1	11.48	98
99	REGALIA REALTY LIMITED	-21.32	4.73	99
100	ELNET TECHNOLOGIES LIMITED	-24.27	0.00	100

7.0 Edward Altman's Z score Model:

Altman is known for the development of the Z-Score formula, which he published in 1968. The Z-Score for predicting Bankruptcy is a multivariate formula for a measurement of the financial health of a company and a powerful tool that forecasts the probability of a company entering bankruptcy within a 2 year period. Most managers use ratio analysis to identify future failure of companies. Altman (1968) is of the opinion that ratios measuring profitability, liquidity, and solvency are the most significant ratios. From about 1985 onwards, the Z-scores gained wide acceptance by auditors, management accountants, courts, and database systems used for loan evaluation (Eidleman, 2003). However, it is difficult to know which is more important as various studies indicate different ratios as indicators of potential problems. For example, a company may have poor liquidity ratios and may be leads for liquidation. That same company's good profitability may escape the potential risk that is highlighted by the poor liquidity ratios. As a result, interpretation using traditional ratio analyses may be incorrect. Altman's 1968 model took the following form:

Where: Z=overall index

A= Working capital / Total Assets

B=Retained earnings/ Total Assets

C=EBIT / Total Assets

D=Market value of Equity/Book value of total debt

E=Sales / Total Assets

Z < then the firm classified as "Failed".

7.1.1 Altman's Revised Z-Score Model:

Rather than simply inserting a variable into an existing model to calculate the Z-Scores Altman advocated for a complete re-estimation of the model,

substituting the book values of equity for the Market value in D. This resulted in a change in the coefficients and in the classification criterion and related cut-off scores. The revised Z score model took the following form:

Where:

R1 = (Current Assets-Current Liabilities) / Total Assets

R2 = Retained Earnings / Total Assets

R3 = Earnings before Interest and Taxes / Total Assets

R4 = Book Value of Equity / Total Liabilities

R5 = Sales/ Total Assets

Zones of Discrimination:

Z' > 2.9 "Safe" Zone

1.23 < Z' < 2.9 "No conformation" Zone (Grey zone)

Z' < 1.23 "Distress" Zone

7.2 EMPIRICAL RESULTS:

Five common business ratios weighted by coefficients were used to calculate the Z-score. Weighted and summed up to arrive at an overall score that formed the basis for classification of firms into one of the a priori groupings (distressed and non-distressed).

The Z-score formula: $Z' = 0.717R1 + 0.847R2 + 3.107R3 + 0.420R4 + 0.998R5$.

The following zones of discrimination: Z' > 2.9 "Safe" Zone, 1.23 < Z' < 2.9 "Grey" Zone and Z' < 1.23 "Distress" Zone. All the companies which had a Z score below

1.23 were classified as companies in a distress zone, companies which had a Z score of between 1.23 and 2.9 were classified as companies in a No conformation zone while those companies which had a Z score above 2.9 were classified as companies in a safe zone. In a distress zone there is a high probability of bankruptcy for a firm, in a no conformation zone there is uncertainty whether the

firm be bankrupt or not, while in a safe zone there is a low probability of firm becoming bankrupt. The following table shows company with the state of the discrimination.

Edward Altman's financial distress prediction model is found out of 100 companies , 45 companies in safe zone,50 companies in grey zone and 5 companies is under Distress zone .

S.No	Company Name	Z-score	Zone
1	ACROW INDIA LIMITED	3.75	Safe
2	AKRUTI NIRMAN LIMITED	1.97	Grey
3	ANANT RAJ INDUSTRIES LIMITED	11.62	Safe
4	ANSAL BUILDWELL LIMITED	2.89	Grey
5	ANSAL HOUSING & CONSTRUCTION LIMITED	1.98	Grey
6	ANSAL PROPERTIES & INFRASTRUCTURES LIMITED	2.2	Grey
7	ARIHANT FOUNDATIONS & HOUSING LIMITED	1.96	Grey
8	ARTSON ENGINEERING LIMITED	3.97	Safe
9	ASHIANA HOUSING & FINANCE (INDIA) LIMITED	12.29	Safe
10	ATLANTA LIMITED	1.84	Grey
11	B L KASHYAP & SONS LIMITED	4.42	Safe
12	BHAGHEERATHA ENGINEERING LIMITED	8.14	Safe
13	C & C CONSTRUCTIONS LIMITED	2.36	Grey
14	CCAP LIMITED	4.48	Safe
15	CONART ENGINEERS LIMITED	1.43	Grey
16	CONSOLIDATED CONSTRUCTION CONSORTIUM LIMITED	8.24	Safe
17	D S KULKARNI DEVELOPERS LIMITED	2.06	Grey
18	DCM SHRIRAM CONSOLIDATED LIMITED	2.23	Grey
19	DHURV ESTATES LIMITED	5.18	Safe
20	DLF LIMITED	1.45	Grey
21	ELDECO HOUSING & INDUSTRIES LIMITED	5.12	Safe
22	ELNET TECHNOLOGIES LIMITED	2.03	Grey
23	ENGINEERS INDIA LIMITED	3.29	Safe
24	ERA CONSTRUCTIONS (INDIA) LIMITED	2.01	Grey
25	GAMMON INDIA LIMITED	3.07	Safe
26	GARNET CONSTRUCTIONS LIMITED	9.8	Safe
27	GAYATHRI PROJECTS LIMITED	2.38	Grey
28	GMR INFRASTRUCTURES LIMITED	4	Safe
29	HB ESTATE DEVELOPERS LIMITED	3.69	Safe
30	HINDUSTAN CONSTRUCTION COMPANY LIMITED	2.07	Grey
31	HOUSING DEVELOPMENT & INFRASTRUCTURES LIMITED	2.91	Safe
32	IRCON INTERNATIONAL LIMITED	7.42	Safe
33	ITD CEMENTATION INDIA LIMITED	3.31	Safe
34	IVR PRIME URBAN DEVELOPERS LIMITED	2.58	Grey
35	IVRCL INFRASTRUCTURES & PROJECTS LIMITED	3.02	Safe
36	JAI PRAKASH ASSOCIATES LIMITED	3.06	Safe
37	JAIHIND PROJECTS LIMITED	1.46	Grey
38	JMC PROJECTS (INDIA) LIMITED	4.89	Safe
39	KAMANWALA CONSTRUCTION & HOUSING LIMITED	2.23	Grey
40	KCP LIMITED	4.61	Safe
41	KEC INFRASTRUCTURES LIMITED	3.51	Safe
42	LANCER HOLDINGS LIMITED	2.74	Grey

43	LANCO INFRA TECH LIMITED	1.88	Grey
44	LARSEN & TOUBRO LIMITED	4.39	Safe
45	LOK HOUSING & CONSTRUCTIONS LIMITED	3.54	Safe
46	MADHUCON PROJECTS LIMITED	2.51	Grey
47	MAHINDRA LIFESPACES LIMITED	5.43	Safe
48	MARG CONSTRUCTIONS LIMITED	1.93	Grey
49	MARTIN BURN LIMITED	2.07	Grey
50	MARUTI INFRASTRUCTURES LIMITED	2.85	Grey
51	MSK PROJECTS (INDIA) LIMITED	1.92	Grey
52	NAGARJUNA CONSTRUCTION COMPANY LIMITED	2.87	Grey
53	NARENDRA PROPERTIES LIMITED	2.69	Grey
54	NAV KAR BUILDERS LIMITED	4.87	Safe
55	NILA INFRASTRUCTURES LIMITED	2.18	Grey
56	NOIDA TOLL BRIDGE COMPANY LIMITED	1.61	Grey
57	OMAXE LIMITED	1.93	Grey
58	ORBIT CORPORATION LIMITED	2.58	Grey
59	ORIENT LIMITED	2.84	Grey
60	PARSVNATH DEVELOPERS LIMITED	2.13	Grey
61	PATEL ENGINEERING LIMITED	2.43	Grey
62	PBA INFRASTRUCTURES LIMITED	1.98	Grey
63	PENINSULA LAND LIMITED	2.71	Grey
64	PETRON ENGINEERING CONSTRUCTION LIMITED	6.35	Safe
65	PRAJAY ENGINEERS SYNDICATE LIMITED	2.78	Grey
66	PRATHIBA INDUSTRIES LIMITED	3	Safe
67	PRAVEEN PROPERTIES LIMITED	1.56	Grey
68	PRIME PROPERTY DEVELOPMENT CORPORATION LIMITED	3.22	Safe
69	PUNJ LLOYD LIMITED	2.56	Grey
70	PURAVANKARA PROJECTS LIMITED	2.03	Grey
71	RADHE DEVELOPERS (INDIA) LIMITED	16.11	Safe
72	RAGHAVA ESTATES LIMITED	1.34	Grey
73	RAINBOW FOUNDATIONS LIMITED	2.01	Grey
74	RANDER CORPORATION LIMITED	15.92	Safe
75	REGALIA REALTY LIMITED	3.08	Safe
76	RELIANCE INDUSTRIAL INFRASTRUCTURES LIMITED	3.63	Safe
77	ROMAN TARMAT LIMITED	3.01	Safe
78	RUCHI INFRASTRUCTURES LIMITED	0.18	Distress
79	SAAG RR INFRASTRUCTURES LIMITED	3.26	Safe
80	SIMPLEX INFRASTRUCTURES LIMITED	3.48	Safe
81	SIMPLEX PROJECTS LIMITED	1.87	Grey
82	SOBHA DEVELOPERS LIMITED	2.5	Grey
83	SRINIVASA SHIPPING & PROPERTY DEV LIMITED	3.86	Safe
84	SUBHASH PROJECTS & MARKETING LTD	3.22	Safe
85	TANTIA CONSTRUCTIONS LIMITED	2.18	Grey
86	TEMPUS INFRA PROJECTS PVT LTD	1.37	Grey
87	THAKKERS DEVELOPERS LIMITED	17.08	Safe
88	TRENCHLES ENGINEERING SERVICES	1.24	Grey
89	TRIBHUVAN HOUSING LIMITED	1.09	Distress

90	TRINETRA INFRA VENTURES LTD	3.12	Safe
91	UNIQUEST INFRASTRUCTURE LTD	2.38	Grey
92	UNITECH LIMITED	2.96	Safe
93	UNITED BREWERIES (HOLDINGS) LIMITED	2.02	Grey
94	UNITY INFRA PROJECTS LIMITED	3.97	Safe
95	VALECHA ENGINEERING LIMITED	1.22	Distress
96	VIATON INFRASTRUCTURE LTD	0.61	Distress
97	VICTORIA ENTERPRICES LTD	0.61	Distress
98	VIJAY SHANTI BUILDERS	3.64	Safe
99	VIPUL LIMITED	10.91	Safe
100	WIRTGEN INDIA PVT LTD	2.19	Grey

CONCLUSION:

Based on my study the following conclusions have been drawn: Identified the seven factors which are important indicators of the construction industry they are liquidity factor, activity factor, long-term solvency, efficiency, profitability, asset management, inventory factors. A performances result shows that the performance of Indian construction industries in our study has been diminishing year by year. The reason might be continuous economic crises and still continuous the stagnation. The performance grades of the Indian construction industry shows that pioneer position of the construction sector have 40% of companies under Zero performance index. The government should analyse the financial state of the construction industry urgently and undertake related action. From discriminate analysis shows that 45 % companies in safe zone, 5% of companies in Distress zone and remaining 55% companies under grey zone. Performance evaluation study provide a basis for the governments to undertake corrective action Meanwhile, in order to start any action a realistic and continuous review of the industry is a necessity.

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Comparison of Conventional, Aluminium and Tunnel Formwork

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Abstract- Construction industry is having biggest role in economy of India. In recent times, if we look at the global economy and growth of population in India, land acquisition has become more difficult. To fulfill the need of shelter of this growing population and increasing industrialization, speedy construction is the necessity of time. Same time, due to inadequacy of land Vertical growth is preferable than Horizontal one. Formwork plays an important role in construction of the buildings. It constitutes 20% cost and 60% time of the total construction. This project does the comparison of the Conventional Formwork, Tunnel Formwork and Aluminum Formwork systems.

Index Terms- Conventional Formwork, Tunnel Formwork, Aluminium Formwork, Construction Cost, time

I. INTRODUCTION

Formwork is a temporary structure which supports fresh concrete till it becomes strong enough to sustain its own weight. After setting of concrete, the formwork is removed and a solid structure of required shape and size is produced. This is the very important element in the construction of building. For many years, in the field of construction, use of conventional i.e. wooden formwork was a regular practice. Now the scenario of construction field is much different, but the study is needed in order to choose the suitable Formwork with different perspectives. Cost, time are the basic parameters but along with that we should also focus on quality, safety and construction waste generation during the process.

Now days, low waste formwork systems for construction are being used. The large sized columns in buildings are now being replaced by small thickness shear/RCC Walls. So it gives a large carpet area and removal of offsets in the building. Also the quality of construction is getting upgraded. At the present time, many formwork solutions are available in the market, but the study has to be done in order to choose the best formwork for any particular type of building.

II. DATA COLLECTION

2.1 Basic types of formwork

1. Conventional Formwork
2. System Formwork

As the name system itself gives the idea that it must be well organized and time saving also.

The quality of conventional formwork degrades as the repetition increases and also it needs proper maintenance in order to get more repetitions. So to avoid this, the comparison between different types of Formwork is needed in order to maintain the quality of construction. Also the current formwork field in India is labour intensive and also skilled labours are also lacking. So to avoid or minimize the manual errors, System formwork is being adopted by the contractors for speedy and economic construction.

Frequency of accidents in Reinforced Cement Concrete (RCC) construction because of

inferior formwork and scaffolding is also accountable. So system Formwork has the challenge of safety during the construction along with faster completion of the projects.

2.2 Conventional Formwork

The most common material used for formwork of wall is the Plywood sheet in which it is used in combination with timber. Normally, wall forms are framed panels with the plywood facing sheet connected to a timber frame. If the special attention is not given to the corners and joints of the panels, grout may come out in the form of slurry which will lead to poor quality construction.

The cycle time for one floor with the use of conventional formwork is minimum 3-4 weeks. Also the block or Brick work and plastering is needed in order to get the finished surface. This takes more time and skilled labours too. This ultimately increases the time required for the completion of the project.

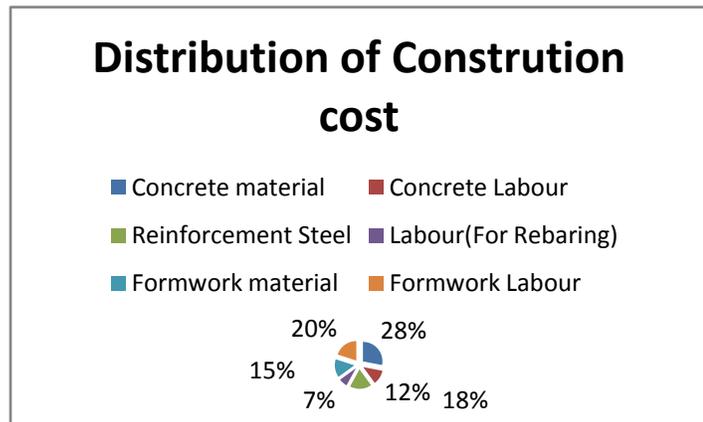
2.3 System Formwork

The name System Formwork itself clears that the approach is systematic. Speed in construction activities will lead to faster completion of project. This will save the time and ultimately money involved in it.

Currently in India other types of Formworks are also available. Different range of systems of formwork gives wide solutions to

construction of concrete which suits the requirements of a particular building. The choice of such Formwork system changes and depends upon required slab cycle, required quality of construction and budget or funds available for the project . Out of them ,Tunnel Formwork and Aluminium formwork are the two leading systems.

The distribution of the construction cost is as shown below in pie chart 2.3



2.3 Distribution of Construction cost

2.3.1Aluminum Formwork

This is the formwork which can be a good option for timely completion of construction with maximum efficiency. In this system an Aluminium alloy Al-6061-T6 is normally used. This can withstand the load of about 65 KN/m2. In this system of Formwork ,Aluminium panels are placed vertically , attached to each other with the help of stub pins and wedge pins. In this basically three types of panels are there:

1. Wall-Wall(with and without Rocker ,Wall Top panel, Wall End Panel
2. Beam-Beam panels, Beam Bottom panels, Beam props
3. Slab- Slab panels, Slab prop

Also in addition to this, many types of accessories are also needed in order to maintain the verticality and alignment of wall. Those are wailers, wire rope, ACT props(Adjustable Collapsible Telescopic)

2.3.2 Tunnel Formwork

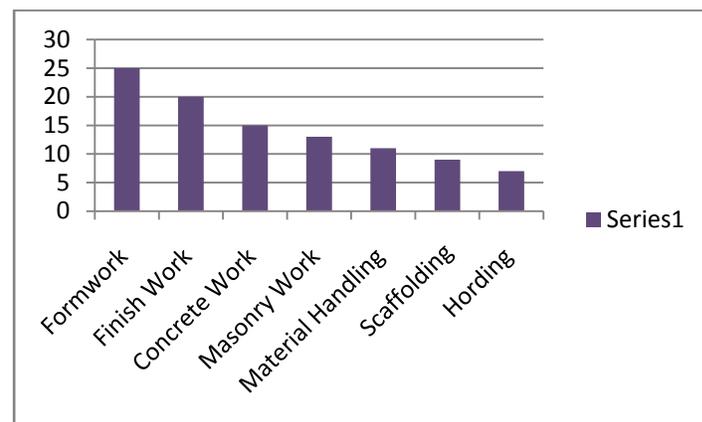
Tunnel formwork system is used for a multi storied building construction in order to reduce cycle time .As this is the type of system formwork slab & the wall are cast monolithically. So Tunnel Formwork is a fast-track construction method .It is best suited for repetitive type cellular projects. Different components of this system are made up of steel.

Normally used for the rooms with span between 2.5m to 6.5 m. If the span exceeds 11m then the new component called Mid-Span Table is introduced .There are no loose fittings in this system of formwork.

Basic and the main component of the Tunnel formwork is Half tunnel. When these two tunnels are joined together , it forms Tunnel. It is available in two lengths i.e. 1.2 &2.5m.

2.3.3 Construction waste generation

Construction waste generated during the complete process of formation of a building is also a matter of concern which make us to turn towards Low Waste housings. The System Formwork van give better results than Conventional Formwork for this aspect of comparison. The Following chart 2.3.3 gives an idea about the percentage contribution of each item in the generation of construction waste .



2.3.3Construction waste generation

2.3.4: Table for Cost analysis for Conventional villa N F 30X40

Sl. No	Scope of work	Units	Quantity	Rate/Unit (in Rs.)	Amount (In Rs.)
1	Laying Plain cement concrete	m ³	14.51	4,400	63,844
2	Laying Reinforced cement concrete	m ³	18.28	8,500	1,55,380
3	Laying Reinforced cement concrete (for column)	m ³	8.91	8,500	75,735
4	Laying Reinforced	m ³	3.25	8,500	27,625

	cement concrete				
5	Laying Reinforced cement concrete	m ³	22.98	8,500	1,95,330
	(for slab)				0
6	Laying Reinforced cement concrete (for chejja ,Lintels)	m ³	3	8,500	25,500
7	Providing and removing centring, shuttering (for flat surfaces)	m ²	166	240	39,840
8	Providing and removing centring, shuttering (for stairs)	m ²	33.93	374	1,94,779
9	Providing and removing centring, shuttering (for columns)	m ²	149.45	282	42,144.9
10	Providing and removing centring, shuttering (for beams)	m ²	186.05	206	38,326.3
11	Reinforcement for RCC works	MT	7.35	63875	4,69,481.25
12	Precast concrete Solid blocks	m ²	186.29	725	1,35,060.25

	Size- (40x15x20)				
13	Precast concrete Solid blocks Size- (40x10x20)	m ²	62.76	710	44,559.60
14	Providing 12mm thick cement plaster (for internal walls)	m ²	393.56	362	1,42,468.72
15	Providing rough cement plastering 15mm thick (for dadoing)	m ²	69.92	318	22,234.56
16	Providing 12mm thick cement plaster (for ceiling)	m ²	158.74	362	57,463.88
17	Providing 20mm thick cement plaster external	m ²	359.35	385	1,38,349.75
Total in Rs/-					19,29,582.91

2.3.5: Table for Cost analysis for Aluminium formwork villa NF 30X40

Sl. No	Scope of work	Units	Qty.	Rate / Unit (in Rs.)	Amount (In Rs.)
1	Providing and laying cement concrete (For	m ³	44.2	5,186	2,29,221.20

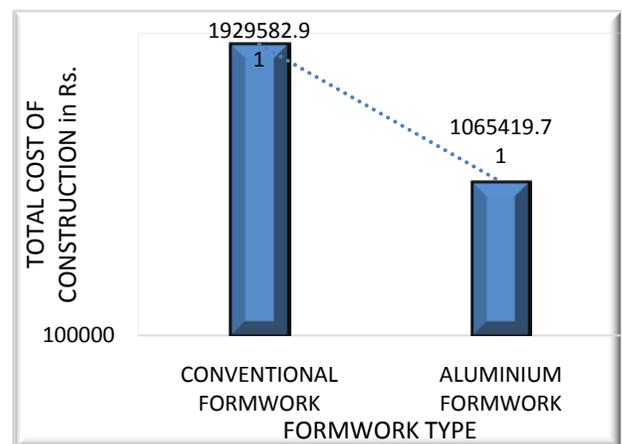
	Monolithic shear walls)				
2	Providing and laying cement concrete (For Beam)	m ³	1.58	5,186	8,193.88
3	Providing and laying cement concrete (For slabs)	m ³	18.54	5,186	96,148.44
4	Providing and laying cement concrete (For chejjas)	m ³	0.89	5,186	4,615.54
5	Providing and laying cement concrete (For staircase)	m ³	2.86	5,186	14,831.96
6	Providing and removing centring, shuttering (For Slabs)	m ²	131.53	300	39,459
7	Providing and removing centring, shuttering (For Monolithic shear walls)	m ²	748.99	300	2,24,697
8	Providing and removing centring, shuttering (For stairs)	m ²	21.28	300	6,384
9	Providing and removing centring, shuttering (For Lintel	m ²	5.9	300	1,770

	Beam)				
11	Steel reinforcement for RCC works	MT	6.89	63875	4,40,098.75
Total in Rs/-					10,65,419.77

2.3.6: Table for Estimated cost of Conventional formwork and Aluminium formwork Construction

Sl. No	Wing type	Type of formwork used	Estimated cost (in Rs.)
1	NF	Conventional formwork	19,29,582.91
2	NF	Aluminium formwork	10,65,419.77
Saving in cost			8,64,163.14
% Saving in cost			44.78

2.3.7: Figure for Cost of conventional formwork and aluminium formwork construction



2.3.8 Saving in the cost of formwork material

Sl. No	Description	Aluminium Formwork	Conventional Formwork
1	Formwork area for NF 30X40	907.7m ²	907.7 m ²
2	No. of repetitions available	150	13
3	Total area of shuttering work that can be carried out by a single set of formwork	136155 m ²	11800.1 m ²
4	Number of sets required for shuttering for villa	1	12
5	Procurement cost/m ²	Rs. 11250	Rs. 600
6	Procurement cost to finish a shuttering work of villa for 136155 m ²	(No. of sets x Area of single set of formwork x cost/m ²) = 1,02,11,625	(No. of sets x Area of single set of formwork x cost/m ²) = 65,35,440
7	Scrap value @ Rs.128/kg (1m ² =30 kg)	Rs. 3485568	Rs. 0
8	Total investment	Rs. 6726057	Rs. 6535440

9	Formwork cost/m ²	Rs. 49.4	Rs. 553.84
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2.3.9 Time analysis

Planning for 100 Villa (aluminium formwork)

- Total number of villas= 100
- Number of aluminium formwork sets available at site= 1 full set
- 1 full set requires 25 days to complete concreting of one villa
- Number of days required to complete ground floor of 100 the villa = (100/1)*10 = 1000 days.
- Total number of days required complete 100 villas with one set of aluminium form work =1000+15=1015 days
- Note – To complete 100 the villa we need extra 15 days after ground floor.
- Construction period in above example:
- Ground floor slab –10 days
- First floor slab – 10 days
- Terrace floor Slab – 5 days
- Total = 1015days = 39.03 months considering 26 working days per month.
- Total days required to complete the finishing works of villa =2 months
- Total construction period will be about 41.03 months for 100 villas, if only one set of aluminium formwork is used for construction.
- Planning for 100 villas (Conventional formwork).
- Ground floor slab –41days.
- First floor slab – 31 days.
- Terrace floor Slab – 10 days.
- Total days required for one villa =82days.
- Total number of villas= 100.

Number of day conventional formwork sets available at site= 8 full set /13 repetitions

1 full set requires 82 days to complete concreting of one villas
required to complete 100th villa = $(13 \times 82) = 1066$ days.

- Time necessary to complete the Block work and plastering works = 40 days.
- Time essential to complete the finishing works of villa = 120 days.
- Total number of days required to complete 100 villas = $1066 + 40 + 120 = 1226$ days.

Total construction period will be about 47.15 months for 100 villas, if we use 8 sets of formwork with 13 repetitions of Conventional formwork is used for construction.

III. CONCLUSION

The time plays the main role in the cost of any project and is greatly affected by the type of system adopted. The case study will be helpful for the choice of formwork to be used in coming future. Also this will be helpful to minimize the construction waste due to the formwork.

- From the results obtained we came to a finale that when the aluminium formwork is utilized in the Villa project, the sum project cost can be reduced by nearly 40 % and the duration of the project can be reduced by 50% compared to conventional formwork.
- Although the Aluminium system formwork is the most costly formwork type in terms of high initial cost, it proves to be economical if the number of repetitions is between 200 and 250 in construction of villa project.
 - Mean while the highest total expenditure is obtained when contemporary conventional kind of formwork is utilized in the building project which is the slightest costly formwork sort.
 - A floor cycle of 3-10 days can be obtained using aluminium formwork and hence the whole project time will be condensed.

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Starting, Steady-State Modelling and Simulation Studies Of Single-Phase Transfer-Field Reluctance Motor, Operating In the Asynchronous Mode

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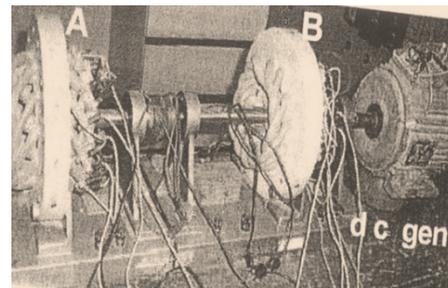
Abstract- The work presents starting, steady-state modelling and simulation studies of single-phase transfer field reluctance motor operating in the asynchronous mode from which the performance indices could be predicted. The machine is made up of two similar motors that are integrally wound and mechanically coupled together, but with their pole axes 0.5π degree out of phase in space. The transfer field machine in general is a low speed machine operating at half the synchronous speed of a normal induction machine. The equivalent circuit of the machine is derived using d-q-o transformation fundamentals. The speed range of the machine unlike the normal induction machine counterpart with slip range $0 \leq s \leq 2$, has a corresponding slip range $0.5 \leq s \leq 1.5$. The simulation results reveal a good similarity in its steady state characteristics with that of the existing normal single phase induction motor counterpart. Obviously, all single phase asynchronous motors are not self starting. They suffer the severe problem of getting the rotor rotate when started. The designed value of capacitor necessary for satisfactory starting performance of the machine is also discussed. Due to its inherent half speed characteristics, the possible areas of application are limited and are also suggested in the work.

Index Terms- asynchronous mode, single-phase transfer field machine, induction machine, slip, half-speed, clockwise rotating field, counter-clockwise rotating field.

I. INTRODUCTION

Basically, the asynchronous machines are those machines whose rotors rotate at speeds other than the synchronous speed of the rotating magnetic field in the air gap (Obute et al 2010). These machines are notably induction machines and transfer field machines. The asynchronous machine is reversible in the sense that it can operate as either a motor or a generator at a time. The mode of operation of the machine is a function of the speed of the rotating field in relation to the rotor. In reality, all asynchronous machines are basically motors. The single phase operation of the induction motor dates over several decades ago. However, the single phase operation of transfer field reluctance motor is new and gradually gaining ground in literature. In general, a reluctance machine is an electric machine in which torque is produced by the tendency of a movable part to move into a position where the inductance of an energized phase

winding is a maximum. The single phase transfer field reluctance machines are basically single-phase induction motors built with variable air-gap reluctance and with no d.c. supply on the rotor. The machine in its most primitive form comprises two identical salient-pole machines (A&B) whose rotors are mechanically coupled together but with their pole axes displaced by 0.5π electrical radians in space. Each machine unit has two sets of windings, identifiable as main and auxiliary windings respectively. The main windings of both machines are connected in series. The auxiliary windings are also connected in series but are transposed and short-circuited. No winding (conductor) is necessary in either of the rotors. The pictorial/connection diagrams are shown in fig. 1 (a and b) respectively. This class of machines has a peculiar advantage over the normal induction motor counterpart from the control point of view, since the auxiliary winding terminals, which act as the rotor conductors in normal induction machines are readily available without the use of slip-rings or current gears (Agu 1978).



(a)

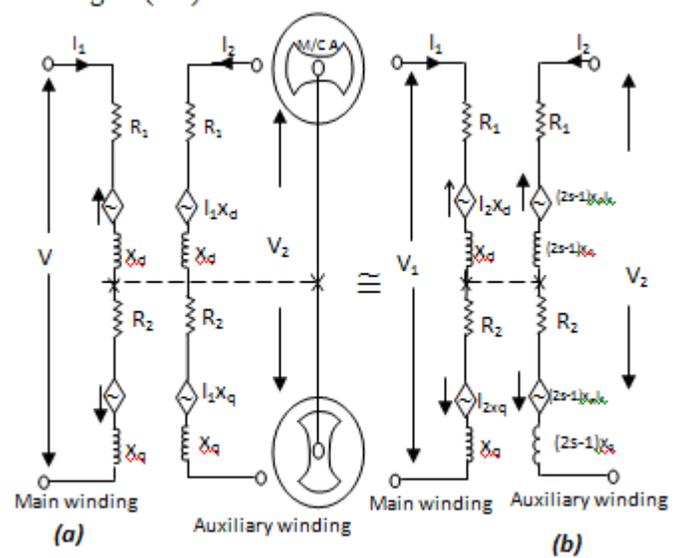
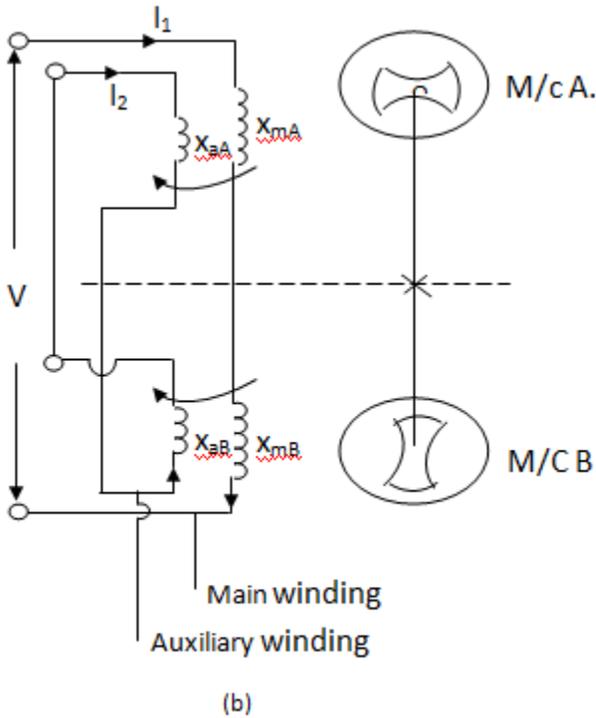


Fig. 2 - Modified circuit models of single phase transfer field reluctance motor

- a) – Motor under standstill condition ($s = 1$)
- b) – Motor under running condition at variable slip ($2s-1$)

Where

I_1 = Main winding current of machine A and B, I_2 = Auxiliary winding current of machine A and B, X_{mA} , = Main winding reactance of machine A, X_{MB} = Main winding reactance of machine B, X_{aA} , = Auxiliary winding reactance of machine A, X_{aB} , Auxiliary winding reactance of machine B, V = Supply voltage.

Fig. 1a – The pictorial diagram of transfer field reluctance motor (Courtesy of machine laboratory University of Nigeria Nsukka)

b – The connection diagram of transfer field reluctance motor

II. EQUIVALENT CIRCUIT OF SINGLE PHASE TRANSFER FIELD RELUCTANCE MOTOR

In the course of developing the equivalent circuit of single phase transfer field motor, fig. 1b is redrawn for clarity and then analysed as shown in Fig. 2 (a/b) below:

From fig 2a,

$$V_1 = I_1(R_1+R_2) + I_2 x_d - I_2 x_q + I_1(x_d+x_q) \\ = I_1 (R_1+R_2) + I_1 (x_d+x_q) + I_2(x_d-x_q) \quad \dots 1$$

Since windings are identical, $R_1 = R_2$

$$\therefore V_1 = 2I_1 R_1 + I_1 (x_d+x_q-x_d+x_q) + I_1 (x_d-x_q) + I_2(x_d-x_q) \\ = (2R_1 + 2x_q)I_1 + (x_d-x_q) [I_1+I_2] \quad \dots 2$$

Similarly, from fig 2b,

$$V_2 = I_2(R_1+R_2) + (2s-1)x_d I_1 - (2s-1)x_q I_1 + (2s-1)x_d I_2 + (2s-1)x_q I_2 \quad \dots 3$$

Since windings are identical, $R_1 = R_2$

$$\therefore V_2 = 2R_2 I_2 + I_2 [(2s-1)x_d + (2s-1)x_q] + I_1 [(2s-1)x_d - (2s-1)x_q] \\ \frac{V_2}{(2s-1)} = \frac{2R_2 I_2}{(2s-1)} + I_2 [x_d + x_q] + I_1 [x_d - x_q] \\ \Rightarrow \frac{V_2}{(2s-1)} = \frac{2R_2 I_2}{(2s-1)} + I_2 (x_d + x_q - x_d + x_q) + I_2 (x_d - x_q) + I_1 (x_d - x_q) \\ \Rightarrow \frac{V_2}{(2s-1)} = \frac{2R_2 I_2}{(2s-1)} + 2x_q I_2 + (x_d - x_q) [I_2 + I_1] \\ \frac{V_2}{(2s-1)} = \left[\frac{2R_2 + 2x_q}{(2s-1)} \right] I_2 + (x_d - x_q) [I_2 + I_1] \quad \dots 4$$

From the analysis of the circuit of fig. 2, it could be observed that equations 2 and 4 result in an equivalent circuit shown in fig 3 below.

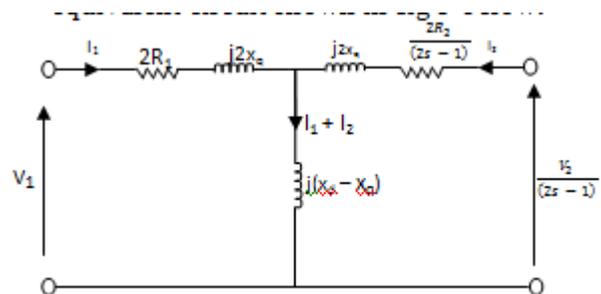


Fig. 3 - Equivalent circuit of single-phase reluctance motor
 Since the auxiliary winding of Fig. 1b is short-circuited; then fig. 3 yields $\frac{V_2}{2s-1} = 0$.
 Hence Fig 3 is redrawn as below;

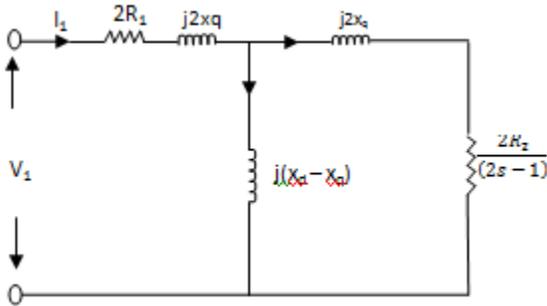


Fig 4 - Equivalent circuit of the machine when the output voltage $\frac{V_2}{2s-1}$ of Fig 3 is shorted.

Table 1 – Parameters of the experimental machine of fig. 1

Parameter	Value
L_{md}	133.3mH
L_{mq}	25.6mH
$L_m = L_a$	25.6mH
L_s	24mH
$r_m = r_a$	3.0Ω
r_s	2.5Ω
V	220V
F	50Hz
J	$1.98 \times 10^{-3} \text{ kgm}^3$
No of poles P	2

From fig. 4 and table 1.

If $2R_1 = r_m, 2X_q = X_m = X_a$
 $2R_2 = r_a, X_d - X_q = X_{ma}, NB - (X=2\sqrt{r}FL)$

Then fig. 4 can be redrawn as below;

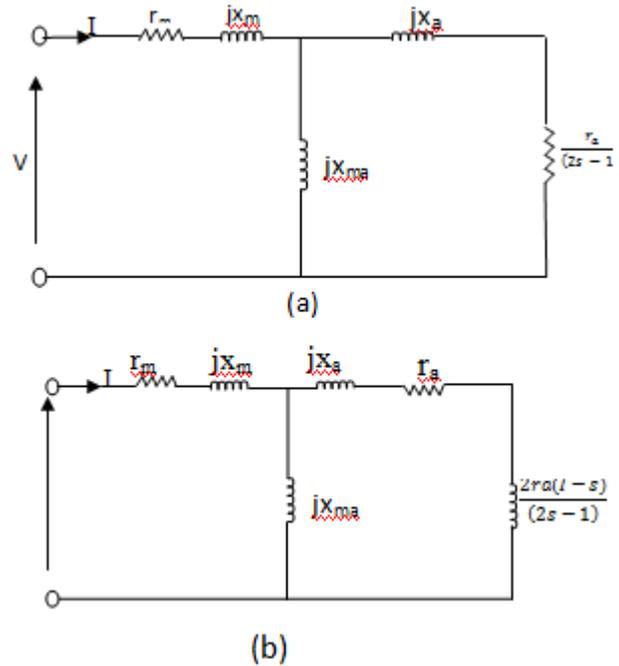


Fig. 5 (a/b) – Steady-state equivalent circuits of single phase transfer field motor with the machine parameters.

III. ROTOR SLIP WITH RESPECT TO TWO ROTATING FIELDS.

All single phase asynchronous motors suffer from a severe handicap. Since there is only one phase on the stator winding, the magnetic fields in all single-phase asynchronous motors do not rotate. Instead it pulses, getting first larger and then smaller, but always remaining in the same direction. Because there is no rotating stator magnetic field, all single-phase asynchronous motors have no starting torque.

However, once the rotor begins to turn, an induced torque will be produced in it. This stationary pulsating magnetic field of single phase motor can be resolved into two rotating magnetic fields, each of equal magnitude but rotating in opposite directions. The motor responds to each magnetic field separately, and the net torque in the machine will be the sum of the torques due to each of the two magnetic fields (Stephen Chapman 2005).

The flux density (B_s) of the stationary magnetic field is given by,
 $B_{s(t)} = B_{max} \cos\omega t \dots 1$

A clockwise-rotating magnetic field (B_{cw}) can be expressed as;

$$B_{cw(t)} = (0.5 B_{max} \cos\omega t) \hat{i} + (0.5 B_{max} \sin\omega t) \hat{j} \dots 2$$

Similarly, a counter clockwise –rotating magnetic field (B_{ccw}) can be expressed as;

$$B_{ccw(t)} = (0.5 B_{max} \cos\omega t) \hat{i} + (0.5 B_{max} \sin\omega t) \hat{j} \dots 3$$

Hence, equation 1 becomes;

$$B_s(t) = B_{cw(t)} + B_{ccw(t)} \dots 4$$

For the single phase transfer field reluctance motor, the reaction between the fields created by the current in the main winding, causes the rotation of the rotor. The difference between the rotor speed (ω_r) and the synchronous speed (ω) is the slip(s), usually given as a percentage of the synchronous speed.

The size of mechanical load on the motor varies directly as the slips (s) and inversely as the rotor speed (ω_r). So far, the

characteristic features of single phase reluctance motor is similar to that of a normal induction motor counterpart, but with synchronous speed being half that of the normal synchronous motor.

If we let us suppose that;

ω_R = synchronous speed of the transfer field motor, then from the foregoing expression;

$$\omega_R = 0.5\omega \quad \dots 5$$

Generally, for normal induction machine, slip s , ω_r and ω are related by;

$$\omega_r = \omega (1-s) \quad \dots 6$$

Similarly, for the half speed machine of our concern, the slip (S_{cw}) with respect to clockwise rotating field is given by;

$$S_{cw} = \frac{\omega_R - \omega_r}{\omega_R} \quad \dots 7$$

By substituting equation 5 into equation 7, we have;

$$S_{cw} = \frac{\omega - 2\omega_r}{\omega} \quad \dots 8$$

Also, the rotor direction of rotation is in opposition to that of the counter clockwise rotating field, therefore, the slip (S_{ccw}) with respect to the counter clockwise rotating field is;

$$S_{ccw} = \frac{\omega_R - (-\omega_r)}{\omega_R} = \frac{\omega_R + \omega_r}{\omega_R} \quad \dots 9$$

By substituting equation 5 into 9, we have;

$$S_{ccw} = \frac{\omega + 2\omega_r}{\omega} \quad \dots 10$$

Hence, substituting equation 6 into 8 and 10, we have;

$$S_{cw} = \frac{\omega - 2\omega(1-s)}{\omega} = 2s - 1 \quad \dots 11$$

Similarly,

$$S_{ccw} = \frac{\omega + 2\omega(1-s)}{\omega} = 3 - 2s \quad \dots 12$$

If the clockwise and counterclockwise rotation of the machine at slip s is considered, then fig 5a is modified as below;

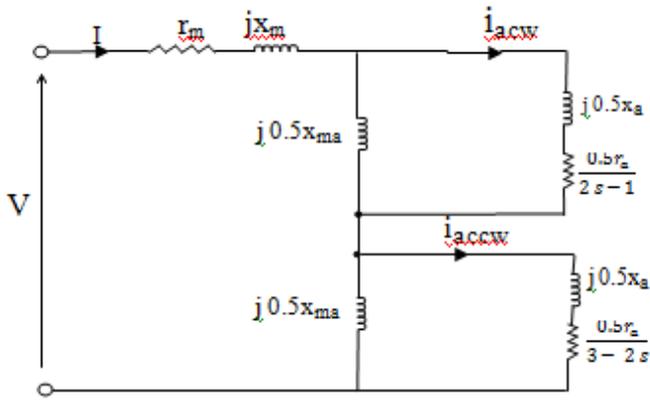


Fig. 6 – Modified equivalent circuit of single phase transfer-field reluctance machine rotating at slip s

From the modified equivalent circuit of fig. 6, let Z_{cw} and Z_{ccw} be the impedances due to clockwise and counter clockwise rotating field respectively.

$$\text{Hence, } Z_{cw} = \frac{\left(\frac{0.5r_a}{2s-1} + j0.5X_a\right) (j0.5X_{ma})}{\left(\frac{0.5r_a}{2s-1} + j0.5X_a\right) + (j0.5X_{ma})} \quad \dots 13$$

$$Z_{ccw} = \frac{\left(\frac{0.5r_a}{3-2s} + j0.5X_a\right) (j0.5X_{ma})}{\left(\frac{0.5r_a}{3-2s} + j0.5X_a\right) + (j0.5X_{ma})} \quad \dots 14$$

Similarly, for the series arm, let $Z_m = r_m + jX_m$... 15

$$\therefore \text{ Total impedance of the circuit } Z_T = Z_m + Z_{cw} + Z_{ccw} \quad \dots 16$$

$$\Rightarrow I = \frac{V}{Z_T} \quad \dots 17$$

More-still, by current division principle;

$$i_{acw} = \left[\frac{j0.5X_{ma}}{\left(\frac{0.5r_a}{2s-1} + j0.5X_a\right) + (j0.5X_{ma})} \right] I \quad \dots 18$$

Similarly;

$$i_{accw} = \left[\frac{j0.5X_{ma}}{\left(\frac{0.5r_a}{3-2s} + j0.5X_a\right) + (j0.5X_{ma})} \right] I \quad \dots 19$$

IV. POWER ACROSS AIR – GAP, OUTPUT POWER AND TORQUE IN SINGLE PHASE TRANSFER FIELD RELUCTANCE MOTOR.

Mechanical power and torque can be computed by application of power and torque relations. The torques produced by the clock-wise (cw) and counter clockwise (ccw) fields each can be treated. The interactions of the oppositely rotating flux and mmf waves cause torque pulsations and twice stator frequency but produce no average torque.

Hence, the performance characteristics of single-phase transfer field reluctance motor can be obtained by a close analysis of the circuit model of the motor given in fig. 6.

The air-gap power delivered by the stator winding to the clock-wise field ($P_{g_{cw}}$) and the counter clockwise field ($P_{g_{ccw}}$) are given by;

$$P_{g_{cw}} = \left(\frac{0.5r_a}{2s-1}\right) (i_{acw})^2 \text{ watts} \quad \dots 20$$

Similarly,

$$P_{g_{ccw}} = \left(\frac{0.5r_a}{3-2s}\right) (i_{accw})^2 \text{ watts} \quad \dots 21$$

$$\text{Also, the mechanical power output for the clockwise field } P_{m_{cw}} = 1 - (2s-1) p_{g_{cw}} = 2(1-s) P_{g_{cw}} = \left[\frac{r_a(1-s)}{2s-1}\right] [i_{acw}]^2 \text{ watts} \quad \dots 22$$

$$\text{Similarly, the mechanical power output for the counter clockwise field } P_{m_{ccw}} = [1 - (3 - 2s)] P_{g_{ccw}} = -2(1-s) P_{g_{ccw}} = -\left[\frac{r_a(1-s)}{3-2s}\right] [i_{accw}]^2 \text{ watt} \quad \dots 23$$

The mechanical net power output is the algebraic sum of equations 22 and 23.

$$\text{That is, } P_{mn} = P_{m_{cw}} + P_{m_{ccw}} = r_a (1-s) \left(\frac{(i_{acw})^2}{2s-1}\right) - \frac{(i_{accw})^2}{3-2s} \text{ watt} \quad \dots 24$$

The electromagnetic torque developed by the two fields can be expressed as;

$$T_{cw} = \frac{1}{\omega} P_{g_{cw}} \text{ (N-m)} \quad \dots 25$$

Putting equation 20 into 25 we have;

$$T_{cw} = \left[\frac{1}{\omega} \left(\frac{0.5r_a}{2s-1}\right) (i_{acw})^2\right] \text{ N-m} \quad \dots 26$$

$$\text{Similarly, } T_{ccw} = \frac{1}{\omega} P_{g_{ccw}} \text{ N-m} \quad \dots 27$$

Putting equation 21 into 27 yields;

$$T_{ccw} = -\left[\frac{1}{\omega} \left(\frac{0.5r_a}{3-2s}\right) (i_{accw})^2\right] \text{ N-m} \quad \dots 28$$

N.B: ω is the synchronous angular velocity in mechanical radians per second.

Since torque of the counter clock wise field (T_{ccw}) is in the opposite direction to that of the clockwise field (T_{cw}), the net internal torque (T_{net}) of the motor is;

$$\begin{aligned} T_{net} &= T_{cw} + T_{ccw} \\ &= \frac{1}{\omega} (P_{gcw} - P_{gccw}) \\ &= \left[\left(\frac{0.5ra}{\omega} \right) \left(\frac{(i_{acw})^2}{2S-1} - \frac{(i_{accw})^2}{3-2S} \right) \right] \text{ N-m} \quad \dots 29 \end{aligned}$$

V. TORQUE-SLIP CHARACTERISTICS OF SINGLE PHASE TRANSFER FIELD RELUCTANCE MOTOR.

If the values of the supply voltage, frequency and other machine parameters are given as in table 1, equations 26, 28, and 29 become essential tool for the steady state simulation of the machine performance characteristics.

Plots of the clockwise torque T_{cw} , counter clockwise torque T_{ccw} net torque T_{net} and the superimposition of T_{cw} , T_{ccw} and T_{net} against various values of slip s are shown in Fig. 8a, b, c, and d respectively.

VI. EFFICIENCY OF SINGLE PHASE TRANSFER FIELD RELUCTANCE MOTOR

Since the rotor currents produced by the two components air-gap fields are of different frequencies, the total auxiliary winding I^2R loss is the numerical sum of the losses caused by each field.

Thus; clockwise field rotor (auxiliary winding) I^2R loss = $(2s-1) P_{g_{cw}}$.

Counter clockwise field rotor (auxiliary winding) I^2R loss = $(3-2s) P_{g_{ccw}}$. This contributes immensely to the overall reduction in efficiency of the machine. More-still, the poor pull-out and starting torque of single phase transfer field motor to an extent affect its efficiency and thereby makes it inferior to those of a comparable single-phase induction motor counterpart (Anih and Obute, 2012). The overall effect of these losses is a reduction in the net mechanical power output of the machine and the corresponding efficiency.

The motor efficiency (ξ) is given by;

$$\xi\% = \frac{\text{Net mechanical power output}}{\text{Input power}} \times \frac{100}{1} \quad \dots 30$$

Where input power = $VI \cos \phi$...31

But the motor's power factor ($\cos \phi$) = $\frac{r_T}{Z_T}$

$$= \frac{r_m + r_{cw} + r_{ccw}}{Z_m + Z_{cw} + Z_{ccw}} \quad \dots 32$$

Where, r_m , r_{cw} , r_{ccw} are the real parts of Z_m , Z_{cw} and Z_{ccw} respectively.

\therefore Putting equations 17,24,31 and 32 into equation 30 we have;

$$\xi\% = \left[\frac{r_a(1-s) \left(\frac{(i_{acw})^2}{2S-1} - \frac{(i_{accw})^2}{3-2S} \right)}{(r_m + r_{cw} + r_{ccw})} \left(\frac{Z_m + Z_{cw} + Z_{ccw}}{V} \right)^2 \right] \times 100 \quad \dots 33$$

By careful substitution of the machine parameters with varying values of s within the stipulated range, a matlab plot of the efficiency ξ against slip s , for the operation of the machine is

obtained as shown in fig 9. It is seen that the optimum efficiency of the machine is very low at about 38%.

VII. STARTING OF SINGLE-PHASE TRANSFER FIELD RELUCTANCE MOTOR

All single phase asynchronous motors are not self starting. The problem in such single phase motor design is to get the rotor started. There are several ingenious methods for doing this. The method specially applied for this machine is the split-phase method. The principle of split-phasing is to create at starting a condition similar to a two-phase stator winding carrying two-phase current so that a rotating magnetic field is produced. This is achieved by providing, in addition to main single-phase winding, a starting winding which is displaced in space by 90° with the main winding on the stator slots (S.K Bhattacharya 2004). If two windings so placed are connected in parallel to a single phase source, the field produced will alternate but will not revolve, since the two windings are equivalent to one single phase winding. If, however, an impedance (resistance, inductance or capacitance) is connected in series with the one of these windings, the current is made to differ in time phase (Jone and Prior, 1972).

By proper selection of such impedance, the current may be made to differ by as much as 90° thereby producing a rotating field, likened to a two phase motor. However, if the difference between the two currents is less than 90° and the two mmfs are not equal, starting torque will be small, though may be sufficient to start the motor. Hence, accurate design of the impedance necessary to achieve the purpose becomes imperative. In this design, the single phase transfer field motor uses a single-valued capacitor for the starting purpose as shown in fig. 7

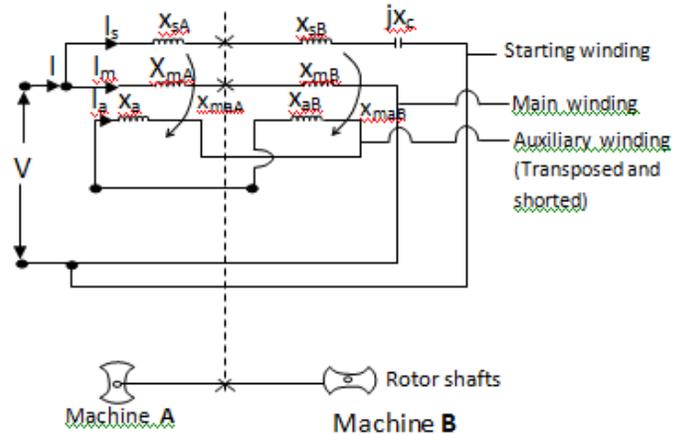


Fig 7- The single phase transfer field reluctance motor with starting windings and capacitor.

Where,

V = Applied voltage, I = Source Current, I_m = Main winding Current, I_s = Starting winding Current, I_a = Auxiliary winding Current, x_{mA} = Main winding of Machine A, x_{mB} = Main winding of Machine B, x_{aA} = Auxiliary winding of Machine A, x_{aB} = Auxiliary winding of Machine B, x_{SA} = Starting winding of

machine A, x_{sB} = Starting winding of machine B, jx_c = Capacitive reactance of the starting capacitor (c).

VIII/I – Designing for the value of the starting capacitor necessary to place the main and starting winding currents (i_m/i_s) in 90° phase shift.

With careful use of the machine parameters of table 1, the main winding impedances (for machine A and B) of fig. 7 can be calculated as below.

$$Z_{m(A/B)} = Z_{mA} + Z_{mB} \quad \dots 34$$

Since $Z_{mA} = Z_{mB} = Z_m$ (as $x_{mA} = x_{mB} = x_m$)
 $\Rightarrow Z_{m(A/B)} = 2Z_m$
 $= 2(r_m + jx_m)$...35

By substitution of machine parameters

$$Z_{m(A/B)} = 2(r_m + jx_m)$$

$$= 2(3 + j8.044)$$

$$= (6 + j16.088)$$

$$= 17.17 \angle 69.55^\circ \Omega$$

Obviously, the main winding current I_m lags behind the applied voltage V by 69.55° .

$$\text{Hence } I_m = \frac{V}{Z_{m(A/B)}} = \frac{220}{17.17 \angle 69.55^\circ}$$

$$= 12.81 \angle -69.55^\circ A$$

For an efficient design, the starting windings usually have almost the same size of wire and almost as many turns as the main windings. We therefore have that the starting winding impedance for the machine A/B, is

$$Z_{s(A/B)} = Z_{sA} + Z_{sB} \quad \dots 36$$

So far $Z_{sA} = Z_{sB} = Z_s$, $X_{sA} = X_{sB} = X_s$
 $\therefore Z_{s(A/B)} = 2Z_s$
 $= 2(r_s + jx_s) \Omega$

But from the machine parameters of table 1
 $Z_{s(A/B)} = 2(2.5 + j7.544) = (5 + j15.088) \Omega$

Since, time phase angle between starting winding current I_s and main winding current I_m is 90° , so starting winding current I_s must lead the applied voltage V by;

$$\phi_s = 90^\circ - 69.55^\circ$$

$$= 20.45^\circ$$

If X_c is the capacitive reactance of the capacitor connected in series with the starting winding, then impedance of the starting winding for the two machines A/B, will be given as

$$Z_{s(A/B)} = (5 + j15.088 - jX_c) = [5 + j(15.088 - X_c)] \Omega$$

But for starting winding,

$$T_{an} \phi_{s(A/B)} = \frac{15.088 - X_c}{5}$$

$$\Rightarrow X_c = 15.088 - 5 \tan \phi_s (A/B)$$

$$= 15.088 - 5 \tan(-20.45^\circ)$$

$$= 15.088 - (-1.864)$$

$$= 15.088 + 1.864$$

$$= 16.952 \Omega$$

$$\text{If } X_c = \frac{1}{2\pi f c}$$

$$\Rightarrow c = \frac{1}{2\pi f X_c}$$

$$= (2 \times 3.142 \times 50 \times 16.952)^{-1} F$$

$$= 188 \mu F$$

∴ From the above design, the value of the starting capacitor (C) necessary to place the main and starting winding currents (I_m/I_s) in quadrature is 188μF.

VIII. SUGGESTED AREAS OF APPLICATION

The transfer field machine in general is a low speed machine operating at half the speed of a normal induction machine (Agu 1978). Single phase motor without rotating windings will have future in a variety or special applications such as very slow speed fixed frequency drives, linear motor for small scale transport systems etc. It is common knowledge that a low speed machine will find application in domestic appliances requiring low speed drives such as grinding machines for perishables. However, many household are invariably supplied with single-phase, necessitating the development of single phase transfer field machine for the purpose of wider applications.

IX. DISCUSSION OF RESULTS/CONCLUSION

This paper has presented the equivalent circuit of a single phase transfer field machine from which the performance indices can be predicted. It may be noted that the torque slip curves due to clockwise, counter clockwise and resultant magnetic fields have been drawn for a slip range of $0.5 \leq s \leq 1.5$. From fig.8c, it is observed that;

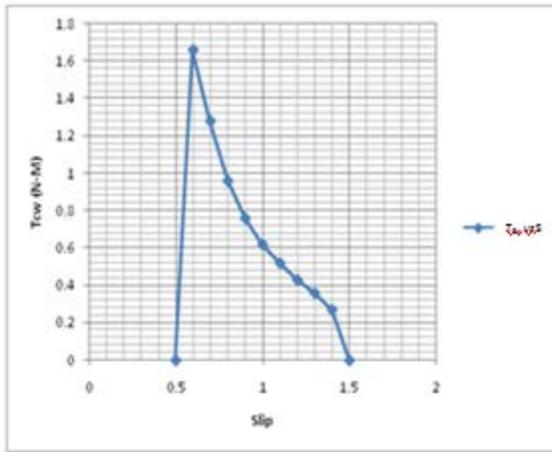
- a. Net torque T_{net} at standstill of the rotor is zero. That is at slip $s = 1$. The torques developed by the clockwise and counter clockwise fields cancel each other. This is responsible for the non self starting ability of the motor.
- b. Assuming the rotor is given an initial rotation in any direction, the net torque developed causes the rotor to continue to rotate in the direction in which it is started
- c. As a corollary to a, the net torque can also be zero at some values of rotor speed below the synchronous speed.

Additionally, the machine suffers severe electrical losses which account for its low efficiency when compared to an equivalent single phase induction motor counterpart. This is as a result its excessive leakage reactance. In addition, the intersegment of conductors between the two machine sections contributes to the leakage reactance and does not in any way contribute to energy transfer in the machine.

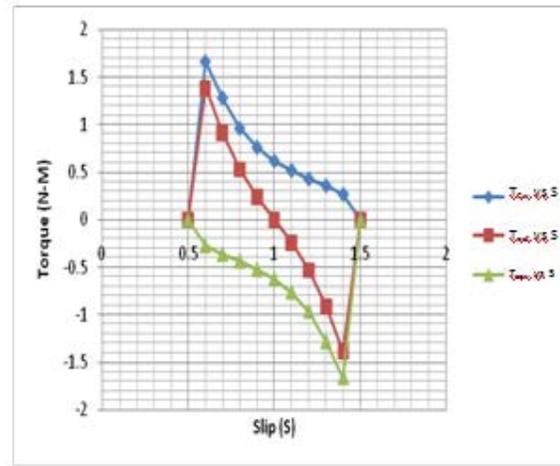
However, the design analysis for the improvement in the efficiency of the machine is on the pipeline as it is being studied by the authors.

X. ACKNOWLEDGEMENT

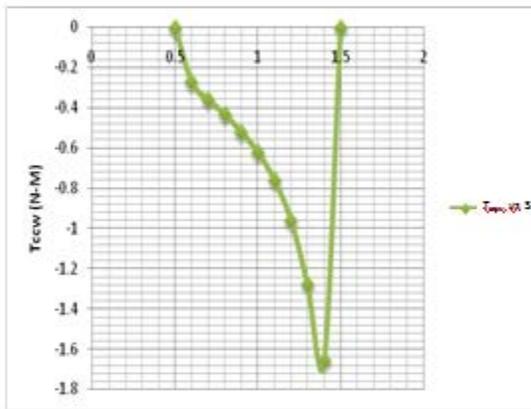
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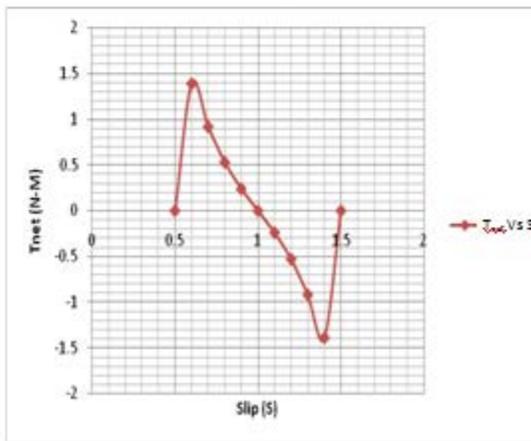
(a)



(d)



(b)



(c)

Fig 8: (a) – Torque developed due to clockwise rotating field
 (b) – Torque developed due to counter clockwise rotating field
 (c) – Torque developed due to reaction of (a) and (b)
 (D) Superimposition of (a), (b), and (c)

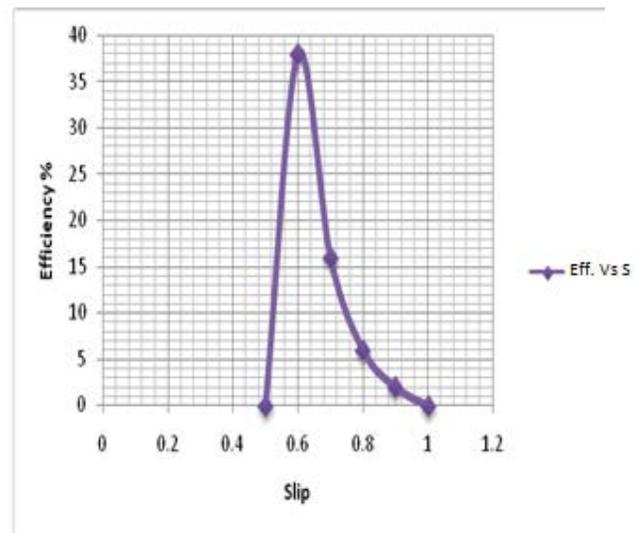


Fig 9: The machine efficiency at motoring mode

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Share of Public and Private Health Facilities: A Study among Hospitalised Cases at Two Different Socio-Economic Settings of Indian States

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Abstract- In India, healthcare sector is growing at a brisk pace due to its strengthening coverage, services and increasing expenditure by public as well private players. The practice of public health has been dynamic in India and has witnessed many hurdles in its attempt to affect the lives of the people of this country. Here an attempt is made to analyse the utilisation of public and private health facilities for the hospitalised cases at two different socio-economic statuses of Indian states. Data for the analyses are drawn from the 71st round of the National Sample Survey held in 2014. It is inferred from the study that the people residing at more developed states are believed on private institutions for medical care services whereas the less developed states are partly depend upon private sector services.

Index Terms- Health facilities, Private sector, Public sector, Hospitalization

I. INTRODUCTION

One longstanding and polarized debate in global health concerns the appropriate role and balance of the public and private sector in providing healthcare services to populations in low- and middle-income countries (Berendes, Heywood, Oliver and Garner, 2011). The public health sector in low and middle income countries is not always sufficiently well-equipped and financed to provide high quality health care that is accessible to all citizens (Basu, 2012 and Logomarsino, 2009). The consequence of this public sector failure has been a proliferation in private providers of healthcare services in most of the countries (Forsberg, 2011; Levin, 2011 and Scott, 2011).

In India, healthcare sector is growing at a brisk pace due to its strengthening coverage, services and increasing expenditure by public as well private players. Indian healthcare delivery system is categorised into two major components - public and private. Public health care is usually provided by the government through national healthcare systems. Public healthcare system comprises limited secondary and tertiary care institutions in key cities and focuses on providing basic healthcare facilities in the form of primary healthcare centres (PHCs) in rural areas. Private health care can be provided through 'for profit' hospitals and self-employed practitioners and 'not for profit' non-government providers, including faith-based organizations. During the survey, the information about medical institution from where they received the health care services was collected (Basu, Andrews, Kishore, Panjabi and Stuckler, 2012).

The practice of public health has been dynamic in India, and has witnessed many hurdles in its attempt to affect the lives of the people of this country. Since independence, major public health problems like malaria, tuberculosis, leprosy, high maternal and child mortality and lately, HIV have been addressed through a concerted action of the government. Social development coupled with scientific advances and health care has led to a decrease in the mortality rates and birth rates (Ministry of Health and Family Welfare, Government of India, 2002).

With this backdrop, here an attempt is made to analyse the utilisation of public and private health facilities for the hospitalised cases at two different socio-economic statuses of Indian states.

II. DATA METHOD

Data for the analyses are drawn from the 71st round of the National Sample Survey held in 2014. Though the survey covered the whole of the Indian Union, this study made an attempt to classify the states into two different socio-economic settings. The latest Human Development Index (2011) was used to group the study states. The top five HDI states were grouped as High HDI states viz Kerala (0.625), Punjab (0.569), Himachal Pradesh (0.558), Maharashtra (0.549) and Haryana (0.545). The bottom five HDI states were grouped as Low HDI states like Orissa (0.442), Bihar (0.447), Chhattisgarh (0.449), Madhya Pradesh (0.451) and Jharkhand (0.464).

During the survey, the details on level of care (public or private) for all current and former members who hospitalized for treatment were collected for last 365 days (hospitalisation occurred from January 2013 to June 2014). Totally 9,746 persons who hospitalized during the reference period were considered for this analysis – including 6,124 from the high HDI group of states and 3,622 from the low HDI group of states. In this analysis, all these medical institutions that having provision for admission of sick persons as in-patients for treatment are grouped into two major heading – Public sector and Private sector. The public sector includes PHC/dispensary/ CHC/ mobile medical unit, HSC/ANM/ASHA/AWW and public hospital. The private sector covers the private doctor/clinic and private hospital. By using SPSS, a bivariate analysis technique has been used to understand the variations in socio-economic and demographic parameters of level care. A logistic regression model also used to assess the determinants such as socio-economic and demographic indicators on selection of health facilities.

III. RESULTS

Table 1 gives the share of public and private sectors in treating the hospitalised cases in the high and low HDI group of states. It is found that the public sector/institutions slightly dominated in treating the in-patients in the low HDI group of states whereas in the high HDI group of states the phenomenon was differed that the private sectors played a major role in treating the in-patients. It is seen that the private and public sector shared more or less equally in providing medical services

at the low HDI group of states. On contrast, more than two-third of the hospitalised cases were treated at private health facilities (70.1 percent) among the high HDI group of states. It is inferred that the people residing at more developed states are believed on private institutions for medical care services whereas the less developed states are partly depend upon private sector services. Further, the table 1 is analysis the share of private and public sectors in treating the inpatients by individual state in each of the HDI group of state.

Table No. 1 Percentage distribution of hospitalized Population by Level of care in High and Low HDI states

STATES	Level of Care			
	Public Sector		Private Sector	
	%	No.	%	No.
HIGH HDI STATES				
Himachal Pradesh	73.5	478	26.5	172
Punjab	25.0	250	75.0	750
Haryana	31.5	310	68.5	675
Maharashtra	21.1	780	78.9	2924
Kerala	33.0	789	67.0	1603
Total	29.9	2607	70.1	6124
LOW HDI STATES				
Bihar	37.5	675	62.5	1127
Jharkhand	36.8	298	63.2	512
Orissa	73.6	1129	26.4	406
Chhattisgarh	46.9	325	53.1	368
Madhya Pradesh	47.5	1093	52.5	1209
Total	49.3	3520	50.7	3622

Private institutions played a vital role in providing medical treatment for in-patients in all the states in the high HDI group (except the Himachal Pradesh) – it ranges from 78.9 percent at Maharashtra to 67.0 percent at Kerala. It is quite surprise to note that among the high HDI group of states, a major proportion of Himachal Pradesh people get hospitalised at the government health facilities (73.5 percent). It is again established among the low HDI group of states that the private intuitions were dominated in providing in-patient services in all the states (except Orissa), however the range is lesser when compared to the high HDI states – it varied from around 63 percent at Bihar

and Jharkhand states to 53 percent at Chhattisgarh and Madhya Pradesh states. On contrast, more than seventy percent of hospitalized cases admitted at public sectors in Orissa state.

The analyses of hospitalized cases with their background conditions at both the study locations are presented in table 2. As expected, the private health facilities played a dominating role in providing the treatment for hospitalised urban population, irrespective of the HDI status of the states. With regard to rural area, private hospitals contributes more in the high HDI group of states and public institutions played a major role in the low HDI group of states.

Table No. 2 Percentage distribution of hospitalized Population by Level of care with SED of the hospitalized population in High and Low HDI states

SED of the hospitalized population	HIGH HDI STATES				LOW HDI STATES			
	Public		Private		Public		Private	
	%	No. P	%	No. P	%	No. P	%	No. P
SEX	NS				***13.037			
Male	29.4	1331	70.6	3190	47.2	1736	52.8	1941

Female	30.3	1276	69.7	2934	51.5	1784	48.5	1681
Total		2607		6124		3520		3622
Residence	***41.816				***65959			
Rural	32.8	1519	67.2	3106	53.4	2220	46.6	1941
Urban	26.5	1088	73.5	3018	43.6	1300	56.4	1681
Age	***35.278				***20.020			
0-14	24.8	383	75.2	1162	52.7	615	47.3	551
15-29	32.9	465	67.1	948	52.8	734	47.2	656
30-44	33.3	532	66.7	1065	48.1	776	51.9	837
45-59	28.8	542	71.2	1338	47.0	725	53.0	817
Above 60	29.8	685	70.2	1611	46.8	670	53.2	761
Caste	***274.749				***293.809			
ST	52.0	204	48.0	188	67.2	638	32.8	311
SC	41.4	647	58.6	916	61.1	732	38.9	467
OBC	29.2	973	70.8	2364	45.6	1531	54.4	1823
Others	22.8	783	77.2	2656	37.7	619	62.3	1021
Education	***64.729				***164.547			
Illiterate	31.7	765	68.3	1648	53.8	1440	46.2	1238
Primary	32.5	712	67.5	1481	53.6	854	46.4	739
Middle/Sec.	28.1	651	71.9	1664	46.6	695	53.4	798
Higher sec/Diploma	27.8	217	72.2	564	36.9	188	63.1	322
Degree	16.5	95	83.5	480	26.1	116	73.9	328
Wealth Index (Rural)	***105.663				***122.493			
Poorest	52.8	152	47.2	136	63.0	821	37.0	482
Poorer	42.9	188	57.1	250	57.0	510	43.0	385
Middle	33.9	183	66.1	357	50.6	355	49.4	346
Richer	34.6	377	65.4	713	45.0	343	55.0	419
Richest	27.3	619	72.7	1650	38.3	191	61.7	308
Wealth Index (Urban)	***144.068				***127.801			
Poorest	42.5	178	57.5	241	56.2	520	43.8	406
Poorer	32.8	219	67.2	449	46.3	306	53.7	355
Middle	30.1	239	69.9	554	39.6	204	60.4	311
Richer	25.5	262	74.5	766	33.9	152	66.1	296
Richest	15.9	190	84.1	1008	27.4	118	72.6	313

***Refers to significant at 1 % level

(Chi-square results – Level of Care and SED at different HDI states) NS-Non Significant

Almost an equal proportion of male and female population (around 70 percent each) get admitted at private hospitals for their ailments among the high HDI group of state. The survey results do not show any gender differentials in the high HDI group of states. On contrast, more number of female approached the public sector for their hospitalized services (51.5 percent) in the low HDI group of states than the counterpart. It shows the gender differentials in this respect among the low HDI group of states. The survey results for the high HDI group of states reveals that around three-fourth of the 0-14 age group population received the services from private sectors. Similarly a higher proportion of the elderly people also hospitalized at private health facilities for the treatment (70.2 percent among 60+ yrs and 71.2 percent among 45-49 yrs). On the other hand, more than half of the people in the respective age-groups were depended on the public health sectors for their medical treatment among the low HDI group of states. It is inferred that the public health facilities played a major role in providing in-patient services for

the low HDI group of states whereas in the high HDI group of states the private health sectors provide key contribution.

Data presents in table 2 examine the relationship between the type of hospital (for hospitalisation cases during the 365 days preceding the date of survey) and social groups, separately for the high and low HDI group of states. Data on high HDI group of states shows that in ST category, more than fifty percent of hospitalization took place in public hospitals (52.0 percent) and the remaining in private medical institutions. On contrast, more than seventy percent of the OBC and 'other' categories population were admitted at private hospitals (70.8 and 77.2 percent respectively). Among the low HDI group of states, the percentage share of the public sectors in hospitalized treatment was quite high for ST and SC household members (67.2 and 61.1 percent respectively). As expected, the private hospitals role was slightly higher among the OBC (54.4 percent) and 'others' (62.3 percent) categories household members. Irrespective of the HDI status of the states, a steady decline in the use of Government

sources and a corresponding increase in the use of private sources for hospitalization cases over the literacy condition of the household members.

The percentage share of the public sector for hospitalised treatment in different level of literacy varied over a very wide range – from 53.8 percent for illiterates to 26.1 percent for the degree holders in the low HDI group of states and from 31.7 percent to 16.5 percent in the high HDI group of states for the respective literacy level. Table 2 also discloses the linkage between the type of hospital for hospitalisation cases during the 365 days preceding the date of survey and usual monthly per capita consumption expenditure (UMPCE), separately for the rural and urban areas of the high and low HDI group of states. Considering UMPCE as a proxy for level of living, the data shows a positive association between level of living and type of hospital used in both the rural and urban areas, The percentage share of the public sector in hospitalised treatment in different quintile classes varied over a wide range – from 27.3 percent to 52.8 percent in rural areas of the high HDI group of states and from 38.3 percent to 63.0 percent in the low HDI group of states. Data in table 5.55 reflects a steady decline in the reliance on public provider for hospitalised treatment with a rise in UMPCE for both the HDI groups of states. Data presents in the above table shows a steady increase in the reliance on private provider

for hospitalised treatment with a rise in UMPCE. The percentage share of the private sector in hospitalised treatment in different quintile classes varied over a very wide range – from 57.5 percent to 84.1 percent in the urban areas of the high HDI group of states. The corresponding percentage for the low HDI states was 43.8 percent to 72.6 percent. Overall, the poorer households appear to depend more on the public sector for hospitalised treatment than the better-off sections of the population, both in the high and low HDI group of states, which conform to the general notion. The bi-variate analysis show a significant association between the level of care (private or public) and all the background conditions of the hospitalised persons both at the low and high HDI group of states.

Determinants of Type of health facility

There are certain factors which affect the selection of type of health facility. To know the net effect of independent variable on dependent variables (type of health facility), binary logistic regression model has been applied. The odds ratios show the effect of one unit change in the independent variable on the odds of the response variable, keeping other variables constants. In Table 3 two models have applied separately for the high and low HDI group of states and for the rural and urban settings.

Table No. 3 Results of logistic regression for determinants of place of care received in High HDI states (Rural and Urban separately)

SED of HIGH HDI States	RURAL			Urban		
	B	Sig.	Exp(B)	B	Sig.	Exp(B)
Age						
0-14 (ref)		.000	1.000		.000	1.000
15-29	-.540	.000	0.583	-.756	.000	0.470
30-44	-.564	.000	0.569	-.755	.000	0.470
45-59	-.243	.036	0.784	-.597	.000	0.551
60+	-.561	.000	0.571	-.367	.005	0.693
Sex						
Male (Ref)			1.000			1.000
Female	-.096	.169	0.908	.116	.135	1.123
Religion						
Hindu (Ref)		.004	1.000		.016	1.000
Muslim	.187	.130	1.206	-.109	.317	0.897
Christian	-.199	.172	0.820	.148	.403	1.160
Others	.331	.004	1.392	.447	.004	1.564
Caste						
ST (Ref)		.000	1.000		.000	1.000
SC	.481	.001	1.617	-.097	.708	0.908
OBC	1.013	.000	2.754	.370	.140	1.447
Others	1.183	.000	3.264	.515	.040	1.673
Education						
Illiterates (Ref)		.076	1.000		.000	1.000
Primary	-.029	.739	0.971	-.067	.536	0.935

Middle/Sec	.210	.046	1.233		.208	.083	1.231
Hr.sec/Dip	.065	.668	1.067		.398	.015	1.490
Degree	.393	.058	1.481		.850	.000	2.340
Occupation							
Agri activities (Ref)		.000	1.000	Self.emp		.005	1.000
Non-agri activities	-.530	.000	0.589	Reg. wa	-.209	.023	0.811
Agri. Casual lab	-.582	.000	0.559	Cas. lab	-.311	.002	0.733
Others	-.358	.012	0.699				
UMPCE (Rural)							
Poorest (Ref)		.000	1.000			.000	1.000
Poorer	.348	.033	1.416		.442	.001	1.555
Middle	.742	.000	2.100		.505	.000	1.658
Richer	.691	.000	1.995		.728	.000	2.071
Richest	1.074	.000	2.926		1.240	.000	3.456
Household Size							
Less than 4 (Ref)		.000	1.000			.000	1.000
4-6 members	.306	.001	1.358		.264	.011	1.302
Above 6	.588	.000	1.801		.601	.000	1.823
Constant	-.620	.002	.538		.158	.594	1.171
-2 log likelihood	5137.323 ^a				4217.691 ^a		
Cases	4375				3902		

***Sig. at 1% level, **Sig. at 5% level, * Sig. at 10% level; NS Not significant; (R) Reference category

Age of the persons has significant impact on type of health facility from where they received the medical care. The odds ratios show that the old age persons were 57 percent (OR=.571) significantly less likely to receive medical care from private health facilities in comparison to the 0-14 age group population. The odds ratio show that persons who belong to 'Others' had 39 percent more chances (OR=1.392) to get admitted at private health facilities in comparison to the Hindus which was considered as the reference category in the analysis. Among the social groups, a big difference can be seen in terms of level of care (public or private). Scheduled castes were 1.6 times (OR=1.617), Other Backward Castes were 2.7 times (OR=2.754) and others were 3.3 times (OR=3.264) more likely to get medical services from private sectors than Scheduled Tribes. The likelihood of receiving medical services from private hospitals for the rural degree holders were 48 percent higher (OR=1.481) in comparison to illiterates in the high HDI group of states. The probability of receiving private medical services persons working in non-agricultural sector was 58 percent (OR=0.589) lesser than that of persons engaged in agricultural activities. Similarly the persons working in agricultural casual labourers were 56 percent (OR=0.559) less likely to admitted at private hospitals with

reference to agricultural labourers. As household's wealth quintile increases, the likelihood of receiving medical services at private sectors also increases. The odds ratio show that in richest wealth quintile were 2.9 times (OR=2.926) significantly more likely to admitted at private hospitals in comparison to the poorest wealth quintile population at the rural area. Household with more than six members were 80 percent (OR=1.801) significantly more likely to receive medical care from private institution in comparison to households with less than four members. The results of regression analysis for the high HDI states (urban sector) show that the background variables such as age, religion, education, household size, UMPCE categories had an effect on the type of health facilities.

Results of odds ratios for type of health facility for the rural and urban area among the low HDI states are described separately in table 4. In the rural location, most of the variables that are considered in logistic regression for level of care are in the expected direction. However, some variables emerged as having opposite effect for level of care. For example, Christians and 'others' categories persons were less likely to approach private hospitals.

Table No. 4 Results of logistic regression for determinants of place of care received in High HDI states (Rural and urban separately)

SED of LOW HDI States	RURAL			Urban		
	B	Sig.	Exp(B)	B	Sig.	Exp(B)
Age						

0-14 (ref)		.148	1.000			.052	1.000
15-29	-.045	.715	0.956		-.384	.013	0.681
30-44	.138	.214	1.148		-.076	.597	0.927
45-59	.200	.072	1.221		-.056	.695	0.946
60+	.072	.543	1.074		-.148	.290	0.863
Sex							
Male (Ref)			1.000				1.000
Female	-.139	.051	0.871		-.061	.471	0.941
Religion							
Hindu (Ref)		.084	1.000			.885	1.000
Muslim	.352	.017	1.422		-.079	.536	0.924
Christian	-.171	.602	0.843		.084	.822	1.088
Others	-.378	.410	0.685		.186	.643	1.204
Caste							
ST (Ref)		.000	1.000			.000	1.000
SC	.132	.269	1.141		.408	.036	1.504
OBC	.741	.000	2.097		.801	.000	2.228
Others	.744	.000	2.104		.882	.000	2.415
Education							
Illiterates (Ref)		.013	1.000			.000	1.000
Primary	-.014	.866	0.986		-.113	.323	0.893
Middle/Sec	.151	.134	1.163		.174	.147	1.190
Hr.sec/Dip	.325	.069	1.384		.389	.013	1.476
Degree	.785	.003	2.193		.690	.000	1.993
Occupation							
Agri activities (Ref)		.329	1.000	Self.emp		.324	1.000
Non-agri activities	.020	.804	1.020	Reg. wa	-.097	.310	0.908
Agri. Casual lab	.239	.067	1.271	Cas. lab	.069	.516	1.072
Others	-.015	.921	0.985				
UMPCE (Rural)							
Poorest (Ref)		.000	1.000			.000	1.000
Poorer	.228	.016	1.256		.407	.000	1.502
Middle	.414	.000	1.513		.654	.000	1.923
Richer	.690	.000	1.993		.835	.000	2.306
Richest	.912	.000	2.489		1.128	.000	3.089
Household Size							
Less than 4 (Ref)		.000	1.000			.000	1.000
4-6 members	.332	.000	1.394		.177	.119	1.194
Above 6	.682	.000	1.977		.623	.000	1.864
Constant	-1.452	.000	.234		-1.140	.000	.320
-2 log likelihood	5088.768 ^a				3596.583 ^a		
Cases	3917				2800		

***Sig. at 1% level, **Sig. at 5% level, * Sig. at 10% level; NS Not significant; (R) Reference category

At both the locations, females were less likely to be hospitalized at private sector. Rural females were about 87 percent and urban females were 94 percent less likely to be hospitalized at private hospitals than males (OR=0.871 and OR=0.941 respectively). At both locations, age and religion do not play any influences of level of care. The OBCs and 'others'

were more likely to be hospitalized at private health facilities when compared with ST population. Rural OBC and 'Others' were 2.0 times and 2.1 times respectively more likely to be hospitalized at private sectors than ST category. The corresponding figures for urban was 2.3 times and 2.4 times for urban social groups. It is noted that the effect of educational attainment was still significant when other background characteristics were controlled for; this indicated that persons with diploma holder (OR=1.384) and degree holders (OR=2.193) were 1.4 times and 2.2 times respectively more likely to be admitted at private sector in the rural area. The corresponding figures for urban was 1.5 times and 2.0 times for the urban educated. The analysis showed a positive association between the UMPCE and level of care. People from the highest UMPCE category were 2.4 times more likely to admit at private hospitals than those in the lowest UMPCE category at the rural locations. This probability of private hospitalization was 3.1 times higher among the urban area. Household size variable emerged as having opposite effect for private hospitalization. Households with more number of persons were more likely to be hospitalized at private hospitals.

IV. CONCLUSIONS

This study identified that the rural people, most marginalised population (ST/SC) and the most deprived societies (poorest and poorer) are mainly depend on the public health facilities for their medical care, irrespective of their HDI status. Therefore, it is suggest that various strategies should be adopted to improve quality and effectiveness of the public health care services and thereby it can be possible create a healthy nation that is one of the best places to live in.

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Teaching and the research are the two major components in my academic carrier. To my credit, I have guided 22 M.Phil and two PhD students on various topics which are mostly monitoring and evaluation of population and health related programmes and presently guiding 7 PhD scholars. Besides, I have completed two UGC, three ICSSR, one Ford Foundation and one POPCOUNCIL project and presently I am handling one UGC major research projects. In addition, I have published totally 73 research articles on various national, international journals and edited books. I have presented around 50 research papers at various national and international conferences held within India and outside India (Malta, Pakistan, France, Malaysia and Tanzania). I have continuously interacted with demographers, NGO personnel, and government officials at all levels to share and train personnel in various aspects of population and health projects.

An Investigation on corrosion parameters in SA 213 TUBE and SA387 tube plate in FWTPET with absence and presence of Inhibitor

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Abstract- Corrosion is the destructive attack of a metal and its properties by chemical or electrochemical reaction with its environment. The importance of corrosion studies is threefold includes conservation, improved safety and economic losses. The structural deterioration of all metallic mains is due to the external corrosion which is included by environmental and operation conditions. It is necessary to remember that the choice of material depends on many factors, including corrosion resistance, cost, fabricability, strength. Complete corrosion resistance is almost all media can be achieved by the use of glass, but it is not practical. The corrosion resistance of the material is the most important properties in most engineering applications. In this investigation, FWTPET process has been carried to achieve high-quality leak-proof joints. SA 213 tube and SA 387 tube plate are dissimilar material joined using by FWTPET process of interference fit with backing block. Polarization study and AC impedance spectra have been used to investigate the corrosion parameters of the material system immersed in well water in the absence and presence of the inhibitor Sodium Potassium Tartrate (SPT) and the result shows the increase of corrosion resistance in the materials.

Index Terms- SA 213 tube; SA 387 tube plate; FWTPET; SPT

I. INTRODUCTION

Corrosion of metal is of great practical interest because metals are widely used in the oil, gas and offshore environments for pipelines, flow-lines, down-hole tubular equipments; well heads. Corrosion inhibition is being extensively employed in minimizing metallic wastage of engineering materials in service [1]. Metallic material constitutes a great part of construction material elements in industries, agricultural equipment, medical services, process and allied industries. In these industries, the metallic material as a result of interaction with its environment loses its integrity over a period of time [2]. Corrosion control is an important activity of technical, economical and environmental importance. Thus, the search for efficient corrosion inhibitors has become a necessity to secure metallic materials against unmitigated degradation. The presence of corrosion inhibitors in the cleaning and pickling solutions is very important to keep the surface of steel intact. For this reason, many researches were conducted to study its corrosion properties and to find out suitable chemical compounds to be used as corrosion inhibitors for it in acidic solutions [3]. The process of friction welding of

tube to tube plate using an external tool (FWTPET) was invented in the year 2006[4]. FWTPET is a solid state welding process which produces welds due to the compressive force contact of work pieces which are either rotating or moving relative to one another. Heat is produced due to the friction which displaces material plastically from the faying surfaces. The aim of the present work is to join two dissimilar materials SA 213 tube and SA387 tube plate using FWTPET. The corrosion parameters are investigated by using the techniques Polarization study and AC impedance spectra. The process is carried out in two cases; in the first case the material system is investigated by immersed in well water in the absence of SPT and in the second case the material system is investigated in the absence of SPT. The result shows that in the presence of SPT, the corrosion resistance of the welded metal system immersed in well water increases. Also reveals that SA 213 and SA387 FWTPET joint show good grain structure and due to the fine refinement of grains it exhibits better corrosion resistance.

II. EXPERIMENTAL

A. Preparation of Work piece:

Seamless ferritic and Austenitic alloy grade materials such as SA 213 and SA 387 are taken for this research as tube and tube plate respectively. The experiment has been conducted using 6 mm thickness SA 387 tube plate and cut into the required sizes (50 mm x 50 mm) square block with center drill. Similarly, SA 213 steel tube of outer diameter 20.5 mm, inner diameter 16 mm and length 30 mm have been cut into required size. The metals are welded by FWTPET and the welded work piece is used for the investigation of corrosion parameters by immersing the piece into well water with the presence and absence of SPT.

B. Analysis of AC impedance spectra

AC impedance spectra have been used to confirm the formation of protective film on the metal surface. If a protective film is formed on the metal surface, charge transfer resistance (R_t) increases; double layer capacitance value (C_{dl}) decreases. Impedance value increases.

C. Analysis of Potentiodynamic Polarization Curves

Polarization study has been used to confirm the formation of protective film formed on the metal surface during corrosion inhibition process. If a protective film is formed on the metal surface, the corrosion current value (I_{corr}) decreases.

D. Preparation of Sodium Potassium Tartrate

1 g of sodium potassium tartrate is dissolved in double distilled water and made up to 100 ml in a standard measuring flask. 1 ml of this solution was diluted to 100 ml to get 100 ppm of sodium potassium tartrate.

III. RESULTS AND DISCUSSION

A. Analysis of Potentiodynamic Polarization Curves in SA 213 Tube

The formation of protective film on the metal surface during corrosion inhibition process is confirmed by polarization study. The corrosion current value (I_{corr}) decreases if a protective film is formed on the metal surface. The Potentiodynamic polarization curves of Tube metal immersed in well water in the absence and presence of inhibitor are investigated. When Tube metal is immersed in well water the corrosion potential value is -389 mV vs SCE. When 100 ppm of SPT is added to the above system the corrosion potential shifted to the negative side -477 mV vs SCE. This indicates that the cathodic reaction is controlled predominantly.

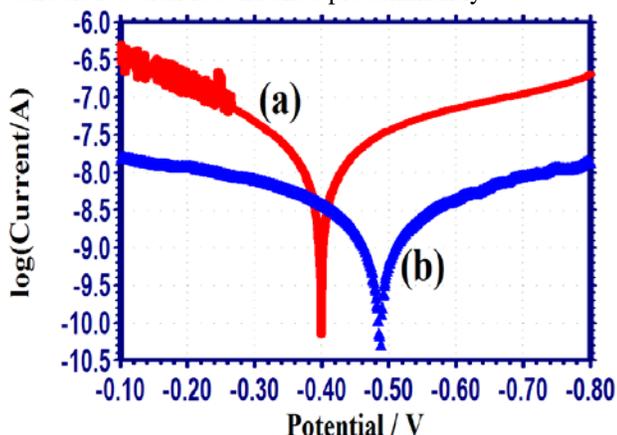


Figure 1: Polarization curves of Tube metal immersed in various test solutions

(a) Well water (b) Well water + SPT 100 ppm
(b)

Table 1: Corrosion parameters tube metal immersed in well water in the absence and presence of inhibitor, Sodium potassium tartrate (SPT) obtained from polarization study

System	E_{corr} mV V SCE	ba mV/decade	bc mV/decade	LPR ohm cm^2	I_{corr} A/ cm^2
Well water	-389	232	152	2726502	1.264×10^{-8}
Well water + SPT 100 ppm	-477	219	201	23037226	0.246×10^{-8}

The LPR value increases from 2726502 ohmcm^2 to 23037226 ohmcm^2 ; the corrosion current decreases from 1.264×10^{-8}

A/cm^2 to $0.246 \times 10^{-8} A/cm^2$ shown in Table 1. Hence, polarization study confirms the formation of a protective film on the metal surface.

B. Analysis of AC Impedance Spectra in SA 213 Tube

The AC impedance parameters namely charge transfer resistance (R_t) and double layer capacitance (C_{dl}) derived from Nyquist plots are given in the table 2. It is observed that when the inhibitor (100 ppm of SPT) is added to well water the charge transfers resistance (R_t) increases from $12890000 \Omega cm^2$ to $20730000 \Omega cm^2$. The C_{dl} value decreases from $3.772 \times 10^{-13} F/cm^2$ to $2.89 \times 10^{-13} F/cm^2$. The impedance value increases from 6.906 to 7.12.

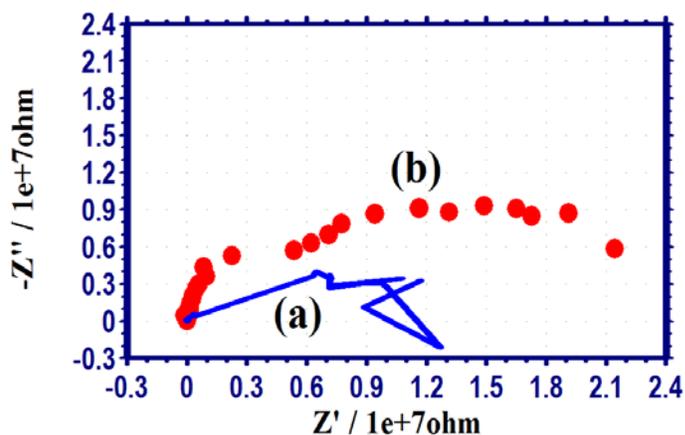


Figure 2: AC Impedance spectra of Tube metal (Nyquist Plots)
(a) Well water (b) Well water + SPT 100 ppm

Table 2: AC impedance parameters of Tube METAL IMMERSED in well water in the absence and sodium potassium tartrate (SPT) obtained by AC impedance spectra

System	R_t ohm cm^2	C_{dl} F/ cm^2	Impedance Log (z/ohm)
Well water	12890000	3.772×10^{-13}	6.906
Well water + SPT 100 ppm	20730000	2.89×10^{-13}	7.12

These results lead to the conclusion that a protective film is formed on the metal surface. Electrochemical studies lead to the conclusion that in presence of sodium potassium tartrate (SPT), the corrosion resistance of Tube metal immersed in well water increases.

C. Analysis of Potentiodynamic Polarization Curves in SA 387 Tube Plate

When Tube Plate metal was immersed in well water the corrosion potential is -419 mV vs SCE. When 100 ppm of SPT is added to the above system the corrosion potential shifted to the anodic side, -401 mV vs SCE. This indicates that the anodic reaction is controlled predominantly. The LPR value increases

from 170710 ohmcm² to 243210 ohmcm²; the corrosion current decreases from 2.067x10⁻⁷ A/cm² to 0.9989x10⁻⁷ A/cm².

Figure 3: Polarization curves of Tube metal immersed in various test solutions

(a) Well water (b) Well water + SPT 100 ppm

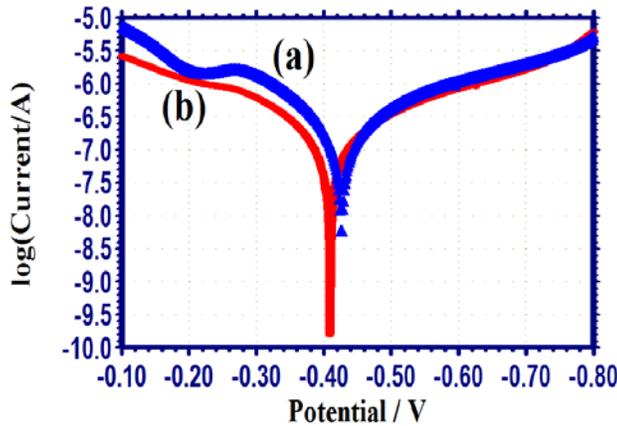


Table 3: Corrosion parameters tube metal immersed in well water in the absence and presence of inhibitor, Sodium potassium tartrate (SPT) obtained from polarization study

System	E _{corr} mV V SCE	b _a mV/decade	b _c mV/decade	LPR ohm cm ²	I _{corr} A/cm ²
Well water	-419	238	158	170710	2.067x10 ⁻⁷
Well water + SPT 100 ppm	-401	226	208	243210	0.9989x10 ⁻⁷

Hence, polarization study confirms the formation of a protective film on the metal surface.

Table 4: AC impedance parameters of SA 387 Tube METAL IMMERSSED in well water in the absence and sodium potassium tartrate (SPT) obtained by AC impedance spectra

D. Analysis of AC Impedance Spectra in SA 387 Tube

It is observed that when 100 ppm of SPT is added to well water the charge transfers resistance (R_t) increases from 102795912 Ω cm² to 139789509 Ω cm². The C_{dl} value decreases from 4.412x10⁻¹³ F/cm² to 3.202 x 10⁻¹³ F/cm². The impedance value increases from 4.1 to 4.432. These results lead to the conclusion that a protective film is formed on the metal surface.

System	R _t ohm cm ²	C _{dl} F/ cm ²	Impedance Log(z/ohm)
Well water	102795912	4.412x10 ⁻¹³	4.1
Well water + SPT 100 ppm	139789509	3.202 x 10 ⁻¹³	4.432

This result shows that in presence of sodium potassium tartrate (SPT), the corrosion resistance of Tube metal immersed in well water increases.

IV. CONCLUSION

The Investigated values of the polarization study confirm the increase in LPR values and the decreases in corrosion current in the presence of SPT; it clearly shows the formation of a protective film on the metal surface. By the AC impedance spectra parameters of Tube metal immersed in well water in the absence and presence of sodium potassium tartrate, the formation of protective film is confirmed with the increase in charge

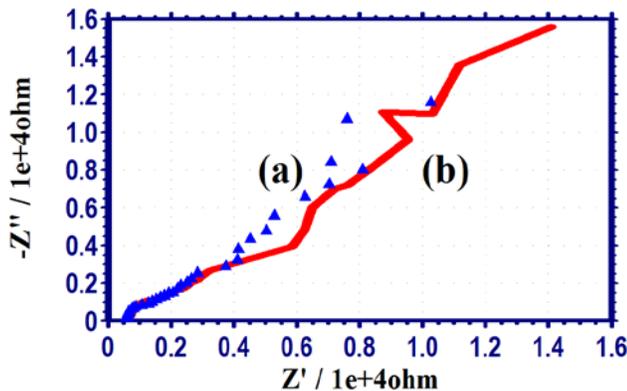


Figure 4: AC Impedance spectra of Tube metal (Nyquist Plots)

(a) Well water (b) Well water + SPT 100 ppm

transfer resistance, increase in Impedance value and decrease in capacitance value. The FWTPET metal joint corrosion parameter results showed that the SPT has excellent inhibition properties for the corrosion of SA 213 and SA 287 metal in aqueous medium and also concluded that the metals have good grain structures with good mechanical properties. The investigation concludes that SA 213 and SA 387 metals joints are suitable for the various industrial applications.

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Perceived Effects of Videogames: Chinese Case Study

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Abstract- This research investigates the current situation of videogames in China by analyzing the effects of playing computer games on academic achievement and social skills, as well as attitudes toward playing games from the perspective of both parents and children. Paper and online questionnaires were used to collect data, and Chi-Squared and Logistic Regression analyses were done to evaluate the significance of findings using R and Excel.

The main findings concern the prevalence and circumstance of people playing videogames, utilization of computers, perceived necessary learning skills for people, and the effects of playing computer games on students' studying and social lives. It is clearly revealed that youths are prone to play games with violence and excitement so that they can release their pressure from the heavy workload in school. However, adults prefer to play games that can improve their intelligence and working skills, all of which are useful for their careers. When asked about the effects of playing videogames, most participants think there is slight reduction in both studying and socialization.

In addition, this research discusses the effects of playing videogames more deeply and provides students, teachers, and parents with suggestion about the current situation of games addiction. With the suggestions, students and teachers or parents could neutralize their opinions on playing videogames.

Index Terms-videogames, effects of playing, academic achievement, social skills, learning skills, game preference, logistic regression, chi-squared

I. INTRODUCTION

As society develops promptly and dramatically, people have more opportunities and access to use technological devices, and this has led to the development of videogames. Computer games have been evolving through several decades, adapting so that players can experience different kinds of games in different ways. The more prevalent games become, the more problems are raised by people who consider video games as a "drug" to players. For example, it is controversial whether the technology should be widely utilized in the education.

While thinking about this contradiction, some people have the conservative opinion that if people get addicted to video games, this may cause negative effects on students' study and damage people's physical health. On the contrary, others suggest that video games promote many social and learning skills for people to improve themselves by properly playing games which utilize their intellects to solve problems.

This article will first examine the literature that supports these points of view, and then introduce original research into the perceptions of individuals to see how they match the empirical results of the research.

II. LITERATURE REVIEW

One of the most contentious debates concerning video games is their effect on learning skills. Although not universally agreed upon, there are some essential and necessary factors of promoting academic achievements. Creativity, motivation, critical thinking, communication ability, and adaptability all effectively influence students' capability of absorbing knowledge and making achievements (Saavedra & Opfer, 2012). Time management skill, self-assessment, and self-diagnosis are also significant to learning, especially before assessments (Nordell, 2009). Playing games can enhance these skills and promote achievements using technology, because increased access to technology improves students' technology proficiency, engagement, and academic achievement (Sharpley, Sheehan, Maloney, & Walker, 2011).

In reality, parents are worried about the negative effects of using technologies and therefore strictly supervise students' playing time (Salceanu, 2014). However, using technology such as videogames playing is one way to promote students' learning skills and achievements. Creativity is promoted by games that require cognitive demands to be creative, and games connected with a large breadth of visual attention throughout, including both central and peripheral visual processing (Yeh, 2015). Additionally, while playing violent video games, children can not only fulfill their basic impulses that cannot be met in the real world, but also avoid conflicts and transfer violence into their learning settings to promote themselves (Salceanu, 2014; Agina & Tennyson, 2012).

In addition to creativity and expression, video games can also help kids learn social skills. When students were encouraged to play video games from childhood, it was shown to be the best time for them to learn to understand rules and express themselves (Annetta, 2008). Furthermore, while playing video games, children can be encouraged to actively explore and learn things such as rules and social skills (Agina, 2012).

Different types of video games can have even more direct benefits. Keeping students motivated is one of the most essential factors of learning, which could provide enjoyable learning experiences by playing AVGs (Active Video Games) (Sun & Gao, 2016). AVGs can benefit them by promoting physical activity and facilitating children to put in a high volume of body movement, improve their cardiorespiratory fitness (ie. capability of hearts and lungs), and enhance academic achievement in school (Sun & Gao, 2016).

Technology in learning has different effects on various students. Kim and Chang's research (2010) concludes that minor language-learning students who played computer games in math every day demonstrated higher math performance scores than those male English-speaking majority students who never played. In addition, it also shows that playing games promotes the participation of linguistic minorities in class and students of both genders have better academic achievement than those not playing

games (Kim & Chang, 2010). Another experiment reveals that male students show greater confidence, derive more enjoyment, and are more likely to participate in the playing of computer games playing so that they could improve more (Liu, Lee, & Chen, 2013).

Technology is not only beneficial to students' achievements, but helps teachers to better educate and guide students. The systems of process monitoring such as CBA (Curriculum-Based Assessment) and CBM (Curriculum-Based Measurement) are used to help teachers pay attention to the performance and progress students achieve, enable them to change instruction when experiencing difficulties, and enhance the level of information that can be modified by educators (Ysseldyke & Bolt, 2007). Those games' features such as clear goals, learner control, challenging tasks, and repetition may help teachers to create individualized learning methods to take control and improve students' achievements (Shin, Sutherland, Norris, & Soloway, 2012). For example, motivation, one of the teachers' chief concerns, could be solved by encouraging students with interesting activities found in technological devices (Granito & Chernobilsky, 2012).

Academic promotion, especially mathematics achievement, is obviously improved by the application of technology. Playing videogames is an efficient method to improve attentional capacities that are significant for creating an academic basis, which has been seen to promote students' mathematics performance (Novak & Tassell, 2015). So when education technology is put into practice appropriately, the incorporation of technology into instruction has positive effects on students' achievement and significant gains in students' math achievement (International Society for Technology in Education). A telling example is that students in AM (Accelerated Math)—a computer program that allows students to progress at their own pace—classrooms have significantly higher scores than those in common classrooms (Ysseldyke & Bolt, 2007). Similarly, playing AVGs could also assist students in facilitating good special abilities which positively relate to high mathematics achievement, successful geometry studying and normalized test performance (Novak & Tassell, 2015), since this method interests the students in the class so that they are attracted to the studying content (Lari, 2014). If the knowledge is presented by visual tools, students are more attracted to and motivated by the contents (Lari, 2014).

Based on the research listed above, it can be seen that applying technology can positively affect students' motivation to study and help promote their academic achievements, development of social skills, and other stimulation in thinking. Thus, if technology is so advantageous to students, it must be examined how universal technology utilization is in schools.

The research by Stearns (2012) implies that teachers and schools must incorporate technology into the classroom and the education process. However, factors including the cost of computer technology, necessary training for staff and students to use the equipment and materials, and accessibility of computers should be considered and solved so that students could improve

their reading comprehension skills with technology (Stearns, 2012). Nowadays, most schools have started to implement computer technology into classrooms, but actual usage is not that optimistic since "school leaders do not have a clear sense of how to evaluate effective use of technology" (Lim, Zhao, Tondeur, Chai, & Tsai, 2013). Therefore, though technology is positively influential to students' achievement, schools practically do not take action to strengthen them, because they do not know how to attain this positive influence.

In addition, it is the gap between the technology tendency and use of technology in school that influences the complete implementation of technology in students' classrooms. No matter how many necessary conditions are applied, it is still complicated to judge the success of technology implementation because there are not enough specific goals and models to imitate (Lim, Zhao, Tondeur, Chai, & Tsai, 2013). Although researchers have repeatedly stated that successful policy completion requires clearly decided goals directly related to student learning (Fullan, 2001), in all specific educational goals, only concrete conciliatory goals such as "amount of hardware, student-computer ratios, and connectivity rates" are defined in educational technology policy documents (Lim, Zhao, Tondeur, Chai, & Tsai, 2013).

Thus, to ensure that introduced technology is truly helpful to students' education, we should pay more attention to how to improve their enthusiasm for using technology in order to promote their achievement in not only academic ways but also positive social aspects. The reason we achieve this is that student-motivating activities are elements of "high novelty, high attention demand, intensive exploration opportunity, instant enjoyment, and moderate physical challenge", which are all related with learning (Sun & Gao, 2016). Then, challenging tasks and repetition in videogames motivate students to complete exercises, influencing greater achievement and strengthening learning skills, positive motivation, persistence, and curiosity for learning, which leads to better academic performance (Shin, Sutherland, Norris, & Soloway, 2012). To some extent, students themselves are interested in learning by playing video games, since they increase their practice efforts and are assisted to facilitate higher order learning goals, though there are still violence and aggression features in them (Barko & Sadler, 2013).

Once the government finishes this goal and the mechanism of gaming education is completely established, students can improve by providing learning environments which give them active control over their learning experiences (Barko & Sadler, 2013). The pedagogical use of technology in the classroom and amalgamated learning, the desire to bring together broad issues concerning the effects of teachers and learners' use of technologies currently in service of success, and attitude outcomes must all be considered in the future construction of technology in schools (Schmid, Bernard, Borokhovski, Tamim, Abrami, et al, 2014).

Although there have been many researches about the effects of playing video games on students, most of them focus on the

physical influences and mental illnesses possibly caused by playing computer games in the long term. Moreover, most of the research does not directly explore the relationship between playing games and learning skills, which is comparatively significant to consider about while investigating whether the effects on the students are positive or negative, and most of them do not include the supervision of parents on children's playing games.

Therefore, this survey's purpose is not only to pay attention to these aspects but also to provide opinions to game-designing corporations by discussing people's preferences and their worries about video games.

III. METHODOLOGY

This section outlines the participants and their basic information as well as the instruments, procedure, data collection method, processing and analysis.

A. Participants and their Basic Information

There were 343 participants from over 20 provinces across China and 8 international residents who filled out the questionnaire while collecting data, including 158 students and 185 adults.

B. Instruments

The main purpose of designing this survey is to research people, especially students, on their beliefs about the impact of playing games on academic achievement. Both paper and online questionnaires were utilized.

Twenty-three questions are included in the survey. The first two questions are about gender and age. The next two questions investigate people's situation of playing games. Then, there are four questions related to the connection between playing games and scores or personal ability. The ninth question is designed to divide the subjects into two parts, one of which is students and the other is parents so as to research various attitudes toward videogame playing. After that, questions 10-16 ask students about whether and how their parents supervise them while using the computer, the influence of playing games on scores and social ability, and their preferred type of games. Questions 17-23 ask the same of parents. There are fourteen single-answer multiple-choice questions, four open-ended questions, and five questions where more than one choice can be checked.

C. Changes made on questionnaires

The questionnaire was meticulously translated into Chinese when done in China so that the translation would have minimal influence on the results. There were also some changes made to

the questionnaire to make the result more clear and the following will explain the changes and the reasons why they were made.

In question 7, the ranking of students' scores in the Chinese edition was changed into the percentage of every student in their class, because in China, some students are ranked in the order of scores, while others are ranked in the percentage of students' scores in the entire class, not the exact number.

While analyzing the data, the choice of "others" in question 8, 11 and 18 was omitted since there were only 7-10 participants out of 358 who chose this option, and most of them didn't fill in the blank space with detailed information. Then, the "-3"s in the data of a few questions was changed into "NA", since the survey program automatically codes omitted question as "-3". However, this number would actually affect the result when analyzing the data mathematically, so the recode was necessary.

D. Procedures

The questionnaire was done in both paper format and online format to get a larger sample and more diverse participants.

The paper questionnaires were handed out mainly in Liaoning Province Shiyuan High School. The total sample of the paper questionnaires was 15.

The online questionnaires were distributed in Wechat moments, QQ chat groups, and Qzone, three of the most popular social media platforms in China. Sojump, an online survey tool, was used to upload the questionnaire to the Internet and transform it into an online format. The total sample of online questionnaires was 343. Statistical analysis done in the data analysis program named R.

E. Data processing

During the data analysis period, totally 358 responses were used for analysis. There are slightly more students than adults and comparatively more difference in male and female participants. About age, every divided age group has roughly same people with a few more people below 14 and above 30.

IV. FINDINGS AND DISCUSSIONS

In the tables, * indicates significance at 10% level; ** indicates significance at 5% level; *** indicates significance at 1% level.

A. Findings about people playing videogames

This section talks about the findings of people playing games. By analyzing game preferences, perceived effects of playing games on students, and other factors or results, differences of sex and age can also be seen in the following discussions.

a. Findings and discussions about game type

Table1: Number of survey participants by each category

Students		Gender		Age group					
Yes	No	Male	Female	0-14	15-17	18-22	23-30	31-40	41+
183	175	166	192	75	55	43	42	80	63

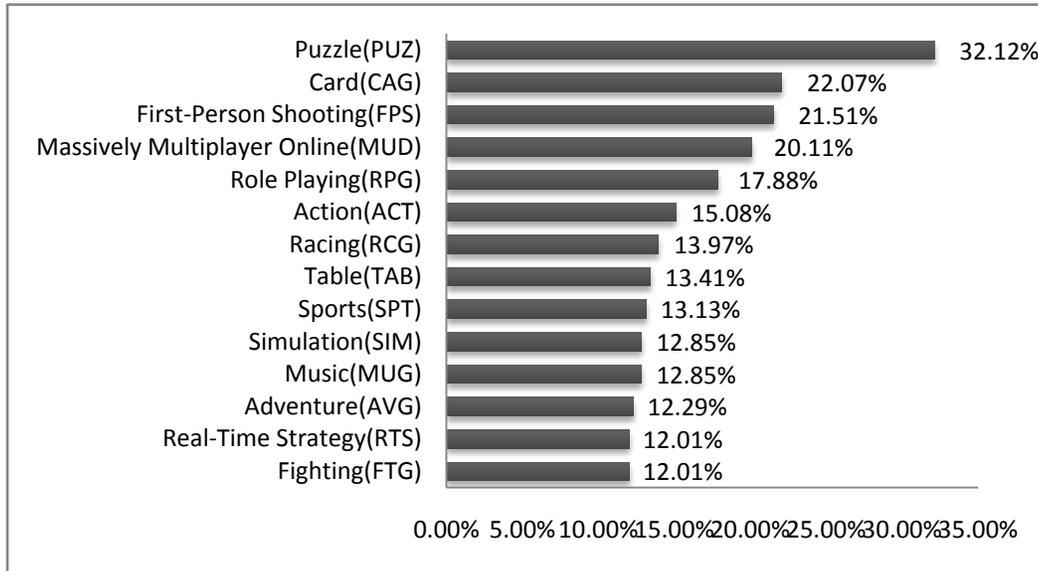


Figure 1. Games preferences of people

As seen in Figure 1, the three most popular videogames for people are Puzzle Games, Card Games, and First-Person Shooting (FPS) Games. However, the least preferred three games are Adventure, Real-Time Strategy (RTS), and Fighting games, which is noticeable because these are full of violent plots, which research has shown is a serious concern for critics of video games. However, the probable reason why FPS Games are so popular even though they are violent should be attributed to people's outlet and relaxation from heavy working and studying loads (Salceanu, 2014; Agina & Tennyson, 2012). FPS is more effective than this than the other violent games because it gives the perspective of an actor rather than an observer.

Table 2 shows the distribution of people who like the top three kinds of games and discusses the differences between youths and adults (any participant above 22 years old is classified as an adult, since this is the common age at which people complete their education in China).

Table 2.

Favorite games preferred by adults and youths

Age Category	Puzzle	Card	FPS
Youths	23.6%	25.8%	31.9%
Adults	44.2%	19.6%	11.7%
Difference	-10.6%***	6.2%***	20.2%***
(X-squared)	(26.47)	(12.04)	(30.39)

Note: N=183 for youths, 175 for adults.

From the difference in game preference between adults and youths seen in Table 2, it is clear that these top three kinds of games are more liked by different groups of people. The percentage of adults who like Puzzle Games exceeds the percentage of youths, while the percentage of youths who like Card Games is more than the percentage of adults. In addition, the number of youths who like First-Person Shooting Games largely outweighs that of adults. Because of youths' stress from work and

study, they prefer violent video games to release their anger and lessen their pressure. Furthermore, Card Games are recently more prevalent among youths largely because of the incredibly popular game *Hearthstone*, which respondents report playing on mobile devices as well as computers. However, Puzzle Games play a comparatively important role in adults because they want to maintain the ability of reasoning and logistic thinking.

The differences in preference for Adventure, Real-Time Strategy, and Fighting Games may be concluded by Table 3.

Table 3.

Disliked game types by different groups of people

Age Category	Adventure	RTS	Fighting
Youths	17.6%	17.0%	17.6%
Adults	7.4%	7.4%	6.7%
Difference	10.2%***	9.6%***	10.9%***
(X-squared)	(18.23)	(17.53)	(19.41)

Note: N=183 for youths, 175 for adults.

Though these three games are the more disliked than the other kind of games, youths show the tendency that they have more appreciation for these games, and these data are all statistically significant. The reason why adults don't like them may be that: firstly, they suppose they are too boring to play. Adventure Games have the characteristics that it needs people to spend much time on exploring and colonizing the new areas to promote their power and living style. In addition, Fighting and Real-Time Strategy Games take players time not only to play, but also require complex knowledge and strategy just to be able to play at a basic level, which wastes much more time than Puzzle Games which can be picked up quickly. Secondly, some of them cannot classify the Adventure and Fighting Games, since they are both like Action Games. For instance, *Minecraft* involves not only the construction of players' homes but also attack and defense from other online

players, so participants in this research showed some confusion in distinguishing these two types of games.

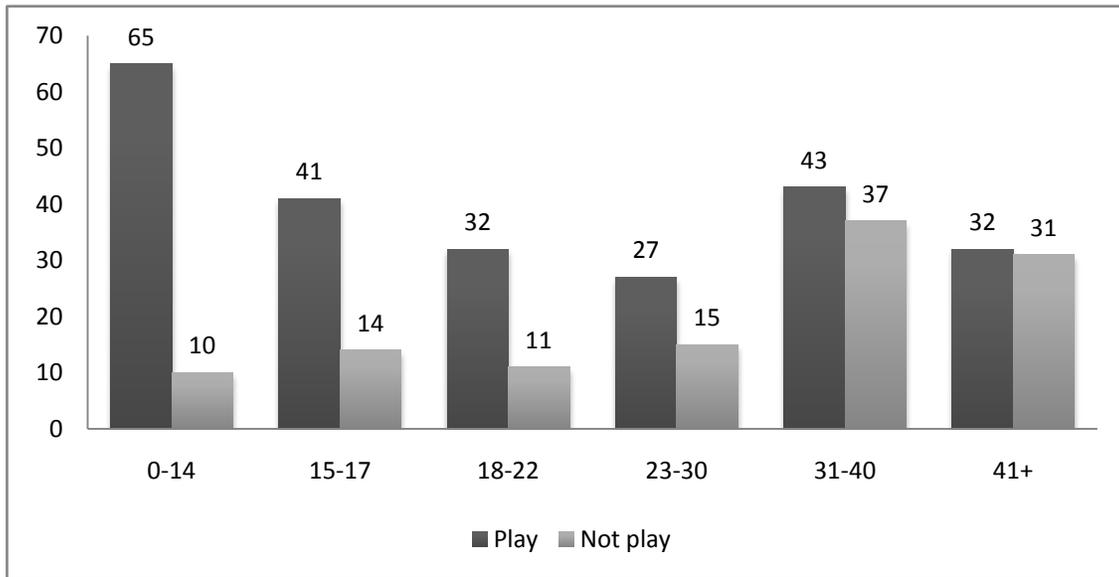


Figure 2. The situation of playing videogames for different age groups

b. Findings and discussions about relation between ages and games

The comparison between whether people play videogames and their ages is shown in the Figure 2. From the graph, it is clear that as people get older, they are prone to not play video games. When observing the data depicted above, the participants aged from 0 to 30 have many more individuals who play videogames than not. Nevertheless, the subjects aged 31 and above show comparatively little difference between playing and not playing games. This reaffirms the findings about adults and students, but allows for further disambiguation of the trend. More specific analysis can be done through binomial logistic regression, shown in Table 4.

From the analysis shown in Table 4-1, it is possible to see the impact of different variables influencing whether people play videogames. Model (0) tests the effect of the two basic demographic factors, “Student/Adult” and “Sex”, showing they are both significant predictive variables related to people’s playing computer games. Furthermore, the R-squared (McFadden’s) shown reveals that these two factors explain 11% percent of the variance in the game-playing variable, which shows that many other factors must affect individuals’ propensity for playing.

It is surprising that when “Age” is added in Model (1), “Student/Adult” remains significant—albeit less so than before—but age does not appear to be significant. The correlation between these factors was only around 0.66. This suggests that the reason students play more video games is not simply that they are younger.

Perhaps even more surprising is that once “Achievement” (participants’ attitudes toward their own academic or work-related achievement) is considered in the Model (2), “Age” and

“Achievement” show predictive influence, while the significance of “Student/Adult” disappears. This could perhaps suggest that younger individuals with lower achievement are more likely to play games, regardless of whether they are students or not. This could support some typical concerns of parents that playing video games decreases motivation. At the same time, the R-squared of Model (2) is approximately 20 percent higher than that of Model (0), which means that achievement and age do add to the reliability of the model beyond the basic identifications, even though the raw predictive ability is still low at 13%.

In Model (3), a list of variables related to learning skills is added in the regression, and the data indicates that the significance of “Age” in the Model (2) disappears, but “Achievement” shows more significance in the new model. The disappearance of significance for age and identity of a student when the mental factors are added into the model indicates that the playing of games is not a generational phenomenon, but is more connected to individual outlooks and achievements. The mental outlooks are responses to the questions of what leads to success and it is very notable that professional knowledge and creativity are closely associated with a proclivity to play video games. Individuals who value creativity most are much more likely to play video games, as the odds that a person associating creativity with success will play video games is nearly 2.5 times higher than an average individual. On the contrary, the odds that a person favoring professional knowledge will play video games are only half those of an average respondent. This is in line with the fact that people promoting video games in education usually point to individual benefits, and creativity values individual perspectives.

Finally, the R-squared in the Model (3) is almost 40 percent more than that in the Model (0), and 20 percent higher than Model

(2), indicating these mental outlooks have a conspicuous impact on whether an individual chooses to play video games, even when the increased number of variables is taken into consideration.

Table 4-2 explains the significance and dependence of these variables which indicates the relation between playing videogames and themselves controlling for the other variables. These odds explain the comparative groups of people who play and those who do not. More specifically, having two people of identical characteristics but of different sexes, the odds of the

female playing video games would be the odds of the male playing video games multiplied by 0.25. For example, suppose that the ratio of males who play video games and those not is 1 to 1, and then the same ratio of females is approximately 0.25 to 1 (1 to 4). Both ratios means that 50 percent of males play video games and 20 percent of females play video games. Thus, it is apparent that the male is more likely to play than the female because when the populations of males and females are the same, there are more females not playing than males.

Table 4-1. Regression of playing videogames, logistic binomial

	Model(0)	Model(1)	Model(2)	Model(3)
Intercept	4.19*** (0.56)	4.04*** (0.56)	4.19*** (0.57)	4.65*** (0.67)
Student/Adult	-0.92*** (0.25)	-0.55* (0.33)	-0.35 (0.35)	-0.35 (0.36)
Sex	-1.29*** (0.26)	-1.30*** (0.26)	-1.31*** (0.26)	-1.37*** (0.28)
Achievement			-0.16* (0.08)	-0.20** (0.29)
Age		-0.58 (0.37)	-0.61* (0.37)	-0.59 (0.38)
Motivation				-0.05 (0.27)
Confidence				-0.15 (0.27)
Concentration				-0.12 (0.29)
Reading comprehension				0.07 (0.28)
Professional knowledge				-0.68** (0.29)
Productive practice				-0.21 (0.32)
Time administration				-0.22 (0.29)
Creativity				0.85*** (0.31)
R-squared	0.11	0.12	0.13	0.15

Note: For dependent variable: 0=don't play video games, 1=play video games.

Table4-2. Coefficients converted into odds factors, Model (3)

Intercept	Student/Adult	Sex	Achievement	Age
104.42***	0.71	0.25***	0.82**	0.55
Motivation	Confidence	Concentration	Reading comprehension	Professional knowledge
0.95	0.86	0.89	1.07	0.51**
Productive practice	Time administration	Creativity		

0.81	0.80	2.33***		
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Note: Numbers displayed are odds factors or multiples, not coefficients. The coefficients (log odds) of the logistic regression were exponentiated in order to produce the odds increase in playing video games for a unit change in the independent variable.

Table 5-1. Regression of playing time, logistic binomial

	Model(0)	Model(1)	Model(2)	Model(3)
Intercept	2.01*** (0.47)	2.02*** (0.48)	2.29*** (0.50)	2.41*** (0.57)
Student/Adult	-0.79*** (0.25)	-0.82** (0.32)	-0.50 (0.34)	-0.55 (0.34)
Sex	-1.02*** (0.24)	-1.02*** (0.24)	-1.03*** (0.25)	-1.13*** (0.26)
Achievement			-0.29*** (0.09)	-0.28*** (0.10)
Age		0.04 (0.07)	-0.02 (0.32)	-0.02 (0.33)
Motivation				-0.22 (0.27)
Confidence				0.24 (0.26)
Concentration				0.15 (0.28)
Reading comprehension				0.11 (0.27)
Professional knowledge				-0.34 (0.28)
Productive practice				0 (0.31)
Time administration				0.25 (0.29)
Creativity				-0.22 (0.28)
R-squared	0.08	0.08	0.10	0.12

Note: For dependent variable: 0=don't play video games, 1=play video games.

Table5-2. Coefficients converted into odds factors

Intercept	Student/Adult	Sex	Achievement	Age
11.15***	0.57	0.32***	0.75***	0.98
Motivation	Confidence	Concentration	Reading comprehension	Professional knowledge
0.80	1.27	1.17	1.11	0.71
Productive practice	Time administration	Creativity		
1.00	1.29	0.80		

Note: Numbers displayed are odds factors or multiples, not coefficients. The coefficients (log odds) of the logistic regression were exponentiated in order to produce the odds increase in playing video games for a unit change in the independent variable.

Table 5 looks more in depth at people's likelihood of playing video games by analyzing how much time they play instead of simply rather they play or not. It compares people who play more than one hour a day with those who play less and looks that the factors determining who chooses to spend more time playing. From Table 5-1, and aligning with traditional ideas and previous research, "Sex" and "Achievement" are the most significant variables because males and people with comparative low academic achievements are more likely to play videogames. In Model (0) and Model (1) with a few crucial variables, "Student/Adult" and "Sex" show apparently influence to the participants' playing time no matter whether "Age" does or does not exist in the model, but the significance of "Student/Adult" remains. Once "Achievement" is further considered in the Model (2) and Model (3), it shows strong significance and

“Student/Adult” totally loses its significance, mirroring what was observed in the previous analysis. However, different from the analysis of whether people play at all, the list of variables of learning skills has little correlation to the dependent value, which can be seen and concluded from Model (3). Though these learning skills in Model (3) do not show any significance to the people’s playing time, this model still has almost 50 percent more R-squared than that of the Model (0) and Model (1), and 20 percent more than that of Model (2).

Comparing the two tables of “coefficients converted into odds factors” (Tables 4-2 and 5-2), there are some interesting points that should be discussed in those learning skills variables. For people who think confidence, concentration, and time administration are important factors of learning, they do not usually play video games—per Table 4-2— but when they do play games, they may spend more than an hour on playing computer games.

The reason may be that playing for longer amounts of time means people must have well scheduled plans to permit themselves sufficient time for playing, have enough confidence to keep playing even though they lose several times, and cannot be distracted by disturbances while playing games.

All the findings and analysis above were expected when the survey was being conducted, and the main reason for the finding should be that youths have more relaxation time and less self-control so that they play more videogames than adults do.

c. Findings and discussions about relation of gender and games

The ratio of males and females who play videogames are collected in the Figure 3.

Of all participants who play videogames, 57% of them are male, and 43% are female. It can be easily concluded that males are more likely to play videogames than females, which is also seen in the common life. No matter whether they are students or adults, men show more enthusiasm and receive more satisfaction while playing videogames than women do. Therefore, this result is in the expectation.

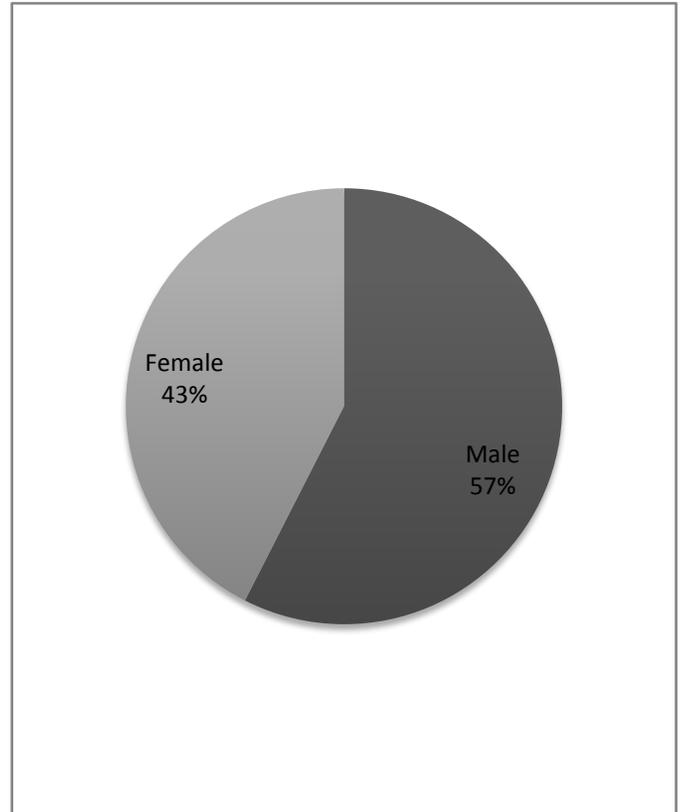


Figure 3. Gender and whether play or not

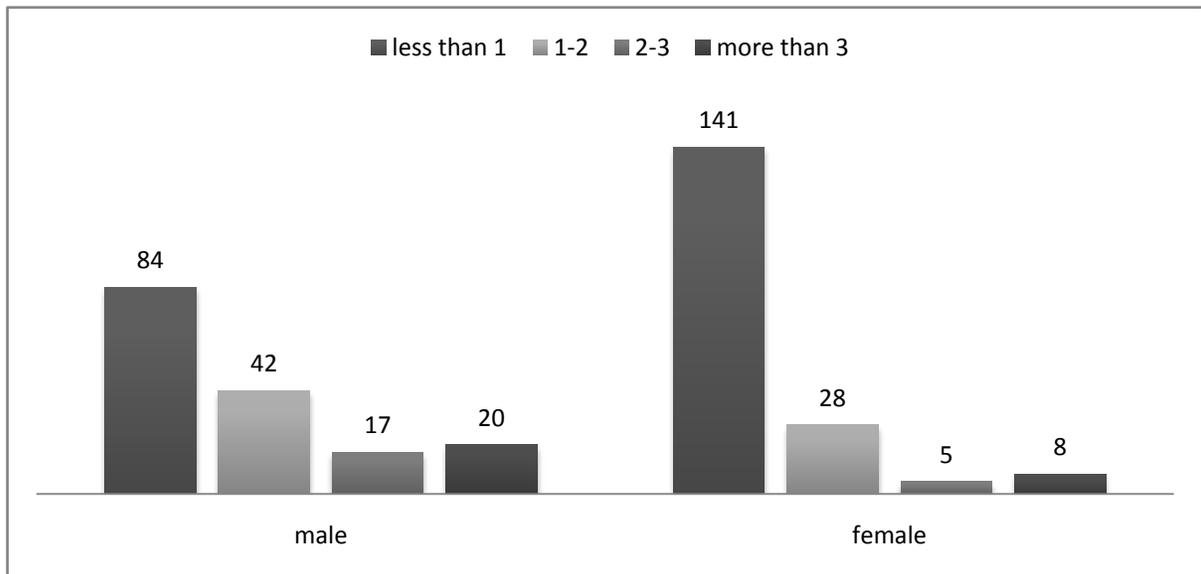


Figure 4. Comparison of gender in playing time

From the bar chart about relation of gender and playing time above, it also reveals that males tend to spend much more time

playing videogames than females do. There are fewer male participants than female who play less than 1 hour, but males

exceed female in the other choices. It can be inferred that males are more likely to play and spend more time playing than females do, which can also be observed and concluded from the previous regression tables. A probable reason for this is that males like to release pressure by playing videogames. By playing games such as First-Person Shooting or Action games, people can do whatever they want, such as killing the enemy, beating anyone in the games, and doing other violent movements that cannot be achieved in the common life. Hence, they can transfer internal anger to action in the games in order to maintain a psychologic balance. On the contrary, females who play video games regard it as an activity for relaxation. They often play games with less

competition and strategy because they just want to while away time of boredom.

B. Findings and discussion about learning and computer use

This part will analyze the research of learning skills that are important for students in learning, and tries to find people’s computer uses in different age groups, especially the impact of parental supervision on the game-playing habits of students.

a. Findings and discussions about learning skills

The following tables and figures represent important learning skills and methods that people think they need and their uses of computer.

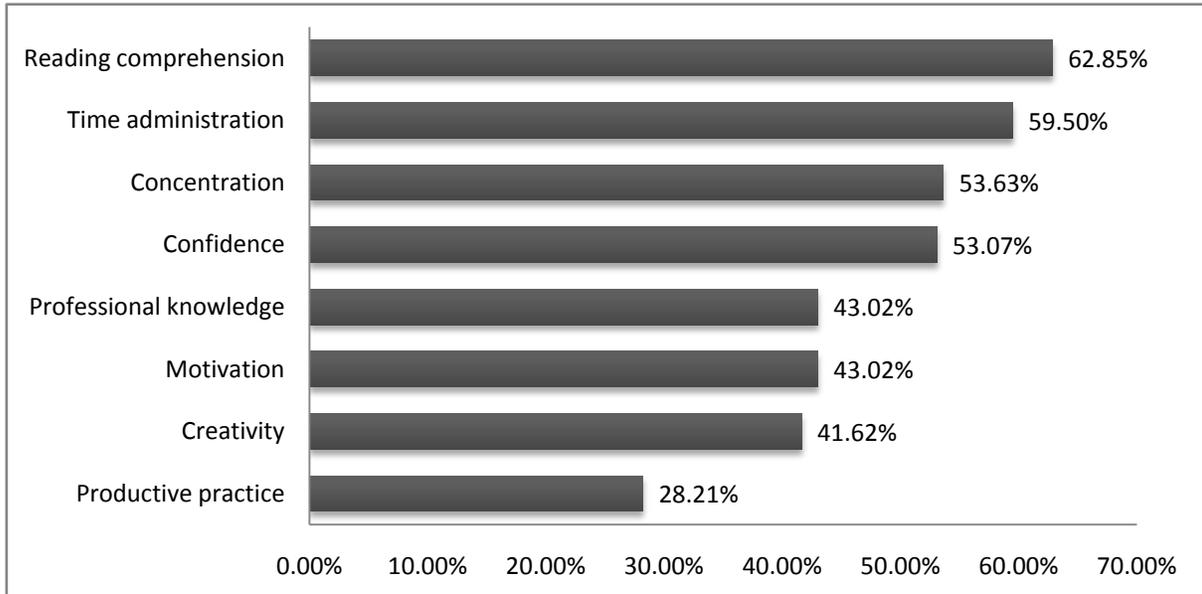


Figure 5. Learning skills that people think are important

From Figure 5, it can be seen that, comparatively, four learning skills are outstanding in all choices and above half of all participants: reading comprehension, time administration, concentration, and confidence. However, they think professional knowledge, motivation, creativity, and productive practice are

four less favored learning skills, all of which are below 50 percent.

The next two tables reveal the relation of people’s ages and their thinking about necessary learning skills.

Table 6. Relation of favorite learning skills preferred by various ages

Age Group	Reading comprehension	Time administration	Concentration	Confidence
Youths	59.0%	59.0%	57.4%	54.1%
Adults	66.9%	60%	49.7%	52%
Difference (X-squared)	-7.9% (2.03)	-1% (0.01)	7.7% (1.82)	2.1% (0.09)

Note: N=183 for youths, 175 for adults.

From Table 6, we can see that for the four learning skills considered most important, there is no significant difference between youth perceptions and adult perceptions. Though all differences above have no statistical significance, fewer youths than adults consider reading comprehension important, but more youths regard concentration as crucial. Common believe would suggests that youth should have regarded reading comprehension

as one of the most important factors of learning because it is frequently connected to formal education. However, the research above shows adults are more concerned with this skill but less with concentration. Thus, students think they have few problems in the understanding the knowledge in the class but are difficult to focus on studying, whereas adults are confident in their ability to focus, but feel challenged in understanding.

Table 7. Relation of least favorite learning skills preferred by various ages

Age Group	Professional knowledge	Motivation	Creativity	Productive practice
Youths	46.0%	47.5%	47.0%	33.3%
Adults	40%	38.3%	36%	22.9%
Difference	6%	9.2%*	11%**	10.4%**
(X-squared)	(1.04)	(2.76)	(4.00)	(4.34)

Note: N=183 for youths, 175 for adults.

While analyzing the learning skills least associated with success in Table 7, it can be seen that there are significant differences between youths and adults in “Motivation”, “Creativity”, and “Productive practice”. To be exact, “Creativity” and “Productive practice” show more statistical significance than “Motivation”. However, youths are prone to choose these three choices all approximately 10 percent more than adults. The

probable reason for this is that as young people learn in schools, they regard productive practices in studying and creativity as more essential components of learning.

b. Findings and discussions about computer use

The following discussion is about people’s computer usage, as well as the impact of parental supervision on students playing videogames.

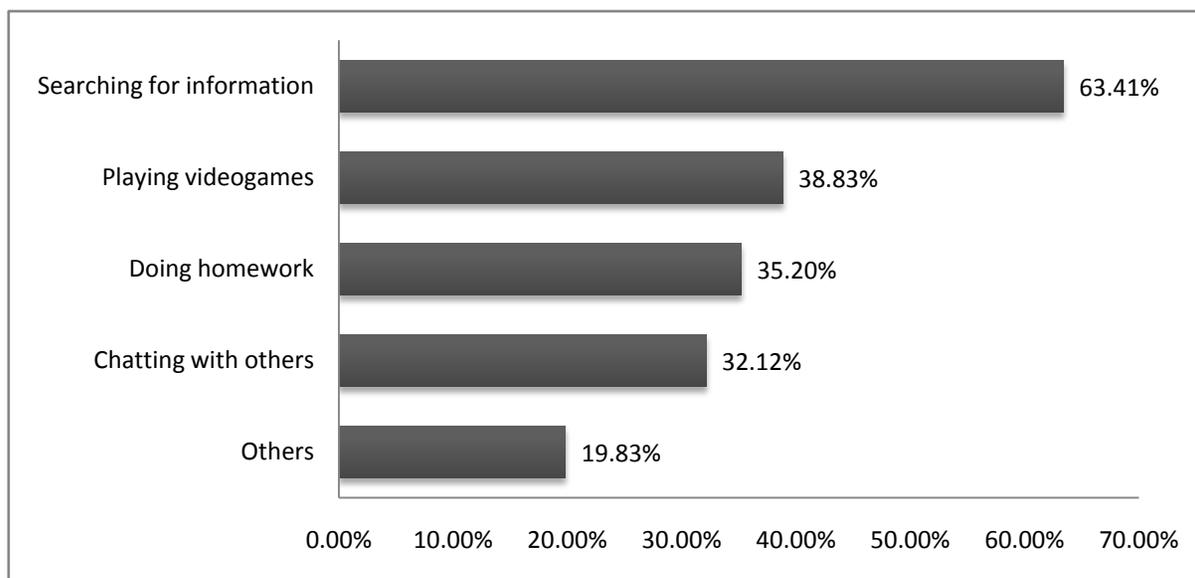


Figure 6. People’s main computer uses

From the bar chart above, it can be observed that the most common use of computer is searching for information, followed by playing games, doing homework, and chatting with others. Comparatively, half of all participants use computers to search for

information, while around a third use them for videogames, work and chatting.

Table 8 looks at whether there are differences between adults and youth in how they use computers.

Table 8. Various ages and their favorite computer uses

Whether is youth	Searching for information	Playing videogames	Doing homework	Chatting with others	Others
Youths	58.5%	53.6%	56.3%	38.3%	12.0%
Adults	68.6%	23.4%	13.1%	25.7%	28%
Difference from youths (X-squared)	-10.1%* (3.51)	30.2%*** (32.92)	43.2%*** (71.12)	12.6%** (5.89)	-16%*** (13.38)

Note: N=183 for youths, 175 for adults.

By calculating the difference between youths and adults, it is obviously found that adults are likely to use computers to search for information and do other things such as watching videos and working. Nevertheless, youths have more possibility to play videogames, do homework, and chat with friends on computers. The data above are all statistically significant showing that different generations certainly view and use computers differently.

c. Findings and discussions about supervision on computer use

This section will analyze the situation of students who are under supervision while playing videogames and adults’ willingness to supervise their children in order to look at how students’ opinions compare with adults’.

Table 9. Methods to supervise playing videogames

	Restrain	Limit	Set code	Don’t
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	time	Internet access	on computer	care
Students	60%	14%	6%	36%
Parents	82%	19%	23%	5%

Table 9 shows that restraining playing time is the most common method that parents use to supervise their children. Furthermore, while few students report having passwords to unlock electronic devices set by their parents, almost a quarter of parents reported locking their children’s computers. While the participating parents may not be the parents of the students, such a large gap still suggests inconsistencies in purpose and practice. Similarly, about one third of all students consider that their parents do not care about whether they play video games, but only a few parents really do not care about this. Therefore, It seems that most parents want to supervise their children, but most students do not think it actually happens.

C. Findings and discussions about effects of playing games

Table 10 shows the perceived effects of playing videogames on students learning and sociability from their own and parents’ perspectives.

Table 10. Effects of playing games on learning and sociality

	Scores	Social skills
Students	3.24	2.75
Parents	3.82	3.33

Note: 1 is the apparent promotion and 5 is the apparent reduction, a score of 3 suggests no perceived effect.

Comparing students’ ideas with parents’ ideas, it shows that parents think both scores and social skills will have slight reduction after playing videogames, whereas students believe games slightly reduce scores, but actually slightly promote social skills. The differing opinion of the social effects could be a product of the different views of what constitutes social interaction. Parents may not know students are playing with friends rather than alone, or they may not count this as building social skills.

The free responses in 358 questionnaires show mostly neutral opinions about the positive and negative effects of playing videogames. The most frequently cited positive effect was that people can get relaxed while and after playing computer games. A somewhat surprising amount of respondents also explained their ideas by claiming that playing videogames improves people’s physical coordination and growth of intelligence. Specifically, Puzzle Games stimulate people to think about knowledge in different ways, and Massively Multiplayer Online Games motivate them to meet new friends with common interests and promote team working productivity.

On the other hand, the most cited negative effects is that playing videogames wastes too much time, and distracts them from focusing on studying and working on their own projects. In addition, they explain that playing computer games does harm to their eyesight and decreases their physical activities outdoors, thereby negatively impacting their health. Many participants noted that there is no positive or negative effect of playing

videogames, but whether good or not depends on the time people spend playing games.

V. CONCLUSION

Although playing videogames has already been discussed for a long time by many researchers, most of them focus on the effects of playing games on study and socialization, the best kinds of games for students to improve themselves, and the situation of students playing games. This report contributes by analyzing the differences between perception among youths and adults about the impact of demographic, achievement, and mental factors on participation, playing time, and game preference. More importantly, this report gives suggestions to students and parents so that they can better understand each other, while also informing future research on possible relationships to examine.

As mobile devices make game playing more and more accessible and external moderation by authority figures more difficult, it is important to consider perceptions and beliefs of students specifically. Thus, that is why it is important that they can regard this report as a reference to mitigate the addiction of students to games and inspire teachers and parents to come up with effective methods to solve the problem or combine the games with studying in effective ways. For stimulating the harmonious relationship between youths and adults, people can observe the situation of students playing games so as to discover the ways to deal with possible addiction.

This research also generates many useful findings for providers and researchers, including preferred game types, learning and social skills influenced by games, and effects of playing. About game types, youths like playing First-Person Shooting games with violent and enthusiastic plots with the goal of relaxation, while adults are prone to play Puzzle games with information to promote their intelligence. With this information, teachers and parents can know what and why their students or children are playing, and to judge whether their participation is harmful to their mental health. Simultaneously, the game design company can devise videogames for various age groups and increase their benefits.

About learning and social skills influenced by games and effects of playing, neither parents nor children think they can be apparently or even slightly promoted by playing games. On the contrary, most believe playing videogames negatively affects their study and social lives. However, when analyzing the free responses answered by participants, it shows that the effects of playing games depend on how long people spend on them. Thus, teachers and parents should negotiate about this situation that it takes their students or children too much time to play games, and they may figure out a way to solve the problem. Rather than trying to utterly ban games, schools and parents could consider implementing controlled play periods where students can use electronic devices for short periods. Also, game design companies may consider the information from this report deeply so that they can make or invent a type of game that can decrease players’ time spent on them each day, and market these more to parents wanting to compromise with their kids.

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Mathematical Model for the Diurnal Rhythm of Leptin in Healthy Young Women

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Abstract- New parameters can be introduced to expand families of distributions for added flexibility or to construct covariate models. Introduction of scale parameter usually leads to the accelerated life model, and taking powers of the survival function introduces a parameter that leads to the proportional hazard model of Morgenstern gumbel bivariate distribution was applied to find the diurnal rhythm of leptin depends on energy, or carbohydrate, availability, not intake, and exercise has no suppressive effect on the diurnal rhythm of leptin beyond the impact of its energy cost on energy availability.

Index Terms- Luteinizing hormone; pulsatility parameter, survival functions

I. INTRODUCTION

The independent effects of energy availability and exercise stress on the 24-h mean and amplitude of the diurnal rhythm

of leptin. Before their participation, volunteers received a detailed oral and written description of the screening process and experimental protocol, which was approved by the Institutional of university. All volunteers signed an informed consent document. The daily exercise treatment consisted of a series of supervised 30min bouts of walking on a treadmill at 70% of each individual's aerobic capacity, with 10-min rest intervals between bouts until each subject had expended 30 kcal. After the baseline days ,dietary energy intake was controlled by feeding subjects measured amounts of the liquid dietary product, Ensure. Subjects were permitted to drink water ad libitum, but nothing else. Compliance with the energy availability treatments was checked each morning by monitoring urinary acetoacetate levels with Multistix dip sticks. For each subject, 24-h mean leptin concentration was calculated, and leptin time series were expressed both as absolute concentrations and as relative concentrations normalized to the 24-h mean for each subject.

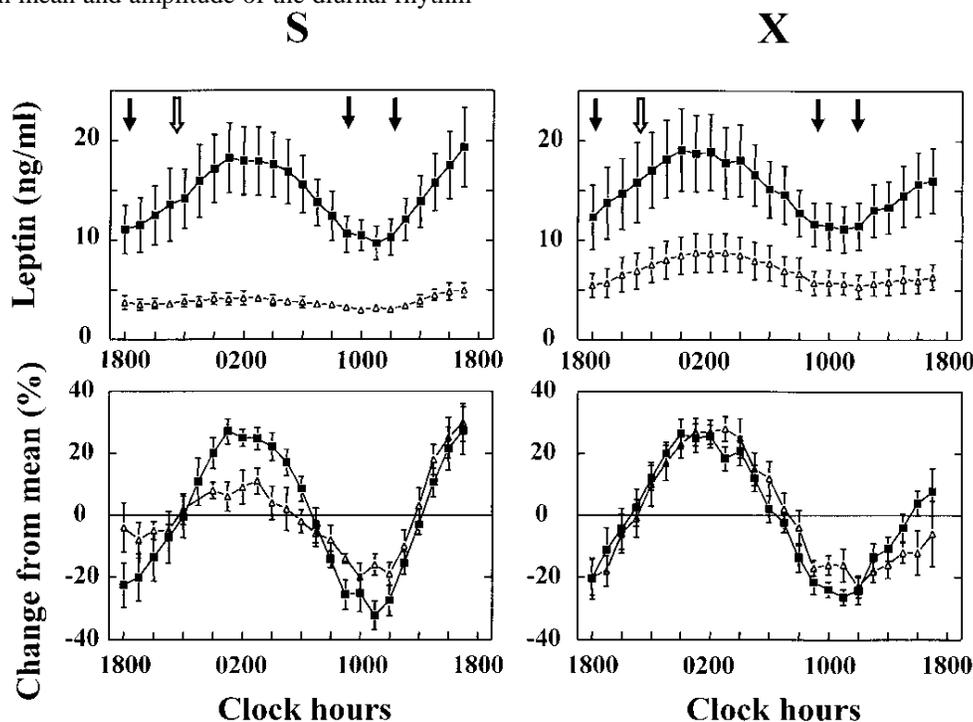


Fig. The 24-h group mean leptin rhythms at the end of 4 days of abalanced (j) and low (n). Left: sedentary treatment group (S, n = 5 7). Right: exercising treatment group (X, n = 5 9). In S, but not in X, low energy availability blunted the amplitude of the

diurnal leptin rhythm as a percentage of the 24-h mean. Values are means \pm 6 SE. Meal times were at 1800, 0900, 1200 (solid arrows), and 2100 (B only, open arrows).

The resulting two time series for each subject were analyzed by cosinor rhythmometry with the assumption of a period of 24 h. All leptin parameters were calculated from the raw leptin data and not from the fitted cosinor curve. The acrophase and nadir were defined as the maximum and minimum leptin concentrations, respectively. Amplitude was defined as one half of the difference between the acrophase and the nadir.

Figure shows the leptin profiles measured during the 24-h frequent blood sampling period. The profiles are presented separately as concentrations and as percentage changes from each individual's 24-h mean. Profiles for balanced and low energy availability treatments are plotted together for comparison. Table presents summary statistics for the profiles shown in Fig.

Table *Leptin parameters after balanced energy availability treatments and effects of low energy availability*

	Units	Sedentary (S)		Exercise (X)	
		Balanced	L effect	Balanced	L effect
Leptin concentrations					
24-h Mean	ng/ml	14.3 ± 1.8	-10.5 ± 1.6‡	15.0 ± 1.8	-8.2 ± 1.4‡
	%		-72 ± 3%‡		-53 ± 3%*‡
At acrophase	ng/ml	18.7 ± 2.3	-14.4 ± 2.0‡	19.6 ± 2.3	-10.8 ± 1.9‡
At nadir	ng/ml	9.5 ± 1.1	-6.5 ± 1.0‡	8.9 ± 2.3	-5.1 ± 0.8‡
Amplitude	ng/ml	4.6 ± 0.7	-3.9 ± 0.6‡	4.6 ± 0.6	-2.8 ± 0.6‡
	%		-85 ± 3‡		-58 ± 6*‡
% Change from 24-h mean					
At acrophase	%	30 ± 2	-17 ± 3‡	31 ± 2	0 ± 4*
At nadir	%	-34 ± 3	13 ± 5‡	-31 ± 2	8 ± 2‡
Amplitude	%	32 ± 2	-15 ± 4‡	31 ± 2	-4 ± 3*

All values are means ± SE. Effects of low energy availability by exercise expenditure less than effects by dietary restriction: * $P < 0.05$. Effects of low energy availability (L effects = low energy availability values – balanced energy availability values): † $P < 0.01$, ‡ $P < 0.001$.

Comparing exercising women (X) to sedentary women (S) at the same energy availabilities revealed that exercise stress had no suppressive effect on either the 24-h mean ($P > 0.2$) or the amplitude ($P > 0.3$) of the diurnal leptin rhythm. As mentioned above, however, the unexpectedly excessive rises in leptin during the afternoon of the 2nd day of sampling were smaller in the exercising than in the sedentary women.

Comparing women receiving low energy availability treatments with themselves when they received balanced energy availability treatments revealed that low energy availability strongly suppressed both the 24-h mean and amplitude of the diurnal rhythm of leptin. Low energy availability blunted the amplitude of the leptin rhythm by 10% in all seven sedentary women, and cosinor rhythm analysis was unable to detect a significant rhythm in two of the women. By contrast, the rhythm was maintained in all nine of the exercising women during the low energy availability treatment, and the amplitude was blunted by 10% in only two. Thus there was an interaction between energy availability and exercise stress on both the 24-h mean and amplitude of the diurnal leptin rhythm. This interaction was due to the greater suppression of both the 24-h mean and amplitude of leptin in the sedentary women by low energy availability.

The diurnal rhythm of leptin displayed by the women in this experiment after the balanced energy availability treatments in figure was similar to the rhythms observed in other groups who consumed their diets as oral meals. As in some other experiments however, leptin levels were much higher at the end of the 24-h frequent blood sampling period than at the beginning because of an excessive rise in leptin during the afternoon of the 2nd day of our 24-h frequent blood sampling period in figure probably as an artifact of our feeding schedule. Throughout the treatment period, we controlled energy availability on a 24-h clock from 0800 to 0800, but the frequent blood sampling period was scheduled from 1700 to 1700. During the frequent blood sampling, we administered the balance of the first day's food

between 1700 and midnight, in keeping with the feeding schedule during the treatment period, but we administered the entire next day's food between 0900 and 1200, causing an unusually strong drive for leptin secretion in the afternoon. Exercise stress had no suppressive effect on either the 24-h mean or amplitude of the diurnal rhythm of leptin.

II. MATHEMATICAL MODEL

New parameters can be introduced to expand families of distributions for added flexibility or to construct covariate models. Introduction to scale parameter usually leads to the accelerated life model, and taking powers of the survival function introduces a parameter that leads to the proportional hazard model. Marshall and Olkin (1997) introduced a method of obtaining an extended family of distributions including one more parameter. For a random variable with a distribution function $F(x)$ and survival function $\bar{F}(x)$, we can obtain a new family of distribution functions called univariate Marshall-Olkin family having cumulative distribution $G(x)$ given by

$$G(x) = \frac{F(x)}{\alpha + (1 - \alpha)F(x)}; -\infty < x < \infty; 0 < \alpha < \infty$$

Then the corresponding survival function is

$$\bar{G}(x) = \frac{\alpha \bar{F}(x)}{1 - (1 - \alpha)F(x)}; -\infty < x < \infty; 0 < \alpha < \infty$$

This new family involves an additional parameter α . In bivariate case if (X,Y) be a random vector with joint survival function $\bar{F}(x,y)$, then

$$G(x, y) = \frac{F(x, y)}{\alpha + (1 - \alpha)F(x, y)}; -\infty < x < \infty; -\infty < y < \infty; 0 < \alpha < \infty.$$

Constitute Marshall –Olkin bivariate family of distributions. The new parameter α results in added flexibility of distributions and influence the reliability properties.

Consider the bivariate exponential distribution of Gumbel(1960) with joint cumulative distribution function.

$$F(x_1, x_2) = 1 - e^{-x_1} - e^{-x_2} + e^{-(x_1^m + x_2^m)^{\frac{1}{m}}}, x_1, x_2 > 0, m \geq 1$$

The survival function of the Morgenstern Gumbel bivariate distribution can be obtained as

$$\bar{F}(x_1, x_2) = e^{-\frac{(x_1^m + x_2^m)^{\frac{1}{m}}}{m}}$$

Consider the survival function \bar{F} . The new family of survival functions is constructed using Marshall-Olkin method by taking

$$\bar{G}(x; \alpha) = \frac{\alpha \bar{F}(x)}{1 - (1 - \alpha)\bar{F}(x)}; 0 < \alpha < \infty$$

When $\alpha=1$, we get

$$\bar{G} = \bar{F}$$

Marshall – Olkin Gumbel bivariate exponential distribution can be written as

$$\bar{G}(x_1; x_2) = \frac{\alpha \bar{F}(x_1, x_2)}{1 - (1 - \alpha)\bar{F}(x_1, x_2)}; \alpha > 0, x_1 > 0, x_2 > 0$$

$$= \frac{\alpha e^{-(x_1^m + x_2^m)^{\frac{1}{m}}}}{1 - (1 - \alpha)e^{-(x_1^m + x_2^m)^{\frac{1}{m}}}}$$

When $\alpha=1$, it easily follows that $\bar{G} = \bar{F}$
 From these we get

$$\bar{G}_{x_1}(x_1) = \frac{\alpha e^{-x_1}}{1 - (1 - \alpha)e^{-x_1}}; \alpha > 0, x_1 > 0$$

And

$$\bar{G}_{x_2}(x_2) = \frac{\alpha e^{-x_2}}{1 - (1 - \alpha)e^{-x_2}}; \alpha > 0, x_2 > 0$$

There are univariate Marshall-Olkin exponential distributions

Theorem 7.2.1 Let N be a geometric random variable with $p(N=n)=pq^{n-1}$,

$$N=1,2,\dots, 0 < p < 1, q=1-p$$

Consider a sequence $\{(X_i, Y_i), i \geq 1\}$ of $i.i.d$ random variables with common survival function $\bar{F}(x,y)$, N and

(X_i, Y_i) , are independent for all $i \geq 1$. Let $U_N = \min_{1 \leq i \leq N} X_i$ and $V_N = \min_{1 \leq i \leq N} Y_i$. Then the random vector (U_N, V_N) is distributed

as Marshall – Olkin Gumbel Exponential(MOGE (m,p)) if and only if (X_i, Y_i) , has the Gumbel bivariate distribution with parameter m .

Proof. Let $\bar{S}(x,y)$, be the survival function of (U_N, V_N) . By definition

$$\begin{aligned} \bar{S}(x,y) &= P(U_N > x, V_N > y) \\ &= \sum_{i=1}^n (\bar{F}(x, y))^n pq^{n-1} \end{aligned}$$

$$= \frac{p \bar{F}(x, y)}{1 - (1 - p)\bar{F}(x, y)}$$

$$= \frac{pe^{-(x^m + y^m)^{\frac{1}{m}}}}{1 - (1 - p)e^{-(x^m + y^m)^{\frac{1}{m}}}}$$

→ MOBGE (m,p)

Conversely let (U_N, V_N) has MOGE (m,p) distribution. Then solving the equation was get.

$$\frac{p \bar{F}(x, y)}{1 - (1 - p)\bar{F}(x, y)} = \frac{pe^{-(x^m + y^m)^{\frac{1}{m}}}}{1 - (1 - p)e^{-(x^m + y^m)^{\frac{1}{m}}}}$$

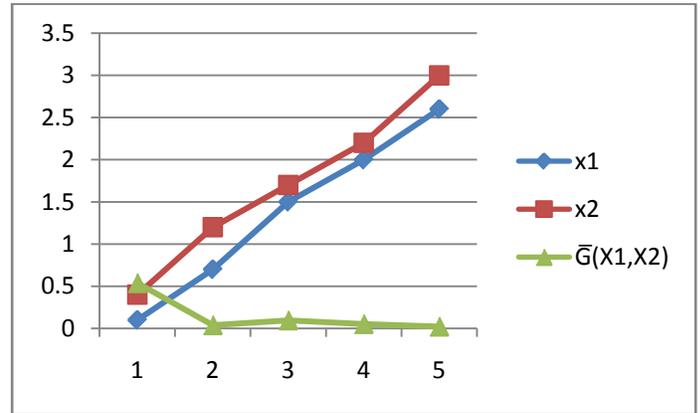
Then we get,

$$\bar{F}(x, y) = e^{-(x^m + y^m)^{\frac{1}{m}}}$$

Which is the survival function of the Morgenstern Gumbel exponential distribution with parameter m.

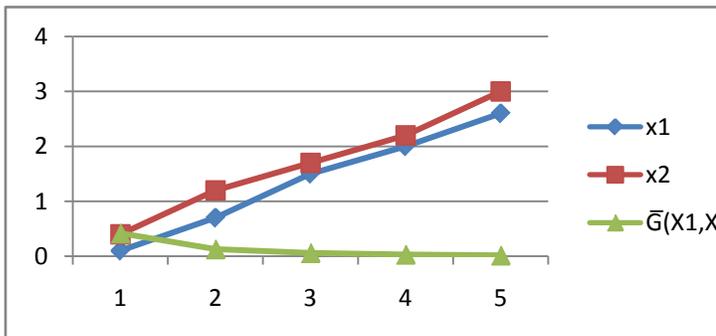
Leptin level in sedentary treatment group

X ₁	X ₂	$\bar{G}(X_1, X_2)$
0.1	0.4	0.418469
0.7	1.2	0.129825
1.5	1.7	0.061828
2	2.2	0.033297
2.6	3	0.017632



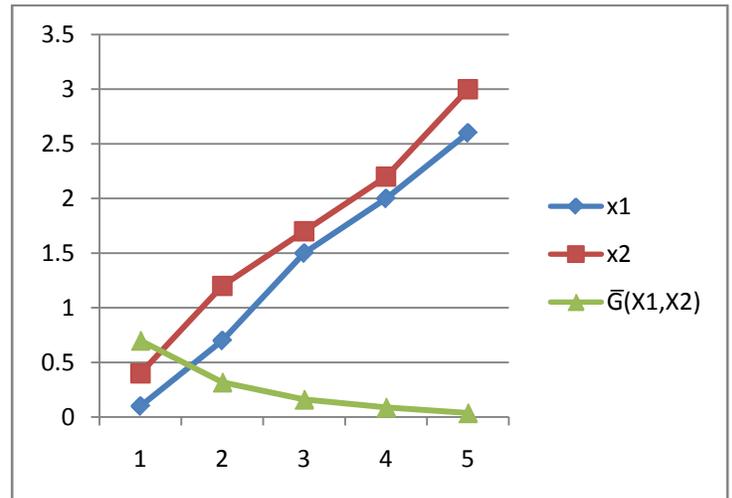
Mean for leptin in sedentary treatment group

X ₁	X ₂	$\bar{G}(X_1, X_2)$
0.1	0.4	0.700207
0.7	1.2	0.318379
1.5	1.7	0.161762
2	2.2	0.089550
2.6	3	0.038154



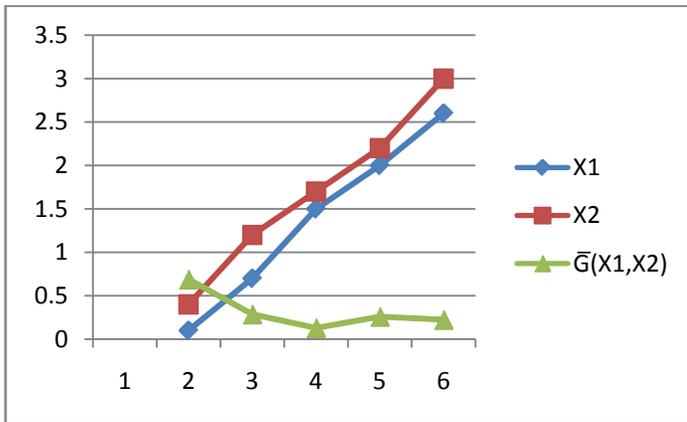
Leptin level in exercising treatment group

X ₁	X ₂	$\bar{G}(X_1, X_2)$
0.1	0.4	0.538496
0.7	1.2	0.039567
1.5	1.7	0.097089
2	2.2	0.053288
2.6	3	0.022881



Mean for leptin in exercising treatment group

X ₁	X ₂	$\bar{G}(X_1, X_2)$
0.1	0.4	0.689103
0.7	1.2	0.286986
1.5	1.7	0.129572
2	2.2	0.259413
2.6	3	0.223891



III. CONCLUSION

The survival function of the M.G bivariate distribution was applied in diurnal rhythm of leptin depends on energy, or carbohydrate, availability, not intake, and exercise has no suppressive effect on the diurnal rhythm of leptin beyond the impact of its energy cost on energy availability and also found cumulative distribution function of leptin hormone.

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A Critical assessment of Corruption within the Legislature in Nigeria

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Abstract- Nigerian is confronted with an array of challenges which threaten its survival. One of these is corruption, especially within the legislature, given the fact that this arm of government is the lamp of the society, any calculated action, or omission from it, has significant impact on the general outlook of the country. Corruption is viral as such combating it is persistently proving difficult. However, laudable achievements have been recorded by the legislature but regrettably, the ugly incidences of corruption in the system is grossly beclouding these strides. Generally, corruption brings about economic backwardness, political instability, social insecurity, infrastructural decay, negation of the principle of law, etc. Based largely on secondary data, findings reveal that the consequences of corruption on the legislature in Nigeria includes bills that are not entirely beneficial to Nigerians have been passed into law in order to please the executive, political patronage, partisanship, and primordial sentiments characterise legislative activities; negating the principle of check and balance between the three arms of government. It is recommended among others that corrupt individuals should not be part of the legislature; the emolument of political office holders at all tiers of government should be made public; effective laws to check the excesses of legislators and all political office-holders in Nigeria be put in place as a matter of urgency; The Nigerian federation be restructured in order to deal with the psychology of national cake sharing which breeds corruption in governance and holding forth honesty and integrity in the discharge of legislative constitutional responsibilities.

Index Terms- Corruption, Critical Assessment, Legislature, Nigeria.

I. INTRODUCTION

The legislature in Nigeria is making significant efforts towards enunciating effective laws in order to bring about the promotion of a progressive Nigeria. Yet it appears as if nothing is being done. This is premised on the fact that this arm of government is faced with multiplicity of challenges prominent of which is the incidence of corruption which hampers its efforts in executing this onerous task. It is based on the foregoing that this paper attempts a critical assessment of corruption within the legislature in Nigeria. To achieve this, the paper is divided into eight sections consisting of: background; conceptualization; theoretical framework; factors responsible for corruption in the Nigerian legislature; incidences of corruption in the Nigerian legislature; consequences of corruption within the legislature on Nigeria; conclusion; and solution.

II. BACKGROUND

The Nigerian state from its inception as a socio-political and economic entity has been shaken and is still being threatened by the phenomenon of corruption. In recognition of this, the colonial administration in fashioning out laws for the various component units (regions) which constitutes it un-mistakenly enshrined legislations against it in the constitutions of these areas. Specifically, Section 98, 98A, 98B, and 104 of the Criminal Act; and Section 115-122 of the Penal Code which prevailed in the Southern, and Northern parts of the country respectively lay emphasis on this. In spite of these legislations, the phenomenon still prevailed over the country in varying degrees, though not as serious and as systematic as it has become nowadays. Worrisome is its prevalence in the legislative arm of government from the first Republic to the present. Corruption within the Legislature in Nigeria is a function of acts of omission, or commission, or a combination of both, as regards what its members have, or have not done as regards holding forth the light for illuminating the country. Under this circumstance, personal aggrandizement becomes the decisive factor for the foregoing action(s). In his analysis of how corruption rested within the domain of power in Nigeria, Osoba (1996:373-381), made a chronology of corruption development in Nigeria which he identified as the monopoly of power by the colonialist which eventually transcended to the use of powers by politically influential Nigerians (herein lies the genesis of corruption within the legislature in Nigeria) over award of contracts for public projects, issuance of commodity buying agents' licenses, etc. This resulted in the emergence of ten percent "kickbacks" and other forms of corrupt practices during the period of decolonization (1952-60); During the immediate post independent era (1960-1966), the governing elites used state power and the state treasury to better their lot as well as other forms of corrupt practices which include fraudulent awards (including outright sale) of unsecured government loans, produce buying and import-licenses to cronies, inflation of contract values, etc. The intervention of the military in Nigeria's politics between 1966 and 1979 saw the foundation of kleptocracy in the nation's body polity especially the immediate post-civil-war era due to the emergence of the oil boom. However, the fourth republic presented a new dimension to the phenomenon, thus various forms of unwholesome misappropriation through the budget and other financial dealings including vested interest in what is called *constituency projects* which engenders corruption. It is important to note that Nigeria has multiple legislations for controlling corruption. These include: the provisions of the Code of Conduct Bureau and the Code of Conduct Tribunal; the

provisions of the 1999 Nigeria constitution; the failed Bank and Financial Malpractices Decree No.18 of 1994; and the money laundering decree No. 3 of 1995 as amended in 2003 and 2004 Money Laundering Acts; provisions of the Criminal Code, Penal Code, Criminal Procedure Act etc; the ICPC Act of 2000; as well as the EFCC 2004 Act. There are a number of agencies and statutory bodies for managing corruption in Nigeria. These include: Code of Conduct Bureau and the Code of Conduct Tribunal; the Public Complain Commission; the Independent Corrupt Practices and other related offences Commission (ICPC); the Economic and Financial Crimes Commission (EFCC). Effort at sanitizing the body polity of corruption especially in the legislature is proving difficult. This is due largely to the fact that it is non arguable that the fight against corruption was never systematic and deliberate due to the presence of the menace within the corridors of power in Nigeria especially the legislature which is supposed to be the light of the nation. Thus it is important to examine corruption within the legislature in Nigeria. This is because defining Nigeria as “fantastically corrupt” in the words of the then British Prime Minister, David Cameron in 2016, is not to be taken for granted by those that have the interest of Nigeria at heart. Furthermore, “corruption in Nigeria has passed the alarming and entered the fatal stage and Nigeria will die if we keep pretending that she is only slightly indisposed” (Achebe in Agedah, 1993:67). On the other hand, Ohiorhenuan (2015:97-125), conceives corruption as the driving force for the evolution of institutions in Nigeria. It is observed that “whereas war at most kills off a fragment of the present, economic warfare *represented by corruption* murders *not just the present but the future*” (Hitler, 1983:8; emphasis mine).

III. CONCEPTUALIZATION

All human societies have rules and regulations which guide their interactions (socio-political and economic relations), the essence of which is to bring about predictability in the behaviours of members of the society in question, the foregoing places boundary for the definition of compliance, or non-compliance to these bodies of norms. Very important is the fact that rules and regulations are socially created to serve defined purpose for the society. It is equally true that all societies have systems through which these rules and regulations are generated. Same can be said for all regimes (military or civilian; authoritarian, despotic, totalitarian, monarchical, democratic etc) everywhere, thus Nigeria is not in isolation as regards this. As a Democratic State, the body responsible for making these rules and regulation as far as Nigeria is concerned, is the legislature. In line with this, Section 47 of 1999 Nigerian Constitution observes that “there shall be a National Assembly for the Federation which shall consist of a Senate and a House of Representatives” and section 90 declares that “there shall be a House of Assembly for each of the States of the Federation.” The legislature in Nigeria from the foregoing operates at two tiers of government i.e. at the Federal, and the State; while at the Federal level, it operates as two distinct chambers i.e. the upper chamber (Senate) and the lower chamber (House of Representatives) due to the fact that Nigeria runs a bicameral legislature. Thus as stated in Section 4(1) of 1999 Nigerian Constitution, “the legislative powers of the

Federal Republic of Nigeria shall be vested in a National Assembly for the Federation which shall consist of Senate and a House of Representatives.” While Section 4(6) holds that “the legislative powers of a State of the Federation shall be vested in the House of Assembly of the State.”

As regards the number of individuals whose responsibilities it is to see that Nigeria is properly governed with good legislation specifically at the Federal level, Section 48 of the constitution of the Federal Republic of Nigeria holds that “the Senate shall consist of three Senators from each State and one from the Federal Capital Territory, Abuja” in this case, 109 members given the fact that Nigeria is made of 36 states; and Section 49 of the constitution indicates that “...the House of Representatives shall consist of three hundred and sixty members representing constituencies of nearly equal population as far as possible, provided that no constituency shall fall within more than one State” in this case, the population dynamics of closely bounded areas is the delineating parameter. Thus the total number of the legislature at the Federal level is summed up to 469 members.

The primary responsibility of the legislature (at the Federal level) which undoubtedly is making of laws is clearly stated in Section 58 of the 1999 Nigerian Constitution which states that:

- (1) The power of the National Assembly to make laws shall be exercised by bills passed by both the Senate and the House of Representatives and, except as otherwise provided by subsection (5) of this section, assented to by the President.
- (2) A bill may originate in either the Senate or House of Representatives and shall not become law unless it has been passed, except as otherwise provided by this section and section 59 (which deals with the appropriation bills or supplementary appropriation bills as well as other financial and tax matters) of this constitution, assented to in accordance with the provisions of this section.
- (3) Where a bill has been passed by the House in which it originated, it shall be sent to the other House, and it shall be presented to the President for assent when it has been passed by that other House and agreement has been reached between the two Houses on any amendment made on it.
- (4) Where a bill is presented to the President for assent, he shall within thirty days thereof signify that he assents or that he withholds assent.
- (5) Where the President withholds his assent and the bill is again passed by each House by two-thirds majority, the bill shall become law and the assent of the President shall not be required.

However, Section 100 of the same Constitution elaborates the corresponding responsibility of legislature at the State level (House of Assemblies).

The second issue under review here is the concept of corruption. Scholars have attempted various definitions for this global evil which emergence cannot absolutely be tied to any particular society due to the fact that it manifests in varying degree in particular, or different places at given, and different times. For example, Dambazau (2009:94&95), observes that

“corruption by itself is crime...which takes the form of bribe, undue gratification, fraud and embezzlement...It is found in business, politics, religion, and education...It encourages criminal acts as a result of its ability to encourage dishonesty, theft, and violence in the society.” While Otite (in Peter, 2013:241), holds that corruption is “the pervasion of integrity or state of affairs through bribery, favour, or moral depravity” this is anchored on the fact that it produces dishonest, unfaithful or defiled situations when at least two parties have interacted to change the structure or processes or the behaviour of functionaries in the society. To Osoba (1996:372), it is “a form of anti-social behaviour by an individual or social group which confers unjust or fraudulent benefits to its perpetrators”. To him, it is inconsistent with, and a negation of legal norms and prevailing moral ethos of the society due to its capacity to subvert the capacity of government or any other legitimate authority to fully provide both the material and spiritual wellbeing of members of the society justly and equitably. However, Yakubu (2004/2005:54), observes that “corruption is the negation of the ideals of democracy and good governance” hence bad governance, premised on the ground that the termination of democratically elected governments is linked to corruption in the system. On the other hand, Section 98, 98A, 98B, and 104 of the Nigerian Criminal Code specifies actions which can be conceived as corruption especially Official Corruption in line with Section 115 to 122 of the Penal Code. For example Section 98 of the Criminal Code is clear in stating that:

- (1) Any public official who-
 - (a) Corruptly asks for, receives or obtains any property or benefit of any kind for himself or other persons; or
 - (b) Corruptly agrees or attempts to receive or obtain any property benefit of any kind for himself or any other person, on account of-
 - i. Anything already done or omitted, or any favour or disfavour already shown to any person, by himself in discharge of his official duties or in relation to any matter connected with a function(s), affair(s) or business of a Government department, public body or other organisation or institution in which he is serving as public official, or
 - ii. Anything to be afterwards done or omitted, or any favour or disfavour to be afterwards shown to any person, by himself in the discharge of his official duties or in relation to any such matter as aforesaid.

Is guilty of felony of official corruption and is liable to imprisonment for seven years.

However, Section 116 of the Penal Code states that:

Whoever accepts or obtains or agrees to accept or attempts to obtain from any person for himself or for any other person any gratification, whatever, whether pecuniary or otherwise as motive or reward for inducing by corrupt or illegal means any public servant-

- (a) To do or forbear to do any official act; or

- (b) In the exercise of the official functions of such public servant to show favour or disfavour to any person; or
- (c) To render or attempt to render any service or disservice to any person with any department of the public service or with any public servant as such shall be punished with imprisonment for a term which may extend to three years or with fine or both.

Despite how corruption has been defined by scholars, this research considers it in relation to the legislature, as any act or action which contravenes the 5th schedule of the 1999 Nigeria Constitution. Therefore, corruption within the legislature in Nigeria is the wrongful use of one’s influence or position as a legislator in order to procure or gain some benefit(s) for one’s self, other person(s), or group(s) contrary to their right(s) of duty or the right(s) of others. Furthermore, it is associated with cheating, indiscipline, abuse of privileges, powers and rights. It brings about inertia/retrogression not only in the legislature, but the country as a whole, increases the rate of inefficiency, greed, waste of resources and as such introduces instability and mediocrity (negation of meritocracy) in the country. This usually leads to non-compliance to the rule of law and constitutionality. In line with the foregoing, legislative corruption can be deduced from Samuel, Aju, and Elaigwu, (2014: 20) and Ohiorhenuan (2015:104-106), who locate it within the context of political corruption, which entails misuse of legislative power and rights which also include legislation carried out to benefit political office holders, abuse of judicial procedure, auditing, investigatory and oversight functions abuse. Destabilization of electoral processes through buying of votes and bribing officials, conversion of public property for one’s interest or those of cronies, usurping of public coffers for private cause, large political donations and bribes. This type of corruption is associated with top level executives, legislative and judicial officials, top businessmen and captains of industries, bureaucratic power holders and the political elites.

IV. THEORETICAL FRAMEWORK

Corruption committed within the legislative arm of government in Nigeria is complex, hence would be inadequately explained from the stand point of just a single theoretical interpretation. Thus, an integrative approach would serve a better purpose towards this end. This is because, while corruption committed by members of the legislature is unarguably *class* based as indicated by Achebe (1984:38). He also stated that any meaningful discussion on corruption in Nigeria must be located within the *corridors of power* since, as he observed, what the common man has is not *power*. Therefore, corruption within the legislature from the foregoing is linked to two fundamental elements which are; power and status, hence, elitist in nature.

What makes this power elite explanation of corruption interesting is the fact it is triggered by two basic elements which are: the drive for wealth acquisition, which capitalism breeds as explained by the Marxist theory and the obligation to satisfy primordial demands as propounded in Ekeh’s two publics. Every individual uses his/her position as well as influence to accumulate as much wealth as possible - including adapting various forms of corrupt practices. So, using one’s status as a

politician and position as a legislator as well as the influence associated with it makes it easy for one to accumulate wealth. This is because specifically in Nigeria, it is believed that public position is the quickest as well as the shortest means of becoming wealthy due to the fact that such position(s) is considered to operate within the realm of the *civic public* as explained by (Ekeh, 1975), which is regarded as amoral, consequently, it is permitted that individuals holding such position(s) (in this said realm) steal as much as they can in order to better their *primordial public*, which is considered as moral (which they cannot steal from). This is because one is only considered as a good, productive and beneficial member of the primordial public if he/she generously gives part of the largesse or booty stolen from the civic public to it. This set of individuals will enjoy protection and blessing from their primordial public as well as honoured with chieftaincy titles; very important is the fact that this drive for wealth accumulation brought by legitimization of banditry i.e. stealing from the civic public is facilitated through the principle of *Social Exchange* which incidentally is the second factor. This system of exchange is transactional and driven by the philosophy of utilitarianism which is guided by the psychology of both intrinsic and extrinsic desire for gain (material, position, pleasure, etc) which the individual stands to gain from the process. This exchange model holds that every individual no matter how highly placed has a price, once the price is mentioned/or offered, the deed is as good as done. Coupled with the fact that the individual(s) involved at this level of transaction(s) are power elites hence, they are largely considered *sacred* as such, untouchable by the regulatory agencies. Therefore, they are above the law despite being part of the law making process. The only time their actions are considered out of place is only when the reciprocal obligations of an exchange relationship(s) are violated, forcing deprived parties/individuals with no option than to sanction negatively those violating the norm of reciprocity, or when the elite's/elites' action(s) threatens the general wellbeing of the elites' group, or those of the elite group higher than the group the elite(s) belongs. Next to this is the question of how much does the said elite(s) count in the whole elite arrangement. This largely determines how his/her action(s) would be managed no matter how severe. Otherwise, the totality of the elite group would go up in flames as cans of worms might be opened here and there.

This integrated theoretical approach which combines the: Power Elite theory; Marxist's Historical and Dialectical materialism; Ekeh's Two Publics in Africa: a theoretical statement; and Exchange theory, offers us a balanced explanation of corruption in the legislature in Nigeria, and as such adequate insight into possible solutions to this evil bedevilling the Nigerian State.

V. FACTORS RESPONSIBLE FOR CORRUPTION IN THE NIGERIAN LEGISLATURE

Psychology holds that stimuli give rise to response. Indeed, there cannot be smoke without fire, the above point to the fact that there are factors either within or without the realms of the legislature in Nigeria, which conditions the occurrences of corruption in it. A careful examination of issues reveal that the occurrences of corruption in the Nigerian legislature are not

strait-jackets, hence cannot be compartmentalized since they correlate with other factors. Some of these identified factors include:

Executive indiscretion

This, by and large requires the support of the legislators (through lobbying) whose desires must be met by the executive in one way or the other but most often as the case in Nigeria is, through appropriations in the budget, but sometimes through outright bribing of the legislature in order to facilitate passage of bills sent to it by the executive. Due to the fact that the norm of check and balance of power is in principle expected to guide the relationship between the executive, legislature, and the judiciary in the federal system of government for effective and efficient dispensation of governance to the people, regrettably, the reality is something different as far as Nigeria is concerned. The outfall is that the legislature is made inactive, dormant, or at best make excuses for not calling the executive arm to order where it is evident that they are missing the mark. for example: Zuma of South Africa was found guilty in March 2016 for using about 246 million rand (\$15-16.7 million) state resources to renovate personal edifice in 2009 (Power steering, 2016:64; Onishi, 2016); Brazilian President, Dilma Rousseff was removed from office by that country's Senate in August of 2016 for indiscretion in office. These stated examples, were not, are not and may not be part of the process in Nigeria except her democracy is taken seriously. Furthermore, it is yet to be witnessed that any legislative assembly of all the years that Nigeria experimented or experienced democratic governance, that the executive is held responsible as regards campaign promises made to the people during electioneering periods as obtainable in advanced democracies, and not merely making mention of them on floor of the house and subsequently play politics with them. It is equally important to note that executive indiscretion is a direct/indirect failure of the legislature. This is premised on the tenets of Section 84 of the Nigerian Constitution. For example, Subsection 1 of it observes that: remuneration, salaries, and allowances of the President, Vice President, Chief Justice of Nigeria, Justice of the Supreme Court and other officials of government as enumerated in Subsection 4, may be prescribed by the National Assembly, however, not exceeding the amount as determined by the Revenue Mobilization Allocation and Fiscal Commission, just as Section 124 correspondingly observes those of the States' House of Assembly as regards State Governors and their Deputies, etc. the question however, is, to what extent has the legislature in Nigeria lived up to its constitutional responsibility with regards to the issue being discussed without being somehow compromised? From the foregoing, it is evident that lack of understanding of legislative functions, correlates strongly with executive indiscretion to bring about the incidences of corruption in the legislature.

Lack of understanding legislative functions

The incidences of corruption in the corridors of the hallowed chambers (Senate, and the House of Representatives, and the States House of Assembly) in Nigeria can best be described as unfortunate. This is because a good number of individuals in these chambers do not in the first instance understand what the business of legislation is, neither are they

interested in understanding it. Thus according to Wilmot (2007:124), as regards their activities during Nigeria's democratic experience (1999-2007) for instance, "instead of passing laws to promote economic development, justice, probity and the rule of law, legislators await the President's bagmen to bribe them with up to \$1,000,000 to ensure he continues to misrule". These monetary attraction was a factor for the quest for the unrealised third term bid adventure by the then President for the number one citizenship position of the country. While commenting on the constituency project saga between the executive and legislative arm of government in Nigeria, Ajaja (in Adesomaju., Olorok, & Onuba, 2016:7) observed that

"the idea is an organised fraud driven by the most ignoble men and women who have serially foisted themselves on Nigeria and Nigerians as lawmakers, but with no intentions of making laws that would engineer national development beyond advancing a cause for themselves via loopholes in the system".

Closely related to the issue under study is the fact that the voting format of shouting *I* or *Ney* in favour, or against motions used in these chambers may be argued to be defective hence may not yield the best outcome. This is premised on the ground that it is not systematic for one to verify the consent of members where equal number of members assent to the options. Furthermore, greater number of members with low vocal capacity may likely not have their way concerning a given motion due to their low sounding vocal strength, hence fewer number of members with high and stronger vocal capacity assent, erroneously accepted as the popular opinion. Not forgetting the fact that subjectivity may come into the presiding officers' decision on such matter(s) since objectivity is not followed. Under this circumstance, level of vocal sound is what is used to decide a motion instead of the scientific method of counting members' votes. Regrettably, Section 56(1 & 2) of the 1999 Nigerian Constitution is clear on this matter by stating that:

"...any question proposed for decision in the Senate or the House of Representatives shall be determined by the required majority of members present and voting; and the person presiding shall cast a vote whenever necessary to avoid an equality of votes but shall not vote in any other case; ...the required majority for the purpose of determining a any question shall be a simple majority."

Section 98 (1 & 2) of the same Constitution upholds the method of voting for States' House of Assembly.

Wealth acquisitive drive and personality influence

The above discussed factors and more are premised on the fact that a good number of Nigerian legislators are crazy for wealth acquisition as events and evidences over time have proven. Integrity is not the watch word, honesty and transparency is outdated virtues; what counts is how influential one is on the bases of wealth acquired. Since the foregoing accounts for how influential the individual becomes which would bring about recognition within and outside the individual's immediate community, as well as account for Honorary awards, and chieftaincy titles he/she receives (Wilmot, 2007; Dambazau 2009; Ethelbert, 2016a & b). No wonder political commentators and scholars in Nigeria often refer to them as *legislators* (the undesirable Judases in the midst tarnishing the image of the legislature) who react to the acquisitive instincts of primitive

accumulation of capitalism as if they have all it takes to outwit every other person if the said behaviour was an acceptable one. To summarize this wealth acquisitive drive and personality influence, (Waive, 2016) holds that, the super wealthy status of Nigerian politicians and past leaders can only be explained by their involvement in government. This phenomenon dates back to the immediate post independent era (1960-1966), the governing elites used state power and the state treasury to better their lot as well as other forms of corrupt practices which include fraudulent awards (including outright sale) of unsecured government loans, produce buying and import-licenses to cronies, inflation of contract values, etc.(Osoba, 1996). To elucidate the foregoing, Zi and Benard (2013) observed that wealth glorification has become part of contemporary Nigeria's tradition.

Corrupt individuals within the fold

Another factor responsible for the prevalence of various forms of corruption within the legislature is the undeniable fact that this organ of government in Nigeria as it is today, harbours a good number of individuals who have been accused of, or convicted of one corrupt practice or the other either as onetime chief executive of their state (governor) who manipulated their way into the legislative arm; as well as others whose cases of corrupt practice(s) were effectively thwarted. These individuals have, over time, indicated to Nigerians by their actions that they are experts in manipulating and circumventing the judicial process of the country, and as such considered sacred cows and hence untouchable. According to a report in Power Steering Journalism (March 2016: 62), there are top Nigerian politicians who are sacred and cannot be touched by the regulatory agencies in Nigeria. Having understood the nitty-gritty of the judicial process on the basis of how best to thwart justice (including obtaining perpetual injunction to prevent their trials), they stand as prelude for others to emulate within the system. According to Dewey (in Guerin,1993:10), "because response is in effect a classification of stimulus, the organism is in effect confronted with the problem of an indeterminate stimulus. How the conflict is resolved will shape how the organism responds to future stimulus." The import of this statement is that, the measure(s) taken by both the legislature and the regulatory agencies in response to corrupt practice(s) by any member or group(s) in the legislature, would determine the extent to which corrupt act(s) reduce(s) or otherwise in it. This will also shape the general outlook of the legislature and the agencies in charge of corruption management and control. In so far as there prevails what I have argued elsewhere as *corrupt individuals within the corridors of power* (Ethelbert, 2016b:33) corruption will persist within the legislature in Nigeria in spite of efforts made by few honest and dedicated legislators. This position is supported by Jibrin (in Obi, 2016: 14) who stated that "President Olusegun Obasanjo had been right and that, yes we (National Assembly members) are corrupt...there is corruption in the House of Representatives, and not only is there corruption, there is institutional corruption. These are things that I can prove and it is what my struggle is about." What the actors have said is like stating the obvious. Take for instance in June of 2011, the then Head of the Economic and Financial Crimes Commission (EFCC), Mrs. Farida Waziri while reacting to petitions received

by the Commission concerning legislators declared that, “we have evidence for arraignment, with this revelation, there are indications that more arrests and arraignment of lawmakers, (principal officers particularly) in the National Assembly on charges of corruption may not be ruled out” (Oluwasegun, 2011:12). Furthermore, Jibrin (in Ameh, 2016) stated unequivocally “I dare say corruption in the House of Representatives today is more than that of the executive and judiciary combined”

Absence of effective laws

Laws guide and direct human actions and interactions so that relationships can be predicted. However, effective laws are those which are adequate towards producing the desired result. This means that there are laws which though exists, but do not produce the desired result towards given end. From the foregoing, the absence of effective laws which would ultimately check the excesses of legislators and indeed other political office-holders in Nigeria is a major factor leading to the incidences of corruption, coupled with the fact that due to the propensity of some legislators towards corruption and the smear of corruption allegation on others, it is difficult for legislators in Nigeria to enunciate let alone pass into law effective laws which will enhance the success of the crusade against corruption in the country. On the contrary, what prevail are the antics of attempting the amendment of existing inadequate laws to further their selfish subjective interests. For example, the attempt at amending the Code of Conduct Act and the Code of Conduct Tribunal to remove the powers of executing of criminal procedure from the CCT on individuals brought before it; and those of Section 308 of the 1999 Nigerian constitution, in order to guarantee immunity for the principal officers of the Legislative Assemblies at all levels in Nigeria as evident in 2016. It is important to state in an unequivocal term that politics by its very nature is not bad or dirty. The issue however is the fact that some political actors in Nigeria and elsewhere are dirty or murky, and stinking as a result of corruption. Ironically, some of these set of individuals make their way into the legislature to make laws for those who have better moral standing and standard than they have. Furthermore, it is not out of place for us to also add that, sound and effective legislation which promotes the very essence of humanity should necessarily proceed from sound minds, not criminals and rogues. Consequently, due to dearth in the number of those with integrity in Nigerian politics, *demonarchracy*, (a system where democratically elected political leaders act like absolute monarchs with absolute powers, hence no check and balance on their activities) prevails (Ethelbert, 2016b:27); or better still *lootocracy* stands in place of democracy; *legislooting* carried out by *legislooters* (those who are not qualified to be in the legislature who define legislative functions in terms of monetary benefits only) replaces legislation performed by legislators.

It is equally important to note that there prevail the incidences of extra-legislative activities by the political actors in the legislature. This is evident in numerous incidences of meddling into the activities of corruption regulatory agencies in Nigeria (EFCC, ICPC and CCB) especially where one of their members is indicted for corrupt practice, or efforts at using these agencies for getting at political opponents (Umar, 2015;

Ethelbert 2016a; Igun, 2004/2004:49; Enweremadu, 2011:9; Zi & Benard, 2013: 161-162; Samuel, Aju, and Elaigwu, 2014:29). Consequently, these resulted into poor or weak control mechanisms, that is, weak anti-corruption laws and anti-graft agencies or these agencies are made weak, or ineffective (Osoba, 1996:385; Igun, 2004/2004:51; Our Milestones, 2011:31 & 32; Zi & Benard, 2013:161-164; Odekunle, 2013/2014:57). The point being made here is that the rule of law should prevail and not the rule by law (Osibanjo, 2008: 50 & 51). Nigeria must learn from advanced democracies the maturity of political actors/public office holders resigning their position on allegation of corruption to pave way for proper as well as unhindered investigation, and prosecution of cases against them where facts and evidences are established. Regrettably, the reverse is the case in Nigeria where these individuals fight back with everything in their arsenal, including employing various forms of propaganda and attack on anybody that seems to be standing on their path, castigating and throwing of tantrums, constituting impediment(s) to the anti graft agencies in various ways, constituting praise singers (including journalists) paid to drum to the world how innocent they are and how some primordial sentiments are deployed to persecute, *not prosecute* them etc, and at extreme, use their legal counsel(s) to raise frivolous claims and counter claims during litigation, thus leading to constant increase on number of high profile cases of corruption spread across various courts in Nigeria, so that cases involving a host of former governors, ministers and lawmakers remain pending, only petty thieves bear the full wrath of the law (Samuel, Aju, and Elaigwu, 2014:29; Ndujihe, 2015).

Pseudo federalism

A major contributory factor to the prevalence of corruption in Nigeria as a whole and not just the legislature is the fact that the Nigerian state upholds and practices a defective as well as an unbalanced federalism. The fact is that the present/assumed federalism practiced in Nigeria is nothing short of a unitary system of government, hence, *pseudo-federalism* bequeathed to it by the military regime (beginning with Ironsi) since the collapse of the first Republic (which was a parliamentary system of governance) in 1966, and granted further impetus by the 1979 and 1999 defective military backed crafted federal constitutions. The facts are obvious that the nation’s federalism lacks the ingredients of a true and proper federalism. According to Ekeh (2000:12-14), the ingredients of true federalism must include: a specified proportion of the federating unit rectifying the Federal Constitution; each federating unit has its own constitution in which it specifies how many legislative chamber it desires (unicameral, or bicameral legislature), as well as the location of its Capital; each component unit has and flies its own flag alongside that of the National flag; each constituent state has its own Police formation, as well as the Federal Police; each federating state develops and control its own human and material resources; and each federating unit enjoins a notion of justice in which it gives to the centre and receives some proportion in return. The facts are there that the present Nigerian Federation lacks in the above discussed ingredients. From the foregoing, Uwalak (2013:22), observed that “the way forward is to divide Nigeria into countries, or practice confederalism or resource control federalism-some call it true federalism...that will give the

power of development to states, regions etc.” It is not arguable that the present defective unitary cum federalism practiced in Nigeria concentrates resources as well as the power for its allocation to the centre, enthroning parasitism, where states sit idly by and wait for central government to dish out the monthly allocation from the resources of other states (Uwalak, *ibid*). As such, denying the communities with these natural endowments rights over their benefits, this is a corrupt and defective system itself, hence, brings about nothing but corruption (Ekeh, *ibid*). Consequently, the practice of national cake sharing which every member of the political elite jostle to grab as much as he/she can, not minding whose Ox was gored is the outfall of this pseudo federalism. Therefore, this pseudo federalism has to be resolved through the adoption of both political and economic solutions that will grant political and economic autonomy to the component/federating units. These units expectedly would remit specified sum to the centre on agreed intervals to enable it maintain the federal workforce and other federal responsibilities.

Defective electoral process

Closely linked to the issue of defective federalism is the fact that Nigeria electoral process is equally defective. The foregoing implies that the process through which these political gladiators come to power is itself corrupt. Evidence on ground points to the fact that from the first republic, elections in Nigeria is characterized by irregularities such as snatching of ballot boxes; stuffing of ballot boxes; manipulation of election results; bribing of electoral officials; prevalence of various forms of electoral violence including political assassinations, arsons etc; late arrival of election materials; short supply of these materials or completely non supply of these materials to some areas to favour as it were a prebendal candidate who is ready to buy anything and indeed anybody in order to win election, hence ready to comply effectively with the ugly method of rigging ; buying of voters cards; deliberate omission of voters' names or other associated antics that accompanies it; cancellation of results in some areas to give a preferred candidate undue advantage; declaration of result in favour of preferred candidate for areas or centres where election(s) did not take place; announcing of pre-doctored results; as well as the multiple challenge which confronts various electoral tribunals, due largely to unhealthy/defective electoral system. Hence, individuals rig their way through, buy their way through, or shot their way through to desired political position through the assistance of their hired thugs and other political agents. In corroborating this, Obi (2016:14) observed that “all our elections end up inconclusive and in litigation because there is no truth in them. Elections are marred by violence because someone wants to bend the truth with force” It is therefore not surprising that these set of legislators in these hallowed chambers quickly forget the tenets of Section 66(2b) and 107(2b) which holds that, any person who has been declared to be of unsound mind is not qualified to be a legislator either at the Federal or at the State level, as such finds it not difficult to abuse themselves, or throw punches and wrestle each other at different times at both the federal and states assemblies in a manner more proficient than professional wrestlers and boxers in the Madison square-garden (Ethelbert 2016:34) or better still throw caution and dignity to the winds as

they climbed and jumped over the Federal Assembly complex locked gate as was the case in 2014.

Simply put that the legislature in Nigeria is being turned into a mercantile, thus some of those whom have been entrusted with securing the general good have dubiously turned it into their private pockets or those of their cronies (Ekeh, 1975; Osoba, 1996; Fayose, 2005 ; Ethelbert, 2016). Otherwise, what is the justification for attempting to procure and allocate N35million worth of vehicle for each member of the upper hallowed chamber which Nigerians carried out against in 2016; what is the moral justification for the huge amount of money these law makers take home as remuneration monthly, an action which the then Central Bank governor Mallam Sanusi Lamido now Emir of kano, reverberated to Nigerians that so much money go into settling of overhead cost of these law makers, which they attacked with all the venom they could muster at the time. To be specific, Odama (2013/2014:68) observed that N138.02 billion was sunk into servicing personnel and overheads cost of 469 National assembly members in 2010. This expectedly increased as the years go by. To be clear on this issue Uwalak (2013:22) observed that “the executive arm is bloated, the legislative arm bloated and criminally ineffective. The emoluments of those in government are heavy load to the resources of the country.” In summarizing the wealth acquisitive crave of the political elite, Achebe (1984:22), notes that, when it comes to grabbing of material wealth, the Nigeria elite hardly ever consider their numerical insignificance in caparison with amount of national wealth which they have looted or lay claim to.

The fact is that larger percentage of Nigerians are unaware of the amount of monies these legislators rake into their bank accounts on monthly bases while salaries of workers across the country are unpaid; when the approved minimum wage for workers cannot feed their families for one week; while the rate of unemployment is increasing uncontrollably; and inflation rate of between 13 to16 percent is driving the mass of Nigerian population to their untimely and early graves; while bank lending interest is nothing less than 14 percent and mostly available to the elite class; an appalling growth rate revolving around 1 percent. Ironically only a handful of individuals who constitute less than one percent of the country's population create avenues for carting away the nation's wealth, live in affluence with all the good trappings and luxuries of life, while the majority constitute what Fanon (1961) referred to as the “wretched of the earth” or what Madunagu (in Agidah, 1993:69) referred to as the popular mass, who are down trodden, oppressed, subjugated, exploited, and denied the right for a better tomorrow by those they have elected into office to safeguard and secure a future for them through meaningful legislation but were rather betrayed due to the denial of, or not understanding the importance of the social contract between them. According to Suleiman in Osah et al (2014:3),”serious allegations of financial misconduct abound in the chambers of the National Assembly which has become cash counters for sharing bribe money”.

VI. INCIDENCES OF CORRUPTION IN THE NIGERIAN LEGISLATURE

The legislature in Nigeria is bedevilled with multiplicity of corruption scandals and allegation from the inception of self-rule

(from independence to the present). The incidences of corruption somehow manifests in each democratic government from the first Republic to the present. For example, during the fourth Republic, two speakers of the House of Representatives (Salisu Buhari; Patricia Etteh and her deputy Babangida Nguroje - though not indicted officially hence no criminal procedure instituted) were removed or forced to resigned on ground of various forms of corruption bordering on Toronto Certificate scandal in the year 2000; and misappropriation of funds as relates to the renovation of official residence and purchase of official cars for the House of Representative to the sum of about N628 million in 2007 respectively. A number of Senate Presidents (from the South-East) were removed due to various unhealthy issues (borne out of power tussle conditioned by corruption). Various corruption scandals involving various legislative committees like the 3 million dollars bribery scandal involving Farouk Lawan the chairman Oil Subsidy Investigative Committee in 2012 of which about 620,000 dollars was alleged to have been collected by him (Farouk), (Onyejena, 2012:18; Yusuf, 2012:6); the 10 billion naira scandal involving Dimeji Bankole – former Speaker, House of Representatives in 2011, (which he was later cleared of) (Yusuf, 2011:1&2); the 44 million naira bribery allegation which led to the disbandment of the Herman Hambe led Capital Market Investigative Committee in 2012, (Yusuf, 2012:1); the 6.2 billion naira bribery scandal on the Elumelu-led House Committee on power reform in 2008 (Zero Tolerance, 2009b:41); the allegation made by Chief Esai Dangabar during his trial for N32.8billion fraud from the Police Pension fund that some Senators collected N8billion bribe from him (Ugah, 2012:17); the incidence of 108 Land Cruiser Sports Utility Vehicles (SUV) said to be ordered for members of the Senate at the cost of about N3.8 billion at N35million each against the original value of N17 million (Mudashiru, 2016); allegation of altering of the Senate's standing rule levelled against the Senate President, Bukola Saraki and his Deputy, Ike Ekweremadu which was said to have contributed to their being able to acquire the said position in 2015. An action considered as criminal and as such prompted court litigation constituted against them by the Minister of Justice and Attorney General of the Federation (Abubakar Malami) in 2016; the incidence of approving the 2016 budget said to have lapses. A report by The Nigerian Tribune of March 25, 2016 stated that “where they decide to look the other way and let a budget that is not fully corrected to be passed we are all in a state of quagmire“ commenting further on the attitude of the legislators, the report said that “when they came out blazing and telling us how the budget had been padded and how so many things were wrong, I honestly thought that we finally had a Senate that is not an extension of the Executive”. Other incidences include the allegation of between N285billion and N400billion 2016 budget padding made by Abdulmumin Jibrin, former Chairman of the House committee on Appropriation against principal officers of the House of Representative which includes the Speaker, Mr Yakubu Dogara; the Deputy speaker, Yussuf Lasun; the Chief Whip, Alhassan Ado Doguwa; as well as the Minority leader, Mr. Leo Ogor. The trouble stated on 21st July, 2016 due to the removal of (he) Jibrin from his position as Chairman of the Appropriation Committee in the House of Representatives ostensibly it was suggested that he may have lost his hunk (chunk) of the deal which is believed to be N4billion in

the said padded budget hence an about-turn to become a whistle blower to prevent others from enjoying their largesse (Akinnaso, 2016:48; Ameh, 2016:7). Afterwards, a connived suspension of Jubrin by solidarity muffler wearing members of the lower chamber especially the ethics committee for attempting to expose the ills of corruption in the legislature. A simple scientific observation reveals that the allegations or incidences of corruption on members of the legislature is located within the context of Sections 98, 98A, and 98B of the Criminal Code, hence, the persistent accusation of corruption on members of some of its investigative committees as well as regards appropriation as observed above.

It is equally important to mention the unhealthy prevalence of double pension for legislators, who were sometimes the governors of their states, this is simply a classical example of outright banditry in an economy like Nigeria. This has no other definition other than corruption.

Furthermore, Code of Conduct Bureau with its obviously clear constitutional functions is expected:

- a. To receive declaration of assets of public officers, made pursuant to the code of conduct;
- b. To retain custody of such declarations and make them available for inspection by any citizen of Nigeria on such terms and conditions as the National Assembly may prescribe;
- c. To examine the declaration and ensure that they comply with the requirement of the code of conduct and of any law for the time being in force (Agedah, 1993:16).

It is appalling that despite the significant role the legislature is expected to play with regards to public officers' declaration of assets, Obi (2016:14) observed that, with the exception of Senator Shehu Sani, “not a single member of (the national assembly) declared his or her assets publicly” as regards the 8th Assembly in line with the CCB tenets. When compared with what obtains elsewhere, one may be tempted to say Nigeria's democracy has a long way to go. For example While in Mongolia public officials are expected to declare their incomes and assets as well as those of their families not more than 30 days of assumption of office and afterwards, mandatory submission of their annual income declarations between 1-15 February of each year. Failure as regards these declarations by any official irrespective of position occupied attracts fine of between 5,000 and 25,000 Tugriks (US\$5.90 to US\$29.40). Furthermore, failure to effectively monitor these declarations by the regulatory officials attracts fines of between 20,000 and 30,000 Tugriks (US\$23.50 to US\$35.30). Heavy sanction awaits officials who fail to declare gifts or details of their foreign bank accounts. These set of officials risk between 30,000 and 40,000 Tugriks (US\$35.30 to US\$47.05) as fines. Very important is the fact that, officials found guilty of corruption will be discharged according to the procedure provided in their law. In the Philippines, immunity from Prosecution is provided for those willing to testify against public officials or any citizen of the country indicted of corruption (Alfiler in Quah, 1999:77).

The above are the reflection of corruption in the legislature in Nigeria. It is therefore not surprising that the Transparency International Report Index in 2004; 2005; and 2006, corruption within the legislature for these periods at 4.2; 4.1; and 4.1

respectively out of 5 points, regrettably, in 2013 the prevalence of corruption in the Nigerian legislature was nothing different but remained constant at 4.2 out of 5 points. This situation is worrisome especially to those who have the interest and progress of the country at heart. The prevalence of corruption in the legislature has direct correlation with the political process which brought these legislators to power, as revealed by that same report which placed the rate of corruption within political parties in Nigeria in 2004; 2005 and 2006 at 4.5 consistently out of 5 points for the period, while as at 2013, it was scored 4.7 out of 5 points, an indication of increase on the rate of corruption within political parties in Nigeria.

Having considered the incidences of corruption within the corridors of the law making institution in Nigerian; it was not surprising when the then British Prime Minister, David Cameron in May of 2016 described Nigeria as *fantastically corrupt* (Ehikioya, 2016:1 & 6; Waive, 2016:16), a statement that correlates with Nigeria's consistent ranking by the Transparency International (TI) Corruption Perception Index (CPI), as one of the most corrupt nations in the world over the years. The foregoing vindicates (Achebe, 1984:9) assertion that, not only that Nigeria is not great at least for now in other aspects of human endeavour like science and technology, it is however one of the most disorderly and corrupt nation under the sun, coupled with the fact that, it is highly insensitive, inefficient, as well as one of the most difficult places to live on earth. Views like the foregoing ones would not have been attributed to Nigeria given its peculiarity in term of geography and geological deposits, but due to inadequacies brought about by dysfunctional and retrogressive legislations that the country is exposed to, as well as the unwillingness of Nigerians to walk along the right path in every aspect of their dealings.

The denial of the above manifestation of corruption realities in the legislative organ of government in Nigeria may not be made. However, some significant efforts have also been made by it in stemming the tide. For example, The Senate Public Accounts Committee disclosed in June of 2002 that of the N40.7 billion recovered from the Abacha loot, N11.7 billion was missing (Ubabukoh, 2015:18); the Senate turned down President Obasanjo's request for the dismissal of Alhaji Hamman Tukur, Chairman of the Revenue Mobilisation Allocation and Fiscal Commission (RMAFC) on account of a face-off arising from the executive unauthorised withdrawal of over N1trillion (Ogundele, 2007); the Senate in 2009 ordered the recovery of N53billion failed banks loans. These were monies collected without collateral from the affected banks by some influential 64 Nigerians by virtue of their positions through various accounts (Ehikioya, 2009:1&2); in 2011, the Senate Joint Committee exposed the oil cartel which had held the nation at ransom for a long time (2006-2012) under the dubious oil subsidy regime which saw an increase on the number of companies involved in fuel importation into the country from 5 and the Nigerian National Petroleum Corporation (NNPC) in 2006, to 140 and the NNPC in 2011, a situation that accounted for the nation losing about N2.6trillion for the period investigated. Funny enough some of these were construction companies that had nothing to do with the oil industry (Adesammi, 2011:4; Leadership, 2012 June, 15:1&3); in February of 2012, the Senate traced N21billion of police pension fund to a commercial bank (Ojiabor and

Onogu, 2012:5); according to (Ugah, 2012:17), "the Elumelu-led House Committee on Power bungled its probe into former President Olusegun Obasanjo's \$13 billion Independent Power Project." Before the N5.2 billion bribery scandal which ended the committee's effort; the Senate Committee on Ethics, Privileges and Public Petition also held its ground against the wish of some members of the general House who wanted to play politics with the Petition of a whistle blower, Mr. Uboh in investigating the N1trillion allegation against the then Chairman of the EFCC, Ibrahim Lamorde in August of 2015 which eventually led to the dismissal of Lamorde (Koyi, 2015:5). The Senate in November of 2016 rejected the executive's request to borrow about \$30 billion from the World Bank for improper articulation of what the monies would be used for just to mention but a few.

These plausible achievements by the Nigerian legislature did not come about by the cooperation of all its members. However, what needed to be done was certainly done. That should be the guiding motive. Regrettably, the ugly incidences of corruption in the system is grossly beclouding these laudable strides, which is why the legislature as the lamp of the society must do all within its powers to identify the black sheep in their fold and let the law run its full course on them. This is premised on the fact that these unwholesome practices (corruption) do not only tarnish its image but has consequences for its effectiveness and efficiency in carrying out its constitutionally assigned responsibilities to the nation at large.

VII. CONSEQUENCES OF CORRUPTION WITHIN THE LEGISLATURE ON NIGERIA

Scholars in hold that corruption has severe negative consequences on not just the particular nation state, but on globe the in general and it is agreed that some of the identified consequences of corruption as a phenomenon on any society include: economic backwardness resulting to *unemployment and poverty*; political instability; social insecurity; infrastructural decay; unaccountability; negation of the principle of law; etc. (Ibrahim, in Odekunle and Lame, 2000; Ikoiwak, 1986; Ejionye and Emereuwaonu, 1986; Fayose, 2005:4; Anyaoku, 2009:19; Wokekoro, 2012:2; Zi, 2013:152; Wika, Dalyop, & Abdullahi, 2015: 80-81; Ethelbert, 2016b:27-29; Waive, 2016:16). However, our focus here is on the consequences of corruption embarked upon by the Nigerian legislature on Nigeria.

The outfall of corruption in the legislature in Nigeria cannot be underestimated. It is important to note that due to this immoral action of corruption, which seems to desecrate the nation's hallowed chambers, bills that are not entirely beneficial to Nigerians (except the very few elite) have been passed into law in order to please the executive (at both the federal and state levels of government). For example, the law prohibiting street trading in different states at various times in Plateau state, Lagos state in 2016, as well as Delta state also in 2016 just to mention but a few a cases.

It is undeniable that some legislators in Nigeria are bent on tarnishing the image of the legislature and the noble efforts those with integrity are making towards making Nigeria great. This is anchored on the fact that these political merchants have overtime proven that they are chefs for brewing corruption in Nigeria. Consequently, political patronage, partisanship, as well as

primordial sentiments are introduced into legislative activities. For example, it is becoming increasingly difficult for the legislature to effectively screen and disqualify individuals whose names the executive arm sends to them for endorsement for appointments into various positions (ministerial, ambassadorial, etc). Is there a better explanation as to why individuals whose records have been dented, or questionable, or better still those who have issues which borders on corrupt misappropriation of funds either in the Ministries or States they had overseen in time past? Other than the fact that these political merchants as loyalists and party faithful, who are in the legislature in their number, would be the ones that will shout the most thunderous *yeah!* in assenting to upholding the appointments of these individuals not minding whether or not they have the requisite capacity for appointment (is the reason for their appointments revolving around rewarding political patronage by the executive), or if they had unresolved issue of corruption or other issues to clear. On the contrary, what prevails is the principle of *take a bow* or unhindered clearance of these set of individuals while their accusers are still protesting that such persons are corrupt and sometimes claim they had petitioned the anti-graft agencies concerning the issue. It is also disheartening that the political merchants and the power elites in the various hallowed chambers in Nigeria due to their involvement in one corrupt practice or the other as well as political patronage so as not sanctioned negatively, may not see anything wrong, or the gravity of not being able to correctly recite the National Pledge, or the National Anthem by Ministerial, or Ambassadorial nominees. Nigerians are not unmindful of the fact that an Ambassador is nothing but the *personification* of the country, as such, legislators must always have at back of their minds that the issue raised above may not take a bow in the countries these individuals are to personify Nigeria (even though they have successfully taken a bow in the presence of the legislators in these hallowed chambers when they should not). The import of this argument is that this group of legislators need to resign or mandated by their various chambers to go and clear their names to enable those legislators without question mark(s) on their integrity and honesty carry on these onerous task of law making with minimum and reasonable challenge. The foregoing is in tandem with Sections 57 and 99 of the 1999 Constitution which makes it an offense for “any person who sits or votes in the Senate or the House of Representatives as well as in State House of Assembly, knowing or having reasonable grounds for knowing that he is not entitled to do so *on ground of being corrupt or any other criminal involvement* commits an offence and is liable on conviction to such punishment as prescribed by an Act of the National Assembly or Law of the House of Assembly.”

A glaring consequence of corruption in the corridor of the legislature in Nigeria is the fact that it negates the principle of check and balance as required by the constitutional enshrined separation of powers between the Executive, Legislature, and Judiciary as evident in Sections 4, 5, and 6 of the 1999 Nigerian Constitution. Hence whether at the State or Federal level the needed impetus for adequately checking the other arm of government is lacking. Thus, it becomes easy for the executives to sometimes overstep their bound with the assurance that the coast is clear premised on the fact that *money talks* whether as appropriation for constituency project allocation or otherwise, as

such he who pays, or agrees to pay the piper, dictates the tune (Ethelbert, 2016b:34). The argument here is that, any form of Executive indiscretion is a function of legislators’ desecration of the hallowed chambers brought about by corruption, hence unwholesome compromise and not perfect understanding which exists between them for the progress of the nation. Due to his understanding of how important the separation of power is as well as its correlating check and balance in governance, the French Jurist Montesquieu (in Yakubu, 2004/2005:70 & 71) notes that:

Political liberty is to be found only when there is no abuse of power. But constant experience shows us that everyman invested with power is liable to abuse it, and to carry his authority as far as it will go... To prevent this abuse, it is necessary from the nature of things that one power should be a check on another...when the legislative and executive powers are united in the same person or body...there can be no liberty if the judicial power is not separated from the legislative and executive... There would be an end to everything if the same person or body, whether of nobles or of the people, were to exercise all these power.

Akinnaso (2016:48), lamented that “Nigeria cannot boast of any arm of government that is corruption-free...is it the judiciary or the legislature or the executive? Sadly,...that brings us to the dilemma of the Nigerian nation. It brings us to why we are stagnant. Who is going to check who? Who is going to investigate who? Where are the checks and balances?”. Obi (2016:14), aptly captures the best solution to the perennial Nigerian challenge of corruption when he stated that “...democracy can only survive on truth and honesty.” The issues discussed has brought a reduction in the effectiveness and efficiency of the developmental programmes and policies which have been formulated by all regimes in Nigeria (Ikoiwak, 1986:83; Ibrahim in Odekunle and Lame, 2000:17) .

VIII. CONCLUSION

It has been argued that the legislature in Nigeria is the lamp of the nation just as the judiciary is the hope of the masses and the media which is conceived as the fourth estate of the realm is believed to be the watch dog of the society, it is therefore not arguable that the legislature has enormous as well as tasking responsibility of enunciating human face policies and not monstrous ones. This way Nigeria and Nigerians would not have reasons to doubt the progress and development of the country. The foregoing brings to mind what Williams Shakespeare said in his work, *Julius Caesar* that “I have come to bury Caesar not to praise him, the evil that men do lives after them” but we rather say in our quest to have a viable legislature that *we have not come to bury Caesar nor to praise him but let him live and function effectively*. Isaac Newton in his first law of motion holds that *everything is in a constant condition of rest until they are compelled to change* (Cutnell & Johnson, 2006). In the same manner, this article is not aimed at mocking or destroying (burying) the legislature in Nigeria given the fact that it has achieved much in its efforts at deepening the country’s democracy as well as giant strides and efforts made by some honesty and integrity non compromising legislators in the fold; but to cry out (mourn) against the ills of corruption which has

gradually turned into a monster destroying all the efforts made and positive results achieved over the years by the legislature in Nigeria. Therefore, those *hell bent* on tarnishing the image of the legislature should resign honourably, or forced to cease to be part of these hollowed chambers, or better still, change for the better so that this menace no longer be mentioned in the legislature in Nigeria..

IX. SOLUTION

In a Presidential system of government, the three organs of administering the state i.e. the executive, legislature, and judiciary work hand in hand even though there exists separation of powers (functions) which by and large promotes checks and balances in the system. Therefore, it is important to note that any form of executive indiscretion correlates with legislative corruption just as judicial inconsistencies has direct link with the way and manner both the executive and legislature manages state affairs through effective legislation and their implementation. Consequently, if the legislature fails or found wanting in its responsibilities, the society indeed is bound to face numerous challenges including uncertainty for the future. As such, the legislature is therefore expected to be constituted by individuals without questionable character. Simply put that, corrupt individuals (real or imagined) should not be part of the legislature, only those with proven integrity should. The above should be enshrined in the constitution of the Federal Republic of Nigeria. This way, effective laws that would meet the yearnings of the people will be passed.

Any legislator alleged of corruption should honourable resign to pave way for unhindered investigation of the allegation. If found innocent, he/she if so willing be restored to the legislature. If this is achieved, probity, accountability, and transparency would be re-established in the legislature. The foregoing would raise Nigerians confidence on the legislature as truly representing those that voted them into office.

The emolument of political office holders at all tiers of government should be published (made public). This way the public and indeed the regulatory agencies like the EFCC, ICPC, and CCB would not be in doubt concerning those living above their means. This we believe will bring about public trust on the legislature, guarantee self confidence of the legislators as well as make the operations of these regulatory agencies smooth due to availability of empirical evidence with regards to the amount of monies at one's disposal and the likely properties it may acquire. More so, there is urgent need to cut down on the personnel and overhead cost of the legislature in Nigeria giving the present economic realities on ground.

Sections 56 and 98 of the Constitution must be adhered to as regards voting methods in the legislative assemblies. This way it would be difficult for unpopular opinions as well as subjective interest(s) of presiding officers being accepted as representing those of the majority. This alone is a major step towards curbing tendencies of corruption as regards decision making in legislature.

It is germane to note that effective laws which would ultimately check the excesses of legislators and indeed other political office-holders in Nigeria be put in place as a matter of urgency as the lack of it, or its inadequacy is a major factor to the

incidences of corruption at all levels of governance in the country. If achieved, this would shield Nigeria from the clutches of political mercantilists, prebendals and Machiavellians who conceive public office as the quick means of accumulating wealth as well as becoming influential. Therefore, all existing laws of the land which in one way or the other encourage impunity in the system should be abrogated.

Due to the fact that some individuals in the legislature are not attuned with how weighty the responsibilities of that organ of government is as well as how peculiar they are to the society in general, it is needful that a benchmark with regards to academic qualification for candidature into these hallowed chambers be reviewed in order to match the pace of Nigeria's political progression as well as prevailing realities. The outfall of this would be that the era of doing whatever it takes to secure entry into the legislature (due largely to material benefits) by all comers (intellectual bankrupt and legislative unfit individuals) would be gone for good, this way, the country would boast of a vibrant and progressive legislature constituted by well qualified intellectuals and think tanks.

The Nigerian federation need to be restructured in order to give all the federating units some sense of belonging by allowing them control their resources and remit agreed sum to the federal government on agreed intervals. By so doing, the psychology of national cake sharing which ultimately breeds corruption in governance (legislature inclusive) would be addressed once and for all in Nigeria. Closely related to this is the fact that for Nigeria to have and maintain a balanced federation, all the component units should have equal representation in the legislature, since no component unit has more or less right than others.

Haven identified that most of the incidences of corruption occurs within its various Investigative Committees, as well as mode of financial appropriation, it is therefore important that individuals appointed into these committees hold forth honesty and integrity in the discharge of their constitutional responsibilities without fear or favour of anybody no matter how highly placed. They must resist any form of inducement from those (power elites) their committees have been mandated to investigate the issues or their agents. Furthermore, the legislature must not allow itself to be comprised by any arm of government through financial appropriation, or misappropriation (whether it is for constituency project or any other project for that matter). If this is achieved, the legislature would stand upright at all times and in all instances to make laws that would bring about peace, security as well as development of Nigeria, and not just a handful of the elite.

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Analysis Childcare Cost of Daycare and Noncare Type from Urban Working Mother in South Sumatera Province Indonesia

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Abstract- This research is based on theory and previous research on the labor supply for married women in particular in support of early childhood care. Working mothers who have children can still work involving the care of the child to the grandparents or other relatives (noncare) or to institute a professional child care (daycare). The aim of research is to see a tendency of working mothers in demand of childcare which raises cost of childcare. It was concluded that the mother worked in four cities in the province of South Sumatera prefer use the type of noncare, which is a type childcare with or without nurse in supervised by grandparents or other relatives. Demand in noncare type raises a greater cost than daycare type. This is due to leave their children on grandparents with or without nurse at home causing non-economic costs of providing care to the grandparents as a form to be thankful to them while mother work at the office. So these findings is the difference from previous research that the type of childcare costs at noncare type is larger and the amount of cost noncare is not fixed per month.

Index Terms- childcare costs, noncare, daycare

I. INTRODUCTION

Nowdays in a family, not only a husband to work but also a lot of wive also work outside the home. Factors that cause married women be a worker because the level education women are increasing and the change in the norms prevailing in society, especially urban areas regarding the appropriate roles carried out by women because of social economi, education and modernization (Elfindri and Bachtiar, 2004). The problem is when a family has a new member of the infant and children of early age, the mother must retun to work after the time of maternity over. Family decisions regarding the raising of children of working mothers would be different for each family. There are mothers who volunteer stopped working outside the home in order to care their own children and not least also mothers returns to work and leave their children in home under supervised grandparents even other people who can be trusted.

For some families, the main elements of what we call domestic production is the supervision and care of children. Many parents pay attention on providing the best quality for their children, in which treatments are produced in a nursing home or purchased outside the home (daycare). There are several forms of programs that can be taken, from the tax credit

childcare services that are purchased by parents worked as shape government subsidies for *day care*, school lunches, and health care. The purpose of this theory in recognizing the implications of labor market programs to support child care (Ehrenberg and Smith, 2012). So the solution of working mothers who have children infants and early childhood (under five years) is a childcare who can be trusted. Leave their children in all types of care raises the cost of chilcare. It is reasonable because mothers can work outside the home should be helped by the presence of childcare. There is a substitution effect of working mothers who shift responsibility to the daycare. The phenomenon of increased levels of maternal education work is also occur in the province of South Sumatera Indonesia, that can be seen in Table 1 below:

Table 1 South Sumatra Population Aged up to 15 Years old by Educational Attainment and Total Employment, August 2014

Education Attainment	Man Working	Working women
Photo / Unprecedented School	17 522	26 956
Photo / Graduated SD	359 302	283 418
SD	715 163	451 218
JSS	425 466	203 577
SLTA	584 436	264 541
Diploma I / II / III / College / University	176 148	185 059

Source: data is processed, the South Sumatera provincial state Work Force 2014

Table 1 above provides information that the number of working women with the highest education level attained the Diploma I / II / III / College / University more than men work. Indeed, for other education (graduate under college) the majority coming from the man who works, so that this data was also informed that the obligation to make a living is still dominated by men, so that men do not need to go back to school and have education higher. Diverse than the women, they continue their education usually comes from motivated herself

otherwise could also from parents motivation and family environment. For women who come from a families that capable both financial and nonfinancial (eg education level) usually encourage children to continue their school to higher education with return to have a better job in the future. So if they children graduated from Diploma level I/II/III/College/ University, parents also push their children to work, include their daughters. This condition is consistent with result from interview that the majority of respondents prior work rather than married.

Table 2. Population of South Sumatra (in thousands) 2014

Age	Amount	
	Man	Female
	416	
0-4	504	398 094
	396	
5-9	274	375 104
	378	
10-14	636	360 773
	368	
15-19	635	352 840
20-24	370201	356 398
	367	
25-29	082	353 241
	345	
30-34	181	334 701
	310	
35-39	404	296 592
	267	
40-44	483	258 374
	226	
45-49	427	223 162
	190	
50-54	167	185 670
	148	
55-59	451	138 681
	250	
60+	544	271 876

Source: BPS, Sumsel in Figures 2015

The second phenomenon can be informed of secondary data in Table 2 above. That the population of South Sumatra Province is composed of young population that is aged in the group 0-4 years and 5-9 years of age. So it is assumed these children have working mothers, the responsibility parenting care of early childhood is likely to be transferred to grandparents or involve other people who would be trusted by worker mothers. This condition has resulted arise daycare centre in Indonesia also occur in a South Sumatera Province. Daycare is a professional day care services are paid to help working mothers. Mother worked are believed into daycare still less because working mothers are more trusted parents and in-laws and other relatives. Demand of mother worker in a paid childcare (daycare) is the last option if no family that can't be helped. The demand type childcare of course arise in child care costs (*cost of childcare*). Therefore, this research seeks to

analyze the costs of both types of daycare and nondaycare from worker mothers that leave their children while working hours.

II. LITERATURE REVIEW

Presence of children forming a request childcare. Childcare is the needs of individuals as well as goods/services ie daycare, nurses, helpers can replace the production time mothers and wives remain in activities outside the home (Bellante and Jackson, 1983).

Ooms and Herendeen (1990), describes how families make decisions to buy childcare services. Economic framework is to understand the child care market (*child care market*) through written descriptions some researchers like Connelly and Maynad Hofferth an economist and a sociologist. Connelly stated that the *Childcare* is a service industry that has developed several years ago, due to a growing number of mothers with young children to enter the labor market, more and more families buy child care services. There is 4 types of child care: *family day care, center-based care, non relative inhome care and relative care*. It was found that childcare is a response to the increase in demand for child care.

According to Blau (2003), there are 4 types of childcare are:

1. Center / formal chid care; Companies are profit
2. Family day care; or including grandparents and *baby sitters* at home (Rosenbaum, 2004)
3. relative; friends and other families (Nicolau and Mumford, 2005)
4. Parental care; father (Hoffeth in Oom and Herendeen, 1990)

Furthermore, for the purposes of this study, the type of childcare is only grouped into two, there are type of daycare and type of noncare (family daycare, relative and parental care). The demand for childcare services raises childcare costs (*cost of child care*). Simplified only one child in need of care as well as excerpts from Rosenbaum and Ruhm (2004) and (Kimmel, 1998). The cost of child care is:

Cost of child care:

$$C = f (Hc, Hm, Ywife, Yhusband, Dtipec)$$

$$C = b_0 + b_1 + b_2 Hc Hm Ywife + b_3 + b_4 + b_5 Dtipec Yhusband + e_3$$

Where : C = cost of child care per month

Hc = the number of hours per day using child care

Hm = number of working hours per day mothers

Ywife = revenue per month from mother

Yhusband = revenue per month respondent husband

Dtipec = dummy types of childcare

where 1 = noncare and 0 = daycare

III. RESEARCH METHODS

This research was conducted in the formal sector. The reason is (1) the level of participation of working mothers who

have high levels of education, preferring to work in the formal sector. (2) the mother who request childcare from their mother work as an employee and the employee which have standard working hours. Limits the scope is in line with statements from BPS Sumsel that in urban areas, most of the type of work is more formal and require certain qualifications for workers who will enter it (BPS South Sumatera, Gender Statistics 2013).

The unit of analysis is the study of working mothers of young children, who have a clear working hours are from 08:00 to 16:00 o'clock pm, in accordance with UU RI No.13 tahun 2003 on employment, in Article 77, paragraph 2 of the working time is 8 hours 1 day and 40 hours a week for 5-day work a week (www.bpkp.go.id).

Data for the population and the sample should be taken from data worker mothers who have early childhood in South Sumatera Province in the urban areas. Because of the limitations of the data obtained so that the population of working mothers to be proxy to data BPS published that the number of worker womens in Palembang, Prabumulih, Pagaralam and Lubuklinggau.

Technical sampling will be using *simple random sampling* method in which every element of the population has the same chance to be selected as the sample (Puspowarsito, 2008).

Table 3. Total Population and Sample of Women Working in Cities in South Sumatera province in August 2014

City	Population	Proportion	Proportion number	Sample
Palembang	265.791	74,98%	260,913	261
Prabumulih	30.727	8,67%	30,163	30
Lubuklingga	33.731	9,51%	33,112	33
u Pagaralam	24.257	6,84%	23,812	24
Total	354.506	100%		348

Source : data processed, BPS South Sumatera Province, Labor Force in August 2014

The sample size in the book Research Methodology can use a formula developed from Isaac and Michael, for an error rate of 1%, 5%, and 10% (Sugiyono, 2007) was calculated by:

$$s = \frac{\lambda^2 \cdot N \cdot P \cdot Q}{d^2 (N - 1) + \lambda^2 \cdot P \cdot Q}$$

where:

λ^2 = chi kuadrat with error rate 5% = 3,481

N = Population

P = Q = 0,5

d = 0,05

$$s = \frac{3,481 \times 354.506 \times 0,5 \times 0,5}{(0,05^2 \times 354.505) + (3,481 \times 0,5 \times 0,5)}$$

$$= \frac{308.508,8}{887,1328}$$

$$= 347,7594$$

$$\approx 348$$

From Table 3 population and sample size calculations obtained information on the number of respondents as the research sample was 348 women working in the formal sector will be taken from 4 cities in the province of South Sumatera, namely Palembang, Prabumulih, Lubuklinggau and Pagaralam City.

IV. RESULTS AND DISCUSSION

In the classical assumption, primary data have problems heterokedastisitas. Then trying eliminated heterokedastisitas by way of a data transformation that is taking the natural log (ln). Heterokedastistas problem passable reduced but still patterned (using graphs plot residual values). According to Gujarati (2006), the problem heterokedastisitas usually found on *cross section* data (data cross-sectoral). So the problem occurs at the primary data heterokedastisitas this study. So after doing a parametric procedure on research data and have been trying to cure the problem heterokedastistas but the variant data is still not homogeneous (homoskedastisitas).

If the parametric procedure has been done and still there is an assumption that is not fulfilled, there is no other way then the use of non-parametric procedures can be considered. Because of nonparametric methods is change the process data that can not be done parametric, then systematic discussion for nonparametric is equal to the parametric methods, namely descriptive statistics and statistical inference (Santoso, 2012).

Technical analysis using multiple linear regression. In nonparametric techniques using Jackknife method in Stata software. Jackknife is a nonparametric and resampling techniques aimed at estimating the regression parameters (Mara, Satyahadewi and Iskandar, 2013). Jackknife method is one of nonparametric methods used to generate the standard error of the regression coefficient is problematic in classical assumptions related data on a parametric approach. The Statistically processed results its given below:

4.1 the simultaneous Test (Test F)

Thus do the next steps to address the alternative hypothesis H_1 by hypothesis testing problem of models of linear regression as follows:

Hypotheses to test the simultaneous / joint coefficients model by F test for regression equation.

Ho : No influence of variables simultaneously Hc, Hm, RYwife, RYhusband, and Dtipenon to variable RC. ($D_1 = d_2 = \dots = d_5 = 0$)

H_1 : There is a simultaneous effect v ariabel Hc, Hm, RYwife, RYhusband, and Dtipenon to variable RC. (At least $d d_i \neq j \neq 0; i, j = 1, 2, \dots, 5$)

In the simultaneous test / model coefficients together with the F test in STATA software, given the simultaneous influence significant when *P Value-value* $\leq \alpha$ with α of 5%.

Table 4 Test results F for significance coefficient regression model.

Equation	statistics F	P-value
RC	36.56	0.0000 *

* Significant to a significant degree (α) of 5%.

From the results of the output table, the statistics generated F [see F (5, 347)] amounted to 36.56 with a *P-value* [see Prob> F] is equal to 0.0000 (*P-value* <0.05) so that in this test are given conclusion that there is a significant influence of the independent variables simultaneously Hc, Hm, RYwife, RYhusband, and Dtipenon to variable RC.

4.2 The partial test (t test)

Hypotheses to test partial / individual model coefficients with t test hypotheses for regression equation given below:

H_0 No effect partial, Hc, Hm, RYwife, RYhusband, and Dtipenon to variable RC. ($D_i = 0; i = 1,2, \dots, 5$)

H_1 : There is a partial effect of variable Hc, Hm, RYwife, RYhusband, and Dtipenon to variable RC. ($D_i \neq 0; i = 1,2, \dots, 5$)

On testing the partial / individual model coefficients with t-test, given significant when *P-value* $\leq \alpha$ with α was set at 10%, 5%, or 1%.

Table 5 Results of t test for significance of regression model coefficients.

variable dependent	variable Independent	Coefficient Regression	Standard Error	statistics	P-value
RC	Hc	0.0293839	0.0454335	0.65	.518
	Hm	0.0017991	0.0567532	0.03	0.975
	RYwife	0.165215	0.0504902	3.27	0.001***
	RYhusband	0.1362324	0.0534104	2,55	0,011**
	Dtipenon	1.342339	0.1013483	13.24	0,000***
	constants	-	0.363642	0.9558352	-2.63

*** Significant to a significant degree (α) of 1%.

** Significant to a significant degree (α) of 5%.

* Significant to a significant degree (α) of 10%.

From the results of the output table, this test gives a conclusion that:

1. There is a significant influence on the RC RYwife variables of 0.165215 (positive effect); meaning that if there is an increase Redominasi of respondents monthly income of 1 million, then Redominasi of consumption of child care per month will increase by 0.165215 million, equivalent to the consumption of child care per month amounted to 165 215; otherwise if there is a decrease Redominasi of respondents monthly income of 1 million, then Redominasi of consumption of child care per month will be decreased by 0.165215 million, equivalent to consumption of child care per month amounted to 165 215.

2. RYhusband variable significant effect on the RC of 0.1362324 (positive effect); meaning that if there is an increase of revenue husband Redominasi per month amounted to 1 million, then Redominasi of consumption of child care per month will be increased by 0.1362324 million or equivalent to the consumption of child care per month amounted to 136,232.4; otherwise if there is a decrease Redominasi husband revenue per month of \$ 1 million, then Redominasi of consumption of child care per month will be decreased by

.1362324 million or equivalent to the consumption of child care per month amounted to 136,232.4.

3. Dtipenon variable significant effect on the RC of 1.342339 (positive effect); meaning that there is a difference Redominasi of consumption of child care per month in child care types, namely: noncare more influence Redominasi of consumption of child care per month amounted to 1.342339 million (or equivalent to the consumption of child care per month amounted to 1,342,339) than daycare.

4. There is no significant influence of each variable to variable Hc and Hm RC; meaning that if there is an increase / decrease in Hc and Hm each by 1 unit, then Redominasi of consumption per month child care will not be affected.

Thus mathematically, the formulation of multiple linear regression models were formed described as follows:

$$RC = -0.9558352 + 0.0293839 Hc + 0.0017991 Hm + 0.165215 RYwife + 0.1362324 RYhusband + 1.342339 Dtipenon + e_4$$

For the validation process, used size *Goodness-of-fit* is coefficient of determination (R^2) and *Mean Square Error* (MSE) [2]. The greater the R-square value, the better the

multiple linear regression models were formed. In addition, measures of goodness is also used linear regression models that MSE (is expected to be small). To assess the goodness of the model can also be used with the following formula MSE size :

$$MSE = RMSE^2$$

RMSE value is obtained from the output value Root MSE.

Table 6 Results of Multiple Linear Regression model validation.

Equation	R-Square	root MSE	MSE
RC	.4583	1.0221	1.044688

From the results table, the size of the *goodness-of-fit* is R-Square and MSE generated good value for linear regression models. R-square value obtained was 0.4583 means that the diversity of the dependent variable explained RC capable of independent variables Hc, Hm, RYwife, RYhusband, and Dtipenon simultaneously / together amounted to 45.83% of which the remaining 54.17% is explained by error (*e*) or other variables that are not included in the multiple linear regression models. In other words, goodness Linear Regression models were formed amounted to 45.83%. In addition, the MSE also obtained the good that is equal to 1.044688 (small).

Presence of children forming a request childcare. Childcare is that meets the needs of individuals as well as goods / services ie daycare, nurses, helpers can replace the production time mothers and wives remain in activities outside the home (Bellante and Jackson, 1983).

The results of statistical calculations show that income mothers (Ywife) and earnings father (Yhusband) positive and significant impact to the cost of child care. This means that the costs incurred father and mother depend on the amount of income of the father and mother (family income). The greater the income received by the father and mother, the greater the cost incurred for child care. Aligned with finding Ronald D. Lee and Rodolfo A. Bulatao (1983) that there is a positive relationship between income and child prices.

Another interesting finding in this study that the type of child care affect positively and significantly to the cost of child care. On the basis of the findings of *empirical studies* Rosenbaum and Ruhm (2004) and (Kimmel, 1998) that the demand for child care (there are several types of child care) affects the cost. With nominal data types where 1 = type of non care and type day care = 0, where the selection of category 1 serve as the basis / comparison so that symbolized Dtipenon (Gujarati, 2006). The calculations show that noncare more influence on consumption Redominasi child care per month to Rp 1.342339 million (or the equivalent consumption of child care per month to Rp 1,342,339) rather than daycare. This means that the demand for the type of non-care nursery pose a greater cost than the type of day care nursery. This is due to leave their children on grandparents with or without caregivers at home causing non-economic costs of providing care to the grandparents as formed a thankful because we could have raised the child under the supervision of the grandparents while mothers

working in the office. Non-economic costs of this proxy to the costs incurred as a gesture of thanks to the grandparents, for example buying food, beverages, pulses and so on. So this cost is not permanent. As for the fixed costs could arise if use the services of a nanny at home that pay monthly salaries of caregivers. So the cost of noncare type larger than daycare type and the amount is not fixed incurred by the mother per month.

Different research findings from Suzanne W Helburn and Carollee Howes (1996) that the daycare costs slightly more expensive than family care. This is due in this study, does not include the costs of noneconomic the calculation in family care. While this research include the costs of noneconomic of family care then if the proxied to the nominal lead to higher costs. Treatment of non-economic costs are factored in due to emotional factors between children and parents, that the respondent (Indonesian) are still figuring out how to continue to respect their parents as an expression of gratitude would supervise the children during the respondents worked outside the home. Further research Helburn and Howes (1996) that there is an opportunity to raise the quality of childcare services due to factors other than economic incentives as production costs such as donations of facilities, equipment and materials, volunteers and workers. So the research advice that the parents should be educated about the daycare, increasing the number of child care from the government and private sectors but keeping provisions / high quality standards that the management of the daycare have an affinity for advancing the quality of childcare services.

The types of child care are selected by respondents to the four cities in the South Sumatera based on descriptive statistics as much as 44.83% choose the type of noncare type, as much as 9.17% choose for relative daycare, as much as 1.15% choose the type of care parental care and as much as 44.25% choose the type of care daycare. It was revealed that these statistics are concluded, many respondents in four cities in South Sumatra choose the type noncare. The reason is because respondents must trust to their parents than others even in day care professionals. Parents have experience caring for and educating their children from childhood to have grandchildren. Leave their children in daycare options can be selected if no other family or can be choose daycare as a last option to leave their children.

That suggested that parents prefer chepare prices than service quality, and if anything, more mothers will choose to work and existing problem due to lack of information of child care services, making the search for childcare increasingly expensive (Ooms and Herendeen, 1990). Demand for high quality care will be rising only when consumers have complete information about child care services and the power of economic incentives to purchase child care services (Blau, 2002). So the father and mother indicators of income (family income) affect the cost of care. Here are the results of multiple linear regression:

$$RC = -0.9558352 + 0.0293839 Hc + 0.0017991 Hm + 0.165215 RYwife + 0.1362324 RYhusband + 1.342339 Dtipenon + e_4$$

RC model constant shows a negative value that is worth -0.9558352, which means the cost of child care will take a source of family savings if the family has no income. For working mothers the possibility to issue a childcare costs will still be

there, so leave their children during working mothers an income effect for income working mothers is the influence of price changes (child care expenses) causes a change in the purchasing power of working mothers (Jehle and Reny, 2001).

From the findings of previous research and statistical calculation results can be interpreted that choose the type of child care and day care cheaper fixed payment per month compared to the type of care noncare. The problem with information about child care services and the level of trust mothers to professional institutions. Besides obstacles in the field, there are many professional institutions (daycare) is owned by the private sector, such as the findings of UNESCO (2005) and unlicensed operation.

V. CONCLUSION

Based on the Descriptive Statistics concluded, many respondents in four cities in South Sumatra choose the type noncare. The reason is because more respondents trusted to their parents than others even in day care professionals. Parents have experience caring for and educating their children from childhood to have grandchildren. Leave their children in daycare options can be selected if no other family or can be choose daycare is a last option to leave their children.

The calculations show that noncare more influence on consumption Redominasi child per month to Rp 1.342339 million (or the equivalent of the cost of child care per month to Rp 1,342,339) rather than daycare. This means that the demand for the type of non-care nursery has a greater cost than the type of day care nursery. This is due to leave their children on grandparents with or without caregivers at home causing non-economic costs of providing care to the grandparents as a fromed thankful because they could have raised the child under the supervision of the grandparents for mothers working in the office. Non-economic costs of this proxy to the costs incurred as a gesture of thanks to the grandparents, for example buying food, beverages, pulses and so on. So this cost is not permanent. As for the fixed costs could arise if use the services of a nanny at home that pay monthly salaries of caregivers. So the cost of child care type noncare is larger and the amount is not fixed incurred by the mother per month.

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The Analysis of Employee Engagement Level of Supporting Staff of Andalas University

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Abstract- Employee engagement is represented by the commitment, decision, and dedication of employee to contribute to the organization. This research aims to analyze the employee engagement of supporting staff of Andalas University (UNAND). This research utilizes the descriptive quantitative methods. The data are gathered through questionnaire for respondents with the total of 224 samples determined based on Slovin sampling method. The questionnaire statements in this research make use of the Gallup method and are combined with X-model questionnaire developed by BlessingWhite. The questionnaire contains statements regarding satisfaction and contribution. The contribution value is also obtained by combining the value from Civil Servant Works Targets 2015 with contribution value from the questionnaire. The result of this research shows that Faculty of Economy has The Engaged criteria with 16.67% which is higher than any other working units in Andalas University.

Index Terms- Teaching personnel of UNAND, employee engagement level, X-model.

I. INTRODUCTION

Tertiary education institutions (*Perguruan Tinggi* or PT) currently are growing and have the challenge of increasingly competitive competition, so that every PT must keep making efforts in maintaining its existence. PT must own the right strategies to face such challenge, one of them is by developing their respective institutional capacity.

It is supported by the presence of Law of The Republic of Indonesia Number 12 Year 2012 on Higher Education (*Dikti Law*) which gives opportunity for PT to enhance their institutional capacity in accordance with their respective potentials. Institutional capacity development aims to respond to the demands and changes happening outside and guarantee the capability of PT to compete with fellow PT in Indonesia and abroad. As a form of protection for PT in Indonesia, the government provides flexibility for PT to improve themselves by offering autonomies on the basis of their respective capability and performance achievement evaluation. One of the autonomies given is Public Service Unit (*Badan Layanan Umum* or BLU). In this case, Universitas Andalas (UNAND) is PT specified by the government as BLU based on Minister of Finance Regulation No. 501/KMK.05/2009.

But in fact, in recent years, UNAND encounters a supporting staff (*Tenaga Kependidikan* or *Tendik*) phenomenon in terms of career, which is *Tendik* refuse to be assigned on

structural and functional position. Even though those assigned *Tendik* have met the minimum requirements of the position and have gone through the fit and proper test process. In addition, UNAND annually deals with resignation from position or reluctance to extend position. The resignation is not only happens on functional position, such as treasurer and committee of procurement/reception of goods and services, but also on *Tendik* that occupy echelon IV (Head of Subdivision). Moreover, it exists on echelon III position (Head of Division).

Those issues causes UNAND to have worries over *Tendik's* contribution because in the future, UNAND will develop the faculties or units to respond to changes occurring outside UNAND, whether it is related to higher education or staffing governance. In line with the opinion of Gibson *et al.* (2012), individuals in organization have uniqueness because they have diversity between one and another in terms of interests, attitudes, and abilities in working situation. It is due to the environment being able to optimally utilize the Human Resources (HR). A convenient environment condition and guaranteed welfare will make employees work wholeheartedly because they feel their engagement to the organization. That individual engagement is well-known as employee engagement, according to Gallup (2011), which is a working engagement which fully involve employee and is willing to be actually bound in an organization. Khan (1990) introduces an engagement theory which explain that employees contributions to their workplace are affected by the work entrusted to them. Those employees can bring themselves or will not show their respective behaviour or performance. Meanwhile, Brown (1996) concludes that engagement is a combination between satisfaction, motivation, and commitment that emerge from the employees themselves. The engaged employee is the satisfied, motivated, and high committed employee who is also given the opportunity to improve in order to optimally contribute to the organization. Robinson *et al.* (2004) clarifies that employee engagement is employee commitment toward the organization that can be recognized by the employee's level of understanding and concern in giving contribution to improve organizational performance through the synergy between individual and organization.

Various researches reveal that employee engagement gives influence on performance of organization or company. High engagement level of a company organization provides diverse advantages, for instance increase of profit and operational income, and also having more employees with a good performance, compared to other companies or organizations that have a lower engagement level. A company or organization will experience a setback or not be able to compete when it has no

ability to upgrade the engagement between organization and the HR within it, which are valuable assets to create a synergy in achieving the objectives that must be achieved (Balakrishnan *et al.* 2014).

Studies by Markos dan Sridevi (2010), Rudin (2013), Putri and Welly (2014), Kaliannan and Adjovu (2014), and Anita (2014) conclude that employees with a high engagement have enthusiasm for company and they work exceeding the prevailing work hours. A number of companies in Indonesia have conducted an engagement survey as a road map of HR development in order to support Good Corporate Governance (GCG). Companies which have performed employee engagement survey, namely PT Jaminan Sosial Tenaga Kerja (PT Jamsostek), PT Pertamina, and PT PLN. Government agency which have performed employee engagement survey is Ministry of Finance. The success achieved by various companies and ministry is inseparable from the survey performed on their employee performance through employee engagement survey. Therefore, the researchers of this research believe that employee engagement survey on *Tendik* of UNAND needs to be done as a basis of UNAND's policy regarding HR planning and management system.

II. RESEARCH METHODS

This research is conducted by taking civil servant *Tendik* (*Tendik Pegawai Negeri Sipil* or PNS) of UNAND as the research object. The aspect studied is the employee engagement of *Tendik* UNAND. This research is conducted from January until March 2016 in UNAND, Padang, West Sumatera. This research is a descriptive quantitative research using survey methods. Types of data used in this research are primary and secondary data. The gathered data are processed, analyzed with a statistic descriptive analysis, and presented in the form of tabulation, charts, and diagram.

III. RESULTS AND DISCUSSION

The measurement of employee engagement level of UNAND's *Tendik* harness the X-model which is based on the satisfaction and contribution of *Tendik*, based on Civil Servant Works Targets (*Sasaran Kinerja PNS* or SKPPNS) 2015. SKP of *Tendik* is reckoned with *Tendik*'s attendance list with reference to the Regulation of Ministry of Research, Technology, and Higher Education Number 31 Year 2016.

The result of questionnaire data and PPKPNS show that employee engagement of UNAND's *Tendik* is categorized into five criteria which is in line with the X-model, namely:

1. The Engaged

The Engaged are *Tendik* with the score of 4.5 in the dimension of satisfaction and contribution.

2. The Almost Engaged

Tendik that are included in this level are *Tendik* with the score of more than 4 but not less than 4.5 in the dimension of satisfaction and contribution.

3. Honeymooner and Hamster

Honeymooner and Hamster are *Tendik* with the score of more than 3.5 but not less than 4 in the satisfaction dimension and the score of less than 3.5 but not less than 3.

4. Crash and Burner

Crash and Burner are *Tendik* with the score less than 3 but not less than 2.5 in the dimension of satisfaction and contribution.

5. The Disengaged

The Disengaged are *Tendik* with the score of less than 2.5 in the dimension of satisfaction and contribution.

According to the analysis results, which refer to the X-model combined with Gallup to measure the engagement level of UNAND's *Tendik*, overall, *Tendik* with The Engaged criteria amount to 4.02%; *Tendik* with The Almost Engaged criteria amount to 21.43%; *Tendik* with Honeymooner and Hamster criteria amount to 39.29%; *Tendik* with Crash and Burner criteria amount to 27.68%; and *Tendik* with The Disengaged criteria amount to 7.59%. The overall distribution of engagement criteria of UNAND's *Tendik* is displayed in Figure 1.

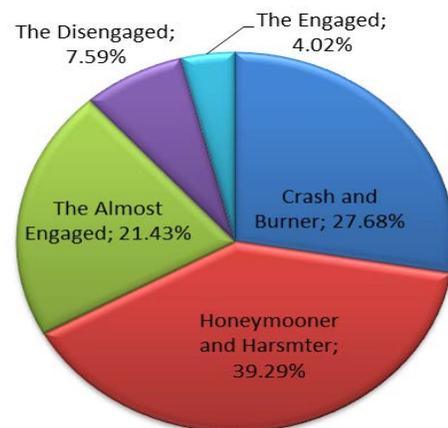


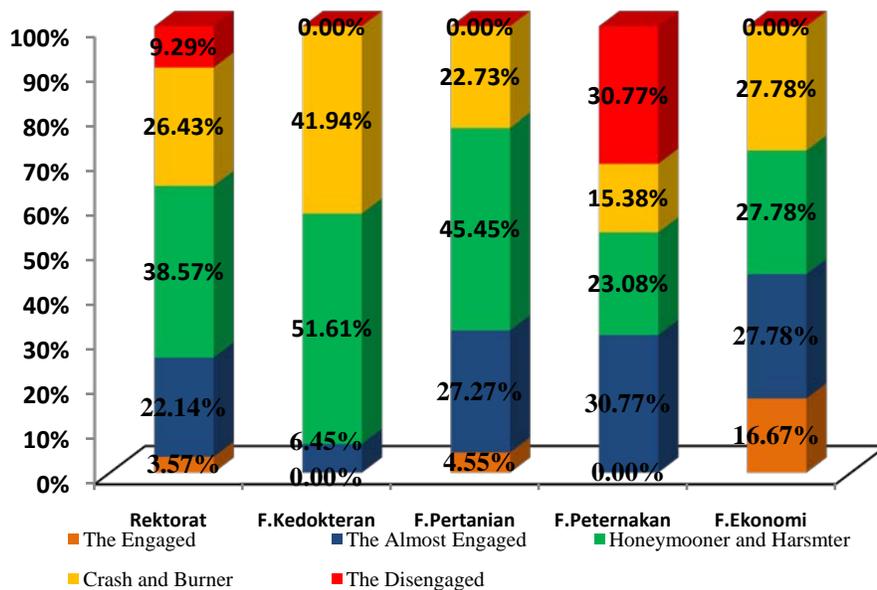
Figure 1 The distribution of engagement criteria of UNAND's *Tendik*

The Engaged criteria is the highest level and can be used as an indicator of engagement of UNAND's *Tendik* in giving contributions for UNAND. *Tendik* with this criteria can be classified into several categories, namely *Tendik* who were originally honorary employee and then appointed as PNS, *Tendik* whose working units able to provide additional income because it implements adequate incentive system due to a high workload, and lastly structural *Tendik* who occupy structural position, have 3 or less *Tendik* as subordinate, and whose working unit has a working rhythm and pressure that not high. It is seen here that honorary employees who already become a PNS give a high contribution as a form of remuneration over their appointment as a PNS. These *Tendik* have occupied a honorary status of more than 10 year and when they are appointed, their years of service are acknowledged and they are given the opportunity to continue study, so that their rank and position have been adapted with their latest education and years of service in UNAND.

Faculty of Economy is a working unit which has *Tendik* with The Engaged criteria with the percentage of 16.67%. Rectorate has *Tendik* with The Engaged criteria who were originally honorary employees and then become a PNS. Faculty of Medical Studies and Faculty of Agriculture have

Tendik with The Engaged criteria whose working unit impose incentive system adjusted with high workload. Faculty of Animal

Husbandry has no *Tendik* with The Engaged criteria. The details can be seen in Figure 2.



Information: Rektorat means rectorate; F. Kedokteran means F. of Medical Studies; F. Pertanian means F. of Agriculture; F. Peternakan means F. of Animal Husbandry; F. Ekonomimeans F. of Economy

Figure 2. The distribution of engagement of UNAND's *Tendik* based on working unit

As presented in Figure 2, Faculty of Animal Husbandry has the highest percentage of *Tendik* with The Almost Engaged criteria, compared to the other working units. Its percentage is then followed by Faculty of Economy, Faculty of Agriculture, Rectorate, and Faculty of Medical Studies. *Tendik* with that criteria are *Tendik* which have high dimension of satisfaction and contribution. Those *Tendik* are *Tendik* who perform their job and function on daily basis. It is in accordance with their level of discipline in performing job or routine as PNS. *Tendik* with Honeymooner and Hamster criteria have a good dimension of satisfaction and fair contribution. These *Tendik* feel satisfied with all obtained from UNAND but do not give any reciprocity in the form of contribution to UNAND. They do more storytelling in performing their jobs which makes their working hours wasted. It is seen from their contribution to the achievement of performance targets that become a guidance in performing job. *Tendik* with Honeymooner and Hamster criteria in Rectorate amount to 22.14% and in Faculty of Animal Husbandry amount to 51.61%.

Tendik of Faculty of Medical Studies with Crash and Burner criteria amount to 41.94% which is higher than the other working units. The respective percentage of *Tendik* with Crash and Burner criteria are as follows: Faculty of Animal Husbandry (15.38%), Rectorate (26.43%), Faculty of Agriculture (22.73%), and Faculty of Economy (27.78%). *Tendik* with this criteria are *Tendik* with high contributions but low satisfaction. They have a high loyalty, high responsibility on job, high education, and have years of service that still relatively moderate and short. They have a heavy workload and risks but feel unsatisfied with the various policies in UNAND which often corner them. In other words, they feel unfairly treated. They feel disrespected even

though they have given their time and energy surpassing the normal working hours and do job outside the real job. They have a bad track records with the current superior. They and their superior have worked in the same working unit before. This condition gives negative impact to the success of working unit in performing its function.

The Disengaged criteria become a very serious problem for an organization because they have no commitment and loyalty and also low productivity. In relation with The Disengaged criteria, only Faculty of Animal Husbandry and Rectorate which own *Tendik* with this criteria. Meanwhile, other working units, namely Faculty of Agriculture, Faculty of Economy, and Faculty of Medical Studies have no *Tendik* with this criteria.

IV. CONCLUSION

The overall measurement results of engagement level of UNAND's *Tendik* are The Engaged (4.02%), The Almost Engaged (21.43%), Honeymooner and Hamster (39.29%); Crash and Burner (27.68%), and The Disengaged (7.59%). Based on working unit, most of *Tendik* with The Engaged criteria exist in the Faculty of Economy which amount to 16.67%. On the contrary, the majority of *Tendik* with The Disengaged criteria are in the Faculty of Animal Husbandry. That percentage of The Disengaged criteria is not only the highest among other criteria but also the highest of all The Disengaged in other working units.

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Role of Paramedical Institutes and Staff in Brand Building and Social Perception of Private Medical Institutes at Lucknow, UP, India

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Abstract- Paramedical services plays vital role in case of pre-hospital medical emergency services. The outstanding paramedical services also improve the Social Perception and subsequently help in the Brand Building. In this paper, a study has been done to identify the effect of paramedical services on the Social Perception and Brand Building of the hospital. In this study, a relevant questionnaire has been filled by 200 respondents including paramedical staff in 9 hospitals at Lucknow. Five case studies are performed in this study to know the relation among Social Perception, Brand Building, Fund Management and Role Performance.

Index Terms- Paramedical Staff, Social Perception, Brand Building, Fund Management and Role Performance

I. INTRODUCTION

Paramedical services deals with the pre-hospital medical emergency services. The person who deals with the above paramedical services is known as a Paramedic. The major contribution of a paramedic is to provide primary medical and trauma care. A successful paramedic always has presence of mind to take right decisions in the critical care. The paramedical science includes working in different areas, i.e. fracture management, spinal injury management, obstetrics, dealing with burns and assessment. Apart from this, a paramedic must have been well trained to deal with medical equipment maintenance, procedures, radio operating procedures along with emergency vehicle operation as discussed by Narayan (2016).

The paramedical persons serve many job responsibilities like medical job maintenance, radiography technicians, radiologists, physiotherapists, speech therapists, audiologists, dialysis therapists, emergency technicians, emergency care practitioners, perfusion technicians, cardiac technicians and respiratory therapists as discussed by Sharma et al. (2016). As per the information provided by the Oxford dictionaries, the paramedical institutes are relating to the services and profession which supplement and support the medical work but do not require fully qualified doctor, such as nursing, radiography, emergency first aid etc. Fioroni and Titterton (2009) explained that private hospitals always focus on the quality services delivered to the patients. The higher quality of medical treatment as discussed by Talib et al. (2015) will satisfy the patients and further will improve the social perception of the hospital which helps in the brand building of the hospital. Paramedical persons (staff) have a big role in improving social perception and brand building because they always deal with the primary and basic medical needs of the patients at the root level explained by Abdulrahman (2015).

Social satisfaction and working methodology are integrated with each other as explained by Tiwari et al. (2015). A meta-analytically examined hypothesis has been designed to test and extend the working methodology with the integration of motivational, social and work context characteristics by Humphrey et al. (2007). By analyzing performance dimensions by the patients and their attendants, the strategic recommendations to Indian hospital administrators has been carried out by Padma et al. (2014). In this study, the attendants and patients perceptions were collected through questionnaire.

The role of anesthesiologist among the paramedical staff at Kathmandu University hospital has been analyzed by Bhattarai et al. (2012). In this study the major focus is on the role of anesthesiologist in Operation Theater in Intensive Care Unit, acute and chronic pain management and in emergency care cases. The relationship between family-work and work-family conflict has been analyzed by Hatam et al. (2016) at hospitals affiliated to Shiraz University of Medical Sciences (SUMS) and they presented a model named SEM.

The social support and quality of life are discussed by Shishehgr et al. (2013). Using focus group discussions, the staff perceptions of hand hygiene has been discussed by Joshi et al. (2012) in a rural teaching hospital in India. Patient satisfaction is an important parameter in the success of hospital. A study in this regard has been performed by Intezar et al. (2016).

The knowledge and attitude of health care workers in organ donation played vital role. A study in this regard has been done by Ahlawat et al. (2013). A similar study has been done by Arun (2015) in the case of eye donation. The widely used approaches for assessing hospital support for safety and improvement are Agency for Health Care Research (AHRQ) and quality hospital survey on patient safety culture (HSPSC). The data from 5 US hospitals have been analyzed the degree of agreement in perceptions of the groups which

are identified later in Boan et al. (2012). The perception of patients and their satisfaction are well studied by Andrabi et al. (2015). They studied the case of quality care at hospital in Srinagar, India. The student perceptions in paramedical area are studied by Anandhasayanam et al. (2015) which is based on BMI, diet and social habits.

II. PROPOSED STUDY

The objectives are as follows;

1. To study the Social Perception of their Role Performance based on various programmes and procedures carried out by Private Medical Institutes
2. To study the Social Perception of the Society towards the Brand Building efforts of the private hospitals.
3. To study the importance of fund management for Brand Building by private Medical Institutes concerning paramedical services.

III. RESULT ANALYSIS

A. Reliability Analysis

The space saver method is used for reliability analysis. In this method, the covariance matrix is not used in the analysis.

Total number of cases=200

Number of items=20

Cronbach's Alpha=0.863

TABLE-1 FREQUENCIES OF VARIABLES

S. No	Variable Name	Total No.	Frequency of 1		Frequency of 2		Frequency of 3	
			Count	%	Count	%	Count	%
1	PatientSatisfaction1	200	179	89.5	21	10.5	0	0
2	PatientSatisfaction2	200	179	89.5	21	10.5	0	0
3	PatientSatisfaction3	200	160	80	40	20	0	0
4	Fund1	200	176	88	20	10	4	2
5	HospitalPromotion	200	180	90	20	10	0	0
6	Fund2	200	179	89.5	21	10.5	0	0
7	Fund3	200	166	83	20	10	17	7
8	Salary	200	174	87	20	10	6	3
9	HospitalEnv	200	158	79	42	21	0	0
10	AdditionalFac	200	154	77	46	23	0	0
11	CarrerDev	200	157	78.5	43	21.5	0	0
12	EducationExp	200	155	77.5	45	22.5	0	0
13	NurseCare	200	152	76	48	24	0	0
14	MachineryHos	200	150	75	40	20	10	5
15	EmergencyMedTreat	200	158	79	42	21	0	0
16	Ambulance	200	149	74.5	51	25.5	0	0
17	AmbulanceUltraModern	200	140	70	60	30	0	0
18	NoPrameStaff	200	138	69	60	30	2	1
19	ListeningEar	200	128	64	72	36	0	0
20	LabTest	200	170	85	20	10	10	5

The experiments are carried out using the SPSS software. Regression tests are performed to investigate the proposed model. The data is collected from 200 respondents from different paramedical institutes and private medical institutes. The study is all around the four variables; Role Performance, Perception of the Society, Brand Building and Fund Management. Role Performance indicates the dedication of paramedical staff towards their assigned duties. Social Perception is the perception received by the patients and their attendants about the medical care provided by the hospital in all aspects. Brand Building covers all the operations which are concerned with the improvement of hospital brand. Fund Management is related to all the efforts used to manage the funds and expenditures effectively.

3.2 Study & Findings I

The study shows the relationship between Role Performance and Social Perception. The Role Performance is treated as independent variable and Social Perception is the dependent variable. Role Performance variable is computed using variables Nurse Care,

Emergency Medical Treatment, Ambulance, Listing Ear and Lab Test. However, the Social Perception is computed using Patient Satisfaction 1, Patient Satisfaction 2, Patient Satisfaction 3, Machinery at Hospital and Hospital Environment.

TABLE 2 MODEL SUMMARY: REGRESSION EXPERIMENT

Model	R	Rsquare	Adjusted Rsquare	Std. Error of the Estimate
1	0.930	0.864	0.863	0.77246

TABLE 3 ANNOVA MODEL

Model		Sum of squares	Df	Mean Square	F	Significance
1	Regression	750.409	1	750.409	1257.600	.000
	Residual	118.146	198	0.597		
	Total	868.555	199			

TABLE 4 COEFFICIENT^a

Model		Unstandardized Coefficients		Standardized Coefficient	t	Significance
		B	Std. Error	Beta		
1	(Constant)	1.209	0.208	0.930	5.807	0.000
	Role Performance	1.993	0.056		35.463	0.000

The relation is explained with following equation given below.

$$SocialPerception = Cons + B \times RolePerformance$$

3.3 Study and Findings II

In this study, Social Perception is treated dependent variable and Role Performance & Brand Building are the independent variables. Social Perception and Role Performance variables are same as defined in the study I. However, Brand Building variable is computed using variable Hospital Promotion, Additional Facility, Carrer Development, number of Paramedical Staff and Ultra-Modern Ambulance, Machinery at Hospitals.

TABLE 5 MODEL SUMMARY: REGRESSION EXPERIMENT

Model	R	Rsquare	Adjusted Rsquare	Std. Error of the Estimate
1	0.956	0.914	0.913	0.61745

TABLE 6 ANNOVA MODEL

Model		Sum of squares	Df	Mean Square	F	Significance
1	Regression	793.449	2	396.724	1040.587	0.000
	Residual	75.106	197	0.381		
	Total	868.555	199			

TABLE 7 COEFFICIENT^a

Model		Unstandardized Coefficients		Standardized Coefficient	t	Significance
		B	Std. Error	Beta		
1	(Constant)	0.269	0.188	0.521	1.430	0.154
	Role Performance	1.117	0.094		11.886	0.000
	Brand Building	0.413	0.039		10.625	0.000

The defined relation is explained by the equation given below.

$$SocialPerception = Cons + B_1 \times RolePerformance + B_2 \times BrandBuilding$$

3.3 Study and Findings III

This study investigates the relation between two variables Brand Building and Fund Mangement. Here, Brand Building is the dependent variable and fund management is the independent variable. Fund Managent is derived from 3 fund variables which are gradually related to improving the paramedical services, machinery improvement and training of paramedical staff.

TABLE 8 MODEL SUMMARY: REGRESSION EXPERIMENT

Model	R	Rsquare	Adjusted Rsquare	Std. Error of the Estimate
1	0.872	0.760	0.759	1.15726

TABLE 9 ANNOVA MODEL

Model		Sum of squares	df	Mean Square	F	Significance
1	Regression	840.702	1	840.702	627.736	0.000
	Residual	265.173	198	1.339		
	Total	1105.875	199			

TABLE 10 COEFFICIENT^a

Model		Unstandardized Coefficients		Standardized Coefficient	t	Significance
		B	Std. Error	Beta		
1	(Constant)	2.427	0.308	0.872	7.870	0.000
	Fund Management	2.204	0.088		25.055	0.000

The relation among the variables is identified as follows;

$$BrandBuilding = Cons + B \times FundManagement$$

3.4 Study and Findings IV

In this study, Brand Building is explained with the parameters; Fund Management and Role Performance. Brand Building is the dependent variable whereas Fund Management and Role Performance are independent variables.

TABLE 11 MODEL SUMMARY: REGRESSION EXPERIMENT

Model	R	Rsquare	Adjusted Rsquare	Std. Error of the Estimate
1	0.913	0.834	0.832	0.96550

TABLE 12 ANNOVA MODEL

Model		Sum of squares	Df	Mean Square	F	Significance
1	Regression	922.235	2	461.117	494.664	0.000
	Residual	183.640	197	0.932		
	Total	1105.875	199			

TABLE 13 COEFFICIENT^a

Model		Unstandardized Coefficients		Standardized Coefficient	t	Significance
		B	Std. Error	Beta		
1	(Constant)	1.682	0.269		6.244	0.000
	Fund Management	1.155	0.134	0.457	8.621	0.000
	Role Performance	1.200	0.128	0.496	9.352	0.000

The above study concludes the following relation among above variables.

$$BrandBuilding = Cons + B_1 \times FundManagement + B_2 \times RolePerformance$$

3.5 Study and Findings V

Role Performance plays vital role in Brand Building. In this study, Role Performance is independent variable and Brand Building is dependent variable.

TABLE 14 MODEL SUMMARY: REGRESSION EXPERIMENT

Model	R	Rsquare	Adjusted Rsquare	Std. Error of the Estimate
1	0.878	0.771	0.770	1.13021

TABLE 15 ANNOVA MODEL

Model		Sum of squares	df	Mean Square	F	Significance
1	Regression	852.955	1	855.955	667.741	0.000
	Residual	252.920	198	1.277		
	Total	1105.875	199			

TABLE 16 COEFFICIENT^a

Model		Unstandardized Coefficients		Standardized Coefficient	t	Significance
		B	Std. Error	Beta		
1	(Constant)	2.278	0.305		7.476	0.000
	Role Performance	2.125	0.082	0.878	25.841	0.000

The above study identifies the following relation,

$$BrandBuilding = Cons + B \times RolePerformance$$

IV. CONCLUSION

Brand building is an important aspect to enhance the quality of medical care and infrastructure. Such efforts lead to enhancement of the social perception of the society towards the quality of medical care delivered to the patients. This perception depends upon the feedback given by the patients and their attendants that will be based on several factors related to physicians, staff and paramedical staff. In this paper, a study has been done to know the role performance of paramedical staff for improving the social perception of the hospital in the society. Five case studies has been performed which are deriving the relations among several parameters; Role Performance, Social Perception, Brand Building and Fund Management.

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Classification of Printed and Handwritten Gurmukhi text using labeling and segmentation technique

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Abstract- This document is based on character recognition which include handwritten and machine written texts. The basic aim of this research is to differentiate between printed or machine text and hand written text. In current work the optical character reader (OCR) for Punjabi Gurmukhi text is performed. Process of research is follow image acquisition, preprocessing, segmentation, feature extraction, classification & recognition, post processing.

Index Terms- OCR, Machine written text, Handwritten text

I. INTRODUCTION

In the era of computer, it has become mandatory to have all the available information in a digital form which can easily recognized by machines. However, on the floor of computer data room, there are main two types of data, like as printed material & handwritten script. In this research, the deep focus of current research is to draw discriminate printed and handwritten Gurmukhi text is part of hard & soft copies. Character Recognition (OCR) is the process of converting scanned images of machine printed or handwritten text into a computer processable format.

Classification of character recognition system is based on character type and recognition mode. Character Type is further divided as Printed/type-written and Hand-written Character Recognition. Handwritten text & printed text. Handwritten can be further divided into two categories: Cursive and Hand printed script. Recognition of handwritten characters is a much more difficult problem. Characters are non-uniform and can vary greatly in size and style. However printed text includes the materials such as books, newspapers, magazines, documents and various writing units in the video or still image. Machine printed characters are uniform in height, width and pitch assuming the same font and size are used. Problem related to these are solved with little constraint.

ਸ਼ਿਵ ਕੁਮਾਰ ਬਟਾਲਵੀ
ਅਵਤਾਰ ਪਾਸ਼
ਮਹਾਨ ਸ਼ਖਸੀਅਤਾਂ
ਪੰਜਾਬੀ ਸਾਹਿਤ
ਪੰਜਾਬੀ ਕਵੀ

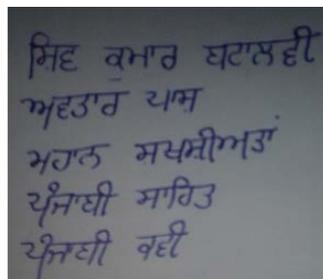


Fig.1 Representation of printed and handwritten Gurmukhi text.

There are number of difference between hand written and machine written text. These are given below:

- In machine, written language has less no. of strokes as compared to hand written text.
- Machine written text is more readable than the hand-written text.
- Machine written language has fixed sized text compare to the hand-written text.
- Machine written text has more options for formats compare to the hand-written text.
- Machine written text is equally spaced compare to the hand-written text.

II. STRUCTURE OF GURMUKHI CHARACTER

Writing style of Gurmukhi script is from top to bottom and left to right. In Gurmukhi script, there is no case sensitivity. Regular Gurmukhi words can typically be divided into three strips: top, core or middle and bottom as shown in Figure. The header line separates the top strip and the core strip and base line separates core strip and lower strip. The top strip generally contains the top modifiers, and bottom strip contains lower modifiers.

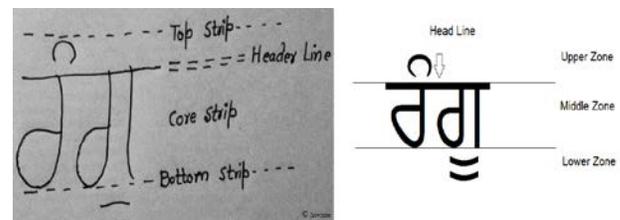


Fig.2 Representation of three Strips of a word in Gurmukhi script.

Gurmukhī has thirty-eight consonants (*akhar*), 10 vowel symbols (*lāgamātrā*), two symbols for nasal sounds (*pair bindi* and *ṭippī*), and one symbol which duplicates the sound of any consonant (*addak*). In addition, four conjuncts are used: three subjoined forms of the consonants Rara, Haha and Vava, and one half-form of Yayya. Use of the conjunct forms of Vava and Yayya is increasingly scarce in modern contexts.

I. Proposed System :

There are number of techniques for recognition of characters. Mostly methods are too much close to each other. In this thesis I follow these steps to find out the result-image acquisition, preprocessing, segmentation, feature extraction, classification & recognition, post processing.

A. Image acquisition

The images are acquired through the scanner. The images are of RGB in nature (Colored). If we deeply observed any image then we can find that there are a number of unwanted elements that can be considered as noise. These elements can create difficulties in the way of performance of the whole system. So that it becomes necessary to remove this noise. Preprocessing works on it.

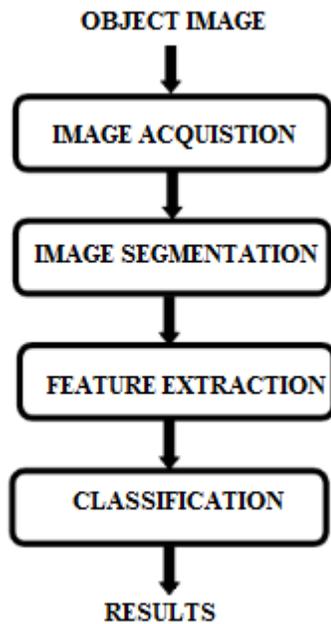


Fig.3 Representation of Proposed System

B. Image segmentation

Segmentation means partitioning of image into various part of same features or having some similarity. In the other words, Segmentation is the phase in which data is decomposed at character or stroke level so that nature of each character or stroke can be studied individually. The segmentation can be done using various methods like otsu' method, k-means clustering, converting RGB image into HIS model, cross correlation etc. Segmentation is carried out mainly two stages namely – Line segmentation and Word segmentation.

- 1) *Line Segmentation*: The line segmentation is carried out by scanning the entire row one after the other and provide results.

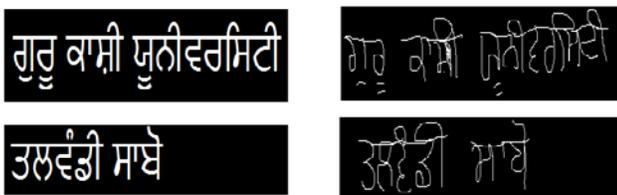


Fig.4 (a) Line segmented printed text (b) Line segmented handwritten text

- 2) *Word segmentation*: In it, the same principle used in line segmentation is used. The only difference here is that the scanning process is carried out vertically.



Fig.5.a) Word segmented printed text (b) Word segmented handwritten text

Otsu Threshold Algorithm for segmentation:

Thresholding creates binary images from grey-level images by setting all pixels below some threshold to zero and all pixels above that threshold to one. The Otsu algorithm defined in is as follows:

- i) According to the threshold, separate pixels into two clusters
- ii) Then find the mean of each cluster.
- iii) Square the difference between the means.
- iv) Multiply the number of pixels in one cluster times the number in the other

a) C. Feature Extraction

b) Feature extraction is used to extract relevant features for recognition of characters based on these features. First features are computed and extracted and then most relevant features are selected to construct feature vector which is used eventually for recognition. The computation of features is based on main two types of feature

c) extraction:

- Statistical feature extraction
- Structural feature extraction

a) *Statistical feature extraction* : In this type of extraction the extracted feature vector is the combination of all the features extracted from each character. The associated feature in feature vector of this type of extraction is due to the relative positions of features in character image matrix.

b) *Structural feature extraction* : This is a primitive method of feature extraction which extracts morphological features of a character from image matrix. It takes into account the edges, curvature, regions, etc. This method extracts the features of the way character are written on image matrix.

d) The functions that are used in feature extraction are:

e) *Indexing and labelling* : This is a process by which distinct characters in an image are indexed and labelled in an image. Thus helps in classification of characters in image and makes feature extraction of characters simple.

f) *Boxing and Cropping* : This is a process of creating a boundary around the characters identified in an image. This helps by making cropping of characters easier. After boxing the characters are cropped out for storing them as input variables for recognition.

g) *Reshaping and Resizing* : Reshaping is done to change the dimensions of the acquired character in desired shape. Resizing is done to reduce the size of characters to a particular minimum level

h) D. QUALITY METRICS

The results achieved from segmentation depend upon the quality of the images. The images get distorted during the acquisition process which degrades its quality. The quality of the image can be judged by the human eye but the results of the segmentation cannot be judged by visualizing. Also in real time environment the subjective evaluation of segmentation gets complex. Therefore there requires some standard parameters for performance evaluation.

(i) *SSIM (Structural Similarity Index Measure)*: It is well known quality metric that is used to calculate the similarity between two images. It is designed by modeling any image distortion as three factors that are contrast distortion, luminance distortion and correlation.

(ii) *MSE (Mean Square Error)*: It is a method used to check for errors. Two MSEs are calculated and then are compared to find the accuracy of an image. It calculates the quantitative score that helps to measure the degree of homogeneity or the level of error or distortion between them. When a zero-mean random source x passes through a cascade of K additive independent zero means distortions. A lower MSE value will result in higher quality image.

(iii) *PSNR (Peak Signal Noise Ratio)*: The PSNR is most commonly used as a measure of quality of reconstruction of loss compression codecs. The signal in this case is the original data, and the noise is the error introduced by compression. A higher PSNR would normally indicate that the reconstruction is of higher quality. Performance Evaluation of Preprocessed Images using PSNR, MSE and Mutual Information metrics.

III. RESULTS & DISCUSSION

In this research work, I have taken the Punjabi (Gurmukhi) alphabets for both hand written and machine written. Our objective is to identify and segment the letters from the image containing text. For it we will take various parameters to have automatic differentiation between machine written and hand written text. These parameters are aspect ratio and wavelength value. Machine written text has constant aspect ratio and common wavelength. But hand written text has varying aspect ratio and the wavelength.

The images with both types of text like hand written and machine written text are given as input. With the help of threshold based technique the text characters are recognized such that automatic system can be developed which can recognize the hand written text and machine written text. With the help of powerful software Matlab, I have done a number of experiments on the handwritten and machine written documents. Here I have an experiment with result.

EXPERIMENT

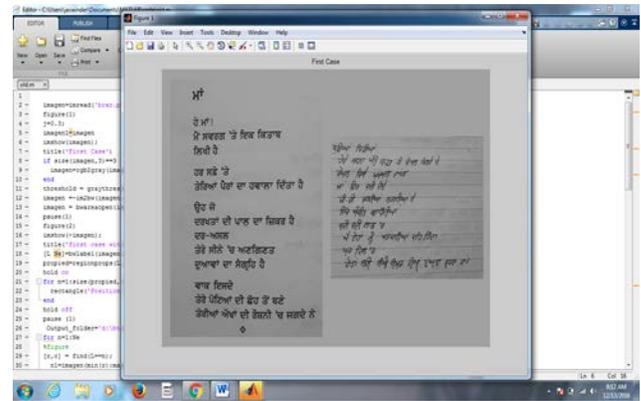


Fig.6 Input Image
After giving the input, the characters are recognized. Image after character recognition are shown below:

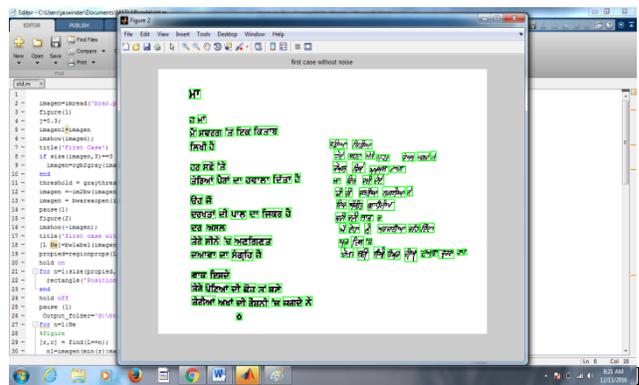


Fig.7
Image after character recognition

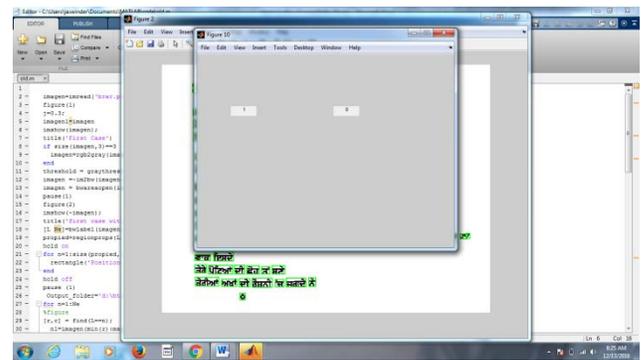


Fig.8 Output Image
Machine written text is shown as 1 and hand written text is shown as 0.

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Impact of TT Vaccination among Adolescent Girls through Nutrition Education in Sirajgonj District of Bangladesh

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Abstract- Mention Nutritional knowledge, personal hygiene and immunization awareness can be gained through nutrition education. In this study, five hundred adolescent girls between ten to nineteen years were selected as samples. In baseline study the participants were randomly assigned to a control and an intervention group and both group had the same number of adolescent girls. In end line, 241 adolescent girls from intervention group and 236 from control group were finally interviewed. This study showed that adolescents who took TT vaccine and who did not take TT vaccine were either normal or malnourished (67.24 vs. 56.77). Adolescent girls were significantly ($p < 0.05$) increased whereas moderate and severe thinness girls were almost less than those who did not take TT vaccine. TT Immunization increased through nutrition education counseling and played a significant role in reducing the thinness among the adolescent girls. In compare with those did not take TT vaccine, nutrition education also appreciably contributed on vaccination coverage between control and intervention group (28.8 to 44.0; $p < 0.001$). This TT immunization awareness can be grown up through nutritional education.

Index Terms- Adolescent girls, Immunization, Tetanus toxoid, Nutrition education

I. INTRODUCTION

Vaccination is the administration of antigenic material (a vaccine) to stimulate an individual's immune system to develop adaptive immunity to a pathogen. Vaccines can prevent or ameliorate morbidity from infection. The Tetanus Toxoid (TT) vaccine is given during adolescent period to prevent the risk of tetanus to adolescents as well as her unborn baby because they are considered as "mother to be" and the future nation depends on them (Measham and Chatterjee, 2000). Adolescence refers to a period of 10-19 years while rapid physical, psychological and emotional changes occur and additional nutritional demands increased for their proper development of the body (Abdur Razzak et al., 2016). Neonatal and maternal tetanus infections remain an important cause of death in many countries. Few studies have reported tetanus toxoid antibody levels of adolescent girls. As part of the Expanded Programme on Immunization most girls receive up to 3 injections in early childhood, and many subsequently do not receive booster vaccinations until pregnant

(Loretta Brabin et.al. 2000). Tetanus is a life-threatening bacterial disease that is caused by the toxin of a bacterium called *Clostridium tetani*. This awareness can be grown up through nutritional education. Nutrition education" means individual or group sessions and the provision of materials designed to improve health status that achieve positive change in dietary habits, and emphasize relationships between nutrition and health, all in keeping with the individual's personal, cultural and socioeconomic preferences (Oregon WIC Program). Previous studies also showed that nutrition education or counseling on elder person had a fruitful outcome (BNNMB, 2003). The aim of this study was to evaluate the impact of TT vaccination coverage and in improving the nutritional status among adolescent girls through nutrition education.

II. MATERIALS AND METHODS

In this study five hundred adolescent girls were selected as samples in the age group of ten to nineteen years to analyze the impact of TT vaccination coverage and in improving the nutritional status among adolescent girls through nutrition education. In baseline study precisely the same number ($n=250$) of adolescent girls was randomly assigned to a control and an intervention group from rural areas of Sirajgong district of Bangladesh. For TT vaccine nutrition education other than the course curriculum was provided only to the intervention group whereas no education was provided to the control group. For TT vaccine nutrition education was provided to all of the subjects through one to one or group discussion using relevant charts, leaflets, posters etc. After two years intervention providing the groups was assessed at the end line of the study. 241 adolescent girls from intervention group and 236 from control group were finally interviewed at end line, to evaluate the impact of TT vaccination coverage and in improving the nutritional status among adolescent girls through nutrition education. Drop out occurred for married and or pregnant adolescent girls those were not included in this study due to their unwillingness to continue the study and marriage at the time of study. Interviewing methods was face to face and study variables like socio-demographic, nutrition, vaccination and anthropometric measurements were considered for this study. Here height and weight were measured using standard anthropometric techniques.

Nutritional status was measured based on the BMI for age Z scores. These Z scores were calculated using WHO Anthro Plus software where data was analyzed by using statistical package for social science (SPSS) software. The normality of the continuous variables was checked using Chi-square test was done

III. RESULTS

Table 1 shows TT vaccination coverage of the adolescent girls was significantly ($P < 0.001$) increased in the intervention group (44.0%) compared to the control group (28.8%) among the adolescent girls.

Table 2 depicts the percentage changes of nutritional status of the adolescent girls based on their BMI for age Z scores (BAZ) between those did not take TT vaccine and those take TT vaccine. In base line, percentage of sever (6.16 vs 1.06) and moderately (18.23 vs 9.57) thinness were significantly ($P < 0.001$) less from combined groups those did not take TT vaccine and those take TT vaccine. Percentage of normal (46.55 vs 53.19; $P < 0.05$) and mild (29.06 vs 36.17; $P < 0.05$) adolescent girls was significantly more from combined groups those did not take TT vaccine and those take TT vaccine. In end line, percentage of sever (6.27 vs 2.30) and moderately (12.54 vs 8.05) thinness were significantly ($P < 0.001$) less from combined groups those did not take TT vaccine and those take TT vaccine. Percentage of normal adolescent girls was significantly more (56.77 vs 67.24; $P < 0.001$) from combined groups those did not take TT vaccine and those take TT vaccine. Between the baseline and end line of the study which indicates that those took TT vaccine has significantly ($P < 0.05$) less severe and moderate thinness adolescent girls among those did not take TT vaccines. On the other hand those took TT vaccine has significantly ($P < 0.01$) more normal adolescent girls among those did not take TT vaccines. Also in baseline of the study mild (29.06 vs 36.17; $P < 0.05$) adolescent girls was significantly more from combined groups those did not take TT vaccine and those take TT vaccine.

Table-1: Percentage of the TT vaccination coverage variable of the adolescent girls in the intervention and the control group.

Characteristics	Control	Intervention
Have taken TT vaccine	28.8	44.0**
Have not taken TT vaccine	71.2	56.0

** Significance level at $p < 0.001$

Table-2: Association between malnutrition based on BAZ¹ and TT vaccination

	Baseline		End line	
	Took TT vaccine	Did not take TT vaccine	Took TT vaccine	Did not take TT vaccine
Normal	53.19	46.55*	67.24	56.77*
Mild	36.17	29.06*	21.26	22.77
Moderate	9.57	18.23*	8.05	12.54*
Severe	1.06	6.16*	2.30	6.27*
Over weight	0	0	1.15	1.65*

¹=BMI (Body Mass Index) for Age Z score

to look for the significant difference on categorical variables between the intervention and control group. Also independent sample t-test was done for assessing the significant difference in anthropometric Z scores between the groups where significant, level was set at $P < 0.05$.

IV. DISCUSSIONS

Vaccination rates are continually considered a substitute measure of protection. Vaccines are the most lucrative public health intervention (World Development Report, 1993). Children and adolescents are at risk for unsatisfactory immunization coverage. Much effort has been spent attempting to increase the vaccination program among children. The effective vaccines against tetanus have been available since 1940s. Peter J. Gergen et. al. found that many Americans did not have immunity to tetanus, and the rates were lowest among the adolescent. They also correlated between vaccination rates and immunity (96 percent) among six-year-olds (Peter J. Gergen et. al., 1995). Before this program, TT vaccine acceptance was favorable but relevant knowledge was low but after nutrition education program, participants had greater knowledge and a more positive attitude ($p < 0.001$), with more adolescent girls (28.8% before vs. 44% after). Tracy T.C. Kwan et. al. showed that among Hong Kong Chinese adolescent girls the vaccination rate was 41.6% to 58.9% and peer support were 32.8% before vs. 56.9% after (Tracy T.C. Kwan et.al., 2011). Earlier exposure to tetanus toxoid through the completion of a primary series of vaccinations may allow an anamnestic response on exposure to tetanus despite the presence of low circulating antibody levels. Other potential factors contributing to the low rate of morbidity include appropriate post exposure wound prophylaxis and decreased exposure to tetanus spores. In most cases, tetanus occurs among adults who are unvaccinated or whose history of vaccination is unknown (Prevots R et.al., 1992). Ruben et al. (1973) showed 98.7 percent of girls who received two doses of DTP two months apart between six months to two years of age had protective levels of tetanus antibody. At least three vaccinations against tetanus are required to ensure adequate, long-lasting immunity (Simonsen O, 1989). This study also found that adolescent girls who took TT vaccine had significantly ($P < 0.05$) less severe and moderate thinness in compare with those who did not take TT vaccines.

V. CONCLUSION

TT vaccination coverage and impact were available among adolescent girls through nutrition education counseling or sessions. Malnutrition occurred more among those adolescent girls did not take TT vaccine. Immunization is increased through proper awareness building to the adolescent girls and their parents or guider. Though nutrition education significantly improved the vaccination coverage and nutritional status of the adolescent girl's malnutrition were still persisted significantly among the adolescents in both groups. Urgency is required to address this situation. Besides door to door immunization nutrition-sensitive programs might crucial for these adolescent girls.

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Case study of Wireless Technologies in Industrial Applications

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Abstract- In this current generation, technology is at its best. Many improved technologies are more facile than they have been before. WI-FI, which stands for wireless-fidelity, is a wireless way to handle networking. This functionality allows computers, smartphones, or other contrivances to connect to the Internet or communicate with one another wirelessly within a particular area. This paper explicates information about different communication modules such as Bluetooth, RF, and Zig bee in industrial applications. In this paper, an overall comparison of these three modules are made, which are predicated upon their industrial applications and characteristics such as standards, bandwidth, battery life, data rate, maximum transmission range, etc.

I. INTRODUCTION

Wireless is a term that describes telecommunications where the electromagnetic waves carry the signals over part or all of the communication path. In the early twentieth century, there were wireless transmitters that went on air using Morse code through radiotelegraphy. It was called "radio" because modulation was made possible. Modulation is used to transmit voices and music via this wireless medium radio. Wireless technology is the biggest contribution to mankind thus far, and it is rapidly evolving. Already a large number of people rely on the technology directly or indirectly.

Wireless technology is used for transferring data over long distances efficiently. When wireless technology was created, many new applications were available to designers. Since wireless technology is an electromagnetic transmission medium, it does not require cables and is emitted through the air by wave frequencies that can be used by satellites and infrared rays. This is a promising technology that allows people to do things easier over long distances. It is especially useful when cables cannot physically fit and it is fast and easy to install. It has great advantages in industrial applications, like greater mobility and

the possibility to move devices and connect to smart phones and tablets freely without constraining cables. Depending upon the range, Wi-Fi can be classified in different ways and each wireless technology is developed to serve specific usage segments that are based on a variety of variables, like bandwidth, distance, and power needs.

II. WIRELESS TECHNOLOGIES

Before wireless was invented and implemented, many industries used wired technologies for communication, which has many disadvantages. Also, it was impossible for communication to be established over the longer distances and also was not reliable. Due to this, wireless technology was introduced. There are many benefits and advantages to wireless when compared with wired technologies.

Different types of wireless technologies

There are many different types of wireless devices that have been introduced for use with wireless communication, so users can communicate even from remote areas. For example, a satellite is used for communicating over the world using wireless communications. In closed environments like colleges, banks, offices, industries, etc., the communication or the transfer of the data is done with the help of wireless sensor networks such as RF modems, Bluetooth, wi-fi, and Zig bee.

When we use wireless sensor networks over cabled networks, there are many advantages like:

1. It is reliable;
2. It is authenticated;
3. Cables are not used; and
4. It costs less than wired methods.

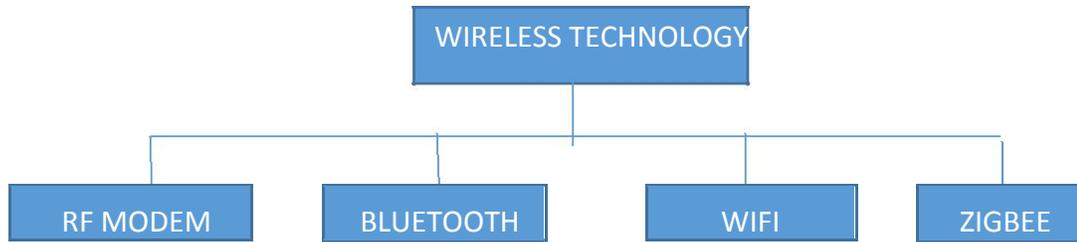


FIGURE 1:Types of Wireless Technologies

III. RF MODULE

The RF module is used to operate the radio frequency and usually the frequency range varies between 30 KHz AND 300 GHz. The RF module is much better than the IR infrared in transmission because the signals through RF can travel through

larger distances, which useful for long-range applications. Also, IR doesn't travel through obstructions, but RF signals can travel even when there is no obstruction between transmitter and receiver.

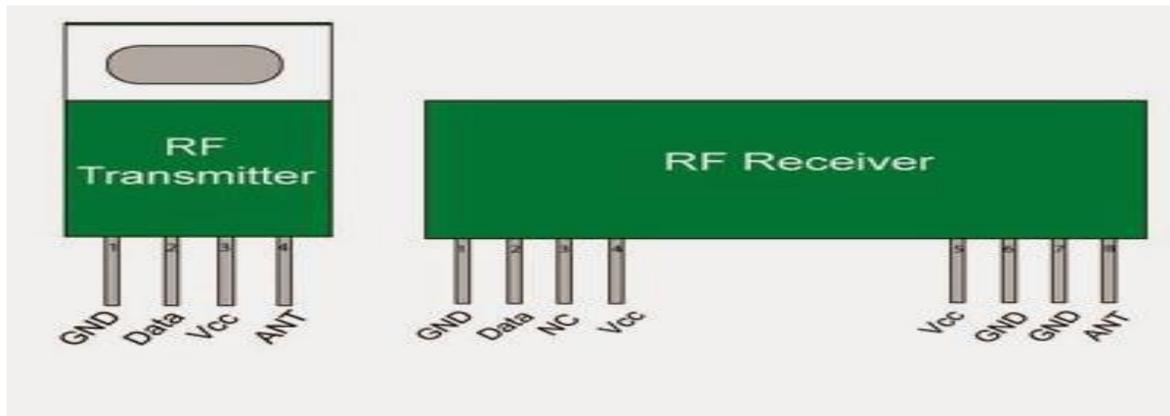


Figure 1 RF MODULE

Advantages of RF

RF is used for radio and television transmissions and also for cellular mobile phone service.

It is also useful in many medical applications, including MRIs, which are used for taking images of the human body and in diathermy instruments for surgery.

It is used for object detection by radar technology.

It is used for satellite communication and microwave line of sight communication systems.

Disadvantages of RF

If the radiation is uncontrolled, then it will have serious impacts, which affects children, older patients with pacemakers, birds, and small insects. Additionally, lightning usually affects RF cellular towers and is prevalent in farmland areas near the RF towers. RF waves can be easily hacked by the intruder and all confidential data can be decoded.

RF MODULE IS INFLUENCED BY THE FOLLOWING FACTORS

Sensitivity of the receiver:

This describes the minimum level that a signal can demodulate before conveying it to the receiver. The amplified signal, which is sent by the transmitter, needs to be softened.

Transmission power

This is the amount of frequency power that comes out of antenna of RF modules.

Line of sight

It is the transmission antenna that can be seen by the receiving antenna in a straight line, which improves communication. Frequently, there will be obstacles such as walls and floors that will absorb the radio wave signal, and the effective operational distance will, in most practical instances, be less than specified.

BLUETOOTH

Bluetooth was initially developed in 1994 by a Swedish mobile phone maker, Ericsson, to let laptop/computers make calls over a mobile phone. Since then, many different companies

have planned to make Bluetooth the low power short-range wireless standard for a wide range of devices. Bluetooth is a short-range technology used for Wireless Personal Area Networks (WPAN) and supports ad-hoc networks. The main aim of Bluetooth is to provide universal short-range wireless capability. With a 2.4 GHz band, two Bluetooth devices can share up to 720 Kbps within 10m of each other. It is also used to support a wide range of applications that are open-ended,

including data, audio, graphics, video, etc. Authentication is also possible with this technology by sending the acknowledgement from the receiver to the transmitter before making a connection between devices. There is a limitation, however, where only eight devices can communicate on a single network. Bluetooth was designed to be as secure as a wire with up to 128-bit public/private key authentication.

Bluetooth network topology

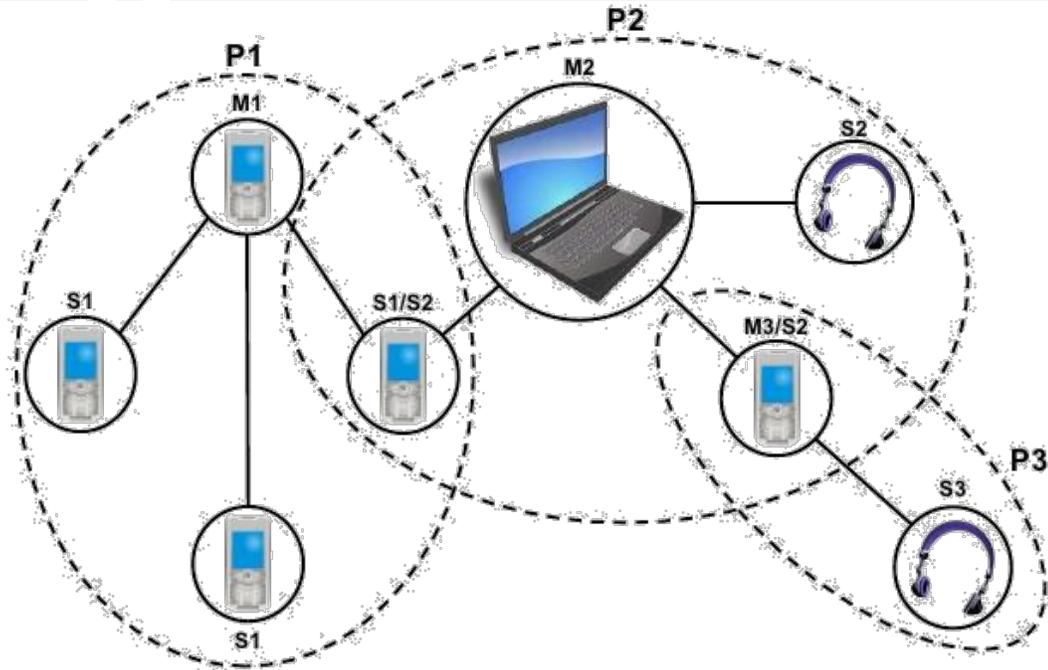


Figure 2 Bluetooth connection

Advantages of Bluetooth:

Bluetooth is easy to connect for sharing data files with other devices.

It uses low power signals, which is an advantage of consuming less battery than other devices.

It has the ability to connect 7 Bluetooth devices at a range of 30 feet, forming a piconet.

Disadvantages of Bluetooth:

The data rate of Bluetooth is 1MBPS, which is slower when compared with infrared.

It is easy to intercept and is vulnerable to attacks because of the high range and radio frequency.

No inbuilt line of sight for security, so it can be more easily hacked than infrared.

WI-FI

WIFI is a short for wireless fidelity, which is a way for wireless devices to communicate. It is also a WI-FI alliance name for wireless standard or a protocol that is used for wireless communication. WIFI devices are certified interoperable, which can run on the medium range networking standard 802.11, which runs at speeds roughly comparable to those of wired networks. It also runs on “free” portions of the radio spectrum, meaning that, unlike cell telephone communications, no license is required to broadcast using 802.11.



Figure 3 Wireless Network

To allow high speed data transfer over short distances, the wireless technology uses waves. There is a problem called multipath interference, which is due to reflection of signals from walls, signals from walls and other obstacles. WIFI provides internet access for many modern devices like laptops, mobiles, tablets, and computers with authentication and increases the devices on a single WIFI connection. The signal strength will be reduced and the connection may get lost, however. Millions of users use WIFI to connect to the internet and private networks without wires.

Advantages of WIFI

1. No wires are needed for establishing an internet connection.
2. Users can access the internet anywhere, anytime and can freely move anywhere within the range of WIFI and can use internet in the surrounding area.
3. Multiple devices can be used to access internet at a time.
4. Cheaper than the wired connections.

Disadvantages of WIFI

1. Wireless connections speed can be sometimes slow when compared to wired connections.

2. When the weather conditions are bad, it slows down the internet speed due to the lack of proper WIFI signals i.e., frequency.
3. Setting up a wireless connection is not cheap, especially in a large facility because companies need many routers and access points to set up the internet connection.
4. Security is one of the major issues in WIFI because when wireless routers and access points grant a direct connection to a company, they can also do the same for an outsider with the right tools.

It can generate radiation, which is very harmful to human health.

IV. ZIGBEE

Zigbee is the wireless technology developed to address the needs of low-cost, low-power wireless Machine to Machine (M2M) networks and operates on the IEEE 802.15.4 physical radio specification. The frequency bands on which zigbee operates are 868MHz, 915MHz, and 2.4GHz and the maximum data rate is 250k bits per second. One of the major advantages of using zigbee is that these devices are capable of operating for several years before their batteries need to be replaced.

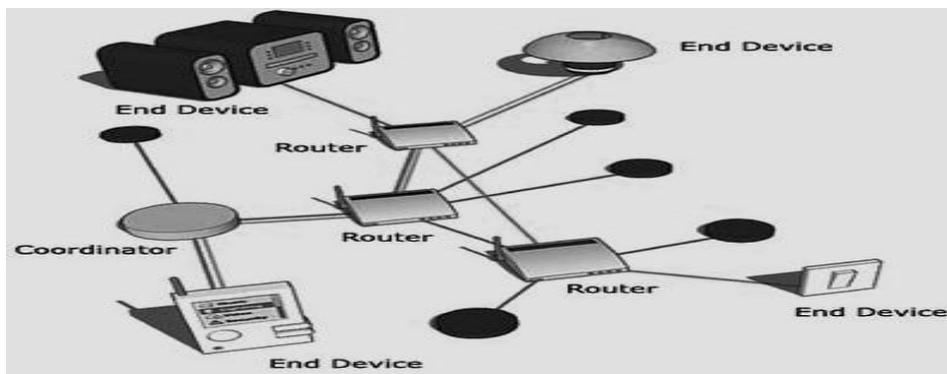


Figure 4 Zigbee Network

TABLE 1:COMPARISON OF KEY FEATURES OF COMPLEMENTARY PROTOCOLS

FEATURES	IEEE 802.11B	BLUETOOTH	ZIGBEE
Power profile	hours	days	years
Complexity	Very complex	complex	simple
Range	100m	10m	70m-300m
Data Rate	11Mbps	1Mbps	250Kbps

TABLE 2:BLUETOOTH VS WIFI

FEATURES	BLUETOOTH	WIFI
Bandwidth	800Kbps	11Mbps
Hardware Requirements	Requires Bluetooth adapter on all devices that connect to each other.	Requires wireless adaptors on all devices of the network ,a wireless router or Access points
Cost	Low	High
Power Consumption	Low	High
Secuirty	Less secure	More secure
Range	10m	100m
Primary devices	Includes usb mouse, mobile phones, keyboards etc	Includes computers, desktops and servers.

TABLE 3:ZIGBEE VS BLUETOOTH

FEATURES	ZIGBEE	BLUETOOTH
Networking Topology	Ad-hoc,star or mesh.	Small networks ,Ad hoc
Frequency	2.4GHz	2.4GHz
Nodes per network	255/65k+	7
Key attributes	Low power, cost and reliable	Cost ,convenience
Application focus	Monitoring and control	Cable replacement

V. CONCLUSION

Zigbee is better for industrial automation applications, as it provides a self-healing network, is easy to install, and has a low-cost deployment. The battery life of zigbee is also much better than Wi-Fi, and needs to be strongly considered if endpoints will run on batteries. There are different zigbee products developed that will function and survive in industrial settings, like high RF noise floors, temperatures, etc.

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Recent Status of Education, Employment and Empowerment of Women in West Bengal

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Abstract- Women's education and employment are indeed likely to play an important role in the empowerment of women through the collective efforts of women with favorable institutional support that can promote the empowerment process. The study points to the correlation between literacy and gender ratios in West Bengal in 2011 and finally look into the socio-demographic covariables of women's employment and their impact on women's empowerment in the state of West Bengal, based on secondary sources of data like, Census of India and NFHS-3. The literacy rate in West Bengal has always been higher than the all-India average, and West Bengal ranks sixth among the major states in this regard. It is observed that there is a fairly low and negative level Correlation, that is, $r = -0.16$ between the literacy rate and sex ratio in West Bengal. The main finding is that employment has a positive impact on active participation in the decision-making process at home. Thus, the results show that in general 38.1 percent of women have generally participated in household decisions, in the rural area 34.26 percent, but the urban area improved a lot, such as 47, 5 percent. It is also found that Muslim women are not a good contributor to household decisions compared to Hindu women. In the case of age at marriage, among non-working women 12-17 age groups considered at an early age in marriage, but working women delayed marriage, especially those who marry later compensate for their delay in marriage. Reproductive reproduction more abundant after marriage.

Index Terms- Education, employment, women empowerment and West Bengal.

I. INTRODUCTION

The concept of status is used in the sense of ordering individuals in terms of attributes such as level of education, occupation and income, perception of their position at home and in the community, role of taking decisions regarding home and family planning issues, the number of restrictions imposed on its activities and freedom and so on. It is truly probable that women's education and employment plays an important role in empowering women through the collective efforts of women with favorable institutional support that can promote the empowerment process. The relationship between women's participation in the workforce and decision-making has long been of interest in the context of contemporary development and in the interest of population policy in India. Women's empowerment refers to the power of women to think and act freely, exercise and choose and realize the potential as equal members of society. Women's empowerment is typically discussed in relation to

political, social and economic empowerment, but the economic empowerment of women has received particular attention and is often cited as one of the most important ways to promote gender equality, reduce poverty and improve the well-being of not only women, but children and societies.

II. STUDY AREA

According to 2011 census there are 19 districts, 347 CD blocks, 909 towns and 40,203 villages in West Bengal. It extends from $21^{\circ}25'N$ to $26^{\circ}50'N$ latitudes and $86^{\circ}30'E$ to $89^{\circ}58'E$ longitudes and it embraces an area of about 88,968 km². The state is bordered by Bhutan, Bangladesh and Nepal and the Indian states of Orissa, Jharkhand, Bihar, Sikkim, and Assam. The state capital is the metropolitan city of Kolkata, also called Calcutta. Total population of West Bengal as per 2011 census is 91,276,115 of which male and female are 46,809,027 and 44,467,088 respectively. This contributes to 7.55 % of the country's total population. The gender ratio or male-female ratio is 947 females per 1000 males. About 68.11% of population lives in rural areas and 31.89% of population urban areas.

III. LITERATURE REVIEW

The empowerment of women is one of the most important issues in the world today. "Women's Empowerment," "Gender Equality," and "Gender Equity" are separate, but closely related concepts. Gender equity implies "the equivalence in the outcomes of women's and men's lives, recognizing their different desires and interests, and requiring a redistribution of power and resources." Gender equity recognizes that women and men have different needs, preferences and interests. The results may require different treatment between men and women "(Reeves and Baden 2000). Empowerment is, above all, power; changing the power relations in favor of those who previously exercised little power over their own lives. Batliwala (1993) defines power as having two central aspects: control over resources (physical, human, intellectual, financial and self) and control of ideology (beliefs, values and attitudes). If power means control, then empowerment is, therefore, the process of gaining control. Mayoux (1997) states, empowerment is a multidimensional concept that has four crucial components: First, the inner Power - which allows women to articulate their aspirations and strategies for change. Second, the power for women to develop the necessary skills and access the resources needed to achieve their aspirations. Third, the Power that allows women to analyze and articulate their collective interests and organize to achieve them. Fourth, power over-changes the underlying inequalities in power

and resources that limit women's aspiration and ability to attain them. Jejeebhoy (2000) considers autonomy and empowerment as more or less equal terms, and defines both in terms of women "who control their own lives in the face of family, community, society and markets." The participation of women in the economic market is deduced to compete with their family responsibilities, since women are usually the only ones responsible for domestic duties. However, the links between women's empowerment and employment status are not extensively explored at the state level. Therefore, this paper investigates the influence of women's education and work status on how to influence the empowerment of women.

IV. OBJECTIVES

This study has the following objectives.

- 1) To find out the correlation between literacy and gender ratio in West Bengal in 2011.
- 2) To examine the role of employment in empowering women economically in West Bengal.
- 3) To analyze socio-demographic covariates of women's employment and their extent of effect on women empowerment in the state of West Bengal.

V. DATA AND METHODOLOGY

The present study is based entirely on secondary data sources, India Census 2011. The two variables, i.e the literacy rate and sex of West Bengal has been taken for this study. The data were processed and calculated the correlation between literacy and sex ratio using Spearman's correlation coefficient method. The following formula has been used:

$$1 - \frac{6\sum d_2}{n_3 - n}$$

Data were also collected from the National Family Health Survey (NFHS-3) conducted during 2005-2006 from 29 states / UTs. Here, the data has been carved for the state of West Bengal. Using the cross tabulation with background characteristics, it is a help for a clear profile of women work participations. The predictors in the study are age, education, age in marriage, husband's desire for children, contraception, caste, religion and place of residence of wealth. Explanatory variables are considered largely sub-dimensional, social, economic and

cultural. 1. The age group has been divided into three categories 15-24, 25-34 and 35+ for this study purpose. 2. Marital status is classified into three categories never married, married and widowed, divorced, and not dating together these categories are calculated in a category because of a much lower percentage. 3. The highest level of education is classified into four categories, no education included ever attended school, primary to fourth grade, secondary to 10th grade and higher level of education attended more than tenth class. 4. Caste or Tribes is divided into three categories: SC / ST, OBC, Other. 5. The index of wealth is classified into three categories: poor, middle and rich. 6. Occupation divided into two categories: not work and work. 7. Religion has been three categories Hindu, Muslim and other categories.

VI. RESULTS AND DISCUSSION

Empowering women through Education

Education is the key to gender equality. Education and employment are two basic tools that can change the economic and social status of women in the near future, as well as for a long time. The literacy rate is generally considered as one of the important indicators of the development of a population and the educational level of a population is considered an important determinant of their quality of life. Education interacts with other human development variables in crucial ways. For example, universal education and special attention to women's education are critical to improving the health practices of a community. In addition, of course, universal education is also likely to be necessary for meaningful and effective decentralization, especially in the next phase when panchayats are given greater responsibility for a wide range of activities. The literacy rate in West Bengal has always been higher than the all-India average, and West Bengal ranks sixth among the leading states in this regard. But up to the last decade, the improvement in literacy has been relatively slow in the state, especially for women. However, in the last decade, the state government has been concentrating its efforts through various special schemes such as "total literacy campaigns", "non-formal education", etc. Apart from formal education for children to achieve the goal of 'education for all' as soon as possible.

Table: 1 Correlation between Literacy and Sex Ratio in West Bengal, 2011

Sr. No.	Districts name	Literacy	R ₁	Sex Ratio	R ₂	d(R ₁ -R ₂)	d ₂
1	Bankura	70.95	14	954	8	6	36
2	Bardhaman	77.15	9	943	13	-4	16
3	Birbhum	70.9	15	956	5	10	100
4	Cooch Bihar	75.49	11	942	14	-3	9
5	Dakshin Dinajpur	73.86	12	954	8	4	16
6	Darjiling	79.92	6	971	1	5	25
7	Howrah	83.85	4	935	18	-14	196

8	Hugli	82.55	5	958	3	2	4
9	Jalpaiguri	73.79	13	954	8	5	25
10	Kolkata	87.14	2	899	19	-17	289
11	Malda	62.71	18	939	15	3	9
12	Murshidabad	67.53	16	957	4	12	144
13	Nadia	75.58	10	947	12	-2	4
14	North 24 Parganas	84.95	3	949	10.5	-7.5	56.25
15	Paschim Medinipur	79.04	7	960	2	5	25
16	Purba Medinipur	87.66	1	936	16.5	-15.5	240.25
17	Purulia	65.38	17	955	6	11	121
18	South 24 Parganas	78.57	8	949	10.5	-2.5	6.25
19	Uttar Dinajpur	60.13	19	936	16.5	2.5	6.25
	West Bengal	77.08		947			1328

Source: Authors' Calculation based on Census of India, 2011

Correlation between literacy and sex ratio in West Bengal in 2011.

As a result, according to the Census, the literacy rate in West Bengal has increased from 48.6 per cent in 1981 to 57.7 per cent in 1991 and to 69.2 per cent in 2001. While rural literacy is predictably lower than in urban areas, it has improved more rapidly in the recent past. Furthermore, as can be seen from

Fig.1, while literacy among rural females is still low compared to other groups, it has increased more rapidly in the recent past, going up by nearly 16 percentage points in the last decade. Table 1 shows the Correlation between Literacy and Sex Ratio in West Bengal, 2011. It is observed that there is a fairly low and negative level Correlation, that is, $r = -0.16$ between the literacy and sex in West Bengal.

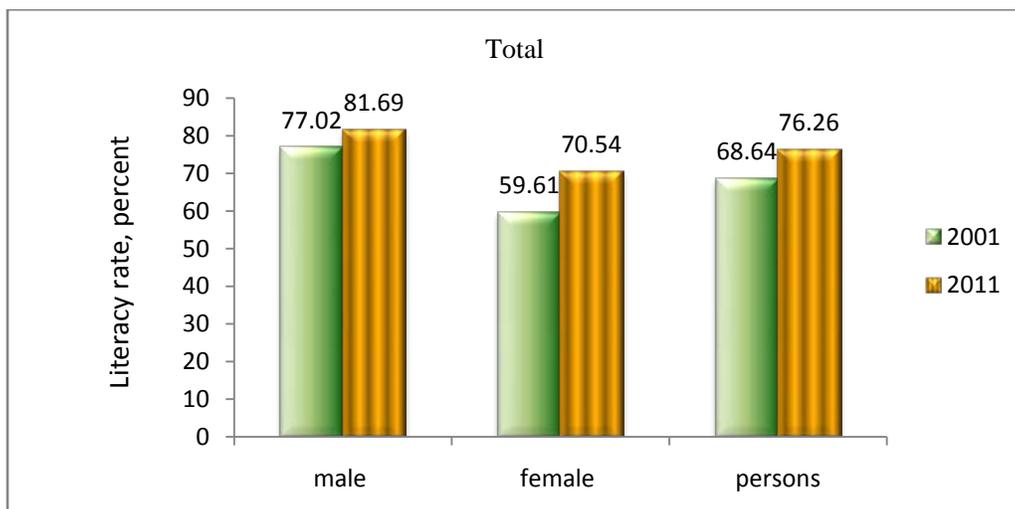


Fig 1: Changes in Literacy Rate in West Bengal during 2001-2011

Role of employment in empowering women in West Bengal

Empowered women should be able to participate in the decision-making process in social and economic life inside and outside the home. The main finding is that employment has a positive impact on active participation in the decision-making process at home. Thus, the results show that in general 38.1 percent of women have generally participated in household decisions, in the rural area 34.26 percent, but the urban area improved a lot, such as 47, 5 percent. It is also found that Muslim women are not a good contributor to household decisions

compared to Hindu women. Because Hindu women are highly engaged in employment compared to Muslim women in both rural and urban areas of West Bengal. Therefore, the study of motivators is acting as a catalyst for the process of effective empowerment.

Employment Status in West Bengal

Women's participation in economic activities, particularly outside the home, is often seen as an important factor facilitating the economic and social empowerment of women. Not only can

employment be a source of economic independence, it can help give women a sense of self-esteem. As a result of the expansion of research and the promotion of women's issues, we now have a better understanding of women's contribution to the economy and society as a whole through the many types of work they do in all the communities. In this section we examine the economic circumstances and patterns of labor participation of women in West Bengal, taking into account the context of globalization that has become increasingly noticeable in India since the 1990s. Experiences accumulated from different parts of the world, now it's clear that those adversely affected by the processes associated with globalization include disproportionately large segments of women, especially from the weaker sections of society, primarily through constraining work opportunities and employment levels, which, in their turn are important determinants of women's over-all situation in society.

The percentage distribution of non-working and working women by background characteristics in West Bengal is shown in Table 2 shows that the percentage distribution of working women increases as their age increases, but this is showing a decline in the non-working group. The educational level of women seems to be one of the most important factors influencing family size and birth rates, in this table non-working women are determined by the literate, but women with more studies are very busy In the labor sector. In the case of age in marriage, among non-working women 12-17 age groups considered at an early age in marriage, but working women delayed marriage, especially those who marry later compensate for their delay in marriage. Reproductive reproduction more abundant after marriage. The wealth index focuses on working women compared to the high contribution to labor participation, then non-working women.

Table 2: Percent distribution of not-working and working women by background characteristics of women in West Bengal, 2005-06

Background Characteristic	Not working	Working
Age group		
<i>15-24</i>	40.00	32.50
<i>25-34</i>	29.60	33.40
<i>35+</i>	30.40	34.10
Marital status		
<i>Never married</i>	16.20	18.40
<i>Married</i>	80.50	70.60
<i>Widowed</i>	2.20	6.80
<i>Divorced</i>	0.30	0.50
<i>Not living together</i>	0.90	3.80
Fertility preference		
<i>Have another</i>	20.40	15.00
<i>Undecided</i>	1.20	0.70
<i>No more</i>	35.10	30.50
<i>Sterilized</i>	24.90	31.80
<i>Declared infused</i>	2.20	3.80
<i>Never had sex</i>	16.00	18.20
Religion		
<i>Hindu</i>	70.90	75.40
<i>Muslim</i>	28.20	23.60
<i>Others</i>	0.90	1.00
Educational status		
<i>No education</i>	29.80	48.40
<i>Primary</i>	21.10	23.30
<i>Secondary</i>	43.00	23.20
<i>Higher</i>	6.00	5.10
Wealth index		
<i>Poorest</i>	18.40	31.90
<i>Poorer</i>	22.90	28.40

<i>Middle</i>	19.20	18.80
<i>Richer</i>	21.20	12.40
<i>Richest</i>	18.30	8.40
Type of place of residence		
<i>Urban</i>	33.00	26.40
<i>Rural</i>	67.00	73.60

Source: Author's calculation based on NFHS-3

Table: 3 Percentage of female workers by Age group and Place of residence in West Bengal, NFHS 2005-06

Background Characteristics		Not Workers	Prof., Tech., Manag.	Clerical Workers	Sales workers	Agric-Employee	Services sector	Skilled & Unskilled Workers
Age Group	15-24	40	38.8	18.8	14.5	27.6	19	43.5
	25-34	29.6	25	37.5	38.9	36.1	34.9	31.5
	35+	30.4	36.2	43.8	46.6	36.3	46	25
Place of Residence	Urban	33	62.7	93.8	46.6	0.7	62.5	24.3
	Rural	67	37.3	6.2	53.4	99.3	37.5	75.7

Source: Author's calculation based on NFHS-3

Table 3 shows the percentage of female workers by age group and place of residence in West Bengal, NFHS 2005-06. It is found that women who do not work are higher, it is 40 percent who belongs to 15-24 age groups. However, skilled and unskilled workers are in groups of 15 to 24 years, which refers to 43.5 percent. It is a good symbol for the empowerment of women because the empowerment of women generally determines the social, cultural, economic and biological context. This table 3

also found that administrative, sales and agricultural employee contributes highly from 35+ age groups. Regarding the place of residence, it is clear that 99.3% of the women belong to rural areas that are concerned as agricultural employees and only 37.3% work in professional, technical or management professions. However, office workers are 93.8 percent found in urban areas and 62.5 percent of women are employed in the service sectors.

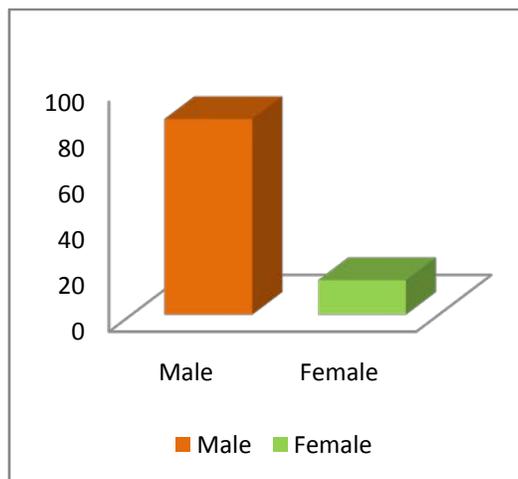


Fig. 2: Percent of male female of household head in West Bengal, 2005-06

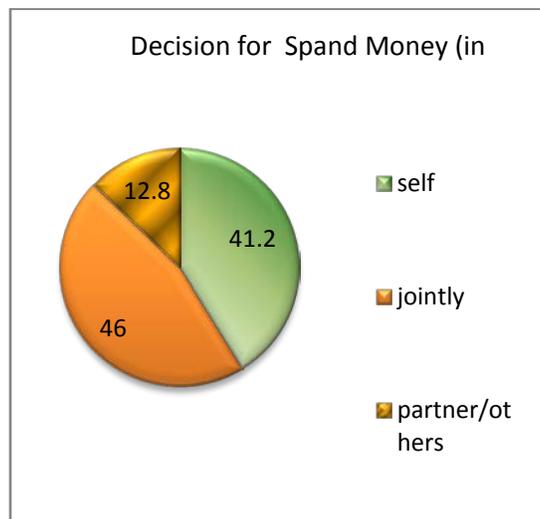


Fig. 3: Decision for Spand Money (in Percent) in West Bengal, 2005-06

Table: 4 Women’s empowerment by residence in West Bengal, NFHS-3, 2005-2006

	NFHS-3	URBAN	RURAL	KOLKATA
Currently married women who usually participate in household decision (%)	38.1	47.6	34.3	55.8
Ever married women who have ever experienced spousal violence (%)	40.3	30.4	44.2	26.7

Source: National Family Health Survey (NFHS-3) conducted during 2005-2006.

Table 4 shows the empowerment of women by residence in West Bengal, NFHS-3 and 2005-2006. Empowerment of women is the process of gaining power, both controls over external resources, as well as internal confidence and capacity. As a result it is found that currently married women who typically participate in decision making at home is higher in urban areas as 47.6 percent and in rural area is only lower as 34.3. Table 4 also focuses on married women who have experienced marital violence. In general, in rural areas, conjugal violence is higher (44.2%), but in urban areas it is a minor concern (30.4%). It is located in Kolkata, the home's decision is 55.8 percent.

This study points to the fact that the mere celebration of statistical swelling in female participation rates at work does not ensure women's power status, but the quality of the work involved is also an important determinant because employment can determine empowerment. Women's education and employment patterns play a significant role in women's empowerment as they are key contributors to their economic empowerment, which in turn influences the overall position of women in society. Economic empowerment, women can gain financial autonomy, enter into participation in work, and have equal opportunities to gain positions of economic power. Thus, on the basis of the empirical result, it can be concluded that employment has a positive effect on the empowerment of women in West Bengal.

VII. POLICY RECOMMENDATIONS AND CONCLUSION

In recent decades, there have been significant changes in the occupational and educational situation of women, although the change has been very low. There is a need for incentives in education and health organization for the participation of women. The government needs special attention in women's educational grants and women's health subsidies that change society's behavior on women. Enable the full participation of women in personal and family decisions, especially those related to maternity.

Gender policies emphasize greater participation of women in the labor market, while social exclusion analysts emphasize employment-based inclusion for vulnerable or excluded groups.

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Rechtsvinding by Judges in Judicial Process

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Abstract- As the spearhead of law enforcement, the position of judge is very significant and prestigious, because based on the consideration and decision, the law is upheld and justice is given to the litigants. In his authority, the justice seekers entrust their fate to judge and therefore the quality of judges becomes crucial to their existence in shaping and enforcing the authority of law. One of judge assignments in performing his judicial function is to decide cases that have been filed upon him. Judge must not refuse to examine and hear as well decide the case presented to him with unclear law reasons or law provision has not been set. The limited scope possible to be accommodated by rule of written law against any concrete events encountered by society who then confronted the judge to examine, hear and decide, has given rise to consequences for the judge to perform rechtsvinding in spacious sense. There are three (3) stages must be conducted by judge in deciding a case, namely ascertain facts, qualify the incident and constituted legal events. Rechtsvinding is an obligation of judges, this is caused by several factors, as follows: First; as stated beforehand, that almost all of the events is not completely depicted within concrete law precisely in legislation. Second; provisions of a legislation, or sometimes conflict with other provisions, thus it requires clarity to be implemented appropriately, correctly and fairly; Third: due to the dynamics of society, there is a variety of new legal events that are not depicted in the legislation; Fourth obligation to rechtsvinding also arises because there is a variety of new law events that is not depicted in the legislation, there is a variety of events that has not depicted yet in the legislation; Fifth: obligation to rechtsvinding also arises due to provisions or the legal principle that prohibits judges to reject a case with unclear law reason or law provisions has not been set.

Index Terms- Rechtsvinding, judges, judicial process

I. INTRODUCTION

Indonesia as a State of Law based on Pancasila and in accordance with the basis of the Constitution of the Republic of Indonesia Year 1945, ever since the construction has had lofty ideals, among others is assured to prosperous society. In realizing a fair social order in societal circumstance, nation and state governed, therefore the lofty ideals of justice must be undergone explicitly by the state, in order to ensure the implementation and execution of all aspects in society life order in the broadest sense. One of guaranteed embodiments judicial in Indonesia, is the establishment of an independent judicial power bodies apart and their influence from intervention agencies of other governmental power. Independent judicial authority is expected to be realized through the role of judges in the country's judiciary in fair, honest, and free. This is in accordance with Article 1 of Law

No.48 Year 2009 on Judiciary Ascendancy as an independent state authority to conduct judiciary to uphold law and justice based on Pancasila and the Constitution of the Republic of Indonesia Year 1945, for implementation of the State of Law of the Republic of Indonesia.

Freedom of judiciary power, in which the execution to be handed over to judicial authority is one of the trademarks of the state law. In essence of freedom is an innate trait in every court. The freedom of judicial power is the duty of the judge to uphold the law and justice based on Pancasila by interpreting law with seeking a legal basis and principles of its ground, through cases that confronted to him, until the verdict reflects the sense of justice of nation and people (Soedikno Mertokusumo, 1985)[1]. Powers carried by the judge is state power in the judiciary, in the context of state services to the people seeking justice, legal protection based on the foundations of justice which appropriate on living legal sense and trusted by society.

Judicial independence is required, because of the many cases that must be resolved, but because the law commands, sometimes even a judge is required to find the law to a case that is not necessarily written rules. Abdul Kadir Muhammad (1985)[2] asserts that in the state based on law or state law, the independence of judges in exercising justice is a characteristic that essential. In examining and deciding the case, the judge shall be free not to be under the influence of any power.

Judicial independence in their professional manner regulated by law, and thus, things that lead to disruption in the workings of judges can be categorized as an act of obstructing the legal process, or even can be categorized as an abuse of the court. Implementation of the judicial authorities handed over to the judicial institutions with the prior task to receive, examine and adjudicate as well resolve any matter submitted to him [3]. One of the judge priorities in performing his judicial function is to decide cases that have been filed upon him. Judges may not refuse to examine, hear and decide the case filled to him by reason of none or unclear rules.

Article 10 Subsection 1 of Law Number 48 Year 2009 states that the Court prohibited from refusing to examine, hear and decide a case filed by motive that law does not exist or is unclear, except obliged to examine and hear it. The consequences of Article 10 Subsection 1 of Law Number 48 Year 2009, which does not justify the Court in the sense of judge to refuse to examine and decide a case with unclear reasons or unclear laws, the Law has mandated to judge to exercise his function as law enforcer and justice upholder in order to follow and understand the legal values that live in society.

The values that live in the community need to be explored by the judge, because these values are generally very crucial in considering a case, this corresponds to the value of justice in society, even the society at a time more respect for the values espoused in comparison with positive law which applies if there

is a conflict of norms. Article 5 Subsection 1 of the Law Number 48 Year 2009 states that a judge as law enforcer and justice upholder shall explore, and understand the legal values that live in the society. Abdul Kadir Muhammad (1985)[4], stated that the judges after obtaining event that certainly has occurred, then the judge assess whether the events occurred is unlawful or not, then a judge determines the legal regulation which of occupy events occurred, in such circumstances means that there is *rechtsvinding* by the judge.

Legal facts show distrust in law enforcement efforts by the judge in the form of a court judgment that has led apathy by society, even the pros and cons accompanying the court's ruling, even cynical accusations of people seeking justice keep expressed that the judge in his ruling has underwent deterioration effort of law and is loaded with engineer act and discriminatory against the weak (Sukarno Aburaerah, 2004)[5]. The limited scope that can be accommodated by rule of written law against any concrete events encountered by citizens and hander upon judge to examine, hear and decide, has given rise to consequences for the judge to perform *rechtsvinding* in a broader sense. The intention is the *rechtsvinding* must be implemented by judges but not limited merely to rules of written law, but also more widely in unwritten law.

Demands to judges to perform *rechtsvinding*, is to answer any legal dispute encountered by society and confronted upon the judge in order to obtain a fair settlement in accordance judge's verdict, especially to a concrete legal event which has not been set explicitly in legislation. Moreover, the judge in deciding a case brought before him tend to passively decide to not perform *rechtsvinding* beyond the law and is only intended to legal certainty without flexing the values of justice and truth.

Therefore, according to Cardozo, asserted when the existing rule of law is no longer able to solve the problem, then the judge must establish a new law for the case against him (W. van Gerven, 1973)[6]. The judge in charge of judicial quantity and intensity of quite large case should perform *rechtsvinding*, given the complex problems facing by society is varied and when confronted upon the judges, there is no reason to reject it. The ability of a judge will be seen from the quality of the decision he did. Decision quality is the result of thinking capability of the judge concerned along with sufficient knowledge of law and various supporting science that he possessed. According to above description thus what becomes the problem, is directed on how judges perform *rechtsvinding* in the judicial process? And what factors are causing the judge perform *rechtsvinding* by exclude the legislation in deciding a case?

II. DISCUSSION

A. The *Rechtsvinding* by Judge in Judicial Process

The judge in the hearing and deciding the case, apparently encounter the fact that existing laws cannot be firmly to answer and resolve disputes that exist in society. Judges should seek its own legal apparatus to find it (Sudikno Mertokusumo, 1993)[7]. Problems of people's lives are very complex and impossibly not covered by legislation thoroughly and clearly. Hence genuinely that there is no legislation that can cover the entire issue of people's lives as complete and as clear as possible.

To respond all the problems of a complex society that is not found in any written law, the judge must conduct the *rechtsvinding* from other law sources. Other law sources are jurisprudence, doctrine, treaties; customs and unwritten law. According to Bernard Arief Sidarta (2000)[8], there are 6 (six) track law-making process, one of which is through the judicial process.

As the spearhead of law enforcement, the position of a judge is very significant and prestigious, because based on the consideration and decision, the law is upheld and justice is given to the litigants. In his authority, those justice seekers bailed their fate to the judge, and therefore quality of judges becomes as crucial to their existence in shaping and enforcing the authority of the law.

The concept state law confirms that it is the obligation of judges in order to reinforce and develop the law in practice in the judiciary. The processes and ways judges thinking to develop and *rechtsvinding* can be divided in 2 (two) ideology as follows: first Conservatism and second is Progressivism (Sudikno Mertokusumo, 1993)[9]. Conservatives ascertain judges that law possibly implemented to an event and then judges apply them according to legislation prescript. Thus, *rechtsvinding* is no other than the implementation of the law coercively or syllogism. This ideology was adopted in Indonesia, or more precisely in the Dutch East Indies, as stated in Article 20 and Article 21 *Bevalingin van Algemene Wetgeving* (AB) which states: "Judges must judge according to law". The flow of this classic ideology has been abandoned because the judge is entitled to perform *rechtsvinding*, and judges are not necessarily tied to the legislation prescript. Judge may take the arguments of rules of law implicitly in legislation by conducting systemization, refining and processing it as well logical deciphering of legislation into a variety of legal principles (Sudikno Mertokusumo, 2004)[10].

As reaction towards way of thinking above thus progressive ideology opinion addresses judge is no longer and merely funnel of legislation. A judge must be independent, on self appreciation to *rechtsvinding*. In the verdict, judge must be guided by law, or by his own thoughts. Progressivism believes legislation is not complete, and the written law is not the only source of law. Legislation is not identical with law, because law is only a stage in the formation process of law, and the judge must find completeness in the process of practice in court.

Furthermore, the ideology that allows *rechtsvinding* by judges in the judicial process is the *Freirechtbewegung* ideology. This ideology asserts that not all laws exist in the legislation, because beside legislation, there are still other legal sources which possibly be used by judge in *rechtsvinding*. According to this ideology judges are not solely devoted to the rule of law, but shall realize justice. Judges must respect the law, but not merely abreast legislation either must utilize legislation as a means of finding a solution to law dispute of any concrete event which confronted upon him. Thus the judge did not just become interpreter of the legislation but including as the creator of law. The *rechtsvinding* called free *rechtsvinding* (Sudikno Mertokusumo, 2004)[11]. Article 5 subsection (1) of the Law No.48 Year 2009 states that a judge as law enforcement and justice shall explore, and understand the values of law in society, legally and philosophically implied that Indonesian judges have

the obligation or the right to perform *rechtsvinding* and invent law, until his verdict is in accordance with the law and a sense of society justice.

According to Paul Scholten, there are laws in human behavior. Hence, law is not solely contained in regulation nor legislation. "Excavation" is that basically referred to the *rechtsvinding* (*rechtsvinding, law making*) and not the law invention (Bambang Sutyoso, 2006)[12]. Society needs legal certainty in every action, moreover Indonesia is included in *Mix Legal System* which imposes plenty legal systems (Achmad Ali, 2012)[13]. This means the numerous of legal system in Indonesia will provide easier choices for the judge to explore the laws of legal systems, thus must firstly describe the concrete legal event and then dig up the law in society that is valid and can be implemented until sense of justice for society concerned can be fulfilled.

Furthermore, in an attempt to resolve a case that proffered upon him, then there are three (3) phases to be conducted judge in deciding the case, namely ascertain facts, qualifying the incident and constituting legal events. According Sudikno Mertokusumom, ascertains fact of assessing whether or not a proposed concrete event before the court, either criminal or private cases, and required proof. Therefore, matter that shall be proven is a concrete fact or event.

In the qualifying stage event that the judge assessing the concrete events (facts) is to categorize and classify any legal events (theft, adultery, blackmail, continuously bickering, physical mistreatment and so on) by arranging rules as logical activity. In this process the judge occasionally not merely implements the rules but also should invent law. The next stage is ascertaining or conferring justice in which judges determine its legal constitution, upholding the justice, which determine the law of legal relationship among law events and the legal subject (the defendant or plaintiff).

The judges are commonly convinced that the law (verdict) they have generated is able to accommodate and anticipate similar lawsuits and related to the substance contained in the verdict. Therefore, the decision has been ascertained, was ensured has accumulated sense of justice and includes collateral benefit if implemented. Judges who encounter concrete events before trial, by just solely implement involved decision (regulation).

The judge in adjudicating a case law determining the law *in konkreto* to a specific event, thus the court judgement is law. Verdict of the Court shall have binding force since spoken and have the force effect after the decision has permanent legal force, whereas after the decision implemented; the decision can be a source of law. The existence on *rechtsvinding* invented by judges on concrete events, then it means that once judges are also forming the law, only the establishment of law by the judge is concrete law. This is in contradiction with law formation made by the legislators because the legislators establish legal objective abstract.

Sense of justice is an abstract, can be felt and thought but could not be seen. Each person has a sense of varies fairness levels, as well as perceived by the judge. In a similar case, a judge gives an assessment of the different justice to every case. In adjudicating a case, judges actively directing a fact in correlation to legislation if a case will be heard. The fact was

taken and the conclusions of the judges with a belief that the fact that compliance with existing resources. If once there is a fact or event that is very difficult to be directed to comply with the existing legal resources, then most likely the fact (the case) will be declared acceptable because it is accordingly to law.

The judge in deciding a case by using logical reasoning, knowledge and experience, so judge will not be talkative in making decisions. Experience has also become one of the factors that affect the sense of justice of judges. Private personal ties between the judge and the defendant may affect the subjectivity of judges in deciding the case. Aspect mentioned could be racial aspects such as religion, gender and ethnicity, there are also other factors such as social factors, political and economy. Experience affects the mindset of judges such his views on fairness in deciding the case, whether the experience was there before acquired judge profession or during occupying the position of a judge.

Oliver Wendell Holmes (Lili Rasjidi dan I.B. Wyasa Putra, 2003)[14] emphasized the life of law is not logic, but rather experience. Oliver Wendell Holmes' insight has affected legal realism. Further, Johnny Dewey in his book entitled "*Logical Method of Law*" that in his view, logic is a theory referring to investigation concerning the possible consequences, a process in which its general principles possibly to be implemented as a tool that must be justified by ongoing work. If mentioned process is arranged in law, it indicates barely to the belief in the propriety of judge decision beforehand that has been prepared with confidence on the general principles should be abandoned and replaced with flexible logic and experience-based. Thus according to Dewey, the law is a process based on experiments where logic is merely one of elements of other elements to point out in a conclusion. In deciding a case, judge is mandated to separate personal experience with social prejudice sense but either experience while serving as a judge, and has passed through several experiments for handling the case and by those matters judge obtained reference in deciding the case to satisfy the justice for all parties.

When a decision has transformed to the form of legislation (jurisprudence), the transformation is not without troubles. The inability to understand policy and substances as well the legal content of the legislation by non-expert people scattered in various ethnic units is a major problem in law enforcement process. The substance of state law and the law moral substance of society are not only out of tune, but further will resort to dispute and possibly open a gaping space. Such conditions obviously a living proof of the existence of legal gaps in the development of law in Indonesia. If the solution were not found, the phenomenon of legal gaps is possibly be turned into a *legal conflict* and *cultural conflict*, hence it is not uncommon that gaping space may aim to a situation that is diametrically opposite and may induce more grave conflict in society later on. Such conditions would greatly affect the quality of decisions and *rechtsvinding* of judge.

For the interests of justice, expediency and certainty of law, judges are obliged to be able to perform *rechtsvinding* not just limited to the usage of *rechtsvinding* methods in existing science of law that is the opinion of legal experts, whereas the opinion of legal experts is not stored as *rechtsvinding* method; but rather as a source of law that would have the force as law if

relied upon by the judge in deciding a case. *Rechtsvinding* method is directed to an event with special sense, concrete, and individual. Hereby, the *rechtsvinding* methods are 'practical' and more usable in legal practice.

The role of judges is enormous and heavy in upholding truth and justice apparently can be seen from the judge's ability to perform *rechtsvinding* in order upholding truth and justice. But reality shows almost none event correctly depicted in a rule of legislation. In order a rule of law applicable to legal event, hence the judge should interpret or elaborate explanation to correspond accurately to occurred legal event. Interpreting or elaborating explanation is commonly called the finding of law or "*rechtsvinding*", "*legal vinding*".

B. Factor of Judge Conducting *Rechtsvinding*

Finding the law is an obligation of judges, this is caused by several factors, as follows: First; as previously stated that almost all of the events are not completely depicted concrete law precisely in legislation. Second; provisions of a legislation, or sometimes conflict with other provisions, thus requiring clarity to be implemented appropriately, correctly and fairly; Third: due to the dynamics of society, there is a variety of new legal events that are not depicted in the legislation; Fourth: obligation to *rechtsvinding* also arises because there is a variety of new law events that is not depicted in the legislation; Fifth: obligation to *rechtsvinding* also arises due to provisions or the legal principle that prohibits judges to reject a case with unclear law reason or law provisions has not been set.

It is undeniable that the four factors that led the judges are allowed to seek legal norms derived from the public is a necessity. These factors also that restricts judges from being arbitrary in deciding a case, as is sometimes the case is decided by the judge not to give justice to the society (in essence), because the judge ignored the four factors above in seeking legal relation to disconnect a case, the judge considered abuse in deciding a case, so that the four factors mentioned above becomes binding indicator of judges in performing *rechtsvinding* in the judicial process.

III. CONCLUSION

In the era of reform and transformation nowadays, legal issues (dispute) in society is continuously happening and demanded legal settlement through the judicial process. To fill the vacuity of law, qualified judges is necessary, which obliged to play role to conduct *rechtsvinding*. Judges should interpret or

elaborate explanation that a legal rule may actually correspond to the legal events that occurred. Interpreting or elaborating explanation is commonly called the finding of law or "*rechtsvinding*", "*legal vinding*".

Factors which caused judge to perform *rechtsvinding* is that almost all of the events are not completely depicted concrete law precisely in legislation, and sometimes conflict with other provisions, thus requiring clarity to be applied appropriately, correctly and fairly. Then new legal events happening frequently which is not illustrated in the legislation, so that the duty of *rechtsvinding* arise because of the provision or principle of law that prohibits judges to refuse to decide case with unclear law reasons or law provision has not been set.

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Response of Soybean to sowing depth and phosphorus fertilizer rate in Dilla, Humid tropics of Ethiopia

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Abstract- An important aspect for improved crop variety is putting seeds at a desired depth with use of optimum fertilizer. These increase the likelihood of germination, emergence thereby improved productivity. The study was conducted with the objective of evaluating response of soybean varieties to planting depth and phosphorus application. A combination of 2 x 3 x 4 factorial experimental design was replicated three times in RCBD. Awassa 04 and Awassa 95 soybean varieties with 3 sowing depth (3.5, 5.5 and 7.5 cm) and 4 phosphorus fertilizers (0, 23, 46 and 46 kg per ha) were used at Dilla university. There were significant depth x phosphorus x variety for leaf number, number of pod plant-1 and thousand seed weights. The highest grain yield of 1273.67 and 1270.00 (t/ha) were obtained from 5.5 cm depth x 46 kg phosphorus ha⁻¹ while the lowest grain yield of 1046 and 1040.33 were obtained from 3.5 cm depth x 69 kg of phosphorus ha⁻¹ for Awassa 04 and Awassa 95, respectively. The maximum number of leaf plant-1 was recorded from 5.5 cm x 46 kg while plant height and branch number (43.11 cm and 5.56) were collected from 7.5 cm x 0 kg; and 7.5 cm x 0 kg ha⁻¹ respectively. The highest means were recorded from 3.5 cm x 23 kg (9.63) and 5.5 x 23 kg (23.00), respectively. Maximum number of pod plant-1 (97.33) was recorded from 5.5 cm x 0 kg. Highest thousand seed weight (2803.33 gram) was obtained from 3.5 cm x 0 kg. The optimum standard germination was recorded from 5.5 cm x 46 kg ha⁻¹. Planting depth 5.5 cm x 46 kg ha⁻¹ phosphorus is recommended to be used to increase soybean productivity. In general, further investigation is required to confirm the current investigation.

Index Terms- soybean, depth, phosphorus, Dilla, Humid Tropics

I. INTRODUCTION

Although cereal crops are most important in Ethiopian Agriculture in providing staple diet to the population, pulses are also important components of crop production (Ali *et al.*, 2003). Because of their high protein and lysine content, they also represent good sources of supplementary protein when added to cereal seed and root crops, which are low in essential amino acids. Legumes are shown to be particularly useful in decreasing blood glucose responses compared with other high-fiber foods. These beneficial effects of legumes are thought to be derived from various components of the beans including their slow starch digestion and their fiber content (Jenkins *et al.*, 1980).

Soybean crops grown in many parts of the world and are primary source of vegetable oil and protein for use in food, feed and industrial application. It can substitute meat and to some extent also milk. Soybean is a nutritional powerhouse capable of

solving protein energy malnutrition problems in Ghana, and has a great potential in the development of three key sectors of the economy: Health, Agriculture and Industry (Plahar, 2006).

Soybean has received increasing attention in recent years from health care providers, biomedical researchers and the lay public alike because of its potential role in the prevention of a number of chronic diseases like cancer, coronary heart disease and osteoporosis (Monje *et al.*, 2006). Even though soybean has such merits its production is constrained by both biotic and abiotic factors such as lack of improved varieties, depth, drought, nutrient, weed and disease. Among these this paper deals with sowing depth, phosphorus fertilizer application and lack of improved variety are the most important limiting factor for the growth and productivity of soybean. Sowing depth can greatly influence soybeans' ability to emerge and establish a uniform stand (Herbek and Bitzer, 1988). It is important to plant accurately in order to achieve good germination, emergence and high plant population (Srivastava *et al.*, 2006). The depth of sowing is important in maximizing the potential of seedling emergence and crop yield. Too shallow sowing results in thin germination due to inadequate soil moisture at the top soil layer. On the other hand, deep sowing (e.g. beyond 6 cm) can significantly affect crop emergence and yield (Aikins *et al.*, 2006; Desbiolles, 2002). Soybean, like all other nitrogen fixing leguminous crops, requires phosphorus for its proper growth and N fixation, soybean's effective contribution on soil fertility improvement can be inhibited due to phosphorus deficiency (Giller and Cadish 1995). Legumes are especially sensible to low phosphorus availability because the biological nitrogen fixation requires high levels of phosphorus. The phosphorus deficiency can limit the nodules formation while the phosphorus fertilization can overcome the deficiency (Carsky *et al.*, 2001).

Thereby, this paper is important to address a combined effect of sowing depth and phosphorus fertilizer application rate and recommend optimum planting depth and phosphorus fertilizer application to improve soybean productivity in Dilla area. Despite its preference, merits, production and productivity in the study area, there is no any research activity on the response of soybean variety to phosphorus fertilizer rates and sowing depth so far. Thus, this research was intended with the following objectives:

General objective

To evaluate the response of soybean varieties to planting depth and phosphorus fertilizer in Dilla

Specific objectives

To determine effect of planting depth on yield and yield components of soybean varieties

To determine effect of phosphorus fertilizer on yield and yield components of soybean varieties

To identify optimum planting depth and phosphorous fertilizer rate for soybean production

II. MATERIAL AND METHODS

2.1. Description of study area

The experiment was done in Dilla university experimental site during 2015 main cropping season. Dilla is found in SNNPRS in Gedeo zone located at 6 and 14N and 38°3'E, latitude and longitude is 978 mm with maximum and minimum temperature of 21.7 and 18.3 C° in that order And soil texture class is clay and loam soil type (Yacob *et al.*, 2015).

2.2. Experimental design and treatments

A combination of 2 x 3 x 4 factorial experimental design was used with three replications arranged in RCBD. There were two soybean varieties (Awassa 04 and Awassa 95) with 3 sowing depth (3.5, 5.5 and 7.5 cm) and 4 phosphorus fertilizers (0, 23, 46 and 46 kg per ha). Two seeds per hole were sowed after emergence appropriate cultural practice followed (weeding, thinning, water management etc.). Each plot measured 1.2 m x 1.6 m with spacing between row and within row of 1 meter and 0.5 meter. The planting material was planted with 10 cm x 40 cm, on each row the number of plants are ten with the total production of 32 plants per plots.

2.3. Data collected

Germination percentage: ratio of number of germinated seedlings at 7th day to total seed sown

Number of leaves: counted from randomly selected ten plants from middle rows for each plot

Plant height: measured from ground to the top of the plant from ten plants by using centimeter

Number of branches: counted from ten sample plants from each treatment and averaged

Number of node: this was recorded from each ten sample plants and averaged

Number of pods: recorded simply by counting pods from each ten sample plants and averaged

Number of seeds plant⁻¹: recorded by counting seeds from average of each ten plants pods

Thousand seed weight: recorded as weight of 1000 seeds from each plot and averaged

Grain yield: collected from whole plants per plot and converted to hectare basis (kg/ha)

3.4. Data Analysis

All collected data was subjected to analysis of variance using statistical procedures as described by Gomez and Gomez (1984) in RCBD. SAS (2002) was used to analysis. And level of significance of the parameters were tested by using least significance difference (LSD) test whenever treatments found significant at $P < 0.05$, and $P > 0.01$, in that order.

III. RESULTS AND DISCUSSION

3.1. Yield and yield components of soybean

All traits except plant height significantly ($p \leq 0.05$ and $p \leq 0.01$) increased by variety and P fertilizer rates (Table 1). There were significant difference at ($p \leq 0.05$) depth, phosphorus, depth x phosphorus, depth x variety, and depth x phosphorus x variety interactions for leaf number while depth, and phosphorus x variety interactions for number of node plant⁻¹. There were significant difference at ($p \leq 0.05$) depth x phosphorus and depth x phosphorus x variety interactions for number of pods plant⁻¹ whereas depth x variety interaction for number of seed pod⁻¹ and phosphorus for 1000 seed weight (Table 1).

There were significant at ($p \leq 0.01$) phosphorus x variety interactions and phosphorus and variety for leaf number and number of branch plant⁻¹ in the given order. There were significant difference at ($p \leq 0.01$) phosphorus, variety and depth x phosphorus interactions for number of node plant⁻¹ while depth, phosphorus, depth x variety and phosphorus x variety interactions for number of pod plant⁻¹. There were significant at ($p \leq 0.01$) phosphorus, variety and phosphorus x variety interactions for number of seed pod⁻¹ while depth, variety, depth x phosphorus, depth x variety and interaction of depth x phosphorus x variety for thousand seed weights while depth, phosphorus and depth x phosphorus interactions for grain yield ha⁻¹ and depth, phosphorus, variety, depth x phosphorus interactions for germination percentage (Table 1). The interaction of sowing depth x P fertilizer rate significantly ($p \leq 0.05$ and $p \leq 0.01$) improved grain yield, number of pod plant⁻¹, thousand seed weight, number of pod plant⁻¹, leaf number plant⁻¹ and germination (%). In the same fashion, interaction of depth x variety improved significantly ($p \leq 0.05$ and $p \leq 0.01$) leaf number, pod plant⁻¹, seed pod⁻¹, 1000 seed weights, and standard germination. Similarly, phosphorus x variety interactions significantly ($p \leq 0.01$) affected leaf number, node plant⁻¹, pods plant⁻¹, seed pod⁻¹ and standard germination. Whereas, leaf number, thousand seed weight and pod plant⁻¹ were significantly ($p \leq 0.05$ and $p \leq 0.01$) affected by the interaction of sowing depth, P fertilizer rate and soybean varieties (Depth x P x Var) (Table 1).

Table 1. Significance effects of sowing depth (Depth), variety (Var), phosphorus fertilizer rates (P) and their interaction on yield and yield related traits of soybean

Parameter	Depth (2)	P (3)	Var (1)	Depth x P (6)	Depth x Var (2)	P x Var (3)	Depth x P x Var (6)	CV	MSE
Leaf number plant ⁻¹	*	*	ns	*	*	**	*	2.79	0.07
Plant height (cm)	ns	ns	ns	ns	ns	ns	Ns	4.05	0.20

No of branch plant ⁻¹	ns	**	**	ns	ns	ns	Ns	9.24	0.06
Nodes plant ⁻¹	*	**	**	**	ns	*	Ns	9.34	0.14
Pod plant ⁻¹	**	**	ns	*	**	**	*	2.75	0.68
Seed pod-1 ⁻¹	ns	**	**	ns	*	**	Ns	6.44	0.06
1000 seed weight (g)	**	*	**	**	**	ns	**	1.92	10.32
Grain yield (kg ha ⁻¹)	**	**	ns	**	ns	ns	Ns	2.98	9.06
Germination (%)	**	**	**	**	ns	ns	Ns	2.32	0.75

Significant at * $p \leq 0.05$, ** $p \leq 0.01$ probability levels; ns: not significant; MSE=Mean squares of error; CV: coefficient of variation; Values in parenthesis indicates the degrees of freedom.

3.2. Agronomic performance of soybean varieties

Mean agronomic performance of yield and yield related traits studied were presented and discussed in Table 2 below.

The highest grain yield of 1273.67 and 1270.00 (t/ha) were obtained from 5.5 cm depth x 46 kg phosphorus ha⁻¹ followed by 3.5 cm x 46 kg ha⁻¹ (1269.00 kg and 1264.33 kg) for Awassa 04 and Awassa 95 varieties, in that order. On the other hand, the lowest grain yield of 1046.00kg and 1040.33 kg were obtained from 3.5 cm depth x 69 kg of phosphorus ha⁻¹ for Awassa 04 and Awassa 95, in that order. In addition, 5.5 cm x 69 kg (1081.67), 7.5 cm x 23 kg (1082.23), 5.5 cm x 0 kg (1089.67) for Awassa 04 and 7.5 cm x 23 kg (1077.67), 5.5 cm x 69 (1078.67), and 7.5 cm x 0 kg (1100.33) performed poor in grain yield ha⁻¹ (Table 2).

In confirmation to the current study, Alemu Abera, (2013) reported that in western Ethiopia, soybean reached a peak yield of 2406.7 kg/ha with application of 46 kg P₂O₅/ha, but higher concentration of fertilizer produced lower yields as the evidence is observed compared with 57.5 kg P₂O₅/ha found in DAP. Similarly, in India Devi *et al.* (2012) reported significant differences in biomass yield when varied the levels of Phosphorus. In line with the current study, Idri *et al.* (1989) also reported phosphorus application significantly increased dry matter production as well as yield and yield contributing characters of soybean. In addition, Singh *et al.* (1973) also reported the positive role of phosphorus to increase the growth and yield of soybean. Similar with this finding, Berg *et al.* (2005) reported that plants per square meter and stems per square meter generally declined with increased P fertilization. They suggested that the addition of phosphorus fertilizer resulted in enhanced interplant competition for light, water, and nutrients, which eliminated smaller, less-vigorous plants and thus decreased plants per square meter and shoots per square meter.

In contrast to the current study, report by Agri-fax (1998) observed that the application of 60 kg P₂O₅ ha⁻¹ increased seed yield, hastened flowering and reduced plant height compared to both an unfertilized check and a rate of 30 kg P₂O₅ ha⁻¹.

In agreement with the current observations, Malhi *et al.* (2001) also reported that alfalfa forage productivity and profitability can be improved by banding the Phosphorus fertilizer with a coulter-type disc rather than using the conventional application method of broadcasting. In opposite to this study, positive yield responses to deep phosphorus fertilizer placement have been reported in alfalfa by several researchers (Teutsch *et al.* 2000; Singh *et al.* 2005). Aikins *et al.* (2006) for maize and Desbiolles (2002) for wheat also reported that 6 cm sowing depth gave best yield. However, Lawson *et al.* (2008)

reported that soybean should be sown at a depth between 1 and 4 cm in Northern Ghana.

The maximum and minimum number of leaf plant⁻¹ was recorded from 5.5 cm x 46 kg and 7.5 cm x 0 kg in that order. The higher the number of leaves, the higher the rates of photosynthesis with resultant increase in carbohydrate production and hence increase in food production. Leaves are the site of photosynthetic activities of crops through which biomass are produced, partitioned among various parts of crops and stored for crop productivity (Asare *et al.*, 2011). In addition, Ridge (1991) reported that the number of leaves produced by a plant is directly proportional to the photosynthate produced. Wareing and Philips (1970) indicated that when photosynthesis becomes active in a young seedling, the power of the plant to synthesize new materials is clearly dependent on the amount of leaves exposed to direct sunlight. The highest (43.11 cm) and lowest (40.71 cm) plant height and highest branch number (5.56 cm) and lowest (4.67 cm) were collected from 7.5 cm x 0 kg; 3.5 cm x 46 kg and 7.5 cm x 0 kg and 7.5 cm x 46 kg ha⁻¹ in the given order. Similarly, in Iran Mahamood *et al.* (2013) reported linear and significant increase of plant height with increases of P levels up to 90 kg P₂O₅ ha⁻¹. In contrast to the current results, Eden (2003) reported that the lowest plant height (82.41cm²) was recorded at high application of P rate, this confirms with the lowest plant height (40.71 cm) was recorded at application rate of 46 kg ha⁻¹. The highest rate of Phosphorus application at the study site had no effect on plant height. This might be due to high dose of phosphorus fertilizer tends to form nutrient interaction and may affects the availability of other nutrients which are essential for growth of the soybean varieties. Similarly, Saleh (1976) reported phosphorus application also significantly increased plant height over the control. Accordingly, maximum plant height might be due to stimulated biological activities in the presence of balanced nutrient supply. In agreement to the current study, (Zafar *et al.*, 2003) reported that number of branches plant⁻¹ was significantly affected by different rates of phosphorus application and this might probably be due to the cumulative effect of phosphorus on the process of cell division and balanced nutrition.

The lowest number of node plant⁻¹ (6.21) and number of seed pod⁻¹ (2.48) were obtained from 5.5 cm x 46 kg whereas the highest values were recorded from 3.5 cm x 23 kg (9.63) and 5.5 x 23 kg (23.00) in the given order. In confirmation with this investigation, Subramanian and Radhak (1981) reported that number of seeds pod⁻¹ was also differed significantly by phosphorus treatments. This was due to more availability of nutrients by increasing the level of phosphorus ha⁻¹ that

increased the number of seeds pod-1. In contrast, Guareschi *et al.* (2011) reported non-significant differences in number of seeds pod-1 after varying P rates.

The result of the present study was in agreement with the findings of Shubhashree (2007), who reported that number of seeds pod-1 increased significantly to levels of phosphorus added. The increment of seeds pod-1 with increasing phosphorus fertilizer application up to optimum level might be phosphorus fertilizer for nodule formation, protein synthesis, fruiting and seed formation.

The highest number of pod plant-1 (97.33) was recorded from 5.5 cm x 0 kg while minimum value was obtained from 7.5 cm x 23 kg. The result was similar to Shubhashree (2007), who observed that applications of different rates of phosphorus fertilizer influence number of pod plant-1. In confirmation to the current investigation, Veeresh (2003) also observed significantly more number of pods plant-1 of common bean at application rate of 75 kg P₂O₅ ha. Singh and Singh (2000) also reported significant increase in number of pods plant-1, due to increased Phosphorus fertilization. In agreement to the current investigation, many investigators also revealed that the number of pods plant-1 was significantly affected by the effect of different rates of phosphorus application (Saleh, 1976; Jayapaul and Ganesaraja, 1990). Similarly, in Brazil Segatelli (2004), reported significant differences in number of pods plant-1 after the application of 36 kg ha⁻¹ P₂O₅. In Kenya Mugendi *et al.* (2010), reported significant increase in number of pods with application of 50 kg ha⁻¹ P₂O₅. In Iran Mohmoodi *et al.* (2013) found significant differences in number of pods with variation in P levels.

Highest thousand seed weight (2803.33 gram) was obtained from 3.5 cm x 0 kg whereas lowest (2618.33 gram) was from 7.5 cm x 69 kg (Table 2). In India Devi *et al.* (2012) also found significant differences in weight of 100 seeds when varying the levels of P fertilizer. Germination was peak at 5.5 cm x 46 kg ha⁻¹. Germination (%) ranged from 68.33 (7.5 cm x 0kg) to 91.67 (3.5 cm x 46 kg). The current result was in contrast with that of Amato *et al.* (1992) wherein seed germination and establishment rate of faba bean was not affected by the phosphorus application.

Table 2. Mean agronomic performance of two soybean varieties in response to planting depth and phosphorus fertilizer rate.

Treatments			Parameters								
Variety	Depth	phosphorus	LN	PH (cm)	Brno	NN	NP	NS	TSW (g)	GY (kg/ha)	Germination percentage
Awassa 04	3.5	0	10.33	41.29	4.74	9.03	91.67	3.00	2803.33	1204.43	79.00
	3.5	23	10.40	41.78	5.11	9.63	90.67	3.07	2770.00	1143.33	86.67
	3.5	46	11.18	40.71	4.73	6.70	86.33	2.60	2707.67	1269.00	91.67
	3.5	69	11.15	42.33	4.97	8.43	85.00	2.53	2692.33	1046.00	86.67
	5.5	0	10.07	42.48	4.84	9.15	97.33	3.10	2710.67	1089.67	76.00
	5.5	23	10.37	42.33	4.87	7.80	92.00	3.13	2713.33	1172.00	85.00
	5.5	46	11.30	41.11	4.83	6.21	92.00	2.48	2698.00	1273.67	90.33
	5.5	69	11.27	41.92	4.72	8.37	95.67	2.78	2709.00	1081.67	82.67
	7.5	0	10.03	43.11	5.56	9.22	90.33	2.97	2683.33	1143.33	72.33
	7.5	23	10.38	42.67	5.03	6.75	82.67	3.13	2639.00	1082.33	78.00
Awassa 95	3.5	0	11.15	42.09	5.23	9.53	90.67	3.19	2712.00	1199.33	71.33
	3.5	23	11.52	43.63	5.33	10.23	90.33	3.19	2617.00	1127.00	79.67
	3.5	46	10.97	42.00	4.01	9.00	92.33	4.29	2700.00	1264.33	84.33
	3.5	69	10.17	42.33	4.41	8.62	90.33	3.34	2500.00	1040.33	82.33
	5.5	0	10.48	42.53	5.00	9.63	94.00	3.20	2664.00	1123.67	72.33
	5.5	23	11.29	45.00	4.46	8.21	96.00	3.37	2650.33	1151.33	78.33
	5.5	46	9.80	41.67	3.81	8.87	97.00	4.06	2519.67	1270.00	85.33
	5.5	69	10.47	43.33	4.61	8.50	94.00	3.09	2496.00	1078.67	76.33
	7.5	0	11.11	43.48	4.98	9.71	85.67	3.06	2574.00	1100.33	68.33
	7.5	23	11.07	41.00	4.84	7.82	85.00	3.23	2622.67	1077.67	73.00
Significance level			*	ns	ns	Ns	*	Ns	***	ns	Ns
	LSD (5 & 0.1%)		0.14	0.81	0.21	0.38	1.16	0.10	24.21	16.24	0.88
	Coefficient of variation (%)		2.79	4.05	9.24	9.34	2.75	6.44	1.92	2.98	2.32

LN= leaf number, PH=plant height, Brno=branch number, NN=number of node, NP=number of pod, NS=number of seed, TSW=thousand seed weights, GY (kg/ha)= grain yield in kilogram ha-1, LSD=least significant difference.

IV. SUMMARY AND CONCLUSION

Soybean (*Glycine max* L) is the most important grain legume crops in the world in terms of total production and international trade. It contains high quality protein, and relatively cheap than other protein sources like egg, fish, meat. Due to this reason soybean is called poor man's meat. Soya bean belongs to family leguminoaceae. It has the ability to fix nitrogen and is common soil building plants. Soya bean is produced for economic importance and domestic demand due to promising source of high quality of protein.

However, its yield is lower compared to other legume crops due to many factors affecting its production and lack of improved variety, sowing depth and phosphorus application rate are the most once. Thus, the study was conducted with the objective of evaluating response of soybean varieties to planting depth and phosphorus application rate in Dilla during 2015, main cropping season.

A combination of 2 x 3 x 4 factorial experimental design was used with three replications arranged in RCBD. There were two soybean varieties (Awassa 04 and Awassa 95) with 3 sowing depth (3.5, 5.5 and 7.5 cm) and 4 phosphorus fertilizers (0, 23, 46 and 46 kg per ha) at Dilla university field experiments. Data was collected from different growth parameters such as number of leaves plant-1, plant height, number of branch plant-1, number of node plant-1, number of pod plant-1, number of seed pod-1, thousand seed weights and grain yield ha-1.

Analysis of variance showed that all parameters exhibited significant except plant height. There was significant at ($P \geq 5\%$) planting depth, phosphorus, depth x phosphorus, depth x variety and depth x phosphorus x variety interactions for leaf number while significant at ($P \geq 1\%$) phosphorus x variety interactions. There was significant at ($P \geq 1\%$) phosphorus and variety for number of branch plant-1. There was significant at ($P \geq 5\%$) planting depth, and phosphorus x variety interactions for number of node plant-1 while significant at ($P \geq 1\%$) phosphorus, variety and depth x phosphorus interactions.

There was significant at ($P \geq 5\%$) depth x phosphorus interactions and depth x phosphorus x variety interactions for number of pod plant-1 while significant at ($P \geq 1\%$) planting depth, phosphorus, depth x variety and phosphorus x variety interactions. There was significant at ($P \geq 5\%$) planting depth x variety interaction while significant at ($P \geq 1\%$) phosphorus, variety and phosphorus x variety interactions for number of seed pod-1. There was significant at ($P \geq 5\%$) phosphorus while significant at ($P \geq 1\%$) planting depth, variety, depth x phosphorus interactions, depth x variety interactions and interaction of depth x phosphorus x variety for thousand seed weight.

There was significant at ($P \geq 1\%$) planting depth, phosphorus and depth x phosphorus interactions for grain yield ha-1. The highest grain yield of 1273.67 and 1270.00 (t/ha) were obtained from the interaction of 5.5 cm sowing depth x 46 kg phosphorus ha-1 followed by 3.5 cm x 46 kg ha-1 (1269.00 and 1264.33) for Awassa 04 and Awassa 95 varieties, in that order. On the other hand, the lowest grain yield of 1046 and 1040.33 were obtained from interaction of 3.5 cm sowing depth x 69 kg of phosphorus ha-1 for Awassa 04 and Awassa 95, in that order. In addition, interaction effects of 5.5 cm x 69 kg, 7.5 cm x 23 kg, 5.5 cm x 0 kg (1081.67, 1082.33, and 1089.67) for

Awassa 04 and 7.5 cm x 23 kg, 5.5 cm x 69, and 7.5 cm x 0 kg (1077.67, 1078.67, and 1100.33) performed less.

From the two varieties Awassa 04 performed best in most studied yield and yield related traits and thus, should to be used in the future in the study area. The maximum and minimum number of leaf plant-1 was recorded from 5.5 cm x 46 kg and 7.5 cm x 0 kg in that order. The highest (43.11 cm) and lowest (40.71 cm) plant height and highest (5.56 and lowest (4.67) branch number were collected from 7.5 cm x 0 kg; 3.5 cm x 46 kg and 7.5 cm x 0 kg and 7.5 cm x 46 kg ha-1 in the given order. The lowest number of node plant-1 (6.21) and number of seed pod-1 (2.48) were obtained from 5.5 cm x 46 kg whereas the highest values were recorded from 3.5 cm x 23 kg (9.63) and 5.5 x 23 kg (23.00) in the given order. The highest number of pod plant-1 (97.33) was recorded from 5.5 cm x 0 kg while minimum value was obtained from 7.5 cm x 23 kg. Highest thousand seed weight (2803.33 gram) was obtained from 3.5 cm x 0 kg whereas lowest (2618.33 gram) was from 7.5 cm x 69 kg. Germination percentage was maximum 91.67 (3.5 cm x 46kg) and 90.33 (5.5 cm x 46 kg) whereas minimum 68.33 (7.5 cm x 0 kg). The optimum standard germination was recorded from 5.5 cm x 46 kg ha⁻¹.

In conclusion, the result indicated that using appropriate combination of sowing depth and phosphorus fertilizer rate should be aim of soybean producers in an effort to increase productivity. Depths of sowing and phosphorus fertilizer rates were revealed significant difference on leaf length, number of pod plant-1 and thousand seed weights. Planting depth of 5.5 cm x 46 kilogram of phosphorus performs best in both varieties in yield and yield components in most traits. Whereas deviation from this declined performance of these traits. Thus, based on the result obtained, it was possible to conclude that planting depth of 5.5 cm x 46 kilogram of phosphorus ha-1 was promising to enhance yield of common bean in Dilla. In general, further investigation is required to highlight the economic and environmental benefits of different varieties to depth and phosphorus application.

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Genetic Study of Some Maize (*Zea Mays L*) Genotypes in Humid Tropic of Ethiopia

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Abstract- The current study was initiated to find out the nature and magnitude of genetic variability for different traits in 12 maize genotypes using randomized complete block designs in humid tropics of Ethiopia in 2015. Analysis of variance showed that the mean squares due to genotype were significant at ($p < 0.01$) for maturity traits, plant and ear height, number of row per ear, thousand kernel weights and grain yield per hectare, indicating the existence of sufficient genetic variability and the potential for selection and improvement of the traits. High phenotypic and genotypic coefficients of variations were obtained from number of ear per plant, ear diameter, grain yield per hectare, number of row per ear and ear length, indicating less environmental influence on the traits. High heritability estimates were obtained from all traits except anthesis-silking interval depicting the traits respond positively due to selection. Estimates of genetic advances as percent of mean at 5% selection intensity ranged from 4.68% for 1000-kernel weights to 78.95% for number of ear per plant.

Index Terms- Genetic advance, Genetic variability, Heritability, Maize

I. INTRODUCTION

Maize is one of the most important cereal crops in the world. It is used as a human food and livestock feed. Moreover it is used to produce different alcoholic and non-alcoholic drinks, construction materials and fuel. It is also used to produce medicinal products such as glucose and used as ornamental plant [1]. Maize was introduced to Ethiopia by the Portuguese in the 16th or 17th century [2]. Since its introduction, it has gained importance as a main food and feed crop.

Maize growing areas in Ethiopia are broadly classified into four ecological zones based on altitude and annual rainfall. These are the high altitude moist zone, which receive 1200 to 2000mm annual rainfall with an altitude of 1700 to 2400 meters above sea level (m.a.s.l), the mid-altitude moist zone (1200-2000 mm annual rainfall with an altitude of 1000 to 1700 m.a.s.l), the low-altitude moist zone with less than 1000 m.a.s.l and 1200 -1500 mm annual rainfall), and the moisture stress zone with 500 to 1800 m.a.s.l and less than 800 mm annual rainfall. Currently, maize is a major crop in Ethiopia in terms of production, consumption and income generation for human beings. In Ethiopia, during the 2015 cropping season, 2,110,209.61 hectares of land was covered with maize with an estimated production of about 72,349,551.02 [3].

Maize breeding in Ethiopia has been ongoing since the 1950's and has passed through three distinctive stages of

research and development [4]. These are from 1952 to 1980, the main activities were the introduction and evaluation of maize materials from different part of the world for adaptation to local condition, from 1980 to 1990, the work was focused on evaluation of inbred lines and development of hybrid and open-pollinated varieties. From 1990 to the present, the main activities were (a) extensive inbreeding and hybridization, (b) development of early maturing or drought tolerant cultivars, and (c) collection and improving of maize with adaptation to highland agro ecologies. As a result, various improved hybrids and open-pollinated varieties were released for large-scale production, especially for mid-altitude zones. The high land maize breeding program was also started in 1998 in collaboration with the international maize and wheat improvement center [4].

The main goal of all maize breeding programs is to obtain new open pollinated varieties (OPVs), inbred lines and from them hybrids and synthetics that will outperform the existing cultivars with respect to a number of traits. In working toward this goal, attention needs to be paid to grain yield as the most important agronomic trait [4].

Grain yield is a complex quantitative trait that depends on a number of factors. It's highly influenced by environmental conditions; has complex mode of inheritance and low heritability. Because of this, during selection for grain yield, attention is given first to determine mean values, components of variance and the heritability of yield related traits in order to establish the best selection criteria [5].

Besides, knowing the correlations between the traits is also of great importance for success in selection to be conducted in breeding programs, and analysis of correlation coefficient is the most widely used one among numerous methods [6].

Success in any crop improvement or breeding program depends upon the selection of suitable parents, a thorough knowledge of genetic variability, heritability and type of gene action. In addition, traits upon which selection of parents is based should be known. Relatively higher estimates of genotypic coefficient of variation for grain weight, plant height, ear placement, kernel rows per ear and number of grains per row along with high heritability suggest that the selection can be effective for these traits [7].

A number of studies in maize have been conducted to elucidate the nature of association between yield and its components which identified traits like ear length, ear diameter, kernels per row, ears per plant, 100-seed weight and rows per ear as potential selection criteria in breeding programs aimed at high yield [7].

According to [8] who reported in his study on phenotypic diversity for morphological and agronomic traits in traditional Ethiopian highland maize accessions, highland maize varieties

may be grouped into a number of completely or partially isolated populations, which may be adapted to different highland conditions. [9] also reported in his study on genetic diversity of maize inbred lines by AFLP Markers that seven pairs of AFLP primers identified 499 scorable fragments out of which 81.7% were polymorphic and the diversity varying from 0.35 to 0.71. The above are among the limited studies made on maize genetic diversity in Ethiopia. The currently proposed study involves maize germplasm which were not used by other researchers for similar studies in this locality and would contribute positively to the study area. Thus, the general objective of this study was to find out the nature and magnitude of genetic variability for different traits in maize genotypes with specific objectives to:-

- Estimate the nature and magnitude of genetic variability for the yield and yield related traits in maize genotypes.
- Determine the heritability and genetic advance of some agronomic traits.

II. MATERIALS AND METHODS

2.1. Description of the Study Area

The experiment of this study was conducted in Humid Tropical area. Abaya district is situated Kolla (70%) and Woina Dega (30%) and an altitude of 1630 meters above sea level. The average annual rainfall is 977.5 mm. The average monthly maximum and minimum temperature is 10.0^oc and 24.0^oc, respectively. The area is dominated by clay soil while loam soil, black soil and verti-soil are also present (Guangua Rural Agricultural office, 2015).

2.2. Treatments and Experimental Design

Twelve maize genotypes were used for the study. The sources of the genotypes were Melkassa Agricultural Research Centre, Guangua and Dilla Rural and Agricultural Offices. The description of the genotypes was depicted in Table 1.

The experiment was carried out in a randomized complete block design with four replications. Each plot consisted of 4 rows of 5.1m in length with row to row spacing of 75cm and within row spacing of 25 cm. All agronomical practices were carried out as recommended for the area.

2.3. Data Collection

Days to 50% anthesis: the number of days from emergence to when 50% of the plants started shedding pollen.

Days to 50% silking: the number of days from emergence to when 50% of the plants in the plot produced 3cm long silk.

Table 1: Description of Genotypes

No.	Name	Description
1. 1	Melkassa-4	Composite
2	Jabi	Hybrid
3	Limu	Hybrid
4	Melkassa hybrid -130	Hybrid
5	Shone	Hybrid
6	Shala	Hybrid
7	Bako hybrid-543	Hybrid
8	Melkassa 6 Quality protein	Composite
9	Melkassa hybrid -140	Hybrid
10	Bako hybrid-140	Hybrid

11	Bako hybrid-660	Hybrid
12	Bako hybrid-661	Hybrid

Source: Melkassa Research Centre, Guangua and Dilla Agricultural and Rural Offices

Days to 75% maturity: the number of days from emergence to when 75% of the plants in the plot reached physiological maturity.

Plant height (cm): heights of five randomly taken plants from each plot measured from the ground level to the base of tassel and the average was recorded.

Ear height (cm): ear heights of five randomly taken plants from each plot were measured from

Number of ears per plant: number of ears per plant from five randomly taken plants of each plot was counted and the average was recorded.

Ear length (cm): length of five randomly taken ears from each plot was measured using centimeter and the average was recorded

Ear diameter (cm): diameter of five randomly taken ears from each plot was measured using caliper and the average was recorded.

Number of kernels per row: the number kernels/row from five randomly taken ears/plot was counted and the mean was recorded.

Number of rows per ear: the number of rows/ear from five randomly taken ears from each plot was counted and the mean was recorded.

1000 kernel weight: thousands of kernels from each plot were counted by automatic seed counter and were weighed using a sensitive balance after adjusting the moisture content to 12.5%.

Adjusted yield (kg/plot): the yield of grain of each plot were weighed and adjusted to 12.5% moisture. Adjusted yield per plot= (FW×0.81) × (100-MMR)/ (100-12.5)

Grain yield (kg/ha): this was calculated by converting plot yield into hectare basis.

$$GY = (\text{Yield per plot (g)} / \text{Plot size}) \times 10000 \text{ m}^2$$

Statistical Analysis

2.4. Analysis of variance

Analysis of variance (ANOVA) was carried out for the quantitative traits as per the procedure outlined by [10]; SAS software [11] was used to analysis.

Estimation of genetic parameters

The amount of genotypic and phenotypic variability that exist in a species is essential in developing better varieties and in initiating a breeding program. Genotypic and phenotypic coefficients of variation are used to measure the variability that exists in a given population [12].

Phenotypic and genotypic variance components and of phenotypic and genotypic coefficients of variation were calculated by the methods suggested by [12].

$$\text{Genotypic variance } (\sigma_g^2) = \frac{M_{sg} - M_{se}}{r}$$

$$\text{Phenotypic Variance } (\sigma_p^2) = \sigma_g^2 + \sigma_e^2$$

$$\text{Environmental Variance } (\sigma_e^2) = \text{Mean Square error}$$

Where M_{sg}= mean square due to genotype

M_{se}= environmental variance

r= the number of replication

Phenotypic coefficient of variation (PCV)

$$PCV = \frac{\sqrt{\sigma_p^2}}{\bar{x}} \times 100$$

Genotypic coefficient of variation (GCV)

$$GCV = \frac{\sqrt{\sigma_g^2}}{\bar{x}} \times 100 \quad \text{Where } X = \text{trait}$$

means

PCV and GCV values were categorized as low, moderate and high values as indicated by [13] as follows.

- 0-10 % = Low
- 10-20% = Moderate
- >20 = High

Heritability in Broad sense for all traits was computed using the formula given by [14]

$$\text{Heritability (H)} = \frac{\sigma_g^2}{\sigma_p^2} \times 100$$

Where (H) = heritability in broad sense

σ_p^2 = phenotypic variance

σ_g^2 = genotypic variance

The heritability percentage was categorized as low, moderate and high as followed by [15], as follows.

- 0-30% = Low
- 30-60% = Moderate
- >60% = High

Genetic advances under selection (GA) expected genetic advances for each trait at 5% selection intensity was computed by the formula described by [16].

$$\text{Genetic advances (GA)} = K. \sigma^2 p. H$$

Where K= constant (selection differential where K= 2.056 at 5% selection intensity)

σ_p = phenotypic standard deviation

H= heritability in broad sense

Genetic advances as percent of means was calculated to compare the extent of predicated advances of different traits under selection using the formula.

$$GAM = (GA / \bar{x}) \times 100$$

Where GAM= genetic advances as percent of mean

GA= Genetic advances under selection

\bar{x} = mean of population in which selection was employed.

The GA as per cent of mean was categorized as low, moderate and high as described by [16] as follows.

- 0-10 % = Low
- 10-20% = Moderate
- 20 and above = High

III. RESULTS AND DISCUSSION

3.1. Analysis of variance

The mean squares due to genotype were highly significantly different ($p < 0.01$) for all the traits studied except for the number of ear per plant, ear length, ear diameter and kernels per row, which indicates the existence of sufficient genetic variability (Table 2).

In line with the current study, [17] reported significant difference in thousand seed weight and days to silking in maize varieties; and in addition, he reported that the highest genetic gain was obtained for plant height and the *lowest genetic gain for number of leaves per plant. [18]; [19]; [20] and [21] also reported similar results.*

Table 2: Mean squares from analysis of variance of the 12 maize genotypes evaluated

SV	DF	DA	DS	DM	PH	EH	EPP	EL	ED	KPR	RPE	TKW	GY
Rep	3	1.69	2.83	0.61	34.36	76.15	0.06	3.98	0.02	16.02	0.14	108.53	0.04
Gen	11	14.29* *	14.11* *	891.38* *	7907.11* *	1992.82* *	0.10n s	5.31n s	0.07n s	10.58n s	3.01**	11620.77 **	9.28**
Error	33	5.29	5.45	1.96	13.45	28.92	0.06	3.77	0.07	7.34	0.46	14.65	0.06
G.Mean		78.02	78.92	168.58	176.63	88.66	1.37	17.96	4.33	34.10	13.49	404.19	8.90
CV		2.95	2.96	0.83	2.08	6.07	17.18	10.80	5.91	7.94	5.04	0.95	2.69
SE		1.15	1.17	0.70	1.83	2.69	0.12	0.97	0.13	1.35	0.34	1.91	0.12
LSD		3.31	3.36	2.01	5.28	7.74	0.34	2.79	0.37	3.90	0.98	5.51	0.34

SV=source of variation, Rep=replication, Gen=genotype, G.mean=grand mean, R^2 = R-square, CV= coefficient of variation, SE = Standard error, LSD = Least significant ** at $p < 0.01$, DA=Days to 50% anthesis, DS=Days to 50% silking, DM=Days to 75% maturity, PHT= plant height, EHT= ear height, LL= leaf length, LW=leaf width, AGBM= above ground biomass, EPP = ears per plant, EL =Ear length , ED = Ear diameter , KPR = kernels per row , RPE = row per ear , TKW = 1000Kernel weight, KT= kernel type, GY=grain yield, and HI = harvest index.

3.2. Range and mean values

The range means and standard errors of the 12 traits studied were shown in Table 3. Wide ranges were recorded for thousand kernel weight (311.5-518), plant height (63-230), ear height (52.60-127) and days to maturity (159-219). Similarly, number of kernel per row (23-37), days to silking (70-83), days to anthesis (70-82) and ear length (13.2-22.40) had wide ranges. Grain yield per hectare ranged from 6.78 tons for Melkasa-4 to 11.75 tons for Limu. Maximum grain yield per hectare was obtained from Limu (11.75 t), and Jabi (11.30 t) while low grain yield were obtained from Melkassa-4, BH-140, and BH-543 6.78 t, 7.20 t and 7.48 t per hectare in that order (Table 4).

Days to anthesis and days to silking ranged from 74.75 and 75.75 for Melkassa 4 to 81 and 82.25 for jabi in that order. Days to maturity was ranged from 159.5 for Melkassa 6 Q to 215.25 for BH-660. Plant height and ear height were ranged from 65.75 cm 226.50 cm for BH-545 and shone in that order. The range for number of ears per plant was 1.10 for shala and 1.60 for Jabi. Ear length ranged from 15.88 for Melkassa 4 to 19.62 for limu

whereas ear diameter was from 4.15 for BH-661 to for shala. Number of kernels per row ranged from 30.70 to 36.40 for BH-661 and limu in that order while number of row per ear was from 12.25 for BH-543 and Melkassa hybrid 130 to 15 for jabi. Thousand kernel weights ranged from 314.38 gram for Melkassa hybrid 130 to 511.25 for jabi (Table 3).

[22] reported that the components of variance revealed a wide range of variability for traits such as number of rows per ear, kernels per row, kernels per ear, ear length, ear diameter, 100-kernels weight and plant height.

[8] also reported that grain yield, plant height, ear height and days to maturity showed wide range of variation, while number of leaves, leaf width and ear diameter showed a narrower range of phenotypic variation of maize in Ethiopia. In general, range and mean values in this study suggested the existence of sufficient variability among the tested genotypes for the majority of the traits studied and their considerable potential in the improvement of maize crop.

Table 3: Mean performance 12 quantitative traits of 12 maize genotypes

NO.	Genotype	DA	DS	DM	PH	EH	EPP	EL	ED	KPR	RPE	TKW	GY
1	Jabi	81.00a	82.25a	164.50dce	217.25b	111.25b	1.60	19.47	4.18	32.90	15.00a	511.25a	11.30b
2	Limu	79.75ba	80.50ba	165.25dc	215.75b	121a	1.43	19.62	4.20	36.40	14.50ba	476.31b	11.75a
3	BH-660	79.50bac	80.00bac	215.25a	160.25edf	76.80ed	1.45	18.26	4.34	33.20	14.25bac	419.25d	8.15e
4	Shala	79.25bac	80.00bac	164.50dce	184.25c	92.00c	1.10d	17.58	4.63	35.40	13.00edf	406.95e	9.45c
5	Melkassa 6 Q	79.00bac	80.25bac	159.50g	165.50d	74.50ef	1.58	16.41	4.33	34.20	14.25bac	398f	8.60d
6	BH-661	78.50bdac	79.25bdac	170.00b	225.75a	111.75b	1.57	18.94	4.15	30.70	13.75bdc	363.88h	9.48c
7	Shone	78.25bdac	79.00ebdac	166.50c	226.50a	123.00a	1.38	18.06	4.43	34.40	13.75bdc	450.63c	9.60c
8	BH-140	78.00ebdac	78.75ebdc	165.00dce	179.75c	84.00d	1.25	18.50	4.44	35.15	13.00edf	362.64h	7.20f
9	MH-140	76.50ebdc	77.75ebdc	163.00fe	155.25f	65.25g	1.39	17.47	4.43	34.60	12.75ef	379.61g	8.25e
10	MH-130	76.25edc	77.00edc	165.00dce	159.50ef	72.00efg	1.28	17.00	4.35	32.20	12.25f	314.38i	8.80d
11	BH-543	75.50ed	76.50ed	161.00gf	65.75g	66.85fg	1.28	18.36	4.40	35.90	12.25f	385g	7.48f
12	Melkassa 4	74.75e	75.75e	163.50de	164.00ed	65.50g	1.20	15.88	4.47	34.15	13.88bdc	382.43g	6.78g
LSD		3.31	3.36	2.01	5.28	7.74	0.34	2.79	0.37	3.90	0.98	5.51	0.34

DA=Days to 50% anthesis, DS=Days to 50% silking, DM=Days to 75% maturity, PH= plant height, EH= ear height, EPP = No. of ears per plant, EL =Ear length, ED = Ear diameter , KPR = No. of kernels per row , RPE = No. of row per ear , TKW = 1000-Kernel weight, and GY/ha = Grain yield per hectare.

3.3. Phenotypic and genotypic variations

The high phenotypic and genotypic coefficient of variations were observed from number of ear per plant (45.44 and 41.77), and ear diameter (24.60 and 23.83) in that order. On the other hand, relatively moderate values were recorded for grain yield per hectare (16.93 and 16.70), ear length (15.06 and 10.49), number of rows per ear (14.29 and 13.38) for phenotypic and genotypic coefficient of variation in that order. Moderate phenotypic coefficient of variation was observed from number of kernels per row (10.49). The remaining traits depicted low phenotypic and genotypic coefficient of variations (Table 4).

In the current study, number of ear per plant, and ear diameter had high phenotypic and genotypic coefficient of variation and hence these traits provide greater chance for effective selection whereas grain yield per hectare, ear length and number of rows per ear had moderate genotypic and phenotypic coefficients of variation, and hence these traits provide average chance for selection. In contrary, thousand kernel weights (2.62 and 2.44), days to maturity (3.92 and 3.83), plant height (4.17 and 3.62), days to silking (6.18 and 5.43), days to anthesis (6.21 and 5.47) and ear height (7.47 and 4.36) had the least phenotypic

and genotypic coefficients of variation in that order, and hence these traits provide less chance for selection (Table 4).

In this study, it was found that phenotypic coefficients of variations were higher than genotypic coefficients of variations for all traits. This might be due to the fact that there is high environmental effect on the studied genotypes. This observation was in line with that of [17] who reported high phenotypic coefficient of variation than genotypic variation in his study on maize. According to [23], traits having high GCV indicate high potential for effective selection.

3.4. Heritability estimates

Broad sense heritability (h^2), an estimate of the total contribution of the genotypic variance to the total phenotypic variance ranged from 34.06 % for ear height to 97.36% for grain yield per hectare (Table 6). All traits had high heritability estimates as followed for grain yield per hectare (97.36%), days to maturity (95.51%), ear diameter (93.83%), number of row per ear (87.63%), thousand kernel weight (86.92%), number of ear per plant (84.52%), days to anthesis (77.46%), days to silking (77.12%), and plant height (75.21%). Relatively moderate estimates of heritability were recorded from ear length (48.48%), number of kernels per row (47.68%), and ear height (34.06%) indicating that all the studied traits may respond positively to phenotypic selection (Table 4).

These observations are in agreement with the findings of [24] who reported high heritability estimates for number of kernels per row (86%), plant height (85%), ear height (83%), physiological maturity (82%), number of rows per ear (77%), ear length (73%), emphasizing that the additive genetic variation was the major component of genetic variation in the inheritance of these traits and the effectiveness of selection in the early

segregating generations of the genotypes for improving these traits. [25] and [26] also observed in their study on maize high heritability estimates for the traits such as grain yield per plant (96.80%), ear height (92.77%), days to 50 per cent tasseling (89.27%), days to 50 per cent silking (88.57%), plant height (93.53%), cob length (85.97%), number of kernels per row (72.80%) and 1000-kernels weight (84.43%).

3.5. Estimates of expected genetic advance

The genetic advances as percent of the mean (GAM) at 5% selection intensity is presented in Table 4. It ranged from 4.68% for thousand kernel weight to 78.95 % for number of ear per plant. High genetic advance expressed as percentage of mean was obtained from number of ear per plant (78.75%), ear diameter (47.47%), grain yield per hectare (33.89%), and number of row per ear (25.75%), depicting that these traits were under the control of additive genes (Table 4).

The current observations were in confirmation with the findings of [25] who reported similar results in their study on maize genotypes. On the other hand moderate estimates of genetic advance expressed as percentage of mean were observed for ear length (15.01%) and number of kernels per row (10.77%).

Low estimates of genetic advances expressed as percentage of mean were observed for thousand kernel weights (4.68%), ear height (5.23%), plant height (6.45%), days to maturity (7.69%), days to silking (9.80%) and days to anthesis (9.89%), indicating the presence of low genetic variability for these traits which are also reflected by their respective low genotypic and phenotypic variations. This in turn showed the importance of genetic variability for the improvement of the traits through selection (Table 4).

Table 4: Estimates of ranges, Standard error (SE), Phenotypic (σ^2_p) and Genotypic (σ^2_g) variance, Phenotypic coefficient of variability (PCV) and Genotypic Coefficient of variability (GCV), Broad sense heritability (H), Expected genetic advances (GA) and Genetic advance as percent of mean (GAM).

Traits	Range	Mean	±SE	(σ^2_p)	(σ^2_g)	(σ^2_e)	PCV	GCV	H%	GA	GA%
DA	70.00-82.00	78.02	1.15	23.47	18.18	5.29	6.21	5.47	77.46	7.72	9.89
DS	70.00-83.00	78.92	1.17	23.82	18.37	3.45	6.18	5.43	77.12	7.74	9.80
DM	159-219	168.58	0.70	43.62	41.66	1.96	3.92	3.83	95.51	12.97	7.69
PH	63-230	176.63	1.83	54.25	40.80	13.45	4.17	3.62	75.21	11.39	6.45
EH	52.6-127	88.66	2.69	43.86	14.94	28.92	7.47	4.36	34.06	4.64	5.23
EPP	0.70-2.20	1.37	0.12	0.39	0.33	0.06	45.44	41.77	84.52	1.08	78.95
EL	13.20-22.40	17.96	0.97	7.32	3.55	3.77	15.06	10.49	48.48	2.70	15.01
ED	3.70-4.80	4.36	0.13	1.14	1.07	0.07	24.60	23.83	93.83	2.06	47.47
KPR	23.00-37.00	34.10	1.35	14.03	6.69	3.74	10.98	7.59	47.68	3.67	10.77
RPE	12.00-15.00	13.49	0.34	3.72	3.26	0.46	14.29	13.38	87.63	3.47	25.75

TKW	311.5-518	404.19	1.91	112.04	97.39	14.65	2.62	2.44	86.92	18.92	4.68
GY/ha	6.5-12.00	8.90	0.12	2.27	2.21	0.06	16.93	16.70	97.36	3.02	33.89

DA=Days to 50% anthesis, DS=Days to 50% silking, DM=Days to 75% maturity, PH= plant height, EH= ear height, EPP=number of ear per plant, EL =Ear length, ED = Ear diameter, KPR = No. of kernels per row, RPE = No. of row per ear, TKW = 1000-Kernel weight.

IV. SUMMARY AND CONCLUSION

4.1. Summary

The progress of crop improvement program depends on the choice of the breeding material, the extent of variability and the knowledge of quantitative traits with yield and yield related traits. In view of this, the current study was initiated to find out the nature and magnitude of genetic variability for different traits in maize genotypes.

Analysis of variance showed the presence of highly significant differences among the tested genotypes for most of the traits considered which indicates the existence of sufficient genetic variability and there were fewer coefficients of variations in all of the traits indicating good precision of the experiment.

The ranges of mean values for most of the traits were large showing the existence of variation among the tested genotypes. Phenotypic coefficients of variation (PCV) were found to be higher than genotypic coefficients of variation (PCV) for all the traits. The two values differed slightly indicating less influence of the environmental factors. The highest phenotypic and genotypic coefficients of variations were observed for number of ear per plant, ear diameter, grain yield per hectare, number of rows per ear, and ear length. 100-kernel weights, days to maturity, plant height, days to anthesis, days to silking, and ear height had the least phenotypic and genotypic coefficients of variations.

Higher heritability values were obtained for grain yield per hectare, days to maturity, ear diameter, number of rows per ear, 1000-kernel weight, number of ear per plant, days to anthesis, days to silking and plant height. Moderate estimates of heritability were observed for leaf length, number of kernels per row, and ear height. Genetic advance expressed as percentage of mean (GAM) was high for number of ear per plant, ear diameter, grain yield, and number of row per ear. Low estimates of genetic advances expressed as percentage of mean were observed for 1000-kernel weights, number of days to anthesis, silking, maturity, plant and ear heights.

4.2. Conclusions

The result indicated the existence of genetic variability in the maize genotypes studied and this can be exploited in the future breeding program. It can also be seen that genotypes Limu, Jabi, shone, BH-661, and shala from among the hybrid varieties and Melkassa 6 Quality protein from local varieties gave high grain yield under Guji condition indicating their potential to promote for production around Guji areas.

In general, ear diameter, number of row per ear and ear per plant, thousand kernel weight, Plant height, maturity traits, should be used as selection criteria for yield improvement in

maize. The genetic variability among genotypes observed should be utilized for future maize improvement program.

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Evaluation of Maternal and Child Health Service in Baghdad City' Primary Health Care Centers

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Abstract- Objective(s): The present study aims at evaluating the delivery of maternal and child health services provided by staff nurses in Baghdad city's primary health care centers.

Methodology: A descriptive design using the evaluation approach carried out in primary health care centers for the period from 22th October 2015 to 26th September 2016. The present study is carried out at (10) primary health care centers selected from (10) health sectors distributed in Baghdad City according to the Ministry of Health, Directorate of Primary Health Care Classification. A non-probability (convenient) sample of (100) staff nurses is selected for the purpose of the present study. A questionnaire, of (3) parts, is adopted and used for data collection to evaluate the phenomenon underlying the study and the overall items included are (28) items. The reliability of study instrument is determined by using Pearson Correlation Coefficient ($r = 0.88$) significant at $P > 0.05$ level. Validity of the study instrument is determined through panel of (10) experts throughout a pilot study. Analysis of data conducted through the application of descriptive data analysis approach.

Results: the study findings present that the overall evaluation of maternal and child services are fair (78.5 %). Which reveals that there are some services not provided within the recommended standards.

Conclusion: Such results for the evaluation of maternal and child health services indicates that most of the services are fairly provided by the staff nurses and therefore the study recommends that nurses in primary health centers need be involved in educational-training programs regarding maternal and childcare services.

Index Terms- Evaluation, Maternal and Child Health Services, Primary Health Care Centers.

I. INTRODUCTION

Throughout the world, especially in the developing countries, more than (150) million women become pregnant each year and an estimated (500,000) of them die from pregnancy-related causes. Maternal health problems are also the causes for more than seven million pregnancies to result in stillbirths or infant deaths within the first week of life. Maternal death, of a woman in reproductive age, has a further impact by causing grave economic and social hardship for her family and community. Other than their health problems, most women in the developing countries lack access to modern health care services and increases the magnitude of death from preventable problems (1).

Maternal and child services is a specialized area of care focuses on the health needs and identifiable response of women, their partners, and families to real or potential health problems associated with childbearing. Maternal and child health is one of the component of primary health care (2).

Maternal and child health services are concerned with preventive and curative activities at all levels of care. In this area, five types of activity can be identified: clinical services-treatment of disease, antenatal care (disease prevention and education are main areas to be stressed), care of newborns and children (the maintenance of growth charts, health education and immunization) family planning, and health education (3).

In addition, WHO Bank child Health, and poverty working Group have suggested that a simple set of six preventive activities and two therapeutic activities could significantly decrease the extent of burden among children. Basic preventive activities include prenatal care, breast-feeding, birth spacing, hygiene, immunizations and insect control. Recommended therapeutic interventions include effective home management of illness and promote medical attention when needed (4).

According to the UNFPA, maternal deaths would be reduced by about two-thirds, from (287,000) to (105,000), if needs for modern family planning and maternal and newborn health care were met. Therefore, investing in family planning and improved maternal health care brings many benefits including reduced risks of complications and improvement in health for mothers and their children (5).

Iraq as one of the developing countries has been subjected to some of the most complex emergencies, conflict and security situations in the world today. Health facilities have sustained serious damage and are in need of urgent rehabilitation. PHC centers have "deteriorated" due to lack of maintenance, lack of supplies, reduced or inadequate health workers or inadequate support services. The available estimates place Iraq among the (68) countries that account for (97%) of maternal and child deaths (Maternal death for every 100,000 live births is 22-99 death). The main causes behind this high rate are poor birth practices, inadequate referral or availability of emergency obstetric care, high level of anemia among pregnant women (35%), which particularly affect rural women and those in the Centre and South Regions, and the lack of adequate health professionals and structural damage to facilities (6).

The contribution of primary care to the health of populations and organization of health systems is well documented in the international scientific literature (7).

The present study aims at evaluating the delivery of maternal and child health services by staff nurses who are working in Baghdad's primary health care centers.

II. METHODOLOGY

A descriptive design using the evaluation approach is conducted in primary health care centers for the period from 22th October 2015 to 26th September 2016. The present study is carried out at (10) primary health care centers selected from (10) health sectors distributed in Baghdad City according to the Ministry of Health Directorate of Primary Health Care Classification. A non-probability (convenient) sample of (100) staff nurses is selected for the purpose of the present study. A questionnaire, of (3) parts, is adopted and used for data

collection. The reliability of study instrument is determined by using Pearson Correlation Coefficient (r) = 0.88 significant at P>0.05 level. Validity of the study instrument is determined through panel of (10) experts throughout a pilot study. Data analysis is conducted through the application of descriptive analysis approaches.

A total score is computed for the measurement of the maternal and child health care services adequacy. It is measured as Adequate, fair, and inadequate for the overall evaluation and each individual services.

III. RESULTS

Table (1): Overall Evaluation of Maternal and Child Health Services

Overall Evaluating	Adequate 84-64.5	Fair 64.4-45.8	Inadequate 45.7-28
Maternal and Child Health Services	14.3 %	78.5 %	7.2 %

The table shows that the majority of maternal and child health services are fairly provided by the staff nurses (78.5%).

Table (2): Evaluation of the Maternal and Child Health Services in Primary Health Care Center

[1] Mother and Child Health Care Services	[2] Adequate [3] 21-17	[4] Fair [5] 16-12	[6] Inadequate [7] 11-7
Breast Cancer Screening Services	[8] 30 Adequate 15-12.4	[9] 48 Fair 12.3-8.7	[10] 22 Inadequate 8.6-5
Immunization for the Mother and Child Services	Adequate 18-14 36	Fair 13-10 43	Inadequate 9-6 21
Integrated Management of Children Illness	Adequate 12-10 34	Fair 9-7 43	Inadequate 6-4 23
Family Planning Services	Adequate 15-12.4 48	Fair 12.3-8.7 32	Inadequate 8.6-5 20
Total	14.3 %	78.5 %	7.2 %

This table shows that mother and child care services are fairly provided by nurses (48%), breast feeding services are fairly provided (50%), immunization for mother and child are fair (43%), immunization services for adults are fairly provided, integrated management of children illness are fairly provide (43%), and family planning services are adequately provided (48%).

Table(3): Mean of Scores for Maternal and Child Health Services' Items

List	Items	Alwa ys	Some time	Neve r	M.S	RS	Sig.
1	Mother and Child Care Services:						

1.1	Recording pregnant' data with respect to weight, height and lab tests.	43	30	27	2.16	72.0	S
1.2	Educating pregnant mothers about proper nutrition and exercise.	21	65	14	2.07	69.0	S
1.3	Follow-up tests for pregnant women.	41	25	34	2.07	69.0	S
1.4	Supporting for pregnant mothers about how to deal with pregnancy discomforts (nausea, vomiting and back pain.	24	55	21	2.03	67.66	S
1.5	Measuring of the pregnant.	33	46	21	2.12	70.66	S
1.6	Monitoring the growth and development of newborn in the review card.	23	58	19	2.04	68.0	S
1.7	Health education for mothers on how to deal with the newborn during bathing and status appropriate to breast-feed.	24	55	21	2.03	67.66	S
2	Breastfeeding Services:						
2.1	Supporting and encouraging exclusive breastfeeding.	41	25	34	2.07	69.0	S
2.2	Educating the family about the importance of breastfeeding for newborn.	24	55	21	2.03	67.66	S
2.3	Reporting pregnant about all benefits of breastfeeding.	33	46	21	2.12	70.66	S
2.4	Explaining and demonstrating the best way to breastfeed.	23	58	19	2.04	68.0	S
2.5	Refraining from giving industrial teats or pacifiers.	24	55	21	2.03	67.66	S
2.6	Helping to shape breastfeeding supporting groups and referring mothers to them pristine singers, especially.	23	58	19	2.04	68.0	S
3	Immunization of the Mother and Child Services:						
3.1	Vaccinating mother during pregnancy.	38	45	17	2.21	73.66	S
3.2	Immunization Campaign especially vaccines during outbreaks of epidemics.	47	31	22	2.25	75.0	S
3.3	Educating parents about the importance of vaccines and its impact on children's health.	28	50	22	2.06	68.66	S
3.4	Implementing of vaccination campaigns during national immunization days.	28	52	20	2.08	69.33	S
3.5	Following vaccination as scheduled by the Ministry Of Health based on	52	36	12	2.40	80.0	HS

	the recommendation of the World Health Organization.							
3.6	Health education of mothers about the immunization program and follow up.	21	46	33	1.88	62.66	NS	
4	Integrated Management of Children Illness:							
4.1	Educating parents about the importance of testing for children.	32	39	29	2.03	63.33	NS	
4.2	Conducting examinations for children in the event of a disease and incidents of emergency.	47	31	22	2.25	75.0	S	
4.3	Disclosing children's genetic diseases.	28	50	22	2.06	68.66	S	
4.4	Taking blood samples of newborns from the age of 72 hours and up to 2 months.	28	52	20	2.08	69.33	S	
5	Family Planning Services:							
5.1	Raising public awareness about family planning.	62	21	17	2.45	81.66	HS	
5.2	Improving educational awareness about sexual and reproductive health.	60	25	15	2.45	81.66	HS	
5.3	Providing the techniques and practices related to birth control.	54	26	20	2.34	78.0	HS	
7.4	Educating women on how to use the contraceptive methods and their side effects.	31	50	19	2.12	70.66	S	
7.5	Educating women on how to use the copper IUD and side effects.	35	37	28	2.07	69.0	S	

MS = Mean of Score, Non Significant = Less than (1.66), Significant = (1.66 – 2.33), Highly Significant = More than (2.33). NS = Non Significant, S = Significant, HS = Highly Significant, RS= Relative Sufficiency.

This table presents the mean of scores for maternal and child health services' items; it is revealed that all of the mother and child care services are significant; most of the breastfeeding services' items are significant; four items of immunization of the mother and child services are significant, one item is highly significant and one item is not significant; three items of integrated management of children illness services are significant and one item is not significant, and finally three items of family planning services are highly significant and two items are significant.

IV. DISCUSSION

Throughout the course of data analysis, the study findings present that the overall evaluation of maternal and child services are fair (78.5 %)(Table 1). Which reveals that there are some services not provided within the recommended standards. Concerning the mother and childcare services, the result indicates that (48) nurses provided the service fairly (Table 2). This is obvious in the mean of score for the items of this service as all the items are significant (Recording pregnant data with respect to weight, height and lab tests, educate pregnant

mothers about proper nutrition and exercise, follow-up tests for pregnant women, supporting pregnant mothers in how to deal with pregnancy discomforts such as nausea, vomiting and back pain, blood pressure measurement for the pregnant, monitoring growth and development of newborn in the review card, and health education for mothers on how to deal with the newborn during bathing and status appropriate to breast-feed)(Table 3). These findings inconsistent with results obtained from study done by Sa'adon and Khalifa (2010), the study focused on determination of quality assurance for maternal and child health services in Baghdad City which indicated that (31%) of the services provided is adequate⁽⁸⁾.

Regarding breast-feeding services, most of the nurses provided the services fairly also (46) (Table 2). This is obvious in the mean of score for the items of these services; six items are significant (Supporting and encouraging exclusive breastfeeding, educating the family about the importance of breastfeeding for newborn, reporting pregnant about all benefits of breastfeeding, explaining and demonstrating the best way to breastfeed, refraining from giving industrial teats or pacifiers, and helping to shape breastfeeding, supporting groups and referring mothers to them singers) (Table 4).

Immunization of the mother and child services, the result presents that most of the nurses are fairly providing the service (43) (Table 2). This is obvious in the mean of score for items of these services; one item is highly significant (Following vaccination as scheduled by the Ministry of Health based on the recommendation of the World Health Organization) and four items are significant (Vaccinating mother during pregnancy, immunization campaign especially vaccines during outbreaks of epidemics, educating parents about the importance of vaccines and its impact on children's health and implementing vaccination campaigns during national immunization days) and one item is not significant (Health education of mothers about the immunization program and follow up) (Table 3).

With respect to the integrated management of children illness services, (43) nurses fairly provided the service (Table 2). This is obvious in the mean of score for the items of these services; three items are significant (Conducting examinations for children in the event of a disease and incidents of emergency, disclosing of children's genetic diseases and taking blood samples of newborns from the age of (72) hours and up to (2) months) and one item is not significant (Educating parents about the importance of testing for children) (Table 3).

Finally, the family planning services' evaluation revealed that almost halve of the nurses (48) adequately provided the service (Table 2). This is obvious in the mean of score for the items of these services; three items are highly significant (Raising public awareness about family planning, improving educational awareness about sexual and reproductive health and providing the techniques and practices that are related to birth control) and two items are significant (Educating women on how to use the contraceptive methods and their side effects and educating women on how to use the copper IUD and its side effects) (Table 3).

Such results for the evaluation of maternal and child health services indicates that most of the services are fairly provided by

the staff nurses and therefor the study recommends that nurses in primary health centers need be involved in educational-training programs regarding maternal and childcare services.

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A Study on Women Empowerment Programmes in Karnataka State- A Theoretical Overview

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Abstract- The World Bank has suggested that empowerment of women should be the key aspect of Social Development Programmes (World Bank, 2001). India has also ratified various international convention committed to securing equal rights to women. The National Policy for the empowerment of women (2001) states that “The women’s movement and a wide spread network of NGOs which have strong grass roots presence and deep in right into women’s concerns have contributed in inspiring initiatives for the empowerment of women”. However, the policy also speaks of “a wide gap between the goals enunciated in the constitution, legislative policies, plans, programmes, and the related mechanisms on the one hand and the situational reality of the status of women in India, on the other..... gender equality manifests itself in various forms, the most obvious being the trend of continuously declining female reaction in the population in the last few decades. Socio strangling and violence at the democratic and societal levels are some of the other manifestations”.

The concept of empowerment has been the subject of much intellectual discourse and analysis for the purposes of this discussion, the conceptual frame work expounded by United Nations is a useful starting point (United Nations 2001), Empowerment is defined as the processes by which women take control and ownership of their lives through expansion of their choices. Thus, it is the process of acquiring the ability to make strategic life choices in the context where this ability has previously been defined. The core elements of empowerment have been defined as agency (the ability to define one’s goals and act upon them), awareness of gendered power structures, self – esteem and self – confidence (Kabeer 2001). Empowerment can take place at a hierarchy of different levels – individual, household, community and societal and is facilitated by providing encouraging factors (e.g., exposure to new activities, which can build capacities) and removing inhibiting factors (e.g., lack of resources and skills). According to Pillai (1995) “Empowerment is an active multi dimensional process which enables women to realize their full identity and powers in all spheres of life. In recent years the focusing of women in planning, policy making, government have been implemented effective roles, polices, programmes for the development and empowerment. Empowerment of women and also it will provide more employment opportunities changing their socio-economic, political, educational, fields of the study. The Government of India and Karnataka state has initiated so many programmes for women empowerment. The Study is Purely Theoretical. The Study is based on secondary data sources. The necessary

information about the Women Empowerment Programmes in Karnataka state and its various components are collected from Books, Journals, Internet Source or related topic. The Researcher study about the women Empowerment programmes in Karnataka state. The Research Work includes,

- I Concept of Women Empowerment
- II Methodology
- III Women Empowerment Programmes in Karnataka state.

Key words: Women Empowerment, Multi dimensional process, Government Programmes, Policies.

I. INTRODUCTION

Empowerment is defined as the processes by which women take control and ownership of their lives through expansion of their choices. Thus, it is the process of acquiring the ability to make strategic life choices in the context where this ability has previously been defined. The core elements of empowerment have been defined as agency (the ability to define one’s goals and act upon them), awareness of gendered power structures, self – esteem and self – confidence (Kabeer 2001). Empowerment can take place at a hierarchy of different levels – individual, household, community and societal and is facilitated by providing encouraging factors (e.g., exposure to new activities, which can build capacities) and removing inhibiting factors (e.g., lack of resources and skills).

Mayoux’s (2000) definition of empowerment relates more directly to power, as “a multidimensional and interlinked process of change in power relations” it consists of: one is “power within”, enabling women to circulate? their own aspirations and strategies for change; another one is “power to”, enabling women to develop the necessary skills and access the necessary resources to achieve their aspirations; third one is “power with”, enabling women to examine the circulate their collective interests, to organize, to achieve them and to link with other women and men’s organization for change; and lastly “power over; changing the underlying in inequalities in power and resources that constrain women’s aspirations and their ability to achieve them. These power relations operate in different spheres of life (e.g., economic, social, political) at different levels (e.g., individual, household, community, market, institutional) etc.

ISI researches identified six general areas or domains in which empowerment of women is believed to be taking place as a result of Grameen Bank, BRAC and other credit programmes; a

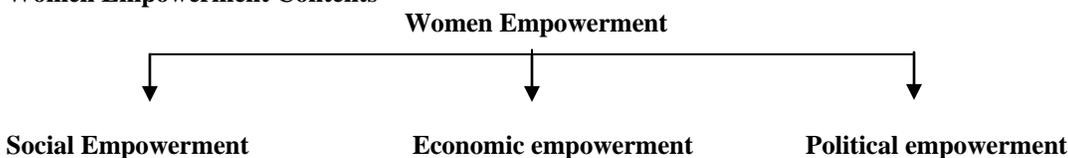
sense of self and vision of future, mobility and visibility economic security, status and decision making power within the household, ability to interact effectively in the public sphere and participation in non – family groups. Thus, their concept of empowerment can be looked at in a behavioral sense as the ability to take effective action (Snow, 1990).

Another set of indicators, which are more intrinsic, revolves around changing gender relations within the household. In the field studies undertaken for the IFAD gender mainstreaming review, women who generated increased income through self – help schemes reported that they had gained greater respect within the household, often with perceptible attitudinal change. Men have been reported to offer little resistance towards the enhanced economic activity of women because such activities were seen as contributing to household well – being. Men and older children have also been reported to be helping with household duties and with the income – generating activity. In Bangladesh, women and older children have also been reported to be helping with household duties and with the income – generating activity. In Bangladesh, women showed a good deal of empowerment in their capacity to articulate their needs and in – their receptivity to new ideas. More impressive was the emergence of women’s groups as a dynamic, articulate constituency (Krishna raj and Kay 2002). These first – hand observations and in – depth interviews appear to validate the findings of other studies (Cheston and Kuhin 2002).

Concept of Women Empowerment

The concept of empowerment has been the subject of much intellectual discourse and analysis for the purpose of this discussion, the conceptual frame work expounded by United Nations is a useful starting point (United Nations 2001). Empowerment is defined as the processes by which women take control and ownership of their lives through expansion of their choices. Thus, it is the process of acquiring the ability to make, strategic life choice in a context which this ability has previously

Women Empowerment Contents



1. **Social Empowerment of Women:** Education, health, nutrition, drinking water and sanitation, housing and shelter, environment, science and technology, women in different circumstances, violence against women, rights of the girl child, man media.
2. **Economic Empowerment:** Poverty eradication, micro credits, women and economic globalization, women and agriculture, women and industry, support services.
3. **Political Empowerment:** Decision making, leadership, administration capacity building, international cooperative, Panchyat Raj institutions, action plans, legislations, judicial legal system.

Methodology

The study is based on the secondary data sources. The necessary information about the women Empowerment

been denied. The core elements of empowerment have been defined as agency, (the ability to define one’s goals and act upon them) awareness of gendered power structures, self esteem and self-confident (Kabeer 2001). Empowerment can take place at a hierarchy of different levels – individual, household community and societal and is facilitated by providing encouraging factors (e.g. exposure to new activities, which can blind capacities) and removing inhibition factors (e.g. Lack of resources and skills).

Empowerment is a word with so much meaning handed into it. It means recognizing women’s contributions and their knowledge. It means enhancing their self respect and self dignity. It means women controlling their resources; it means women becoming economically independent. It means being able to forget their tears, anxiety, their feelings of inadequacy, inferiority etc.

Definitions of Women Empowerment

According to Moser (1989) empowerment is the capacity of women to increase their self – reliance and internal strength. This is identified as the right to determine choices in life and to influence in direction of change through the ability to gain control over material and non – material resources. In the words of clothes but CK and Stuart (1992) we need not “empowerment women but “power man”.

According to Pillai (1995) “Empowerment is an active multi dimensional process which enables women to realize their full identity and powers in all spheres of life.

Hosheimi (1996) developed five indicators to measure women’s empowerment: mobility, economic security, ability to make larger purchases, realize freedom from domination within the family and political and legal awareness and involvement in political campaigning and protests with this in mind. An attempt is made in the following situation to measure empowerment of women respondents.

programmes in Karnataka and its various components are collected from various books, journals, internet source of related topics.

Women Empowerment Programmes in Karnataka state.

The Researcher has studied the Women Empowerment Programmes in Karnataka State in Detail. The Researcher reviewed The Women Empowerment Programmes conducted by Women and Child Development. Women and Child Development initiated so many Programmes for Women Empowerment. The Programmes described by the Researcher. The strategy adopted for the programmes in the areas of women development involves empowerment of women through education and awareness generation and greater emphasis on vocational training and employment so as to enable them to enter the mainstream of economic development as equal

partners. The department implements programmes in the areas of employment, training for women, awareness generation and gender sensitization. The emphasis is on helping women to become self sufficient and economically independent with the help of training and income generating activities so as to enhance their earning capacity and to bring up their status in life.

The department aims at the economic development and integration of women into the main stream of society and also as individuals with a right to human dignity. Besides expanding the on-going programmes, the department has evolved some innovative schemes such as "Stree Shakthi" for empowerment of women and "Santhwana" for providing assistance to victims of various atrocities in the society.

1. Stree Shakthi

The scheme was launched during 2000-01 with an objective to empower rural women and make them self reliant by inculcating the habit of savings and proper utilization of financial resources. Anganwadi workers and supervisors are instrumental in organizing rural women in self help groups. About 15 to 20 women who belong to below poverty line families, landless agricultural labourers, SC/ST join together to form one self help group.

Objectives :

1. To strengthen the process of economic development of rural women and create a conducive environment for social change.
2. To form one lakh Self Help Women Groups based on thrift and credit principles which builds self reliance and enable women to have greater access to control over resources.
3. To create self confidence in rural women by involving them in income generating activities thereby contributing to poverty alleviation.
4. To provide opportunities to the members of the groups to avail the benefits of other departmental schemes by converging the services of various departments and lending institutions to ensure women's access to credit financing.

SAVINGS AND INTER LOANING:

The self help groups conduct regular weekly meetings and save minimum of Rs. 10/-. So far these women self help groups have saved an amount of Rs. 444.91 crores and have lent Rs. 1251.98 crores internally to the members. This enthusiastic savings activity has weaned them away from the clutches of money lenders and take up income generating activities.

REVOLVING FUND:

To help SHGs to take up income generating activities, the department has contributed an amount of Rs.-5,000/- as revolving fund to add to the corpus of each group which is used for taking up income generating activities. So far 1, 13,478 SHGs have been given this revolving fund

KIT MATERIALS:

Each group is given kit materials worth of Rs.600/- consisting of registers and a zinc trunk for keeping the registers and other documents of the group.

TRAINING: Training to members of women SHGs constitutes an important component in Stree Shakthi Programme. The first phase of training for 11 lakh members was taken up to orient SHG members about the Stree Shakthi Programme. In the second phase training in gender issues, leadership qualities, communication skills were taken up. In the third phase training in book keeping, credit management and social issues were taken up. Training in Fashion Designing was given to 30 members from Stree Shakthi groups through National Institute of Fashion Technology.

CREDIT LINKAGES TO SHGs:

As at the end of March 99,969 groups were eligible for credit linkage with banks and also to take up income generating activities. So far 90,182 groups have been credit linked and given financial assistance to the extent of Rs. 496.13 crores.

INCOME GENERATING ACTIVITIES:

SHGs have taken up various IGA programmes available in other Government Departments namely, Animal Husbandry, Nirmithi Kendras etc., A few of these groups have been given training and technical support under Giriraja Scheme of Animal Husbandry Department. The department has also assisted the SHGs to procure Giriraja birds.. The different activities taken up are as follows;

1. Dairying
2. Production and sale of readymade garments
3. Blanket marketing
4. Marketing of seeds and manure
5. Production and sale of
 - a. Papad making
 - b. Sambar Powder
 - c. Agarbathi etc.
6. Production and sale of composite manure
7. Production and sale of soap and detergent

2. NEW SWARNIMA PROGRAMME:

SHGs who belong to backward classes are given financial assistance from Backward Class and Minorities Development Corporation for taking up income generating activities.

CONSTRUCTION OF MARKETING COMPLEX

To encourage SHGs to take up more income generating activities and provide marketing facilities for their products, the department initially was given sanction for the construction of marketing complex at the district level

EXHIBITION AND MARKETING MELAS:

Exhibition and marketing melas are a big attraction for public in the districts and boon for SHGs for marketing of their products locally. Rs.75, 000/- was released to each district for conducting exhibitions and marketing melas at District and Taluk Level.

BLOCK SOCIETY FEDERATION:

In order to strengthen the functioning of SHGs and federate them at taluk level federations have been formed in all taluks and registered. An amount of Rs.30,000/- for each and a total of Rs.54.60 lakhs was released for the strengthening of these societies.

3. Santhwana

Women who are victims of various atrocities such as dowry, rape, sexual harassment, domestic violence etc are subjected to physical and mental torture besides having to face social & financial problems. With a view to console these women and rehabilitate them, the scheme of "Santhwana" was launched during the year 2001-02.

Objective:The scheme not only aims at providing legal assistance, financial relief, temporary shelter, protection to victims of atrocities, but also helps them to be self reliant by providing training in order to empower these women to lead a life like other women in the society.

Scheme outline: The Santhwana centres are run through Non Governmental organizations; preference is given to NGOs who are running short stay homes, Family Counseling Centres & to those who are actively working in the field of women welfare. Santhwana scheme is implemented in all the 27 district head quarters and also in 23 taluk head quarters. A total of 51 santhwana centres are functioning in the state.

Services provided: Facilities and services will be provided for women who seek assistance/help depending on the gravity of the case. The assistance provided to these women range from immediate relief to rehabilitation to enable them to lead a confident & self reliant life.

The services are as follows.

1) Each centre will have a women's help line with toll free telephone no 1091. The Help Line receives complaints from distressed & victimized women from 6 am to 12 midnight. This toll free call can be made from any Public Call Office.

2) Arrangements are made in short stay homes for women who are in need of shelter. In places where there are no short stay homes, such women are housed in Reception centres or State Homes.

3) Counseling services if needed are provided, by trained counselors. If legal assistance is necessary the same will be provided through Legal Services authority or through the legal aid committee functioning under the chairmanship of a District magistrate.

4) Women who are interested in pursuing their education, are provided accommodation in the working women hostels run by NGOs with financial assistance from the department.

5) (a) After registering their complaints with the santhwana centres if the victimized women are in need of financial assistance, the relief ranging from Rs 2000/- to Rs 10,000/- as decided by the District Committee will be provided. Women who have sought shelter in the short stay home/working women hostel are not eligible for this financial assistance.

(b) If the victim dies, an amount ranging from Rs 5000 to Rs 10,000/ is kept as fixed deposit in a nationalized bank in the name of her child for her /his education and rehabilitation until the child becomes an adult. This amount is kept in the joint name of the child and Deputy Director, Women & Child Development Department of the Concerned District.

Training in income generation activities : Karnataka State Women's Development Corporation provides financial assistance to women recommended by the santhwana centres to undergo any skill development training of their preference / interest . Arrangements will be made for their stay in a working

women's hostel during the training period and the cost of their stay and food during this period is met by Women's Development Corporation. Training programmes are selected based on the educational qualifications & the area of their interest. District level committee

4. FINANCIAL ASSISTANCE TO RUN HOSTELS FOR GIRLS FROM RURAL AREAS :

Objective : To enable girls from rural areas to avail facilities for higher education.

Eligibility : Admissions to the hostels are available for students residing in rural areas, whose family income is less than Rs. 10,000 p.a. and studying from 6th Std. Onwards in the institutions run by Government or NGOs recognized by Govt. of Karnataka.

Pattern of Assistance : Maintenance grant of Rs.500/- p.m. per boarder and expenses towards Salary of staff, rent, contingencies etc. are met as prescribed by government from time to time.

5. SCHEME OF FINANCIAL ASSISTANCE FOR REMARRIAGE OF DESTITUTE WIDOWS AND MARRIAGE OF DEVADASIS

a) Financial Assistance of Rs. 10,000/- is being given for the remarriage of destitute widows. The destitute widow should be in the age group of 18 and 35 years and she must be a domicile of Karnataka for more than 5 years. The annual income should be as per the Integrated Rural Development Programme norms. Initially an amount of Rs. 5,000/- is given to the couple to meet the expenses of the marriage and the balance amount of Rs.5000/- is kept in the form of National Savings Certificate in the name of the woman.

b) Financial Assistance of Rs.10, 000 will be given to a couple where the bride is a devadasi. The devadasi woman should be in the age group of 18 to 35 years and must be a domicile in Karnataka for more than 2 years. The suitor should be above 21 years of age at the time of submitting the application. He should have a permanent source of income of not less than Rs.500/- per month. The state government has enhanced the financial assistance for general category to Rs 20,000/- and to Rs 25,000/- for Scheduled caste and Scheduled Tribes.

6. CELL FOR THE ERADICATION OF SOCIAL EVILS

A Special Cell is created in the directorate of Women and Child Development to handle issues related to eradication of various social evils such as dowry system, child marriages, devadasi system, drug addiction and atrocities on women. The functions of the cell are:

- to create public awareness so as to highlight the harmful effects of these evil systems
- to launch anti-dowry campaigns through education and publicity with the involvement of voluntary organizations.
- to take action on the representations received from the victims of dowry disputes and other atrocities on women in the State.
- to bring amendments to the Acts and Rules pertaining to women.

The implementation of the following Acts are monitored by the Special Cell

- The Karnataka Devadasis (Prohibition of Dedication) Act, 1982 and Rules, 1987
- The Dowry Prohibition Act, 1961 with amendments of 1984 and 1986 and Rules 2004.
- Child Marriage Restraint Act, 1929.
- Karnataka Marriage Act 1976.
- Indecent Representation of Women Act 1986

The Government of India schemes implemented by special cell are

- Scheme for Prevention of Alcoholism and substance (Drugs) Abuse

Swadhar

Publicity campaigns are held in the districts to create awareness among public on the amended Dowry Prohibition Act, Devadasi (Prohibition of Dedication) Act, Child Marriage Restraint Act and other social evils like child marriages, sexual harassment of women in work places. Workshops and Seminars are also conducted to create awareness about the benefits available under various schemes of the Department.

7. KARNATAKA MAHILA ABHIVRUDHI YOJANE

Karnataka is the first state in the country to introduce a scheme of inter sectoral allocations for women. The scheme is to earmark one third of resources for women in individual beneficiary oriented schemes and labour intensive schemes of various departments of government. The department launched Karnataka Mahila Abhivrudhi Yojane (KMAY) during 1995-96 to ensure gender equality and to integrate women in the mainstream of development. It was a land mark government order as it was for the first time that a conscious and positive attempt was made by Government to address gender issues

8. KITTUR RANI CHANNAMMA AWARD

The State Government has instituted the Kittur Rani Channamma award as a state recognition of voluntary efforts rendered by individuals and institutions working

- i) in the field of development of women welfare.
- ii) protecting women/preventing women from becoming victims of crimes and other social evils in society.

These State Awards in the name of "Kittur Rani Channamma" are presented on the occasion of International Women's Day. The awards are given to a voluntary organization and an individual working in the field of women welfare for the past 5 years. Awards are also given to women who have excelled in the field of Art, Education, Literature and Sports. A citation and a cash award of Rs.25,000/- is given to each voluntary organization and a citation and a cash award of Rs.10,000/- each is given to individuals.

9. FINANCIAL ASSISTANCE TO WOMEN LAW GRADUATES:

Financial assistance is given to women law graduates to undergo on the job training to practice law in the court. Women law graduates whose family income does not exceed Rs. 40,000/- per annum are eligible to avail the assistance. An amount of Rs.1000/- p.m. is given for a period of 4 years. In

addition to this, Rs. 500/- is given for purchase of essential books pertaining to law and Rs.460/- is given to register their names in bar council.

10. SCHEME OF ASSISTANCE TO WOMEN FOR TAKING UP JOB ORIENTED COURSES:

In order to raise the status of women from the lower strata of the society and to equip them with necessary skills so that they become economically independent, women and girls from lower income groups are assisted to take up diploma courses in any ITI/Polytechnic course, any short term skill imparting courses, and secretarial practice. Financial assistance in the form of fees, scholarships and hostel charges are provided.

Government of India Schemes

1. Scheme of Assistance for the Construction/Expansion of Hostel Building for Working Women
2. Short Stay Homes for Women and Girls
3. Scheme for Prevention of Alcoholism And Substance (Drugs) Abuse
4. SWADHAR - A Scheme for Women in Difficult Circumstances
5. SWAYAMSIDHA

II. ANALYSIS AND FINDINGS

Women Empowerment is multidimensional Process. Women empowerment is a one of the important prospectus of empowering of women in SHGs by providing training, organization the community, facilities to the networking of SHGs and some of important promoting Govt. programmes for promoting women empowering by building up social work capacity through all their procedures and methods implementing of women empowerment by social work and social aspects. The study is based on the secondary data sources. The necessary information about the women Empowerment programmes in Karnataka and its various components are collected from various books, journals, internet source of related topics. The Govt. of India as well as Karnataka State Government has initiated a number of projects and programmes for socio – economic empowerment of women. Thus most of the studies on women related policies and development programmes have confined to the general nature of the programmes and future that made it success or failure. here Natural policy for empowerment of women (2001) is successful policy in India's The study attempted on the impact me generating programmes on rural women through one of the aims of the programmes is to uplift rural women through the implantation of the programme. The Researcher has focused the Women Empowerment Programmes in Karnataka state in Detailed. Main Findings have finalised by the Researcher.

1. The personal background of Women and other variables have something to do with the aspect of empowerment.
2. Women in rural area are so innocents and they are leading simple life. They do not know the meaning of women empowerment in particular way. So Rural women are to know the empowerment programmes in Karnataka State.

3. The Central and State Government have initiated so many programmes and policies for women empowerment.
4. Most of the women are illiterates in rural area. They don't know the government programmes and policies for women empowerment in particular. So the Researcher focus on the women empowerment programmes for women in Karnataka state in Detail.
5. The women of rural area are facing so many basic problems. In such a way policies and programmes are major role in bringing desirable changes with reference to social and economic life of women.
6. Government Policies, programmes and rural women empowerment have a variation as the methodology and approach varies in functioning of them.
7. Proper and timely interventions and suggestions have something to do in bringing desirable changes in the life of the women and their status.

III. CONCLUSION

Women empowerment is a very important aspect. Women Empowerment Programmes have taken significant role in society. Women empowerment is a one of the important prospectus of empowering of women in Women groups by providing training, organization the community, facilities to the networking of Departments and some of important promoting Govt. programmes for promoting women empowering by building up social work capacity through all their procedures and methods implementing of women empowerment by social work and social aspects. The Govt. of India as well as Karnataka State Government has initiated a number of projects and programmes for socio – economic empowerment of women.

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Development has conducted so many programmes for empowerment of Women in Karnataka state.

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Job demands, Job Resources and Affective Commitment

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Abstract- The objectives of this study were to identify the levels of affective commitment in a telecommunication organisation and to investigate the relationships between job demands, job resources and affective commitment. A cross-sectional survey design was used. The total available population of employees (N = 95) in the organisation participated in this study. The Job Demands-Resources Scale and the affective commitment Scale were used as measuring instruments. The results showed that the average affective commitment level of employees was above the Somaliland norm. Job resources, such as skill variety, task significance and task identity, were related to affective commitment of individuals. Job demands did not play a significant role in the affective commitment of employees.

Index Terms- Job demands, Job Resources, Affective Commitment and Telecommunication Companies.

I. INTRODUCTION

Telecommunication organisations face the challenge of becoming more competitive in local and international markets. The telecommunication industry has experienced a significant change in moving from traditional work organisation principles to team based work and multi-skill principles (Gurjeet & Rupali, 2014). Quality testing departments are replaced by total quality management systems. These factors have contributed to an overload of demands and an under-supply of response capabilities in telecommunication organisations, which might affect individuals' psychological experiences of their work, for example, their affective commitment (Nelson & Simmons 2003). Committed workers are enthusiastically involved in, and pleurably occupied by, the demands of the work at hand. Lack of affective commitment from work may result in employee turnover, absenteeism and poor performance (Gurjeet & Rupali, 2014).

Organisations have to unleash the human potential in organisations to improve the overall performance of employees. According to Romina *et al.*, (2016), employees seek fulfilment through self-expression at work. These authors believe that for employees to thrive, they should commit themselves cognitively, physically and emotionally in their organization. Hongwei *et al.*, (2015) points out that self and role exist in some dynamic, negotiable relationship in which a person both drives personal energies into role behaviours and displays the self within the role. It is therefore important to study affective commitment and the predictors thereof.

The three-component model of commitment developed by Allen & Meyer (1991) arguably dominates organizational commitment research (Gurjeet & Rupali, 2014). This model proposes that organizational commitment is experienced by the employee as three simultaneous mind-sets encompassing affective, normative, and continuance organizational commitment. Affective Commitment reflects commitment based on emotional ties the employee develops with the organization primarily via positive work experiences. Normative Commitment reflects commitment based on perceived obligation towards the organization, for example rooted in the norms of reciprocity. Continuance Commitment reflects commitment based on the perceived costs, both economic and social, of leaving the organization. This model of commitment has been used by researchers to predict important employee outcomes, including turnover and citizenship behaviors, job performance, absenteeism, and tardiness (Dole & Schoeder, 2001). Allen & Meyer (1991) provide a comprehensive overview of the theoretical lineage of this model.

The aims of this study were to investigate the affective commitment of employees in a telecommunication, as well as to investigate the relationship between job demands, job resources and affective commitment. The concept of affective commitment is relevant for organisations for various reasons. Firstly, affective commitment is related to job satisfaction, work engagement and low turnover intention (Romina *et al.*, 2016). Secondly, affective commitment is related to personal initiative and learning (Allen & Meyer, 1991). Research regarding the psychological foundations of affective commitment will enable researchers and practitioners to understand and predict why some employees psychologically identify with their jobs. According to Schnorpfeil, et al., (2004), lack of affective commitment is caused by job characteristics (including job demands and a lack of resources), such as excessive workload, physical work conditions, adverse co-worker behaviour, lack of social support, low pay, poor communication, poor training and boring jobs.

II. LITERATURE REVIEW

A. *Affective Commitment*

Allen & Meyer, (1991) identify three components of commitment: affective commitment, continuance commitment, and normative commitment. Affective commitment is defined as individuals feeling closer to the organization emotionally and to have involvement with the organization and its goals. The employees who have strong affective commitment continue to work in the organization because they want to. When employees feel that the organization is responsible toward them such as offering salaries higher than industry average, they tend to reciprocate with positive attitudes toward the organization, including affective bonds and feelings of loyalty.

The antecedents leading to affective commitment are separated into 4 categories: personal characteristics, job characteristics, work experiences and structural characteristics (Allen, Meyer 1991). According to Long & Yan, (2014), age, gender, education level, individual values and desire to success and etc are personal characteristics. Gilbert and Ivancevich refers that management style, work stress, employee award system and the responsibility degree given to employees are job characteristics. As Long & Yan, 2014 mentions, the size of the organization, the formalization degree, the degree of control, working hours, wage system, the career opportunities reflect the structural properties of the organization (Long & Yan, 2014). Work experiences are the most effective one to create affective commitment. Because it fulfills employees' psychological needs to feel comfortable and competent within the organization. Organizational reliability, openness to new ideas, equity, role and purpose clarity meet the needs of employees' feeling comfortable in the work place. On the other hand a challenging job, difficulty of goals, feedbacks made by the management and participation in decision lead people to feel competent. According to Allen and Meyer's survey, that was implemented by a university and two manufacturing firms, the employees commit emotionally to the organizations if they feel competent and comfortable in their work place (Allen, Meyer 1991).

The common point of organizational commitment components is that the employees continue to remain in the organization whatever they feel positive or negative (Long & Yan, 2014). For instance, although the employees have weak affective and normative commitment, the lack of alternatives can lead them to have a strong affective commitment (Ceylan, Bayram, 2006). However the main important point here for the organization is the performance and efficiency of the employee. The attitudes and performance of employees in work place depends on what they perceive about the organization (Allen, Meyer 1991). For instance, when employees perceive that "their" organization acts as a "true organization", they form positive images about it. They feel proud to identify with such an organization, develop their self-esteem, form affective bonds with the organization, develop a sense of loyalty, and make efforts to perform better and to benefit the whole organization (Long & Yan, 2014). The researches show that the individuals, who bond to their organization emotionally, have higher work performance. The results of Jing and Xiao-hua's survey indicate that there is a positive relationship between affective commitment and work performance (Jing & Xiaohua, 2009). Also as the employee satisfaction increases, there will be increase in work performance.

B. *Job demands, Job Resources and Affective Commitment*

Limited information is available regarding the relationship between affective commitment and job demands. Jyoti & Rajib, (2016) define job demands as the degree to which the environment contains stimuli that preemptorily require attention and response. Jyoti & Rajib, (2016) refer to job demands as those physical, psychological, social or organisational aspects of the job that require sustained physical and psychological effort and that are therefore associated with certain physiological and psychological costs. Quantitative job demands refer to the amount of work required and the available timeframe, while qualitative workload involves employees' affective reactions to their jobs. Although job demands are not necessarily seen as negative, they may turn into job stressors when meeting those demands requires high effort and is therefore associated with high costs that elicit negative responses such as depression, anxiety or burnout. Work overload or high demands may also occur if an individual does not have the necessary skills, abilities and support to meet these demands (Schaufeli & Bakker, 2004). According to Jyoti & Rajib, (2016), job demands drain the employee's energy and, in an attempt to cope with the resulting exhaustion, the employee withdraws mentally. When the employee withdraws mentally, his/her affective commitment levels will decrease. Todd & Mari-Amanda, (2016) found that job demands lead to burnout, which in turn might impact on the affective commitment of employees. Job resources seem to increase affective commitment. According to Schaufeli & Bakker (2004), job resources refer to those physical, psychological, social or organisational aspects of the job that either reduce job demands and the associated physiological costs or that are functional in achieving work goals or stimulating personal growth, learning and development. Job resources are not only necessary for dealing with job demands and getting things done, but are also important in their own right (Hobfoll, 2002). In the so-called motivational process (Schaufeli & Bakker 2004), job resources are linked, via affective commitment, to organisational outcomes. Job resources can play an intrinsic motivational role in fostering

individual growth, learning and development, or through an extrinsic motivational role that helps individuals achieve working goals. Job resources are linked to positive organisational outcomes via affective commitment. The effect of high job demands may be reduced by job resources such as providing feedback, social support and supervisory coaching (Alisha et al., 2016). If high job demands are coupled with high job resources, this could lead to affective commitment. Alisha et al., (2016) also state that job demands could lead to health problems via burnout, and that job resources could lead to turnover intention via affective commitment. In order to improve human performance and mental effort, one must make use of a motivation-driven process that includes job resources. Job resources play an intrinsic motivational role because they may help employees to grow, learn and develop. Job resources may also play an instrumental role in achieving work goals. According to Todd & Mari-Amanda, (2016) and Alisha et al., (2016), job resources fulfil the basic human needs for autonomy, competence and relatedness. In giving proper feedback, learning is fostered, increasing job competence, whereas decision latitude and social support satisfy the need for autonomy and the need to belong, respectively. Providing employees with optimal challenges, feedback and freedom in their work creates intrinsic motivation and increases their affective commitment (Todd & Mari-Amanda, 2016). Positive feedback seems to enhance affective commitment levels, whereas negative feedback diminishes it. Employees will be more attached to their organization if they regard their work as challenging and have the freedom to be independent in their work tasks. Wilmar, (2015) found that career development, identification with the organisation and a rewarding work environment also increase the affective commitment levels of employees. Employees will be more engaged in their work if the organisation provides them with opportunities to enhance their skills and abilities, and to manage their careers. When individuals identify with the organisation, they share in its success and are proud to deliver quality work. According to the self-determination theory of Todd & Mari-Amanda, (2016), work contexts that support psychological autonomy, competence and relatedness enhance wellbeing and increase intrinsic motivation (Wilmar, 2015). This intrinsic motivational potential is also supported by the Job Characteristics Theory (JCT) of Alisha et al., (2016). According to the JCT, every job has a specific motivational role that depends on the presence of five core job characteristics: skill variety, task identity, task significance, autonomy and feedback. The JCT further hypothesises that these core job characteristics are linked to positive results such as high-quality work performance, job satisfaction, and low absenteeism and turnover. According to the Effort-Recovery Model of Meijman & Mulder (1998), job resources may also play an extrinsic motivational role through work environments that offer many resources and foster the willingness to dedicate one's efforts and abilities to the work task. It is therefore likely that the work task will be completed successfully and that the work goal will be achieved. Support from colleagues and proper feedback from supervisors will thus increase the individual's likelihood of achieving work goals, and employees will thus be successful in their daily tasks. This will create an energy backflow to the individual. In either case, whether the satisfaction of basic human needs or the achieving of work-related outcomes, the results are positive and the chances for an individual to be engaged will increase. The tendency for employees to leave the organisation will also decrease if organisations provide their employees with valued job resources that enhance learning, growth and development (Wilmar, 2015). Schaufeli & Bakker (2004) found that work engagement is strongly predicted by job resources. It can therefore be expected that job resources have a positive relation to affective commitment. If the employee is provided with variety in his/her job, learning opportunities and autonomy, he/she will be more likely to attach in his/her work. This will make the employee's work more meaningful. In providing the employee with safety in terms of social support (in other words, good relationships with supervisor and colleagues), the employee will feel more secure and safe in his/her job. Ultimately, a positive, fulfilling relationship will exist between the employee and the employer, the employee will achieve work goals from which the employer can benefit, and the employer will provide the employee with valued resources in order to satisfy his/her basic work needs. The following hypotheses are therefore proposed:

Hypothesis 1: Low job demands lead to high levels of affective commitment levels among employees.

Hypothesis 2: High job resources in a manufacturing organisation lead to high levels of affective commitment among employees.

C. Research Theoretical Framework

A theoretical framework refers to the theory that a researcher chooses to guide him/her in his/her research. Thus, a theoretical framework is the application of a theory, or a set of concepts drawn from one and the same theory, to offer an explanation of an event, or shed some light on a particular phenomenon or research problem. Figure 1 presents research theoretical framework, which explains the relationship between job demands, job resources and affective commitment.

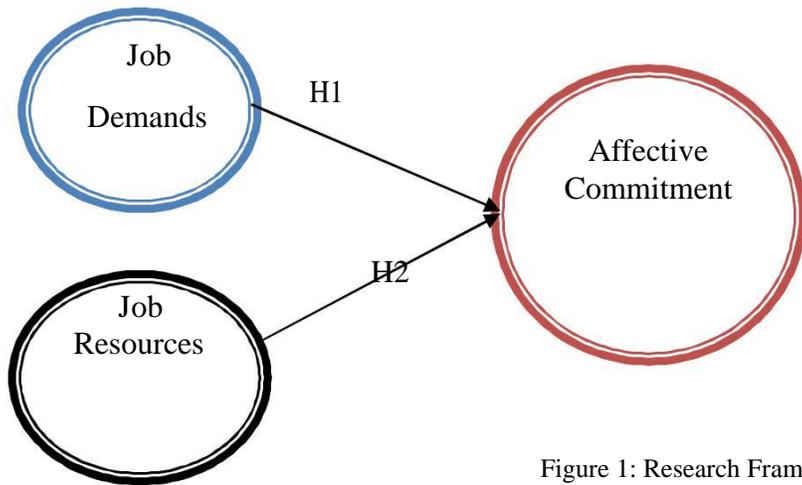


Figure 1: Research Framework

III. METHODOLOGY

A. Research Design

Research design spells out how the research is carried out toward the accomplishment of research objectives and answering of questions. In other word, research design constitutes the outline for the collection, measurement and analysis data (Cooper and Schindler, 2013). Zikmund *et al.* (2012) defined research design as a master plan that outlines the methods and procedures for collecting and analyzing data. Moreover, research design helps the researcher in the allocation of inadequate resources by posing vital choices in methodology (Cooper and Schindler, 2013). The main research design employed in the present research was survey. Survey is defined as a measurement process that utilises a measurement tool called a questionnaire, measurement instrument, or interview schedule (Cooper and Schindler, 2013). Surveys attempt to describe what is happening or to study the reasons for an exacting business activity (Zikmund *et al.*, 2012). The questionnaire is the most common information collection tool in business research (Cooper and Schindler, 2013). The questionnaire is the most extensively used information collection technique in a survey study (De Vaus, 2013). Questionnaire is an organized set of questions or measures used by respondents or interviewers to record answers data (Hair *et al.*, 2010).

B. Sample Size

According to Cooper and Schindler (2013), sampling is the process whereby some elements from the population are selected to represent the whole population. Sample size is the number of units that is required to get accurate findings (Fink, 2003). For the purpose of this paper, the sample size was 95.

C. Data Collection

According to Sekaran (2003), there are many methods that can be possibly used to collect data from respondents such as interviews and questionnaires. Interviews involve unstructured and structured approach. Interviews can differ from being highly unstructured to highly structured. Unstructured interviews are usually conducted by an extremely flexible approach. A questionnaire, on the other hand, is a pre-written set of questions that respondents are required to answer, which is generally within close defined alternatives (Sekaran, 2003). A questionnaire is an efficient data collection mechanism but only when the researcher is aware of what is required and the measures of the variables involved (Sekaran, 2003). In the present paper, questionnaires were used because the researcher was interested in getting specific responses on the issues at hand i.e., job demands and resources, and affective commitment via specific measurements.

D. Measures

Three measuring instruments were used in this study, namely the Affective Commitment Scale (Meyer & Allen, 1991; Meyer, Allen & Smith, 1993), the Job Demands-Resources Scale (Rothmann, Strydom & Mostert 2006) and a demographic questionnaire.

IV. FINDINGS

The descriptive and inferential statistical methods were used to conduct the analysis. For hypotheses testing, the Pearson correlation coefficients were used. The first part of the analysis focused on the descriptive analysis of the respondents. At the end of gathering data, the reliability of the scales was analyzed.

The descriptive analysis focused on the variables such as gender, age, marital status and job status as shown in Table I. Male responders represented 61% while female responders were 39%. Most of the respondents (45.9%) were aged between 35 and 39 years old, 8.2% of the respondents were between 25 and 29 years old, 10.8% of the respondents were between 30 and 34 years old, 18.9% of the respondents were above 50 years old and 16.2% of the respondents were between 40 and 49 years old. Majority of the respondents were having job permanent and were married in a percentage of 72% and 65.8% respectively. While employees; who have contract jobs represented 28% and single staff were 34.2% of the total respondents.

Table I: Demographic Information

Variable	Percentage (%)
Gender	
Male	61
Female	39
Age (in years)	
25-29	8.2
30-34	10.8
35-39	45.9
40-49	16.2
Above 50	18.9
Marital status	
Married	65.8
Single	34.2
Job status	
Permanent	72
Contract	28

An exploratory and confirmatory factor analysis was performed in the study to ascertain the reliability of the measures by using Cronbach alpha reliability coefficient; .60 being the acceptable reliability coefficient level in terms of research standards as shown in Table I.

Table II: Reliability Statistics

Main Variable	Sub variables	Cronbach's alphas
JOB DEMANDS	Quantitative Demands (QD)	.844
	Physical Demands (PD)	.865
	Emotional Demands (ED)	.821
JOB RESOURCES	Skill Variety (SV)	.901
	Task Significance (TS)	.881
	Task Identity (TI)	.845
AFFECTIVE COMMITMENT	Affective Commitment	.899

As it can be seen in Table I, the measures of the study are reliable because all the variables have an acceptable reliability coefficient which ranged from .821 to .901.

The correlation data shows the relationship between the independent and dependent variables of study as shown in Table III. The table displays correlation coefficients between these variables. The correlation coefficients are a measure of the strength of the association between any two metric variables (Hair et al., 2003). The results of the Pearson correlation show that all of the dimensions of the independent variables and dependent variable were positively correlated to each other. The results of Table III demonstrated that there is negative significant Pearson correlation between job demands and affective commitment ($r=-.455$; $p=0.034$) and the correlation is significant if the $p=.05$ or less than that. The correlation shows that there is positive significant relationship between job resources and affective commitment ($r=.543$; $p=.021$). Hence the alternative hypothesis is accepted.

Table III: Pearson Correlations between Variables

Pearson Correlation	Pearson Correlation Coefficient (r)	Hypothesis Support
JD → AF	-.455*	Yes
JR → AF	.543*	Yes

*. Correlation is significant at the .05 level (2-tailed)
 JD: Job Demands, JR: Job Resources and
 AF: Affective Commitment

In order to analyse the levels of job demands, job resources and affective commitment of the employees; an analysis of mean test was conducted as it was documented in Table IV. As it can be seen from Table IV, the affective commitment level among employees' in telecommunication sector in Somaliland as affective commitment of the employees' was rated to be "moderate" (mean = 3.55). Similarly, the level of the other variables such as job demands and job resources were also moderate of mean from 3.11 to 3.61.

Table IV: Mean values

Variables	Mean
Quantitative Demands (QD)	3.35
Physical Demands (PD)	3.51
Emotional Demands (ED)	3.11
Skill Variety (SV)	3.21
Task Significance (TS)	3.32
Task Identity (TI)	3.61
Affective Commitment	3.55

V. DISCUSSION

The aims of this study were to investigate the affective commitment of employees, as well as the relationship between job demands, job resources and affective commitment. The results showed that participants experience a level of affective commitment above the national norm. Affective commitment was best predicted by job resources while job demands showed a weak relationship with affective commitment. The results of this study confirmed that job resources, namely skill variety, task significance and task identity, are positively related to affective commitment, and that job demands (overload) are negatively related to affective commitment.

The results of this study further showed that job demands were not significantly related to the engagement of participants. Therefore, the first hypothesis of the study is accepted. Job demands, such as high physical demands, quantitative workload and emotional workload, did not play a significant role in terms of the affective commitment of participants. It seems that employees will be more attached in their organization if the necessary job resources, such as organisational support and growth opportunities, are provided, regardless of the level of job demands. Hakanen, Bakker & Demerouti (2005) showed that if job demands increase with a lack of increase in job resources, it will have a negative effect on the affective commitment levels of employees.

Fifty-one per cent of the variance in affective commitment of participants in this study was predicted by organisational support and growth opportunities. These results also support the second hypothesis of this study, namely that job resources predict the affective commitment of employees. However, two job resources, namely skill variety and task significance, appear to play a significant role in terms of the affective commitment of employees. Growth opportunities in a job, such as variety, learning opportunities and autonomy,

play an intrinsic motivational role by fostering the employees' growth, learning and development. Task identity plays an extrinsic motivational role by being instrumental in achieving work goals (Schaufeli & Bakker 2004). An increase in job resources will increase the overall affective commitment level of employees. A work environment that offers resources will foster the willingness of the employee to dedicate his or her efforts and abilities to the work task.

In order for employees to experience high physical and mental energy and high levels of enthusiasm, pride and challenge in their work to attain work goals, the organisation must increase the level of job resources, growth opportunities, social support and advancement opportunities (Bakker & Schaufeli 2004; Hackman & Oldham 1980). When job resources are lacking, employees might find it difficult to cope with high job demands. This might result in turnover intentions, as employees will tend to defend themselves against the absence of resources. It is therefore important that the organisation provide employees with the necessary resources and a healthy work environment.

VI. CONCLUSIONS

The aim of the study was to analyse the relationship between job demands, job resources and affective commitment. The adopted measures of this study have shown remarkable level of reliability as shown in Table I. two hypotheses were developed; both of them were supported. Based on the findings of the study, the job resources have a significant relationship with affective commitment. In addition the proposed second hypothesis of job resources and affective commitment is also supported, which means there was a significant relationship between job resources and affective commitment. Finally, job demands, job resources and affective commitment have shown very significant relationship between them.

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The Art of Designing and Producing Product for Facing Global Challenges: A Study on Toyota Production System

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Abstract:

The purpose of this paper is to analyze the quality efforts made by Toyota and suggests appropriate strategic options to face global challenges and improve its problems. In order to do this a description of the quality theories used by automobile industry, such as the Toyota Production System (TPS), Kaizen, Just-in-Time (JIT), etc. has been discussed. The business world today is a very vast one and the management of many companies is looking out for ways in which it can make business more consumer oriented, secure a steady market outlet and steady supply of raw materials, increase consumer confidence, improve financial results, improve the working environment and emerge as superiors by designing and producing products and services over their competitors. Consumers today do not only want the right amount of a product or service but also look out for the right quality. Mindful of the above and a lot more, in this paper recommended some strategy to improve the quality problem of the Toyota keep in mind the quality tools and efforts has been used previously.

Key Words: Customer Satisfaction, Lean Production, Quality, Quality Management, Toyota Production System (TPS),

1. Introduction

In recent decades, although many companies have adopted management techniques to enhance their competitiveness, some of them realized the essential value of applying total quality management, a manufacturing management technique, to obtain and sustain competitive advantage, as well as support long-term success from customer needs to customer satisfaction. As a result, there is an accelerating interest in quality and quality improvements as a business strategy among the industries in the world. For instance, Toyota is always paying significant attention on operational excellence as a strategic weapon.

1.1. Purpose and Execution

The purpose of this report is to analyze the quality efforts made by Toyota and suggest appropriate strategic options to improve their problems. In order to do these firstly, introduce the history and growth of Toyota; Secondly, make a description of the quality theories used by the automobile industry, such as the Toyota Production System (TPS), Kaizen, as well as, Just-in-Time (JIT). The following step of the analysis will be to find out what and how quality tools have been adopted by Toyota on the basis of customer perspective, thirdly, explain the reasons why Toyota decided to use those quality tools, and the outcomes should also be taken into account. Finally, recommend some appropriate suggestions to improve the quality problem of the company.

1.2. Problem Definition

The Toyota Production System (TPS) has become a well-known philosophy, technology, and management tool, which were learned by many companies to achieve continuous improvement on production. According to Toyota, the heart of this system is human development, and it supports the elements of Total Quality Management from the following perspectives: people's needs (not only the customers', but also the employees') under the premise of quality efforts; and involving the quality into the production processes. In addition, it has a significant effect on the quality tools, such as Kaizen and Just-in-Time (JIT).

1.3. Company Background

Toyota, regarded as one of the world's largest auto manufacturers and widely recognized for its quality of products and production systems, can be traced back to 1867, while the inventor and a tinkerer, Sakichi Toyoda was born in a small village in present Kosai, Shizuoka, Japan. In 1926, he started Toyoda Automatic Loom Works, the parent firm of the Toyota Group. Nevertheless, Toyoda's car operations were placed in the hands of his son, Kiichiro Toyoda. It was the year of 1937 that Toyota Motor Co. was established as an independent and separate company.

Since the first Toyota Crown models imported in the USA in 1957, Toyota started its international business. In the early 1960s, Toyota was sold in Europe. In addition, the company increased its business rapidly in the 60's and 70's, and during the years between 1962 and 1972 it produced vehicles domestically from 1 million to 10million (Toyota Motor Corporation, 2009).

The essence of success for Toyota was its astounding quality reputation with continuous process improvements. The company first caught the world's attention in the 1980s, when it became clear that there was something special about Japanese quality and efficiency. During the 1990s, Toyota began to branch out from producing mostly compact cars by adding many larger and more luxurious vehicles to its lineup. Furthermore, today Toyota is far more profitable than any other auto manufacturer with global vehicle sales of over six million cars per year in 170 countries (Linker, 2004).

2. Literature Review

2.1. Quality

Quality is the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs

ISO 8402, ISO 9000(Gustafsson, 2009)

2.2. Satisfaction

Finding new customers are more expensive than managing old ones. By fulfill customer needs and keeping them satisfied, customers are more likely to buy products from the same company in the next purchase situation. (Boles, Braksdale, & Johnson, 1997).

2.3. Kaizen

Kaizen consist of the Japanese word kai, which means change and zen meaning good. In other words, Kaizen can be describe as changing for the better (Bergman & Klefsjö, 1995) or the action to correct if the word is translated from Chinese(World Class Manufacturing).

Kaizen - Table 1

改	Kai
善	Zen

The Kaizen philosophy is to improve the quality and the process by small every day changes. Instead of the common western do-not-fix-if-it-not-broken philosophy, Kaizen stresses that everything can be made better, even if it is not broken. Kaizen should be continues process that involves everyone from the workers to top management and involves two steps:

- Analyze problems; and Generate solutions

2.4. Just in Time (JIT)

JIT is a manufacturing approach that aims to reduce over-production, queues, bottlenecks, excess transport and buffer inventory. The process intentions are to improve all performance variables such as cost, speed, durability and flexibility. Traditional systems isolate the system from the environment; JIT strives to create close liaisons with suppliers. JIT also stresses that the workforce can contribute to improve a process. Encouraging personal responsibility and process ownership from a multi-skilled workforce that proactively seeks solutions to problems can lead to more standardized production designs. JIT also involves creating effective plant layouts, reduction of set-up times, and eliminate places where inventory can be lost. The JIT technique is preventative rather than reactive maintenances. (Oxford Dictionary of Business, 2002).

2.5. 5S

According to (Gustafsson, 2009) the 5S strategy consist of five different steps; sort, set in order, shine, standardize, and sustain. By reducing time waste such as searching for missing parts or locating tools an operating time of a process can be reduced. The first step, sort, is to remove all unneeded tools, parts and supplies from the working area. When all unnecessary components are removed the remaining parts, tools etc., are sorted and given their own place (set in order). This will improve the process by reducing the employees search time for different items. The next step is shine, which simply means cleaning the working area. Constantly cleaning and putting things back in place obtain the two first steps. The fourth step is to standardize the process and create routines and methods for cleaning and sorting. These methods and routines should continuously be improved to smooth the work process. For example, tools and parts that are used often should be placed so they can be easily accessed. The final step is to sustain the 5S

improvements, the processes should be controlled and maintained in order to create a habit and the methods and routes should continually be improved. The 5S strategy also involves eliminating hazardous or dangerous conditions in the working area. (Gustafsson, 2009)

2.6. Lean production

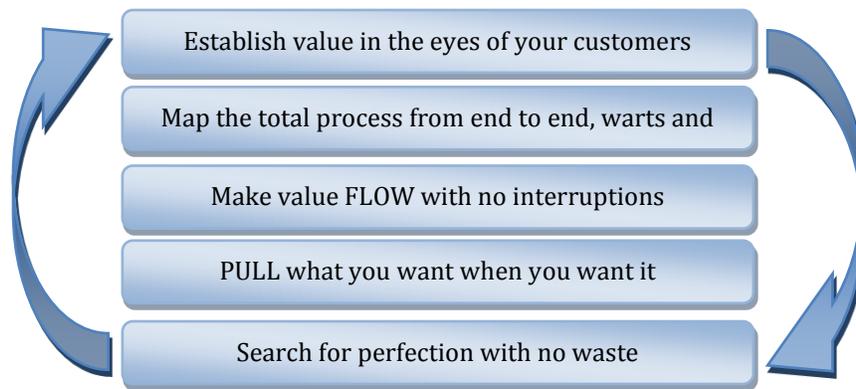
“All we are doing is looking at the time line; from the moment the customer gives us an order, to the point when we collect cash. We are reducing that time line by removing the non-value-added wastes.”

Taiichi Ohno (Gustafsson, 2009)

Lean production (lean thinking) or Toyota Production System (TPS) is a modern management philosophy, is a process-focused production system with the purpose to reduce waste. The aim is to eliminate all non-value adding processes in the production. By reducing defective equipment, overproduction, loose inventories, time-motion lags, over-processing, over staffing, delivery issues, unreasonable floor space, surplus and material leftovers, quality losses, etc., the definitive idea is to reducing lead-times, improving quality, lowering production costs and thereby improving the results (World Class Manufacturing).

All processes have some kind of waste and therefore the lean thinking philosophy can be adopted and applied to other business operations in the manufacturing sector. In all places where wastes can be found the lean thinking approach can be developed and for that reason the whole process chain can be improved (World Class Manufacturing).

Lean Principles – Figure 1



(Gustafsson, 2009)

2.7. Six Sigma

If a system delivers a product with 99 percent accuracy, it will fail to deliver 10,000 units out of a million. The Six Sigma approach is an improvement program that aims for creating a process where the distance between the process average and the nearest tolerance limits should be at least 6σ (Bergman & Klefsjö, 1995). Statistically this means the six sigma approach aims to achieve a quality of only 3.4 units. Out of a million deliveries only 3 or 4 units would be defective using the Six Sigma approach (Lovelock, Wirtz, & Singh Bansal, 2008).

Before, Six Sigma was only used to reduce defective units in a production, but today this approach has evolved to an overall business improvement tool (Lovelock, Wirtz, & Singh Bansal, 2008).

“Six Sigma is a comprehensive and flexible system for achieving, sustaining and maximizing business success. Six sigma is uniquely driven by close understanding of customers’ needs, disciplined use of facts, data and statistical analysis, and diligent attention to managing, improving, and reinventing business processes.”

(Pande, Neuman, & Cavanagh, 2000)

The Six Sigma model can be used in two different strategies. The first strategy is process improvements where the delivery processes are enhanced by identifying and eliminating the cause for the problems. If the problem can be identified or the cause cannot be eliminated, the second strategy has to be used, namely process design/redesign. This strategy works as a supplement to the process improvement strategy and instead fully addresses the root of the problem by redesigning the process (Lovelock, Wirtz, & Singh Bansal, 2008). The different steps in both strategies are shown in the Table 2 below.

Six Sigma - Table 2

	Process Improvement	Process Design/Redesign
Define	<ul style="list-style-type: none"> Identify the problem Define requirements Set goals 	<ul style="list-style-type: none"> Identify specific or broad problems Define goal/change vision Clarify scope and customer requirements
Measure	<ul style="list-style-type: none"> Validate problem/process Refine problem/goal Measure key steps/inputs 	<ul style="list-style-type: none"> Measure performance to requirements Gather process efficiency data
Analyze	<ul style="list-style-type: none"> Develop causal hypothesis Identify root causes Validate hypothesis 	<ul style="list-style-type: none"> Identify best practices Assess process design Refine requirements
Improve	<ul style="list-style-type: none"> Develop ideas to measure root causes Test solutions Measure results 	<ul style="list-style-type: none"> Design new process Implement new process, structures, and systems
Control	<ul style="list-style-type: none"> Establish measures to maintain performance Correct problems as needed 	<ul style="list-style-type: none"> Establish measures and reviews to maintain performance Correct problems as needed

(Lovelock, Wirtz, & Singh Bansal, 2008)

3.0 Implementation

The success of Toyota comes from its culture; Toyota is one of those companies who think for the long term, continuously solving the origin of the problem, improve its employees and have a process of solving the problem. Toyota Production System (TPS) was created to make profits by achieving employee empowerment, customer loyalty and a very strong chain with suppliers. We are going to describe more about the Toyota Production System (TPS) and its effects on empowering Toyota's employees using very successful human resource management, continuous improvement, and innovation (Carreira, 2005).

3.1. Toyota Production Systems (TPS)

TPS or Toyota Production System is designed to get rid of waste (muda), inconsistency (mura), and overburden (muri). The process of production should be flexible without stress "muri" and creates less "muda" and achieves the goals easily without obstacles.

The Toyota Production System is based on two concepts, Just-in-Time (JIT) and Jidoka. Before talk about JIT, first need to explain Kaizen philosophy. The Kaizen philosophy is drawn from the Japanese word kai, which means "continuous" and zen meaning "improvement" or "wisdom". The Kaizen management philosophy therefore, is defined as making "continuous improvement"—slow and incremental but constant (Kaizen, 2000). Toyota used Just-in-Time system to reduce waste and improve overall customer value. JIT is a way of working and means producing the necessary items in necessary quantities at the necessary time. Toyota achieved very low storage of inventories by reducing the waste, which in turn reduced the cost of production and simplified the production process. Waste has been identified as anything that does not create added value in the process of the production. Toyota has identified seven kinds of waste which are: 1) over-production, producing earlier or more than is needed this generates other waste such as overstaffing, storage, and transportation costs because of excess inventory, 2) motion, any motion employees have to perform during the course of their work other than adding value to the part, such as reaching for, looking for, or stacking parts, tools, etc., walking is also a waste, 3) waiting, (workers being idle and waiting other workers to pass them the items is considered waste), 4) conveyance, 5- processing

(waste of spending more time in a process than necessary), 6) inventory such as physical inventory or a queue of information, excess raw material, work in progress (WIP), or finished goods causing longer lead times, obsolescence, damaged goods, transportation and storage costs, and delay. Also, extra inventory hides problems such as production imbalances, late deliveries from suppliers, defects, equipment downtime, and long setup times, and 7) Correction, production of defective parts or correction. Repairing or rework, scrap, replacement production, and inspection means wasteful handling, time, and effort. JIT also reduces the total time spent on production activity and non-business work in addition to problem clarification.

Suppliers play a crucial role in implementing the JIT system in Toyota. Toyota has very strong relationships with their suppliers, which gave Toyota many benefits in relation to building valuable production chains through understanding their work, providing them with solutions for technical problems, providing them with the intensive, selective information, and conducting joint improvement activities – exchange best practices and trigger kaizen initiatives at the supplier's site (Liker, 2004).

3.2. Jidoka (automation with a human touch)

Jidoka means building in quality as you produce the material, being “mistake proofing.” It also refers to designing operations and equipment so your workers are not tied to machines, and are free to perform value-added work (Liker, 2003). In other words, never letting a defect pass into the next station and freeing people from machines— automation with a human touches (Liker, 2003). So workers must solve the problems immediately to resume production. Jidoka is a culture that says stop to fix problems to deliver the quality right the first time. As an example of implementing Jidoka in Toyota, risk of shutting down production in order to surface problems and challenge team members to solve them is done. Inventory hides problems and reduces the urgency to solve them. The Toyota Way is to stop and address each problem as it is exposed (Liker, 2003).

3.3. Employee Empowerment

The quality is employee oriented more than product oriented; Toyota's managers give every employee in the company opportunity to implement their ideas and suggestions in the work which leads to employee loyalty and job satisfaction, this empowerment includes suitable training to the employees and working in teams to achieve the assigned mission. This team is headed by a leader and managers are going to change the system accordingly if a change may contribute in achieving the company's seven goals which are saving time and cost of the job, making the job easier, safer and more productive, improve the quality, remove drudgery and nuisances.

3.4. The Relation with Suppliers

Toyota bases their relation with suppliers on long-term relation, good price, study demand, and minimal paper work, for example using emails and electronic means. On other hand, the suppliers have an obligation towards the company, like deliver zero-defect components, on time delivery, and be a part to its customer's business.

4. Reasons for Development (Toyota Initiative to face Global Challenges)

Prior to their success in the automotive industry Toyota Motors faced many daunting challenges imposed by government ruling after World War II, the economic state, and general lack of instability in fledgling industries. During this time products that were originating from Japan were considered synonymous with poor quality. However, governmental agencies pushed forth programs to increase countrywide competences by supporting cottage industries that would eventually blossom into something of considerable size. Increasing quality and production sizes became one of the primary goals for the country and unquestionably for Toyota Motors.

4.1. Increase Quality

Although, research on improving quality can be traced back to turn of the century, Japan's domination – more formally Toyota's, began after World War II when the need for trucks by the American military was in great demand to aid in rebuilding the country. However, with the ongoing economic state waning due to inflation and worthless currency pervading the market, “cash flow became so horrendous that at one point in 1948 Toyota's debt was eight times its total capital value” (Liker, 2003). After observing American carmaker Ford Motor Co. and their famous production line in 1930 Eiji Toyoda, one the founding family members, along with several managers placed an intimidating challenge on Taiichi Ohno to develop a system that would emulate that of the Ford mass production process. The system had to be customized for the Japanese market and produce cars that met the small demand. In 1950 when Eiji Toyoda along with his cohorts again returned for a 12-week tour of American facilities they realized that many processes within these facilities created unneeded movement with inherent defects within production. Noting this aspect, Toyoda found an opportunity to make this existing system better, more stream-lined, which would inevitably lead to the rise of Toyota.

Seeing that the production lines at Ford Motor Co. were highly inefficient Toyota set out to “streamline” their production based on the continuous flow created by Ford’s production line, and make sure that these resulting processes with their accompanying philosophies were upheld to the highest degree. As stated in (Liker, 2003)’s book *Toyota Way*:

“Toyota did not have the luxury of creating waste, it lacked warehouse and factory space and money, and it didn’t produce large volumes of just one type of vehicle. But it determined it could use Ford’s original idea of continuous material flow (as illustrated by the assembly line) to develop a system of one-piece flow that flexibly changed according to customer demand and was efficient at the same time.”

So the rise of the Toyota Production System (TPS), to fully answer and the American problems that arose from their respective mass production practices. After years of observing their own processes, executing planned actions, and then observing again, TPS has become a formidable process that enables Toyota to be successful.

4.2. Increase Customer Centric Activities

Toyota not only wanted to focus on quality improvement by adhering to their production methods, but the organization also saw that the customer was a priority; which is another primary reason for the development of TPS. Customer needs from end user to supplier management were all deemed by Toyota as important links within the chain. The teachings of W. Edwards Deming through seminars across Japan had prominent influence in the TPS ideology and were deeply interwoven in the principles. Deming’s philosophies are arguably one of the reasons why TPS became such a marveled process that would be emulated the world over. “Each person or step in a production line or business process was to be treated as a ‘customer’ and to be supplied with exactly what was needed, at the exact time needed” (Liker, 2003). Learning this aspect Toyota followed Deming’s ideas where customers are considered the main driving force for business, and therefore is met with competence that foregoes all expectations by all persons within the company. This indefinitely initiated a phenomenon heralded in the business world.

“When Ohno and his team emerged from the shop floor with a new manufacturing system, it wasn’t just for one company in a particular market and culture. What they had created was a new paradigm in manufacturing or service delivery— a new way of seeing, understanding, and interpreting what is happening in a production process, that could propel them beyond the mass production system”

(Liker, 2003).

4.3. Answer to a Faltering Economy

In 1973 the oil-crisis was in full swing and many companies were hit by the faltering economy. The global recession had engulfed many countries, as well as, Japan who was the hardest hit. Industries within the country saw a drastic decline forcing many to pack their bags and leave the market. Toyota too was not immune to such an instance; however, although they were seen to display the same negative effects, the implemented processes and philosophies of TPS allowed them to recuperate and make a profit faster than their counter parts (Liker, 2003).

From these instances, Toyota learned that their TPS system was a powerful business tool that enabled them to overcome many odds. The organization also enabled them to tweak aspects that did not perform properly. However, the 1990s again saw the challenge of TPS when many manufacturers lost a strong foothold in the market. This decade saw the downsizing of many firms, lay-offs of employees, inventory reduction, and the usage of practices that were deemed the best just to survive. Japan as a whole including Toyota saw:

1. late restructuring
2. late off-shore outsourcing
3. late learning and implementation in production
4. late deliveries from supplier
5. with the general stockpiling of inventories

The latter was indicative of the digression of JIT/lean philosophies once valued from manufacturing. Nevertheless, Toyota was able to adapt to the situation, change their current processes to answer the volatile economy, and come out on top once more. Their ability to carry out various production runs at the same time on the same production line due to their standardization efforts allowed them to be flexible, and mold their output to the demands of the market. This ability to develop, to be flexible, and pattern their business model to any economic situation that transpires is the reason why the Toyota Production System is so successful. The derivative of this system

today, though still evolving, is powerful enough to answer many challenges, is one of the reasons why TPS has evolved to such a high complex state, and is the rationality behind for their current market dominance (Schonberger, 2007).

5. Outcome-Continuous Improvement

5.1. Toyota Production System (TPS), A Lean Way

By continuously monitoring the processes and developing them as needed, Toyota and its TPS are in a constant state of flux. Observances carried out by employees allow Toyota to improve and evolve their systems into *leaner* more efficient ones. Buttressed by a corporate-wide culture, having all employees identify where errors occur allow this corporation to grow progressively.

One of the main facets that TPS instills in the production of Toyota's cars is that efficiency is the overruling factor that dictates how processes should be done. Through the use of the adopted practices within TPS and the efficient environments that it creates, Toyota Motors has created a system that is tried and true to the goals it sets for itself. (Teresko 2006) states in his article, "Toyota's per-vehicle time: 27.9 hours compared with Ford and Chrysler at 37 and 35.9 hour respectively" was a decrease of 5.5% from 2003 to 2004. Comparatively, this is 2.2% higher relative to its competitors, which is an indicator that the current status of TPS is properly managing the production runs and achieving its primary objectives.

5.2. KAIZEN

Inherently the costs associated with all of its production runs compared to its competitors and even by its own standards are reduced. Waste or "muda" stemming from the Kaizen ideology is eliminated, thereby removing any additional overhead that may be incurred. Every aspect of the production run is calculated, managed, and executed with precision that in a holistic sense makes a system that is truly efficient. Suppliers are kept close, according to (Dyer 1994) at an average of 140km, which essentially reduces time of deliveries, inherently equating to lower cost. The fact remains "that as the distance between suppliers' and automakers' plants decreases, automakers' inventories as percentage of sales also decrease" (Dyer 1994). Furthermore, "trimming the excess fat" during its production processes make for a well balance system that can readily be modified to fit certain production variants. This allows for faster change over times required to produce different models, and in the long run again reduce the costs associated with them.

According to Masaaki Imai, the author of "The Key to Japan's Competitive Success", it is the Kaizen that leads to the success of Toyota. The successful implementation of Kaizen has helped Toyota to eliminate the producing time and waste of materials, improve the operation process and the quality level of products, as well as inspire the employees. (Imai 1986)

5.3 - Just-in-Time (JIT)

Just-in-Time (JIT) delivers the right items at the right time in the right amounts. The power of JIT is that it allows you to be responsive to the day-by-day shifts in customer demand, which was exactly what Toyota needed all along.

(Liker J., 2004).

Toyota Motors have increased their interaction with subordinates, as well as, suppliers knowing that one of the key elements to properly practice JIT is communiqué. Upper management within all divisions thoroughly communicates their ideas to subordinates, which is supported by (Teresko 2006) who states "Toyota recognizes that fulfilling the enterprise potential of TPS requires a substantial cultural shift toward collaboration and continuous improvement, both internally and externally.

This factor is further developed by the inclusion of suppliers into their system. Suppliers are implemented into the supply chain so that new parts can be delivered on time, every time, and in the right amount. In this open relationship, networking between Toyota Motors and its providers are completely interwoven where suppliers know the exact levels of supplies at a certain point in time, and will deliver more stock when levels dip below a set threshold. Indeed this reduces waiting time for delivery and creates a continuous flow of work that is uninterrupted substantiating the established goal of sales to the market and veritably increasing their profit margin. Toyota Motors favors this perspective so much that when they opened their new \$800M production facility in Texas it included 21 facilities in the surrounding park where important suppliers are located and time of delivery can be kept at a minimum (Teresko 2006).

Furthermore, the exchange of ideas is again strengthened by implanting engineers from their suppliers among in-house automotive engineers in their design facilities and vice versa. Toyota Motors therefore creates a setting where the exchanging of ideas can easily flow between the two entities. Development of new models, in addition to, reprimanding problems that may arise can therefore also be proficiently solved. By increasing face-to-face contact, Toyota Motors has found that a humanistic effect occurs and issues can be rightfully dealt with since these problems are not depicted as automaton issues. Unequivocally, this increases the speed of cycle times in processes and improves quality in terms of services and end product (see Appendix, Figure 2). Research has found that "Toyota

engages in an average of 7,235 man-days of face-to-face contact per year with supplier,” which supports this idea. Further buttressing this fact “roughly 20% of the top managers (*yakuin*) at Toyota’s affiliated suppliers are former Toyota employees, and these individuals help supplier coordinate with Toyota” (Dyer 1994).

5.4 - Customer Satisfaction

“The degree of customer satisfaction is the ultimate measurement of quality. It is always the customers who judge the quality of goods or services, and the quality of our end products is determined by the external customers.”¹

(Bergman, B. & Klefsjö, B., 2008).

In recent years, many companies rate customer satisfaction as their top priority with a carefully designed customer satisfaction framework. Toyota is not an exceptional one, either. Since the foundation, the company always put the customers in the first place. It also has a large ongoing customer survey system which can obtain the information about the buying processes and experiences of delivery, service and product quality of customers at the first hand. (Bergman & Klefsjö 2008) In addition, Toyota set Customer Relations Division to deal with the information about customers’ complaints and expectation directly collected through questionnaires, telephone calls and quality reports or other form documents from dealers, as well as, the information from third party, such as consulting companies or studying institutes.

Due to the continuous efforts on three groups of customer needs (basic, expected and excitement needs), Toyota has achieved quite a lot of rewards and customer satisfaction on some extent, as well as, gained powerful brand name with good reputation for quality efforts among the people in the world. According to Yonkers, New York-Toyota Prius Topped Consumer Reports of "Most Satisfying Vehicles" customer satisfaction survey, 94% of respondents said that they would definitely buy one again. Furthermore, according to the J.D. Power Asia Pacific 2008 Philippines Customer Satisfaction Index (CSI) StudySM, Toyota ranked the highest in customer satisfaction with authorized dealer after-sales service in the Philippines with an overall score of 843, while the score of Ford was 841. (Source: J.D. Power Asia Pacific 2008 Philippines Customer Satisfaction Index (CSI) StudySM).

6. Discussion

6.1. What Toyota Used?

Using Kaizen in Toyota made a huge difference in relation to cost management; its effects are very significant in increasing production efficiency and add harmonization to the work. By implementing Kaizen in Toyota, Toyota could reduce the working hours by eliminating waste of time. In addition, kaizen encouraged good human relations on which TPS is based. JIT is powerful because it drives out unnecessary cost and helps detect problems that cause waste. Jidoka is the response to problems.

JIT is relatively easy to implement, but without the mechanisms of jidoka in place to support it, JIT quickly erodes, and the waste finds its way back in. When JIT and jidoka work together, they form the engine of kaizen that drives your system to get better every day.

6.2. Reasons

The successive trials of TPS through the years saw the evolution of a process that is regarded as world-class and a top business model to behold. Many corporations try to emulate this process, but fail to fully attain the essence of TPS due to not fully grasping the concepts and ideologies proposed by the system. TPS is an answer to the question of how Japan can rise above the chaos of war and overcome an economy in turmoil. TPS became a force to be reckoned with during the latter part of the century since it has stood ground against trying times and has increased its effectiveness through learning collectively from these experiences.

It is obvious to the outside observer that the main reason why the Toyota Production System was developed was to increase the efficacy of existing productions processes within the Japanese market. With influence drawing from American business models and teachings as the basis for the planned strategy, TPS has compellingly achieved this as can be seen by present day’s company status. The Toyoda family set out to create a car brand that was comparable to American brands, with the intent to efficiently produce according to the Japanese market, and they have. While doing this they seized an opportunity identified from observing their counterparts abroad. Mistakes and flaws were improved under the new philosophies derived and reinforce by strict abidance by each member of the organization.

Not only was quality an issue that was seen to need improvement, but the customer aspect is also a great part of the reason for such a remarkable change. Through the teachings of Deming, who even today is considered one of the gurus of quality and productivity, Toyota had harnessed an aspect that was not seen before within the industry. Deming had taught that a customer-centric dogma, which previously did not encompass any aspect of the production except for the end user, was crucial to the success of any system. By treating every person involved as a customer, proper results could be attained reducing the slack experienced during mechanistic transactions that most organizations migrate towards when processes become familiar and managers become complacent. Following Deming's theories created a win-win situation both for Toyota and for its suppliers.

TPS was also a derived answer for the economic plight that was ensuing during its inception and progression through World War II, the 1970s, and later on in the 1990s. Not only did it unintentionally provide Toyota an instance to truly test the capabilities of the processes implemented, but allowed for gathering of knowledge used to make the system better. From the instability experienced during these times, TPS evolved into a more "leaner" system. The inherent aspect of monitoring and changing according to environment further places TPS in the higher echelons of business models. The system displays all the characteristics of a learning system, or rather a learning organization as a whole depict by (Morgan, 2006) in his book, *Images of Organization*. By ingeniously including this open ended learning capability into TPS, the architects that conjured the plan demonstrated another reason for TPS's successfulness – long-term sustainability.

6.3. Outcomes

Toyota considers the human asset a priority, and places a lot of quality efforts to assure that its employees are well trained and work in a pleasing environment, as well as enhance the customer satisfaction constantly. Due to the Toyota Production System (TPS), Kaizen and Just-in-Time, the company has managed to create a continuous flow in its production line. From raw materials to finished product, every niche has been analyzed, monitored, and developed to assure the corporation that a continuous flow of production takes place. In addition, its suppliers are kept close to main production facilities to reduce time of delivery, readily know what these facilities need in terms of parts, and when they are needed.

Nevertheless, as the new system or quality tool has been introduced, there would definitely come up with some changes and problems to the company, furthermore, a successful innovation could not keep the company profitable permanently. In addition, the powerful competitors and changes on customers' preferences or tastes should also be taken into account. Therefore, due to these facets, Toyota should summarize its successful experiences, learn from the mistakes during the past years' efforts, and obtain the sustainable competitive advantage from the customer perspective with continuous innovation on quality as well in order to present a better performance for the future development.

7.0 Conclusion

Toyota Motor Company is a world-class company that represents quality through their products and efficiency through their production. The organization has mastered the art of designing and mass-producing vehicles for the global market. Toyota's achievements in philosophy, management, including the processes involved, have been emulated by organizations around the world that seek a competitive edge within their industries. Through their tried and true methodology, Toyota Motor Company has achieved dominance within the automotive industry, and is now considered the world's largest automaker. Their present status grew from a humble beginning in the 1930s, and has evolved into what it today through research, perseverance, and rigorous abidance of philosophies is learned.

The Toyota Production System (TPS) has grown from several methods used in management, which have been analyzed and scrutinized through research and execution. Comprised of various constituents of kaizen, JIT, 5S, Lean Production, and Six Sigma with the inclusion of an open-ended format for learning, this management system has been tested in real world situations and has repeatedly overcome any obstacles. It is a system that is constantly evolving to meet current demands of the market, assuring Toyota Motor Company that their customers from suppliers to end users will always be content of the service and products they receive.

Fujio Cho, the President of Toyota Motor Corporation questioningly stated in (Liker J. , 2003)'s book:

"We place the highest value on actual implementation and taking action. There are many things one doesn't understand and therefore, we ask them why don't you just go ahead and take action; try to do something? You realize how little you know and you face your own failures and you simply can correct those failures and redo it again and at the second trial you realize another mistake or another thing you didn't like so you can redo it once again. So by constant improvement, or, should I say, the improvement based upon action, one can rise to the higher level of practice and knowledge."

This statement inclines that the underlying values of Toyota Motor Corporation are based on trial and error, which have formidably allowed the organization to evolve and pattern itself for any demand it meets. It is the number one facet that has allowed Toyota Motor Corporation to rise above and overshadow its competitors. Furthermore, this concept has allowed Toyota to be more customer-centered creating close relationships that are long lasting and many times crucial to production. Not only is creating and keeping close relationships important to Toyota Motors, but keeping these relationships physically close allows for a more efficient affiliation. Likewise, allowing interspersions of employees within the rankings of its department from their affiliates and vice versa allows for a resourceful way of collaboration and exchanging of ideas.

However, is such a superlative methodology whose almost every aspect has been scrutinized for perfection fallible? Is there a situation that is so complex and dire that even this system cannot handle the negative interjections it imposes on the market? Only time can tell if this process is capable of handling such an event, but with knowledge about the ingenuity of the system, it would be very hard.

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Separation Axioms on $(1,2)^*$ - R^* -Closed Sets in Bitopological Space

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Abstract- In the present paper, we introduce and the concept of $(1,2)^*$ - R^* - T_i -space (for $i = \frac{1}{2}, 0, 1, 2$) and we discuss some of their basic properties.

Index Terms- $(1,2)^*$ - R^* - $T_{1/2}$ -space, $(1,2)^*$ - R^* - T_0 -space, $(1,2)^*$ - R^* - T_1 -space, $(1,2)^*$ - R^* - T_2 -space.

Mathematical Subject Classification: 54D10

I. INTRODUCTION

An elaborate study on generalized closed sets were done by researchers after Levine [7] introduced this concept in 1970. The concept of regular continuous functions was introduced by Arya S. P. and Gupta R [1]. Regular generalized continuous functions was studied by Palaniappan N. and K.C. Rao [8]. C. Janaki and Renu Thomas [4] introduced $(1,2)^*$ - R^* -closed sets in bitopological spaces.

The purpose of this paper is to introduce and study $(1,2)^*$ - R^* -separation axioms in bitopological spaces.

II. PRELIMINARIES

Throughout this paper, X and Y denote the bitopological spaces (X, τ_1, τ_2) and (Y, σ_1, σ_2) respectively on which no separation axioms are assumed.

Definition 2.1: A subset A of X is called $\tau_{1,2}$ -open[1,4] if $A = A_1 \cup B_1$, where $A_1 \in \tau_1, B_1 \in \tau_2$. The complement of $\tau_{1,2}$ -open set.

Definition 2.2: A subset A of a bitopological space X is

- 1) $\tau_{1,2}$ -closure[5] of A denoted by $\tau_{1,2}$ -cl(A) is defined as the intersection of all $\tau_{1,2}$ -closed sets containing A .
- 2) $\tau_{1,2}$ -interior[5] of A denoted by $\tau_{1,2}$ -int(A) is defined as the union of all $\tau_{1,2}$ -open sets contained in A .
- 3) $(1,2)^*$ - regular open[10] if $A = \tau_{1,2}$ -int ($\tau_{1,2}$ -cl(A)) and $(1,2)^*$ -regular closed[10] if $A = \tau_{1,2}$ -cl($\tau_{1,2}$ -int(A)).

Definition 2.3: A subset A of a bitopological space (X, τ_1, τ_2) is called $(1,2)^*$ -regular semi open[9] if there is a $(1,2)^*$ -regular open set U such that $U \subset A \subset (1,2)^*$ -cl(U). The family of all $(1,2)^*$ -regular semi open sets of X is denoted by $(1,2)^*$ -RSO(X).

Definition 2.4: The union of all $(1,2)^*$ -regular open subsets of X contained in A is called $(1,2)^*$ -regular interior of

A and is denoted by $(1,2)^*$ -rint(A) and the intersection of $(1,2)^*$ -regular closed subsets of X containing A is called $(1,2)^*$ -regular closure of A and is denoted by $(1,2)^*$ -rcl (A).

Definition 2.5: A subset A of (X, τ_1, τ_2) is called $(1,2)^*$ - R^* -closed[4] if $rcl(A) \subset U$ whenever $A \subset U$ and U is $(1,2)^*$ -regular semi open in (X, τ_1, τ_2) . The complement of $(1,2)^*$ - R^* -closed sets is $(1,2)^*$ - R^* -open set [4]. The family of all $(1,2)^*$ - R^* -closed subsets of X is denoted by $(1,2)^*$ - R^* -C(X) and $(1,2)^*$ - R^* -open subsets of X is denoted by $(1,2)^*$ - R^* -O(X).

Definition 2.6: A function $f : (X, \tau_1, \tau_2) \rightarrow (Y, \sigma_1, \sigma_2)$ is called

- 1) $(1,2)^*$ -continuous[6] if $f^{-1}(V)$ is $(1,2)^*$ -closed in (X, τ_1, τ_2) for every $(1,2)^*$ -closed set V in (Y, σ_1, σ_2) .
- 2) $(1,2)^*$ - R^* -continuous[4] if $f^{-1}(V)$ is $(1,2)^*$ - R^* -closed in (X, τ_1, τ_2) for every $(1,2)^*$ -closed set V in (Y, σ_1, σ_2) .
- 3) $(1,2)^*$ - R^* -irresolute[4] if $f^{-1}(V)$ is $(1,2)^*$ - R^* -closed in (X, τ_1, τ_2) for every $(1,2)^*$ - R^* -closed set V in (Y, σ_1, σ_2) .

Definition 2.7: A map $f : (X, \tau_1, \tau_2) \rightarrow (Y, \sigma_1, \sigma_2)$ is called

- 1) $(1,2)^*$ -closed map[6] if $f(U)$ is $(1,2)^*$ -closed in Y for every $(1,2)^*$ -closed set U of X .
- 2) $(1,2)^*$ - R^* -open map[3] if $f(V)$ is $(1,2)^*$ - R^* -open in Y for every $(1,2)^*$ -open set V in X .
- 3) strongly $(1,2)^*$ - R^* -open map[3] if $f(V)$ is $(1,2)^*$ - R^* -open in Y for every $(1,2)^*$ - R^* -open set V in X .

Definition 2.8: A space X is said to be

- 1) a $(1,2)^*$ - T_1 -space if for any pair of distinct points x and y , there exists open sets G and H such that $x \in G, y \notin G$ and $x \notin H, y \in H$.
- 2) a $(1,2)^*$ - T_2 -space if for any pair of distinct points x and y , there exists disjoint open sets G and H such that $x \in G$ and $y \in H$.

III. $(1,2)^*$ - R^* SEPARATION AXIOMS

In this section, we introduce and study separation axioms and obtain some of its properties.

Definition 3.1: A space X is called a $(1,2)^*$ - R^* - $T_{1/2}$ space if every $(1,2)^*$ - R^* -closed set is $(1,2)^*$ -regular closed.

Theorem 3.2: A bitopological space (X, τ_1, τ_2) is $(1,2)^*$ - R^* - $T_{1/2}$ space if each singleton $\{x\}$ of X is either $(1,2)^*$ -regular open or $(1,2)^*$ -regular closed.

Proof: Let $x \in X$. Assume $\{x\}$ is not $(1,2)^*$ -regular closed, then clearly $(X - \{x\})$ is not $(1,2)^*$ -regular open and $X - \{x\}$ is trivially $(1,2)^*$ - R^* -closed set.

Since (X, τ_1, τ_2) is $(1,2)^*$ - R^* - $T_{1/2}$ space, every $(1,2)^*$ - R^* -closed set is $(1,2)^*$ -regular closed.

And hence $(X - \{x\})$ is $(1,2)^*$ -regular closed, and hence $\{x\}$ is $(1,2)^*$ -regular open.

Definition 3.3: A space X is said to be $(1,2)^*$ - R^* - T_0 -space if for each pair of distinct points x and y of X , there exists a $(1,2)^*$ - R^* -open set containing one point but not the other.

Theorem 3.4: A bitopological space (X, τ_1, τ_2) is $(1,2)^*$ - R^* - T_0 space iff for each pair of distinct points x, y of X , $(1,2)^*$ - R^* - $cl(\{x\}) \neq (1,2)^*$ - R^* - $cl(\{y\})$

Proof: Let x and y be distinct points of X . Since X is a $(1,2)^*$ - R^* - T_0 -space, there exists a $(1,2)^*$ - R^* -open set G such that $x \in G$ and $y \notin G$.

Consequently, $X - G$ is a $(1,2)^*$ - R^* -closed set containing y but not x . But $(1,2)^*$ - R^* - $cl(y)$ is the intersection of all $(1,2)^*$ - R^* -closed sets containing y . Hence $y \in (1,2)^*$ - R^* - $cl(y)$, but $x \notin (1,2)^*$ - R^* - $cl(y)$ as $x \notin X - G$.

Therefore, $(1,2)^*$ - R^* - $cl(x) \neq (1,2)^*$ - R^* - $cl(y)$.

Conversely, let $(1,2)^*$ - R^* - $cl(x) \neq (1,2)^*$ - R^* - $cl(y)$ for $x \neq y$.

Then there exists atleast one point $z \in X$ such that $z \notin (1,2)^*$ - R^* - $cl(y)$.

We have to prove $x \notin (1,2)^*$ - R^* - $cl(y)$, because if $x \in (1,2)^*$ - R^* - $cl(y)$, then $\{x\} \subset (1,2)^*$ - R^* - $cl(y) \implies (1,2)^*$ - R^* - $cl(x) \subset (1,2)^*$ - R^* - $cl(y)$

Then $z \in (1,2)^*$ - R^* - $cl(y)$, which is a contradiction.

Hence $x \notin (1,2)^*$ - R^* - $cl(y) \implies x \in X - (1,2)^*$ - R^* - $cl(y)$, which is an $(1,2)^*$ - R^* -open set containing x but not y . Hence X is a $(1,2)^*$ - R^* - T_0 -space.

Theorem 3.5: If $f: X \rightarrow Y$ is a bijection, strongly $(1,2)^*$ - R^* -open and X is a $(1,2)^*$ - R^* - T_0 -space, then Y is also $(1,2)^*$ - R^* - T_0 -space.

Proof: Let y_1 and y_2 be distinct points of Y . Since f is bijective, there exists points x_1 and x_2 of X such that $f(x_1) = y_1$ and $f(x_2) = y_2$. Since X is a $(1,2)^*$ - R^* - T_0 -space, there exists a $(1,2)^*$ - R^* -open set G such that $x_1 \in G$ and $x_2 \notin G$.

Therefore $y_1 = f(x_1) \in f(G)$, $y_2 = f(x_2) \notin f(G)$. Since f is strongly $(1,2)^*$ - R^* -open function, $f(G)$ is $(1,2)^*$ - R^* -open in Y . Thus there exists a $(1,2)^*$ - R^* -open set $f(G)$ in Y such that $y_1 \in f(G)$ and $y_2 \notin f(G)$. Hence Y is $(1,2)^*$ - R^* - T_0 -space.

Theorem 3.6: If $f: X \rightarrow Y$ be an injective $(1,2)^*$ - R^* -irresolute function and Y is $(1,2)^*$ - R^* - T_0 -space, then X is $(1,2)^*$ - R^* - T_0 -space.

Proof: Let x_1, x_2 be two distinct points of X . Since f is injective, there exists distinct points y_1, y_2 of Y such that $y_1 = f(x_1)$ and $y_2 = f(x_2)$.

Since Y is $(1,2)^*$ - R^* - T_0 -space, there exists $(1,2)^*$ - R^* -open set U in Y such that $y_1 \in U$ or $y_2 \notin U$.

ie. $x_1 \in f^{-1}(U)$ and $x_2 \notin f^{-1}(U)$

Since f is $(1,2)^*$ - R^* -irresolute, $f^{-1}(U)$ is $(1,2)^*$ - R^* -open set in X .

Thus for two distinct points x_1, x_2 of X , there exists $(1,2)^*$ - R^* -open set $f^{-1}(U)$ and such that $x_1 \in f^{-1}(U)$, $x_2 \notin f^{-1}(U)$.

Therefore, X is $(1,2)^*$ - R^* - T_0 -space.

Definition 3.7: A space X is said to be $(1,2)^*$ - R^* - T_1 -space if for any pair of distinct points x and y , there exists a $(1,2)^*$ - R^* -open sets G and H such that $x \in G$, $y \notin G$ and $x \notin H$, $y \in H$.

Theorem 3.8: If arbitrary union of $(1,2)^*$ - R^* -open space is $(1,2)^*$ - R^* -open then, a space X is $(1,2)^*$ - R^* - T_1 -space iff singletons are $(1,2)^*$ - R^* -closed sets.

Proof: Let X be $(1,2)^*$ - R^* - T_1 -space and $x \in X$. Let $y \in X - \{x\}$. Then for $x \neq y$, there exists $(1,2)^*$ - R^* -open set U_y such that $y \in U_y$ and $x \notin U_y$.

Implies, $y \in U_y \subset X - \{x\}$.

That is $X - \{x\} = \cup \{U_y : y \in X - \{x\}\}$, which is a $(1,2)^*$ - R^* -open set.

Hence $\{x\}$ is a $(1,2)^*$ - R^* -closed set.

Conversely, suppose $\{x\}$ is $(1,2)^*$ - R^* -closed set for every $x \in X$. Let $x, y \in X$ with $x \neq y$.

Now $x \neq y \implies y \in X - \{x\}$. Hence $X - \{x\}$ is $(1,2)^*$ - R^* -open set containing y but not x . Similarly, $X - \{y\}$ is $(1,2)^*$ - R^* -open set containing x but not y . Therefore, X is a $(1,2)^*$ - R^* - T_1 -space.

Theorem 3.9: If $f: X \rightarrow Y$ is strongly $(1,2)^*$ - R^* -open bijective map and X is $(1,2)^*$ - R^* - T_1 -space, then Y is $(1,2)^*$ - R^* - T_1 -space.

Proof: Let $f: X \rightarrow Y$ be bijective and strongly $(1,2)^*$ - R^* -open function. Let X be a $(1,2)^*$ - R^* - T_1 -space and y_1, y_2 be any two distinct points of Y .

Since f is bijective, there exists distinct points x_1, x_2 of X such that $y_1 = f(x_1)$ and $y_2 = f(x_2)$. Now, X being a $(1,2)^*$ - R^* - T_1 -space, there exists $(1,2)^*$ - R^* -open sets G and H such that $x_1 \in G$, $x_2 \notin G$ and $x_1 \notin H$, $x_2 \in H$. Since $y_1 = f(x_1) \in f(G)$ but $y_2 = f(x_2) \notin f(G)$ and $y_2 = f(x_2) \in f(H)$, $y_1 = f(x_2) \notin f(H)$.

Now, f being strongly $(1,2)^*$ - R^* -open, $f(G)$ and $f(H)$ are $(1,2)^*$ - R^* -open subsets of Y such that $y_1 \in f(G)$ but $y_2 \notin f(G)$ and $y_2 \in f(H)$, $y_1 \notin f(H)$. Hence Y is $(1,2)^*$ - R^* - T_1 -space.

Theorem 3.10: If $f: X \rightarrow Y$ is $(1,2)^*$ - R^* -continuous injection and Y is $(1,2)^*$ - T_1 -space, then X is $(1,2)^*$ - R^* - T_1 -space.

Proof: Let $f: X \rightarrow Y$ be R^* -continuous injection and Y is $(1,2)^*$ - T_1 . For any two distinct points x_1, x_2 of X , there exists distinct points y_1, y_2 of Y such that $y_1 = f(x_1)$ and $y_2 = f(x_2)$.

Since Y is $(1,2)^*$ - T_1 -space, there exists sets U and V in Y such that $y_1 \in U$, $y_2 \notin U$ and $y_1 \notin V$, $y_2 \in V$.

ie. $x_1 \in f^{-1}(U)$, $x_1 \notin f^{-1}(V)$ and $x_2 \in f^{-1}(V)$, $x_2 \notin f^{-1}(U)$

Since f is $(1,2)^*$ - R^* -continuous, $f^{-1}(U)$, $f^{-1}(V)$ are $(1,2)^*$ - R^* -open sets in X .

Thus for two distinct points x_1, x_2 of X , there exists $(1,2)^*$ - R^* -open sets $f^{-1}(U)$ and $f^{-1}(V)$ such that $x_1 \in f^{-1}(U)$, $x_1 \notin f^{-1}(V)$ and $x_2 \in f^{-1}(V)$, $x_2 \notin f^{-1}(U)$.

Therefore, X is $(1,2)^*$ - R^* - T_1 -space.

Theorem 3.11: If $f: X \rightarrow Y$ is $(1,2)^*-R^*$ -irresolute injection function and Y is $(1,2)^*-R^*-T_1$ -space, then X is $(1,2)^*-R^*-T_1$ -space.

Proof: Let x_1, x_2 be two distinct points of X . Since f is injective, there exists distinct points y_1, y_2 of Y such that $y_1 = f(x_1)$ and $y_2 = f(x_2)$.

Since Y is $(1,2)^*-R^*-T_1$ -space, there exists $(1,2)^*-R^*$ -open sets U and V in Y such that $y_1 \in U, y_2 \notin U$ and $y_1 \notin V, y_2 \in V$.
 ie. $x_1 \in f^{-1}(U), x_1 \notin f^{-1}(V)$ and $x_2 \in f^{-1}(V), x_2 \notin f^{-1}(U)$
 Since f is $(1,2)^*-R^*$ -irresolute, $f^{-1}(U), f^{-1}(V)$ are $(1,2)^*-R^*$ -open sets in X .

Thus for two distinct points x_1, x_2 of X , there exists $(1,2)^*-R^*$ -open sets $f^{-1}(U)$ and $f^{-1}(V)$ such that $x_1 \in f^{-1}(U), x_1 \notin f^{-1}(V)$ and $x_2 \in f^{-1}(V), x_2 \notin f^{-1}(U)$.

Therefore, X is $(1,2)^*-R^*-T_1$ -space.

Definition 3.12: A space X is said to be $(1,2)^*-R^*-T_2$ -space if for any pair of distinct points x and y , there exists disjoint $(1,2)^*-R^*$ -open sets G and H such that $x \in G$ and $y \in H$.

Theorem 3.13: If $f: X \rightarrow Y$ is $(1,2)^*-R^*$ -continuous injection and Y is $(1,2)^*-T_2$ -space, then X is $(1,2)^*-R^*-T_2$ -space.

Proof: Let $f: X \rightarrow Y$ be R^* -continuous injection and Y is $(1,2)^*-T_2$ -space. For any two distinct points x_1, x_2 of X , there exists distinct points y_1, y_2 of Y such that $y_1 = f(x_1)$ and $y_2 = f(x_2)$.

Since Y is $(1,2)^*-T_2$ -space, there exists disjoint $(1,2)^*$ -open sets U and V in Y such that $y_1 \in U$ and $y_2 \in V$.

ie. $x_1 \in f^{-1}(U), x_2 \in f^{-1}(V)$.

Since f is $(1,2)^*-R^*$ -continuous, $f^{-1}(U), f^{-1}(V)$ are $(1,2)^*-R^*$ -open sets in X .

Further, f is injective, $f^{-1}(U) \cap f^{-1}(V) = f^{-1}(U \cap V) = f^{-1}(\emptyset) = \emptyset$.

Thus for two distinct points x_1, x_2 of X , there exists disjoint $(1,2)^*-R^*$ -open sets $f^{-1}(U)$ and $f^{-1}(V)$ such that $x_1 \in f^{-1}(U)$ and $x_2 \in f^{-1}(V)$.

Therefore, X is $(1,2)^*-R^*-T_2$ -space.

Theorem 3.14: If $f: X \rightarrow Y$ is $(1,2)^*-R^*$ -irresolute injective function and Y is $(1,2)^*-R^*-T_2$ -space, then X is $(1,2)^*-R^*-T_2$ -space.

Proof: Let x_1, x_2 be two distinct points of X . Since f is injective, there exists distinct points y_1, y_2 of Y such that $y_1 = f(x_1)$ and $y_2 = f(x_2)$.

Since Y is $(1,2)^*-R^*-T_2$ -space, there exists disjoint $(1,2)^*-R^*$ -open sets U and V in Y such that $y_1 \in U$ and $y_2 \in V$.

ie. $x_1 \in f^{-1}(U), x_2 \in f^{-1}(V)$.

Since f is $(1,2)^*-R^*$ -irresolute injective, $f^{-1}(U), f^{-1}(V)$ are disjoint $(1,2)^*-R^*$ -open sets in X .

Thus for two distinct points x_1, x_2 of X , there exists disjoint $(1,2)^*-R^*$ -open sets $f^{-1}(U)$ and $f^{-1}(V)$ such that $x_1 \in f^{-1}(U)$ and $x_2 \in f^{-1}(V)$.

Therefore, X is $(1,2)^*-R^*-T_2$ -space.

Theorem 3.15: In any topological space, the following are equivalent.

- 1) X is $(1,2)^*-R^*-T_2$ -space.

- 2) Let $x \in X$. For each $x \neq y$ there exists a $(1,2)^*-R^*$ -open set U such that $x \in U$ and $y \notin (1,2)^*-R^*\text{-cl}(U)$.
- 3) For each $x \in U, \{x\} = \bigcap \{(1,2)^*-R^*\text{-cl}(U) : U \text{ is a } (1,2)^*-R^*\text{-open set in } X \text{ and } x \in U\}$

Proof: (1) \Rightarrow (2) Assume (1) holds

Let $x \in X$ and $x \neq y$ then there exists disjoint $(1,2)^*-R^*$ -open sets U and V such that $x \in U$ and $y \in V$.

Clearly, $X - V$ is $(1,2)^*-R^*$ -closed set. Since $U \cap V = \emptyset, U \subset X - V$.

Therefore, $(1,2)^*-R^*\text{-cl}(U) \subset (1,2)^*-R^*\text{-cl}(X - V)$

$y \notin X - V \Rightarrow y \notin (1,2)^*-R^*\text{-cl}(X - V)$ and hence $y \notin (1,2)^*-R^*\text{-cl}(U)$ by the above argument.

(2) \Rightarrow (3) For each $x \neq y$, there exists a $(1,2)^*-R^*$ -open set U such that $x \in U, y \notin (1,2)^*-R^*\text{-cl}(U)$

So $y \notin \bigcap \{(1,2)^*-R^*\text{-cl}(U) : U \text{ is a } (1,2)^*-R^* \text{ open set in } X \text{ and } x \in U\} = \{x\}$

(3) \Rightarrow (1) Let $x, y \in X$ and $x \neq y$

By hypothesis, there exists a $(1,2)^*-R^*$ -open set U such that $x \in U$ and $y \notin (1,2)^*-R^*\text{-cl}(U)$.

\Rightarrow there exists a $(1,2)^*-R^*$ -closed set V such that $y \notin V$

Therefore $y \in X - V$ and $X - V$ is $(1,2)^*-R^*$ -open set.

Thus there exists two disjoint $(1,2)^*-R^*$ -open sets U and $X - V$ such that $x \in U$ and $y \in X - V$

Therefore X is $(1,2)^*-R^*-T_2$ -space.

Theorem 3.16: Let (X, τ_1, τ_2) be a bitopological space, then the following statements are true

- 1) Every $(1,2)^*-R^*-T_2$ -space is $(1,2)^*-R^*-T_1$ -space.
- 2) Every $(1,2)^*-R^*-T_1$ -space is $(1,2)^*-R^*-T_0$ -space.

Proof: The proof is straight forward from the definitions

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Effect of Workplace Violence against Nurses in Al-Najaf Teaching Hospitals

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Abstract- Background: Violence against health care workers (HCWs) or workplace violence in general is a major problem affecting health and productivity of HCWs.

Objective: to identify the effect and sources of workplace violence against female's nurses. To find out the relationship between the effect of workplace violence on females' nurses and other factors such as (demographic, reproductive health and etc.). **Material and methods:** A cross-sectional analytic study has been carried out Al - Sadder Medical City and Al-Zahraa Teaching Hospital, November, 1st, 2015 until September, 15th, 2016. A purposive sample of (280) nurses. **Results:** The study showed that low percentage (10%) from nurses subjected to psychological workplace violence. **Conclusion and Recommendation:** The study concludes that the majority of study sample not exposed to any type of workplace violence. But there are low percentage from nurses exposed to workplace violence. The study recommends Curriculum development for nursing students regarding methods of communicating in order to reduce the exposure to violence in the workplace, organizing courses for nurses to define their duties and their rights, as well as development of the skill of the nurses on how to deal with incidents of violence and critical situations and Legislation and activating the laws that promote the protection of health workers, especially female nurses from all sources of violence.

Index Terms- Effect, Work place violence, Nurse.

I. INTRODUCTION

Violence against women is the most prevalent problem in the world within a human rights violation. As well as regarded a deep health problem that weakens female's power, exposes their physical and mental health to danger and erodes their self-confidence. Moreover it increases possibility to hurt, violence incidents increases several other health problems, such as chronic pain, depression, drug and alcohol abuse, and physical disability ⁽¹⁾.

Definition of violence in general according to the (WHO) where deliberately used of physical ability, threatened against himself or other people, a group or community, that either high probability for psychological harm, injury, death, mal development or deprivation ⁽²⁾.

At 1980s and 1990s, it has been seen a rapidly growth in the problems of workplace violence, especially in North America, Australia and Europe. in addition to increasing in searches interest has come a large numbers of published guidance at the professional/occupational and national levels.

Intervention and research both were underpinned by a growing realization that violence was becoming a common reality in many workplaces in the worldwide. Actually, in the eyes of many commentators, the problem of violence at work has risen to the point where, in many countries, it represents a "national epidemic" and an occupational health problem of a large percentage ⁽³⁾.

One alarming phenomena in the world is violence in the workplace. The true size of the problem is largely unknown and recent researches indicate that present numbers constitute only the tip of the iceberg to be alert to these actions and their risk factors may help nurses expect that an incident of violence at work is likely to happen ⁽⁴⁾.

WHO reported that work place violence (WPV) in 2002, is one of the important causes of mortality employees aged 15-44 years. Violence at work has effects on productivity and quality of customer service, not only on lives ⁽⁵⁾.

Objectives of the study:

To identify the effect and sources of workplace violence in Al-Najaf Teaching Hospitals, to find out the relationship between the effect of workplace violence on female's nurses and other factors such as (demographic, reproductive health and etc.).

II. METHODOLOGY

A cross-sectional analytic study performed on female's nurses who work in AL-Najaf Teaching Hospitals, from November, 1st, 2015 until September, 15th, 2016. A formal agreement was acquired from Ministry of Planning/Central Council for statistic. Also a formal agreement was acquired from the Nursing Department in the Faculty of Nursing/ Kufa University. A non-Probability (Purposive Sample) of 280 females' nurses. A non-Probability (Purposive Sample) of 280 females' nurses were selected and the criteria of the sample are: Females nurses who work in all departments of Al- Sadder Medical City and Al- Zahraa Teaching Hospital in Al-Najaf City and female nurses who work in morning and evening shifts. The questionnaire format consisted from (2) parts.

Part I: Functional and Demographic Data Form:

A demographic information sheet that consisted of (12) items. They include age, marital status, economic status, experience years, level of education, name of the hospital or center, ward name, direct contact with patients, patient 's gender, position in the work, work in shift and know your rights.

Part II: Violence Types:

This section it is consist of (1) domain, which contains psychological violence. Every domain contains (6) aspects which include source of violence, reaction of a violence incidents, the impact of an incident violence, times of a violence incidents, and locations of a violence incidents.

Statistical Analysis:

The Statistical Package SPSS (Statistical Package for Social Science) version (20) and Microsoft Excel application was

used for data processing and statistical analysis. Data analyzed through the application of two statistical approaches. **A descriptive data analysis** includes: a- Frequencies and Percentages, b- Measures of central tendency: Mean, Standard Deviation, mean of scores (MS), and c- Pearson's Correlation Coefficients to determine the reliability of the questionnaire (internal consistency) through using Alpha Cronbach., and **Inferential Data Analysis** includes a- Chi-Square test.

III. RESULTS

Table (1): Statistical distribution of the Nurses ' according to their demographic data.

Demographic data	Rating and intervals	Freq.	%
age (Years)	=< 20	34	12.1
	21 - 30	202	72.1
	31 - 40	24	8.6
	41 - 50	16	5.7
	51 - 60	2	0.7
	61 Up	2	0.7
Marital status	Single	155	55.4
	Married	111	39.6
	Widow	9	3.2
	Divorced	5	1.8
Monthly Income	Enough	41	14.6
	Sometime Enough	127	45.4
	Not Enough	112	40.0
Experience years	=< 1	124	44.3
	1 - 5	120	42.9
	6 - 10	11	3.9
	11 - 15	6	2.1
	16 Up	19	6.8
Educational Level	Nursing Course	6	2.1
	Nursing School	7	2.5
	Nursing secondary	133	47.5
	Diploma of Nursing	83	29.6
	Bachelor of Nursing	51	18.2
Hospital or Center Name	Al-Sadder Medical City	108	38.6
	AL-Zahraa Teaching Hospital	122	43.6
	Open Heart Center	15	5.4
	Burn Center	3	1.1
	Tumor Center	13	4.6
	Fertility Center	3	1.1
	Diabetes Center	5	1.8
	Al-forat Center for Neurological Sciences	6	2.1
	Joints and Rehabilitation Centre	3	1.1
Kidney diseases center	2	0.7	

Table (1) (continue ...)

Units name	Surgical room	34	12.1
	Internal room	22	7.9
	Emergency room	35	12.5

	Children unit	27	9.6
	Women unit	49	17.5
	Obstetrics room	20	7.1
	Respiratory Care unit	14	5.0
	Cardiac Care unit	12	4.3
	Operations room	42	15.0
	Consulting room	17	6.1
	Men room	8	2.9
Directly dealing with patients	Yes	272	97.1
	No	8	2.9
Patient gender	Females	149	53.2
	Males	4	1.4
	Mixed	124	44.3
	I don't deal	3	1.1
Position of your occupation	Nurse ward	194	69.3
	Responsible ward	9	3.2
	Head Nurse	6	2.1
	Responsible unit midwife	15	5.4
	Assistant Nursing	3	1.1
	Assistant surgeon	40	14.3
	Total	280	100%
Do you work with Shifts system	Yes	93	33.2
	No	187	66.8
Do you know your rights at work?	Yes	233	83.2
	No	47	16.8
Total		280	100%

Freq.= frequency, %= percentage.

Table (1) shows that the highest percentage is (72.1%) of study sample at age group (21-30). The highest percentage is (55.4%) for single. Concerning monthly income: the highest percentage is (45.4%) for some times enough. Regarding experience years: the highest percentage is (44.3%) for less than one year. Concerning educational levels: the highest percentage is (47.5%) of them graduated from Nursing secondary. Regarding hospital or center name, the highest percentage is (43.6%) most of nurses working in Al- Zahra Teaching Hospital. Concerning unit name: the highest percentage (17.5%) of nurses

working in the women ward. Regarding Directly dealing with patients: the highest percentage is (97.1%) of study sample directly dealing with patients. Concerning patient gender: the highest percentage is (53.2%) of nurses dealing with females. Regarding position of your occupation: the highest percentage is (69.3%) of study sample who are nurses ward. Concerning do you work with shifts system: the highest percentage is (66.8%) of nurses who do not work in shift system. Regarding do you know your rights at work: the highest percentage is (83.2%) of nurses are know your rights at work.

Table (2): Statistical distribution of Exposure to psychological violence Items.

Exposure to psychological violence (Items)	Rating	Freq.	%	M.S	Assessment
1- exposed to spitting.	Exposed	8	2.9	1.97	Pass
	Not Exposed	272	97.1		
2-exposed to obsession	Exposed	50	17.9	1.82	Pass
	Not Exposed	230	82.1		
3- exposed to neglecting	Exposed	72	25.7	1.74	Pass
	Not Exposed	208	74.3		
4- exposed to insulting	Exposed	66	23.6	1.76	Pass
	Not Exposed	214	76.4		
5- exposed to personal privacy intervention	Exposed	48	17.1	1.83	Pass
	Not Exposed	232	82.9		

6- exposed to libel	Exposed	22	7.9	1.92	Pass
	Not Exposed	258	92.1		
7- exposed to sarcasm	Exposed	32	11.4	1.89	Pass
	Not Exposed	248	88.6		
8- exposed to punishment threat	Exposed	81	28.9	1.71	Pass
	Not Exposed	199	71.1		
9- exposed to weapon threat	Exposed	2	0.7	1.99	Pass
	Not Exposed	278	99.3		
10- exposed to work leaving threat	Exposed	34	12.1	1.88	Pass
	Not Exposed	246	87.9		
11- exposed to reward deprivation threat.	Exposed	49	17.5	1.83	Pass
	Not Exposed	231	82.5		
12- exposed to salary stopping threat	Exposed	64	22.9	1.77	Pass
	Not Exposed	216	77.1		
13- exposed to cursing.	Exposed	23	8.2	1.92	Pass
	Not Exposed	257	91.8		
14- exposed to threatened notify administration	Exposed	57	20.4	1.80	Pass
	Not Exposed	223	79.6		
15- exposed to full maternity	Exposed	2	0.7	1.99	Pass
	Not Exposed	278	99.3		
16- exposed to deprivation of time feeding your baby	Exposed	10	3.6	1.96	Pass
	Not Exposed	270	96.4		
17- exposed to sick leave deprivation	Exposed	42	15.0	1.85	Pass
	Not Exposed	238	85.0		
18- exposed to assignments than working as scheduled	Exposed	98	35.0	1.65	Pass
	Not Exposed	182	65.0		
19- exposed to force you to constantly official holidays	Exposed	68	24.3	1.76	Pass
	Not Exposed	212	75.7		

Table (2) (continue ...)

20- exposed to discrimination rights and duties Being Female	Exposed	51	18.2	1.82	Pass
	Not Exposed	229	81.8		
21- exposed to transferring my work position for being pregnant	Exposed	8	2.9	1.97	Pass
	Not Exposed	272	97.1		
22- exposed to changing my work place after my giving birth leave	Exposed	12	4.3	1.96	Pass
	Not Exposed	268	95.7		
23- exposed to legations unjust	Exposed	87	31.1	1.69	Pass
	Not Exposed	193	68.9		
24- exposed to inequality training courses	Exposed	103	36.8	1.63	Pass
	Not Exposed	177	63.2		
25- exposed to underestimate my functional description	Exposed	106	37.9	1.62	Pass
	Not Exposed	174	62.1		
Overall exposure	Exposed	28	10.0	1.90	pass
	Not Exposed	252	90.0		

Freq.= frequency,%= percentage, M.S= mean of score (mean of score \leq 1.5 fail, Mean of score $>$ 1.5 pass)

Table (2) reveal is the highest percentage is (37.9%) from sample of study exposed to under estimate your functional description, while the lowest percentage is (0.7%) from sample of study exposed to the weapon threat and full motherhood leave

deprivation threat. The highest percentage is (90.0%) of nurses who are not exposed to psychological violence. However, (10.0%) of nurse's exposure to psychological violence.

Table (3): Statistical distribution of The effect of psychological violence incident (Items).

The effect of psychological violence incident (Items)	Rating	Freq.	%	M.S	Assessment
1- Fatigue	Yes	100	35.7	1.64	Pass
	No	180	64.3		
2-Depression	Yes	76	27.1	1.73	Pass
	No	204	72.9		
3- Chronic headaches	Yes	35	12.5	1.88	Pass
	No	245	87.5		
4- Nightmares or sleeping disorders	Yes	21	7.5	1.93	Pass
	No	259	92.5		
5- loss of self-confidence	Yes	21	7.5	1.93	Pass
	No	259	92.5		
6- Disappointment	Yes	65	23.2	1.77	Pass
	No	215	76.8		
7- Pains / cramps	Yes	26	9.3	1.91	Pass
	No	254	90.7		
8-Negative effect on the performance of work and care for the patients	Yes	36	12.9	1.87	Pass
	No	244	87.1		
9- Absences and leave work	Yes	7	2.5	1.98	Pass
	No	273	97.5		
10- Hating work	Yes	90	32.1	1.68	pass
	No	190	67.9		

Freq.= frequency,%= percentage, M.S= mean of score (mean of score <= 1.5 fail, Mean of score > 1.5 pass)

Table (3) shows the highest percentage is (35.7%) which refers to fatigue, and lowest percentage is (2.5%) which refers to the absence and leaving the work.

Table (4): Statistical distribution of perpetrator of psychological violence Items.

Perpetrator of psychological violence (Items)	Rating	Freq.	%	M.S	Assessment
1- patient	Yes	38	13.6	1.86	Pass
	No	242	86.4		
2- patient's relatives	Yes	61	21.8	1.78	Pass
	No	219	78.2		
3- co-worker	Yes	58	20.7	1.79	Pass
	No	222	79.3		
4- manager	Yes	114	40.7	1.59	Pass
	No	166	59.3		
5- visitor	Yes	17	6.1	1.94	Pass
	No	263	93.9		

Freq.= frequency, %= percentage, M.S= mean of score (mean of score <= 1.5 fail, Mean of score > 1.5 pass)

Table (4) shows the highest percentage is (40.7%) which refers to manager, and lowest percentage is (6.1%) which refers to the visitor.

Table (5): relationship between Psychological violence and their demographic data.

Demographic data	Chi-square (X^2)	df	P-value (Sig.)
age (Years)	4.752	5	0.447 (NS)
Marital status	2.125	3	0.547 (NS)
Monthly Income	2.016	2	0.365 (NS)
Experience years	8.987	4	0.061 (NS)
Educational Level	6.967	4	0.138 (NS)
Hospital or Center Name	14.457	9	0.107 (NS)
Unit name	9.043	10	0.528 (NS)
Directly dealing with patients	0.057	1	0.811 (NS)
Patient gender	1.653	3	0.647 (NS)
Position of your occupation	4.159	6	0.655 (NS)
Do you work with Shifts system	1.304	1	0.253 (NS)
Do you know your rights at work?	5.253	1	0.022 (S)

S: significant, df: degree of freedom.

Table (5) indicates that there is a significant relationship between the exposure to psychological violence and their know your rights at work at p-value less than 0.05. While there is a non-significant relationship with the exposure to psychological violence and other demographic data.

IV. DISCUSSION

According to (Table 1) in regards to age, the majority of study samples are within age group (20-30) years old. Ahmed, (2012), supports this result; the researcher reported that age 20 years old is dominant age for the study sample⁽⁶⁾.

Concerning the marital status, the highest percentage is a single nurse. This result is disagree with Ching Chen, et al., (2009) that is show majority of study sample are married. In addition, this result comes because the political and economic situation and even the age groups of the study sample; these reasons make the majority of the Iraqis people do not like to marry early⁽⁷⁾.

Concerning the monthly income, the study results indicate that the majority of the study sample are exhibit sometimes enough socio-economic status. The current financial crisis has led to renewed scrutiny of public finances in terms of value for money, and the all-social classes facing some limitation in term of decreasing in socio-economic status. Therefore, we can concluded that the Iraqis people the majority of them are facing the same thing.

Regarding years of experience, the highest percentage of the study subjects having one year. Khademloo, et al, (2013) they stated that most of the study participants are experience years one year supports this result⁽⁸⁾.

Concerning educational levels of nurses, the highest percentage graduated from Nursing secondary. This result is disagree with Serpil Talas, et al., (2011) that found the majority of study sample graduated from nursing college, because of College of Nursing is updated and that the largest proportion of nurses in hospitals are graduates from nursing secondary⁽⁹⁾.

Regarding Hospital or Center Name, the highest percentage of nurses working in Al- Zahra Teaching Hospital, Concerning Unit name, and the highest percentage of nurses

working in the women ward. This result disagree with Ching Chen W, et al., (2009) that found most study nurses working in the acute wards. In addition, because the study is focused on the female nurses, so much of them are working in hospitals that specialized in maternity and obstetric, and that is related to teaching my religion that not wanted mix between males and females⁽⁷⁾.

Regarding directly dealing with patients, the highest percentage of study sample directly dealing with patients. Unfortunately, the researcher do not find a supportive article for this result. However, this result comes because the nurses are working directly and dealing directly with the patients, and provide bedside services.

Concerning patients' gender, the highest percentage of nurses dealing with females. However, this result comes because the nurses are working most commonly in a maternity and obstetric wards, so they more dealing with female patients.

Concerning work with Shifts system, the highest percentage of nurses working in morning shift. This result supported by Shoghi, et al., (2008), who reported that, the highest percentage of study sample working in morning shift⁽¹⁰⁾.

Concerning knowledge about nurses rights at work, the highest percentage of nurses know about their rights at work. This results come because the higher percentage of the nurses are graduated from institute, so they have awareness about their rights, also the policy of the hospitals make the nurses aware about their rights in regarding their job prescription, economic affairs and other things.

According to the results show in (Table 2) the study indicatethat the exposure to psychological violence, some of nurses in the present study exposed to psychological violence. This result supported by Ahmed, (2012); Moustafa et al (2010) who reported some nurses subjected to psychological violence in their workplace⁽⁶⁾ ⁽¹²⁾.

The study results (Table 3) reveal that theeffect of violence on nurses is fatigue. This result disagrees with Chen, et al, (2008) who stated that the effect of psychological violence on nurses are anxiety. In addition, these results might come because the different in psychological violence levels and scales that the researchers studied⁽⁷⁾.

In (Table 4) shows perpetrator of violent incidents in this domain is the manager. This result is in agreement with the study done by Koukia, et al., (2010); Ayranci et al., (2006) they reported that perpetrator of violence incidents is manager^{(11), (13)}.

In regards to the result in (Table 5) indicates that there is a significant association between exposures to psychological violence and the nurses' knowledge about their rights at work. This result disagree with Chen, et al, (2009), who found there is no relationship between exposures to psychological violence and nurses' demographic data. This result comes because that a knowledgeable nurses able to protect themselves from the different types of violence, so the study results indicate that there is a significant relationship⁽⁷⁾.

V. CONCLUSION

According to the study findings and discussion, the study concluded the following: Majority of study sample are nurses who are not exposed to any type of workplace violence. But nurses exposed to workplace violence constitute the low percentage. The knowledge of work rights and nurses exposure to psychological violence at the workplace are tightly connected. The majority of psychological violence perpetrators are the managers.

VI. RECOMMENDATION

According to present results and conclusions, the researcher recommends that:

1. Organizing courses for nurses to define their duties and their rights, as well as to develop nurses skills on how to deal with incidents of violence and critical situations.
2. Legislation and activating the laws that promote the protection of health workers, especially female nurses from all sources of violence.
3. Create communication methods between managers, legal units and female nurses in hospitals for the purpose of facilitating news about the incidents of violence against nurses to be controlled.
4. Curriculum development for nursing students regarding methods of communicating, professional ethics in order to reduce the exposure to violence in the workplace.

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Assessment of Wind Erosion in Bare and Lucerne-cultivated lands in North Atbara, River Nile State, Sudan

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Abstract- The experiment was conducted in two-successive seasons (August 2008- March 2009, August 2009- March 2010). The intensity of wind erosion (IWE) was measured monthly in four directions, namely West (W), North West (NW), North (N), and North East (NE), using vertical (IWE_v) and horizontal soil traps (IWE_h) in a bare and a Lucerne-cultivated land. In the first season, IWE_h in the bare land ranged from 183.3 (W) to 200 (NE) with a mean of 192.9 tons/ha/day, and a coefficient of variation (CV) of 4%. Furthermore, IWE_h ranged from 123.3 (Oct.) to 262 (Aug.) with a CV of 33.2%. The overall mean IWE_h and IWE_v in the first season were 1.3 and 1.4 fold those in the second season, respectively. In bare lands, the overall mean IWE_h was 1.77 and 1.88 fold the corresponding IWE_v values in the first and second seasons, respectively. In the cultivated fields the reverse trend was found in the first season, the overall mean of IWE_v yielded significantly much higher than that produced by IWE_h but in the second season result was inverse with very meager increasing in the overall mean value of IWE_h . The ratio IWE_v/IWE_h of the overall mean values was 1.4 and 0.85 in the first and second seasons, respectively. The IWE_h in the bare lands were 47.0 and 45.7 fold that of the cultivated fields in the two successive seasons.

Index Terms- Intensity of wind erosion; sand traps; Lucerne-cultivated land; River Nile State.

I. INTRODUCTION

The River Nile State lies between latitudes 16° and 22° N and longitudes $31^\circ 88'$ and $35^\circ 70'$ E. It is dominated by hyper-arid and arid climatic zones with mainly two seasons, a hot summer from April to September and cold winter from October to March. The mean annual rainfall is less than 100 mm. and temperatures as high as 49° C is not uncommon in the period extending from April to June. Winds prevail from the north east with a mean maximum speed of 17.6 km/hr. Under such climatic conditions wind erosion is the predominant desertification process. Wind erosion is governed by two main factors namely soil or wind erodibility as an indicator of the vulnerability of the soil mass to detachment by wind, and wind erosivity as an indicator of the ability of the wind energy to transport the detached soil particles. Generation of wind erosion data is essential for designing wind erosion control methods, particularly in arid lands. Previous wind erosion studies were undertaken included assessment of the intensity of wind erosion (IWE) in El-Obeid (Khairseid, 1998) and north east Al-Butana (Haikal, 2005). Hassan and Mustafa (2011) assessed and mapped wind erodibility of the soils of fifty geo-referenced farms widely

spread in the River Nile State. They found that wind erodibility of these farms ranged from 0 to 470.4 tons/ha. They found that these agricultural farms lie within the high erodibility class. Abdi *et al.* (2013) studied the impacts of desertification, degradation and drought on both the natural resources and man's livelihood in the Sudan and to suggest appropriate forest resource management interventions. Results showed that in rain-fed agricultural zones deep ploughing and leveling of the surface soil caused increases susceptibility of soil to wind erosion, beside decline in its fertility and in some places, enhance the formation of sand dunes. The implications of these trends on the natural resource base include environmental degradation, food insecurity and aggravation of income inequalities among the Sudanese producers. The study has suggested agroforestry technology as a potential solution to this continued problem of declining rural agricultural production in the Sudan. Dawelbait *et al.* (2013) identified changes in ground cover of endangered range plant species in north Kordofan state. They found changes in range attributes were clearly noticed and some important plants are being endangered so the study recommended a strategy for range land rehabilitation to be adopted in relation to composition of important, palatable endangered plant species. These studies are very important due to determination the trends of range land so as controlling degradation in plant and natural vegetation composition furthermore carrying capacity should be calculated to avoid the negative impact of overgrazing. Biro *et al.* (2013) analyzed and monitor the land use land cover (LULC) changes using multi-temporal Land sat data for the years 1979, 1989 and 1999 and ASTER data for the year 2009. In addition, efforts were made to discuss the impact of LULC changes on the selected soil properties. Three main LULC types were selected to investigate the properties of soil, namely, cultivated land, fallow land and woodland. Moreover, soil samples were also collected at two depths of surface soil from ten sample plots for each of the LULC type. For these soil samples, various soil properties such as texture, bulk density, organic matter, soil pH, electrical conductivity, sodium adsorption ratio, phosphorous and potassium were analyzed. The results showed that a significant and extensive change of LULC patterns has occurred in the last three decades in the study area. Further, laboratory tests revealed that soil properties were significantly affected by these LULC changes. The change of the physical and chemical properties of the soil may have attributed to the changes in the LULC resulting in land degradation, which in turn has led to a decline in soil productivity. Adam *et al.* (2014) assessed land degradation in Rawashda, area Gedaref state by using remote sensing, GIS and soil techniques. Ali *et al.* (2012) assessed and mapped of soil degradation at Gadambalyia schemes in Gedaref state, related to sorghum productivity. Satellite images and GIS were integrated

with soil quality to detect and map the type and degree of severity of soil degradation. Soil quality indicators were determined and compared with the same indicators, determined previously in the same locations in 1976. The System Integration Risk model was used to classify the area of schemes according to soil chemical and physical degradation. The results revealed that the soil qualities in 2005 were significantly affected ($P < 0.001$) both negatively and positively, compared with the 1976 data. Soil chemical degradation ranged from low to severe, while the soil physical properties were not significantly degraded. The long term average of the sorghum for all farms was between 1 to 3.5 sac per feddan (1 sac = 100 kg; 1 feddan = 0.42 ha). About 1.5% of the total farms (262 farms) had long term average less than 1.5 sacs per feddan. 44.3% of the farms had long term average of 2.5 sacs feddan⁻¹, and 34% of the farms had long term average of 3 sacs fed⁻¹ and above. Only about 10% of the total area had no yield deterioration while about 57% had low to moderate yield deterioration and 33% had high to severe degradation. This means that, although the soil was highly degraded, it was still possible to obtain some sorghum. Abuzied *et al.* (2015) they assessed the extent of sand movement by saltation and surface creep in central part of the Northern state for three areas, namely Al-Baja, west of Al-Golied town and Al-Khowie using soil trenches. In the first season, the rate of sand movement in all months, excepting July in El-Khowi was significantly ($P < 0.001$) higher than that in Al- Golied. In July the rates were equal. The overall mean monthly rate at El-Khowi was 1.39 m³/m-w, which was more than 4-fold that in Al- Golied (0.32 m³/m-w). In the second season, the mean monthly rate was 1.69m³/m-w at El-Khowi, which was 3.8-fold, that of Al- Golied (0.44m³/m-w) and 5.3-fold that of Al-Baja (0.32m³/m-w). The lowest sand drift at Al-Baja site was attributed to the fact that Al-Baja land form is a sand sheet plain. The higher sand movement in the second season was due to the higher wind erosivity in that season as indicated by sand storm visibility ≤ 1 km. The present study was undertaken to achieve the following objectives

1. To generate comprehensive quantitative data on IWE in bare and Lucerne-cultivated lands in north Atbara, River Nile State, using both horizontal and vertical traps.
2. To investigate direction and monthly variation of the IWE.
3. To compare the intensity of wind erosion measured by horizontal (IWE_h) and vertical traps (IWE_v).

II. MATERIALS AND METHODS

2.1. EXPERIMENTAL MATERIALS

The study was conducted in Aboharaz village, about 36 km north Atbara town on the western bank of the River Nile, to produce broad-based data on wind erosion in two-seasons (August 2008-March 2009, August 2009-March 2010). Two fields, 2 km apart, were used for the study, one was bare and the other was cultivated with Lucerne (*Medicago sativa*).

2.2. METHODS AND STATISTICAL ANALYSIS

Oil cans [25 cm (L) × 23 cm (w) × 27 cm (h)] were used as horizontal sand traps for the measurement of wind erosion. They were buried in the soil leaving the open end level with the soil surface. A vertical sand trap was constructed locally as described by Leatherman (1978). It consisted of two PVC tubes. The first one was 60 cm long with an inside diameter (i.d.) equal to 5.1 cm, permanently closed at the bottom end, and inserted completely in the soil with its open end leveled with the soil surface. This tube is stationary. The second tube, 90 cm long and 4 cm i.d., closed at the bottom with a moveable metallic cap, and had two similar slits 2 cm wide and 30 cm long cut in the two opposite sides of the tube. One slit serviced as a collection orifice aligned toward the wind direction, while the other was covered with fine metallic screen to restrict soil particle movement and allow free wind flow. In each field, IWE (ton/ ha/day) was assessed using three replicates for both vertical and horizontal traps in the following directions: West (W), North West (NW), North (N) and North east (NE). Vertical traps were installed at a spacing of 60 cm between the same direction and 1 m from another direction. The replicate traps were installed so that they do not obstruct free wind flow to the other traps. The horizontal traps were placed at a spacing of one meter from the vertical. Each month the horizontal traps were removed and sand was collected and weighed. Furthermore, the sand collected in the metallic moveable tube of the vertical traps was also weighed. These monthly IWE were determined for each direction during the two seasons. The statistical design for this factorial experiment was randomized complete block design. Analysis of variance and separation of means were undertaken according to Gomez and Gomez (1984).

III. RESULTS AND DISCUSSION

3.1. FIRST SEASON (August 2008-March 2009)

Table 1 shows the effects of wind direction and month on IWE_h of the bare field. For the main direction effect the mean IWE_h ranged from 183.3 (W) to 200 (NE) with a mean of 192.9 tons/ha/day, a standard deviation (STD) of 8.0 tons/ha/day and a coefficient of variation (CV) of 4%. The mean IWE_h by the NE wind was significantly greater than that produced by the W direction. However, it was not significantly different from that given by N wind, which was also significantly different from that produced by W winds.

The mean IWE_h values for the main month effect ranged from 123.3 (Oct.) to 262 (Aug.) with a mean of 192.9 tons/ha/day, a STD of 64 tons/ha/day and a CV of 33.2%. Statistically, IWE_h was in the following significant order: Aug. > Jan. > Feb. > Mar. > Nov. > Dec. > Sept. > Oct.; the equal sign indicates that there was no significant effect.

Table 1 Effect of direction and month on the IWE_h (ton ha⁻¹ day⁻¹) measured in the bare field surface during the first season*

Direct.	Month								Mean
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	
W	261	126.0	119.0	134.3	120.0	242	238	226.1	183.3b
NW	260	126.0	127.0	153.0	129.4	259	238	220.3	189.1b
N	263	130.4	118.0	165.0	133.3	267	267	246.4	199.0a
NE	264	126.0	129.3	179.1	133.3	267	261	241.0	200.0a
Mean	262a	127.1e	123.3e	158d	129e	258.8ab	251b	233.5c	192.9

*Means followed by the same letter in the same row or column are not significantly different from each other at the 0.01 level by Duncan Multiple Range Test

Table 2 shows the effects of wind direction and month on IWE_v of the bare field. The mean IWE_v values ranged from 70 (W) to 127 (NW) with a mean of 108.8 tons/ha/day, a STD of 26 tons/ha/day and a CV of 24%. Despite of the high mean IWE_v value caused by the NW wind was not significantly to that produced by winds from the three other directions. The mean monthly data ranged from 65.3 (Sept.) to 156.1 (Jan.) with a

mean of 108.8 tons/ha/day, a STD of 35 tons/ha/day and a CV of 32.2%. The monthly IWE_v values were in the following statistically significant order: Jan. > Mar. > Feb.>Aug.>Nov.>Oct.>Dec. >Sept. The IWE_v values obtained for each month or direction were lower than the corresponding IWE_h values. The overall mean IWE_v value was 56.3% that of IWE_h.

Table 2 Effect of direction and month on the IWE_v (ton ha⁻¹ day⁻¹) measured in the bare field surface during the first season*

Direct.	Month								Mean
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	
W	111.1	64.0	82.0	75.0	28.4	57.0	56	83.3	70.0a
NW	118.0	71.1	81.0	103.0	102.0	204.0	167	167.0	127.0a
N	116.0	63.0	82.2	101.1	79.4	159.4	165	167.0	117.0a
NE	111.1	63.0	78.3	78.0	102.0	204.0	167	166.1	121.2a
Mean	114.1ab	65.3b	81ab	89.3ab	78ab	156.1a	139ab	146ab	108.8

*Letters as explained in Table 1.

Table 3 shows that in the cultivated field, IWE_h data for the main direction effect ranged from 2.3 (NW) to 6.1 (W), with a mean of 4.1 tons/ ha/ day, a STD of 1.6 tons/ ha/ day and a CV of 39%. As expected the data generated in this cultivated field were much lower than the corresponding data obtained from the bare field. The overall mean of IWE_h of this field is about 2.1% of that of the bare field. The mean IWE_h value produced by the W wind was significantly greater than that produced by NW and NE winds, but it was not significantly different from that produced by N winds. The table also shows that the monthly IWE_h data ranged between 2.4 (Jan., Feb, Mar.) and 8.3 (Nov.), with a mean of 4.1 tons/ ha/ day, a STD of 2.1 tons/ ha/ day and a CV of 51%. The main monthly effect showed that IWE_h was in the following

significant order: Mar. > Nov.>Aug.>Sept > Oct.> Dec.> Jan. = Feb.

Table 4 shows that the IWE_v data for the main direction effect, in the cultivated field ranged from 0.41 (NE) to 18.3 (W), with a mean of 5.8 tons/ ha/ day, a STD of 8.4 tons/ ha/ day and a CV of 144.8%. The overall mean IWE_v of this field is about 5.3% that of the corresponding bare field. The main wind direction effect showed that IWE_v was in the following significant order: W > NW = N =NE. The table also shows that the monthly IWE_v data ranged between 1.5 (Sept.) and 10.3 (Nov.), with a mean of 5.8 tons/ ha/ day, a STD of 3.3 tons/ ha /day and a CV of 56.9%. The main monthly effect showed that IWE_v was in the following significant order: Nov.> Dec.> Jan.> Feb. = Mar.> Aug.> Oct.> Sept.

Table 3 Effect of direction and month on the IWE_h (ton ha⁻¹ day⁻¹) measured in the cultivated field during the first season*

Direct.	Month								Mean
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	
W	10.3	5.7	5.9	11	5.00	3.7	3.6	3.6	6.1a
NW	2.9	1.4	1.7	4	2.10	2.1	2.1	2.1	2.3b
N	7.5	5.7	6.4	12	0.58	1.4	1.4	1.4	4.5ab
NE	2.5	4.9	2.7	6	3.00	2.4	2.4	2.4	3.3b
Mean	5.8ab	4.4b	4.2b	8.3a	2.70b	2.4b	2.4b	2.4b	4.1

*Letters as explained in Table 1

Table 4 Effect of direction and month on the IWE_v (ton ha⁻¹ day⁻¹) measured in the cultivated field during the first season*

Direct.	Month								Mean
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	

W	3.3	2.0	5.0	33.2	26.0	26.0	25.5	25.5	18.3a
NW	4.1	2.4	2.3	5.2	3.0	3.0	3.0	3.0	3.3b
N	2.0	1.3	1.0	2.0	0.8	0.8	0.8	0.8	1.2b
NE	0.8	0.4	0.4	0.87	0.2	0.2	0.2	0.2	0.41b
Mean	2.6bc	1.5c	2.2bc	10.3a	8abc	7.5abc	7.40abc	7.40ab	5.8

*Letters as explained in Table 1

3.1. SECOND SEASON (August 2009-March 2010)

In the bare land, the mean IWE_h values for the main direction effect ranged from 130.5 (W) to 162.1 (N) with a mean of 150.7 tons/ ha/ day, a STD of 14.3 tons/ ha/ day and a CV of 9.5% (Table 5). The main wind direction effect showed that IWE_h was in the following significant order: N > NW = NE = W. The mean IWE_h values for the main month effect ranged from 29 (Oct.) to 254.5 (Jan.) with mean of 150.7 tons/ ha/ day, a STD of

84.5 tons/ ha day and a CV of 56.1%. The monthly main effect was in the following significant order: Jan. > Feb. > Mar. > Aug. > Sept. > Dec. > Nov. > Oct. The IWE_h in the bare field surface in the second season was much lower than that in the first season. The overall mean IWE_h value in the second season was 78.1% of that in the first season. There was also variation in the order of magnitude of mean values in the corresponding months or directions.

Table 5 Effect of direction and month on the IWE_h (ton ha⁻¹ day⁻¹) measured in the bare field surface during the second season*

Direct.	Month								
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Mean
W	121.9	117.8	18.4	48.1	43.5	233.5	236.3	224.1	130.5c
NW	125.9	124.6	29.0	89.9	124.6	256.9	235.6	218.3	150.6b
N	129.0	118.6	32.9	108.9	126.4	263.8	268.5	248.6	162.1a
NE	128.1	125.6	35.8	106.1	114.8	263.8	260.7	241.6	159.6b
Mean	126.2c	121.7c	29.0f	88.3e	102.3d	254.5a	250.3a	233.2b	150.7

*Letters as shown in Table 1.

Table 6 shows that the mean IWE_v values for the main direction effect in the bare land ranged from 49.5 (W) to 96.6 (NW) with a mean of 80.3 tons/ ha/ day, a STD of 21 tons/ ha/ day and a CV of 26.2%. The mean IWE_v produced by NW winds was significantly greater than that produced by W winds, but not different from that blown by N and NE winds. The monthly IWE_v data ranged from 9.1 (Oct.) to 151.7 (Jan.) with a mean of 80.3 tons/ ha/ day, a STD of 56.6 tons/ ha/ day and a CV of 70.5%. The main effect of the month showed that IWE_v was in the following significant order: Jan. > Mar. > Feb. > Sept. > Aug. > Dec. > Nov. > Oct. The overall mean IWE_v of the second season was 73.8% of that in the first season. There was also variation in the order of magnitude of monthly IWE_v values or those of the wind directions. As expected the mean IWE_v values obtained for

each month or direction were lower than the corresponding IWE_h values.

Table 7 shows that the IWE_h data in the cultivated field ranged between 1.7 (NW) and 4.4 (N), with a mean of 3.3 tons/ ha/ day, a STD of 1.2 tons/ ha/ day and a CV of 36.4%. The overall mean IWE_h of this field is about 2.2% of that of the bare field in the second season. The main wind direction effect showed that IWE_h was in the following significant order: N = W > NE > NW. The table also shows that the monthly IWE_h data ranged between 2.4 (Mar.) and 3.7 (Aug. and Sept.), with a mean of 3.3 tons/ ha/ day, a STD of 0.46 tons/ ha/ day and a CV of 14%. The main monthly effect showed that IWE_h was in the following significant order: Aug. = Sept. > Oct. > Nov. > Dec. > Jan. > Feb. > Mar.

Table 6 Effect of direction and month on the IWE_v (ton ha⁻¹ day⁻¹) measured in the bare field surface during the second season*

Direct.	Month								
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Mean
W	60.9	76.0	3.3	33.8	21.8	61.1	55.6	83.3	49.5b
NW	56.0	72.7	8.5	51.8	55.6	195.6	166.1	166.7	96.6a
N	59.9	73.3	15.0	25.7	42.3	153.9	161.7	167.8	87.5a
NE	56.1	53.7	9.7	29.9	22.0	196.1	165.0	168.3	87.6a
Mean	58.2bc	68.9b	9.1d	35.3cd	35.4cd	151.7a	137.1a	146.5a	80.3

*Letters as explained in Table 2.

Table 7 Effect of direction and month on the IWE_h (ton ha⁻¹ day⁻¹) measured in the cultivated field during the second season*

Direct.	Month								
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Mean
W	7.8	3.5	4.0	3.8	3.4	3.5	3.1	3.6	4.1a
NW	2.9	1.3	1.7	1.7	1.6	1.2	1.2	2.1	1.7b

N	1.7	5.2	6.0	5.8	5.4	4.9	4.6	1.4	4.4a
NE	2.5	4.8	2.7	2.7	2.7	2.7	2.6	2.4	2.9ab
Mean	3.7a	3.7a	3.6a	3.5a	3.3a	3.1a	2.9a	2.4a	3.3

*Abbreviations as explained in Table 1

Table 8 shows that the IWE_v data for the different directions in the cultivated field ranged between 0.41 (NE) and 6.9 (W) with a mean of 2.8 tons/ ha/ day, a STD of 2.9 tons/ ha/ day and a CV of 103.6%. The overall mean of IWE_v of this field is about 2.6% that of the bare field in the first season. The main wind direction effect showed that IWE_v was in the following

significant order: $W > NW > N = NE$. The table also shows that the monthly IWE_v data ranged between 1.5 (Sept.) and 7.4 (Mar.), with a mean of 2.8 tons/ ha/ day, a STD of 1.9 tons/ ha /day and a CV of 67.9%. The main monthly effect showed that IWE_v was in the following significant order: $Mar. > Aug. > Oct. = Nov. = Dec. = Feb. > Jan. > Sept.$

Table 8 Effect of direction and month on the IWE_v (ton ha⁻¹ day⁻¹) measured in the cultivated field during the second season*

Direct.	Month								
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Mean
W	3.4	1.9	4.9	4.8	4.7	4.7	4.9	25.8	6.9a
NW	4.1	2.4	2.3	2.2	2.3	2.2	2.3	2.7	2.6b
N	1.9	1.3	1.0	0.9	1.0	0.9	1.0	0.8	1.1c
NE	0.8	0.4	0.4	0.4	0.4	0.4	0.4	0.2	0.41c
Mean	2.6b	1.5b	2.2b	2.1b	2.1b	2.0b	2.2b	7.4a	2.8

*Letters as explained in Table 2

IV. DISCUSSION

In the bare fields, horizontal traps in all directions and months yielded significantly much higher IWE than vertical traps. The overall mean IWE_h value was 1.8 and 1.9 fold the overall mean IWE_v value in the first and second seasons, respectively. This was attributed to the fact that horizontal traps collected soil particles transported by the three mechanisms of wind erosion, namely saltation, surface creep and suspension, where as vertical traps collected particles transported by saltation only. The IWE measured by both traps in the first season were much higher than those measured in the second season The overall mean IWE_h and IWE_v in the first season were 1.3 and 1.4 fold those in the second season, respectively. This effect was attributed to the higher wind erosivity in the first season. The wind erosivity was 2483 and 2309.3 m³/sec³ for the first and second seasons, respectively (Abdelwahab, 2012).

In the cultivated fields, the overall mean of IWE_v yielded significantly much higher than that produced by IWE_h in the first season, but in the second season result was inverse with very meager increasing in the overall mean value of IWE_h . The ratio IWE_v/ IWE_h of the overall mean values was 1.4 and 0.85 in the first and second seasons, respectively. This effect is because Lucerne reduced wind erosivity and obstructed the movement of soil particles into the horizontal traps, much more than into the vertical traps in first season whereas in the second season reverse trend was found with very meager increased in IWE_h . This effect was attributed to the lower wind erosivity in the second season. Furthermore, plant cover in the cultivated fields greatly reduced IWE_h and IWE_v .

In general plant cover as a surface roughness element determines the extent to which air flow contacts the ground surface and influences the height of the mean aerodynamic surface and consequently reduces wind erosivity. Both height and density determine the effectiveness of plants in reducing wind erosivity. Chepil and Woodruff (1963) stated that grasses

and legumes are the most efficient in establishing a dense cover. The results showed that IWE measured by both traps were greatly reduced in the cultivated fields in both seasons. In the first season, IWE_h and IWE_v in the cultivated fields were 2.1% and 5.3% those in the bare fields, respectively. In the second season, these ratios were 2.2% and 3.5%, respectively. This was attributed to the good protection offered by Lucerne to the ground from erosive winds. This finding agrees with previous findings of Farah (2003).

There is variation in the order of magnitude of the monthly IWE. The variation due to direction was much lower than monthly; due to the higher monthly variability of wind erosivity. The IWE values obtained in Aug. and Sept. were caused mainly by S and SW winds, which were stronger winds but shorter in duration. However the prevailing N. winds caused high IWE in Jan. (NNW), Feb. (NW) and Mar. (NW), and days of dust storms. Finally, the high temperature effects on pressure and wind velocity in summer caused the transportation of heavier and denser particles opposite effect of low temperature in (Oct., Nov. and Dec.). This finding agrees with previous findings Abuzied (2009) and Farah (2003), with emphasized on minimum sand transport recorded in November and December.

V. CONCLUSION

As expected the bare lands gave significantly higher mean IWE values than the Lucerne-cultivated field. The IWE_h in the bare land was 47 and 45.7 fold that of the cultivated field in the two successive seasons. Thus, cultivating the land with Lucerne will effectively protect the land from erosion. However, it is recommended to establish a shelterbelt, because of its added beneficial environmental effects, and because it permits the variation of the cropping pattern. Moreover growing summer and winter crops with appropriate crop residue management offer good land protection against soil erosion. However this does not preclude the establishment of a shelterbelt.

The results showed that the prevailing wind directions are north, north east and North West, but the southerly winds though of short duration are very strong. Comprehensive studies on wind velocity and direction should be undertaken in the early stages of establishing a scheme to help in making appropriate design of the shelterbelt. The River Nile State occupied large areas with varying metrological conditions. So there is a pressing need for establishing new meteorological stations in some appropriate locations.

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DNA Cleavage Activity of Copper (II) Complexes of Some Phosphonates

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Abstract- Copper (II) complexes of Diphenyl (2-hydroxyphenyl)(phenylamino) methylphosphonate (DHPP) and Diphenyl (4-aminophenylamino)(2-hydroxyphenyl)methyl phosphonate (DAHP) were prepared and characterized by different tools such as elemental analysis, IR, ¹H-NMR, UV/Vis spectra and thermal studies. The IR spectral data showed that the phosphonate compounds behave as bidentate ligands coordinating to the copper ion through the P=O and NH groups. The geometry around copper ion was found to be a distorted octahedral. The activity of the phosphonate ligands and their copper (II) complexes towards DNA cleavage were investigated. The phosphonate ligands showed no activity, while the copper complexes showed DNA cleavage activity. The copper complex of Diphenyl (4-aminophenylamino)(2-hydroxyphenyl)methyl phosphonate showed strong activity towards DNA cleavage.

Index Terms- phosphonate; spectroscopic studies; DNA cleavage

I. INTRODUCTION

In recent years, many researches [1,2] have focused on interaction of small molecules with DNA. DNA is generally the primary intracellular target of anticancer drugs, so the interaction between small molecules and DNA can cause DNA damage in cancer cells, blocking the division of cancer cells, and resulting in cell death [3,4]. Survey of literature demonstrates that interest on the design of novel transition metal complexes capable of binding and cleaving DNA [5-7] increases continuously. Metal complexes that can bind to DNA are gaining considerable attention owing to their diverse applications in the field of bioinorganic chemistry viz. diagnostic agents for medical applications, development of cleavage agents for probing nucleic acid structure [8,9] and identifiers of transcription start sites [10]. The interaction of DNA with transition metal complexes is important for the design of effective antitumor drugs that exhibit different properties than those which are currently in use [11] like cisplatin. Among the metal ions regarded as coordination centers of potential anticancer agents, platinum and ruthenium ions are the most widely investigated up to now [12,13]. However, there is a growing interest in the synthesis of cheaper first-row transition metal complexes as efficient DNA binders with potential cytotoxic activity [14,15].

Phosphonates represents an important class of organophosphorus compounds. Their use in a variety of applications is well documented and their importance in a range of fields is increasing. Phosphonates have a lot of industrial

applications as effective chelating agents, corrosion inhibitors in cooling systems [16-18] and water softeners[19]. In addition, the phosphonate functionality has been incorporated into a range of clinically useful drugs. cyclic nucleoside phosphonates have shown potential as therapeutics for pathogenic species [20], anti-parasitic agents. [21,22] and HIV protease inhibitors [23]. Phosphonate containing protease inhibitors also have shown great potential for the treatment of Hepatitis C virus [24]. Some have shown potential as cancer therapies [25] to inhibit growth of malignant cell lines [26,27] and also as Inhibitors for Urokinase-Type Plasminogen Activator [28].

In this study, small phosphonate molecules were prepared and characterized. The copper (II) complexes of the phosphonate ligands were also prepared and fully characterized. The ability of the phosphonates and their copper (II) complexes to cleave the DNA was investigated.

II. EXPERIMENTAL SECTION

2.1. Materials.

Perchloric acid, acetaldehyde, aniline, *p*-phenylenediamine and acetonitrile were purchased from Sigma-Aldrich Chemical Co.

2.2. Synthesis of phosphonate ligands

2.2.1. Diphenyl (2-hydroxyphenyl) (phenylamino)methylphosphonate (DHPP)

HClO₄ (0.201 g, 2 mmol) was added to a solution of the salicylaldehyde (1.22g, 0.01 mol) and aniline (0.93 g, 0.01 mol) in acetonitrile. The mixture was stirred for 15 min and then triphenyl phosphite (3.1 g, 0.01 mol) was added. After completion of the reaction (6 h), the reaction mixture was quenched with aq. saturated NaHCO₃ followed by brine solution and then extracted with CH₂Cl₂, dried over Na₂SO₄, and concentrated under vacuum. The crude mixture was purified by washing with mixture of ether and pet. ether to afford the product.

2.2.2. Diphenyl (4-aminophenylamino)(2-hydroxyphenyl)methylphosphonate (DAHP)

HClO₄ (0.201 g, 2 mmol) was added to a solution of the salicylaldehyde (1.22g, 0.01 mol) and *p*-phenylenediamine (1.08 g, 0.01 mol) in acetonitrile. The mixture was stirred for 15 min and then triphenyl phosphite (3.1 g, 0.01 mol) was added. After completion of the reaction (6 h), the reaction mixture was quenched with aq. saturated NaHCO₃ followed by brine solution and then extracted with CH₂Cl₂, dried over Na₂SO₄, and concentrated under vacuum. The crude mixture was purified by

washing with mixture of ether and pet. ether to afford the product.

2.3. Synthesis of metal complexes

Copper (II) chloride (0.01 mol) dissolved in about 50 ml absolute ethanol was added to the ethanolic solution of the selected ligand (0.01 mol). Small amount of solid sodium acetate was added to the solution with heating and contentious stirring. The precipitate was obtained, filtered off and washed many times with ethanol and then dried in an oven at 80 °C.

2.4. Physical methods

Carbon, hydrogen and nitrogen contents were determined at the Microanalytical Unit, Cairo University, Egypt. IR spectra of the ligand and its solid complex were measured in KBr on a Mattson 5000 FTIR spectrometer. The electronic spectra were performed using Varian Cary 4 Bio UV/VIS spectrophotometer. ¹H-NMR spectrum of the ligand was recorded on Joel-90Q Fourier Transform (200 MHz) spectrometers in [D₆] DMSO. The mass spectra of the phosphonate ligands were recorded on a Shimadzu GC-S-QP 1000 EX spectrometer using a direct inlet system. Thermal analysis measurement (TGA) was recorded on a Shimadzu thermo-gravimetric analyzer model TGA-50 H, using 20 mg sample. The flow rate of nitrogen gas and heating rate were 20 cm³ min⁻¹ and 10°C min⁻¹, respectively. The magnetic susceptibility measurements for the copper (II) complexes were determined by the Gouy balance using Hg[Co(NCS)₄] as a calibrant at room temperature.

2.5. Nuclease-like activity assay (DNA cleavage)

Genomic DNA extracted from mammalian blood by salting out method was used to examine the DNA cleavage activity of the examined ligands and their copper (II) complexes. DNA purity and concentration were examined spectrophotometrically at 260/280 nm. The cleavage reactions were carried out in a total volume of 15 µl containing 5 µl genomic DNA, 5 µl of ligand or complex (from 1.0 nM to 1mM), and 5 µl TE buffer (25.0 mM Tris-HCl containing of 50.0 mM NaCl pH 7.2). Genomic DNA alone or genomic DNA in the

buffer was used as a control. The reactions were carried out at 37 °C at different time points (0, 0.5, 1, 2, 6, 12 hours). A solution of loading dye (0.05% bromophenol blue, 5% glycerol, and 2 mM EDTA) was added to the reactions mixtures prior to running the gel. Dose dependent and time dependent experiments were carried out for each ligand and its complex used in this study. The prepared compounds were run on 1.0% agarose slab gel at a constant voltage of 100 V for 30 min in TBE (Tris- Borate-EDTA) buffer. Gels were stained with ethidium bromide and visualized under UV trans-illuminator (Syngene gel documentation system with digital camera).

III. RESULTS AND DISCUSSION

The phosphonate compounds were prepared as mentioned previously [29] by stirring the mixture of the aldehyde, amine and triphenyl phosphite as one-pot reaction.

3.1. IR spectra

IR spectroscopy is very important technique for the characterization of the organic compounds and their metal complexes. The IR spectral data (Figure 1) of the prepared ligands (DHPP) and (DAHP) exhibit peaks at 3440 cm⁻¹ due to νOH. The bands appear at 3320 and 3430 cm⁻¹ are corresponding to νNH for (DHPP) and (DAHP), respectively. The bands corresponding to νP=O appear at ~1215 cm⁻¹[30]. The bands attributed to NH₂ are observed at 3320 and 3280 cm⁻¹. The spectral data show bands at ~1640 cm⁻¹ and 1435 cm⁻¹ attributed to NH and OH bending, respectively.

¹H-NMR spectrum (Figure 2) of the ligand (DHPP) shows δ = 4.68 (d, 1H, CH), 6.78-7.78 (m, 19H, Ar-H), 5.41 (brs, 1H, OH) and 8.43 (brs, 1H, NH). At the same time the ¹H-NMR spectrum of DAHP shows δ = 4.76 (d, 1H, CH), 6.79-7.78 (m, 19H, Ar-H) and 8.33 (s, 1H, NH). 5.61 (s, 1H, OH), 2.73 (s, 2H, NH₂).

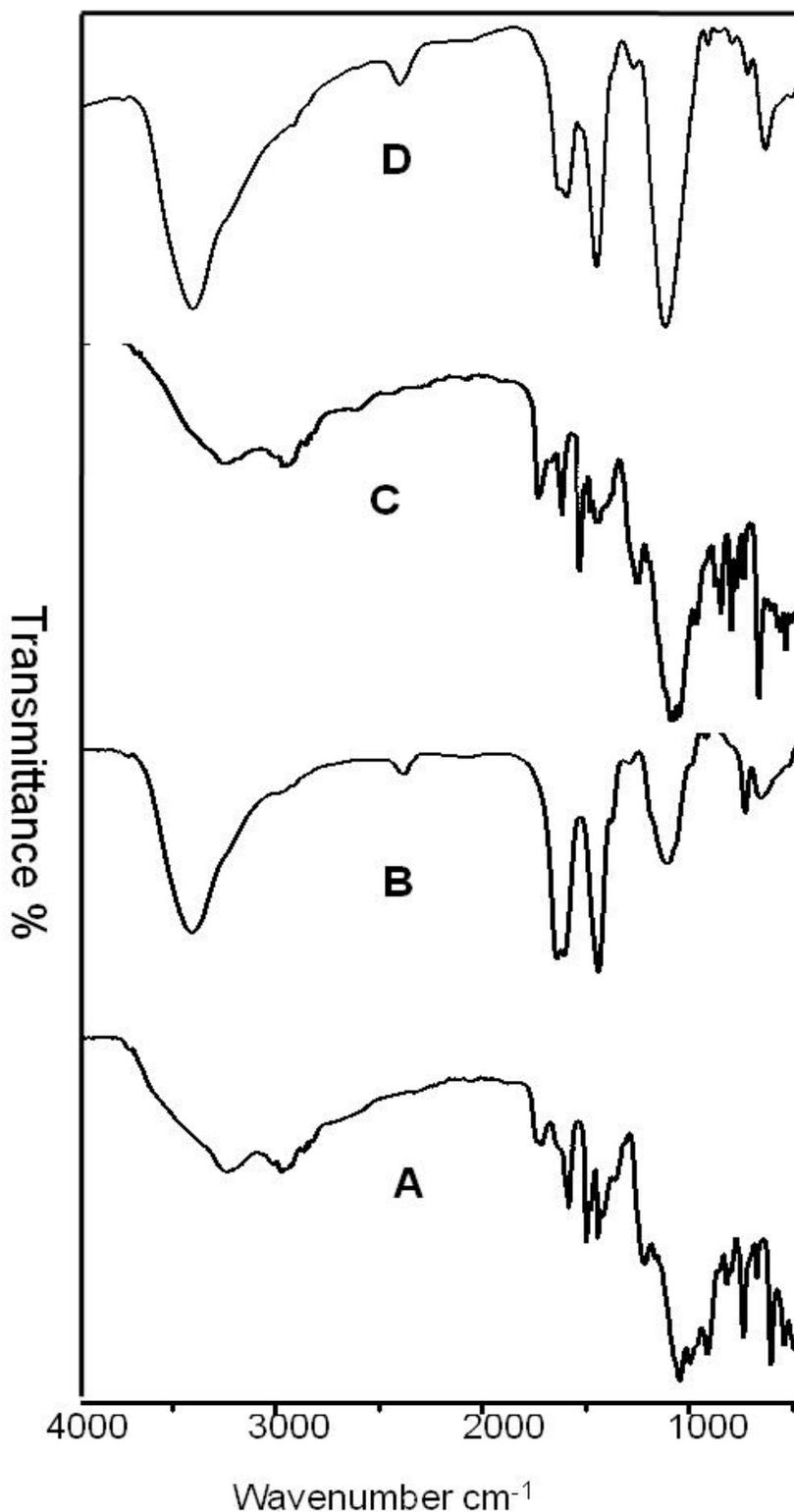


Figure 1. IR spectra of the ligands and their copper (II) complexes DHPP (A), Cu^{II}-DHPP (B), DAHP (C) and Cu^{II}-DAHP (D).

3.2. Mass spectroscopy

The mass spectrum of the ligand (DHPP) shows ion peak at $m/e = 431$ as the molecular peak. The ion peak at $m/e = 339.23$ is due to $M^+(C_{19}H_{16}O_4P)$. The ion peak at $m/e = 338.28$ corresponds to $M^+(C_{19}H_{17}NO_3P)$. The ion peak at $m/e = 265.14$

is due to $M^+(C_{13}H_{13}O_4P)$, while the ion peak at $m/e = 111.08$ corresponds to $M^+(CH_6NO_3P)$ and the ion peak at $m/e = 71.09$ (100%) corresponds to $M^+(CNOP)$ which is the base peak. The fragmentation patterns of DHPP are shown in Scheme (1); Figure3.

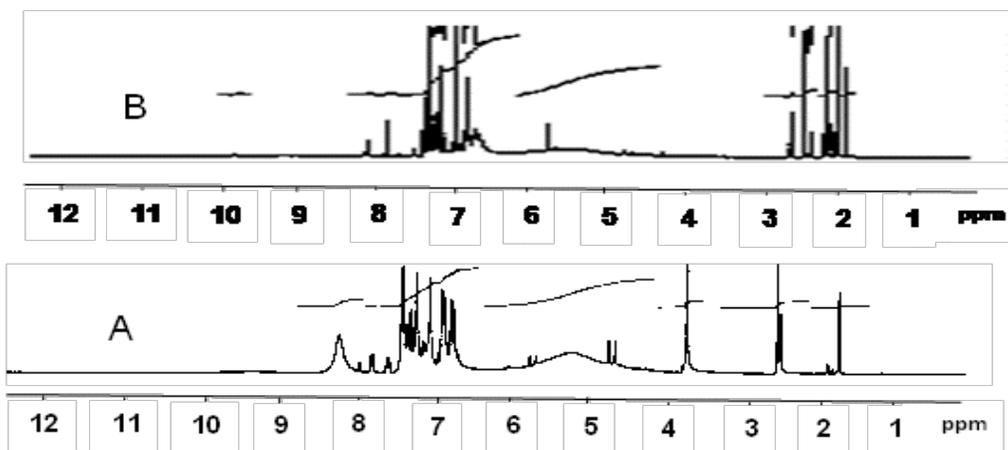
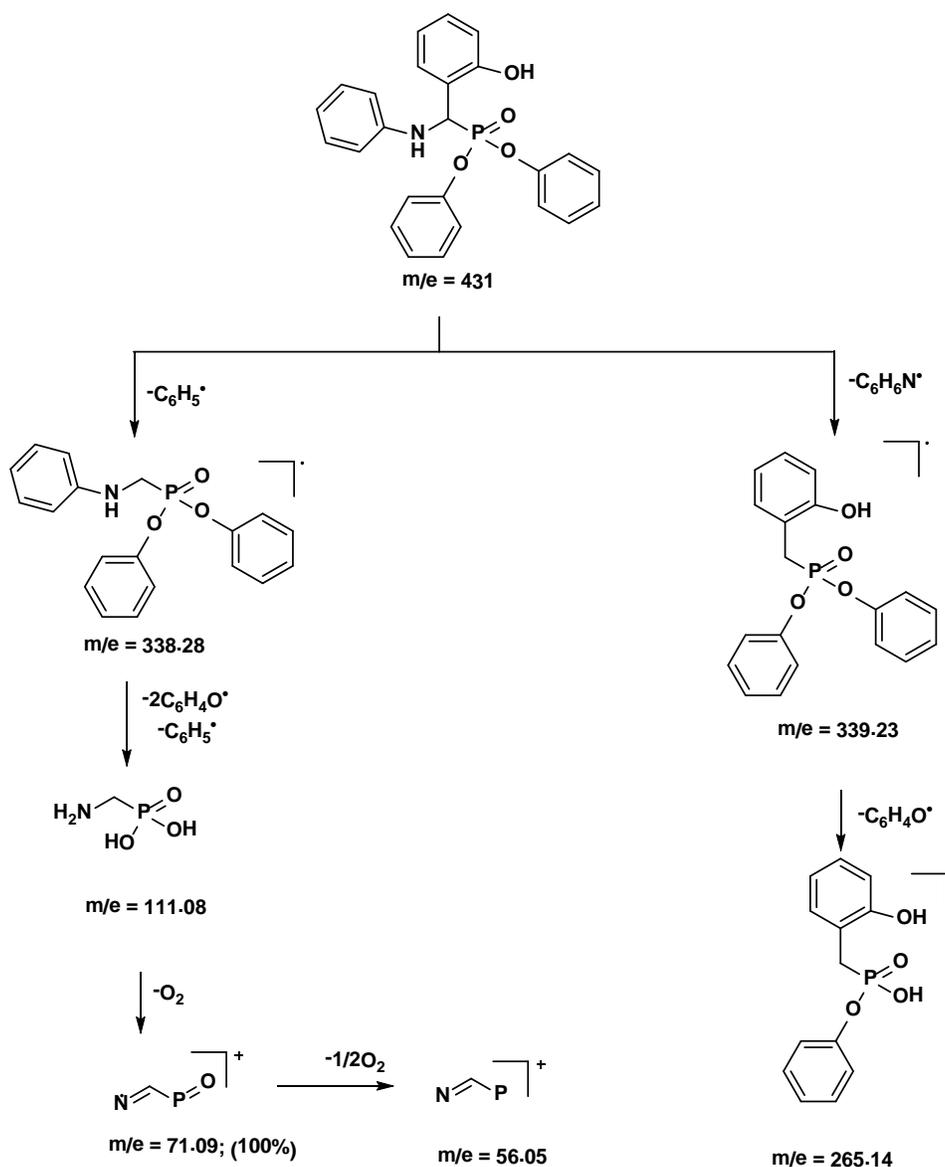
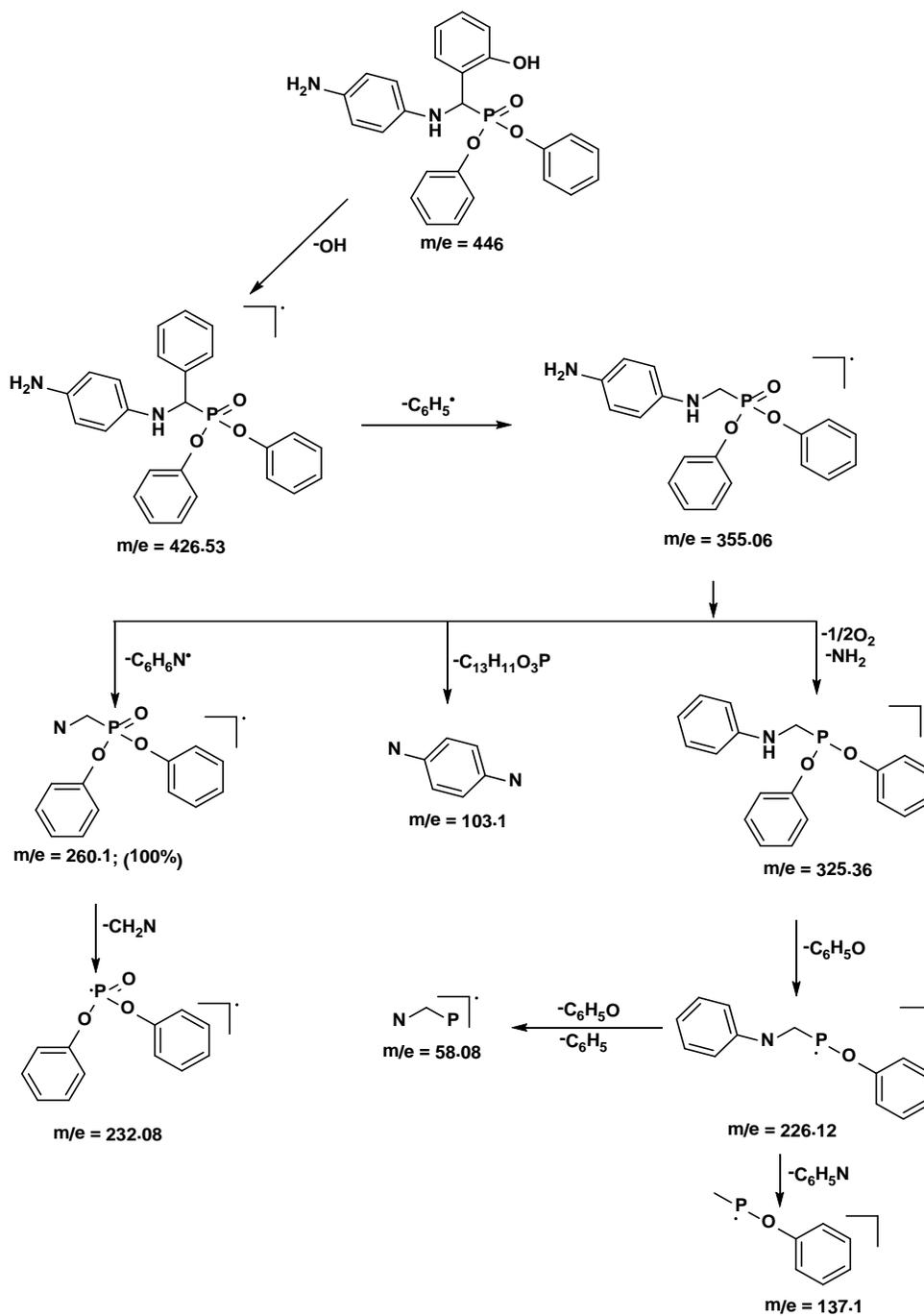


Fig. 2; ¹H-NMR of DHHP (A) and DHAP (B) in d₆ DMSO



Scheme 1; Mass fragments of DHPP



Scheme2; Mass fragments of DAHP

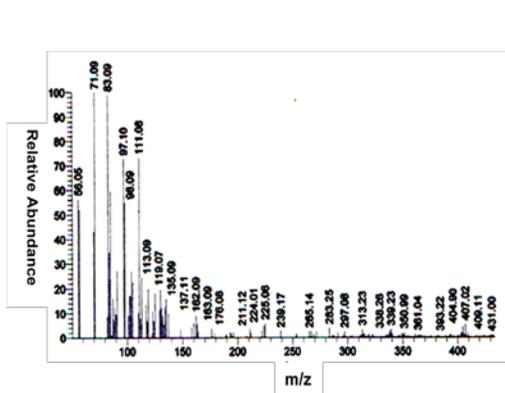


Fig. 3; Mass spectrum of DHPP

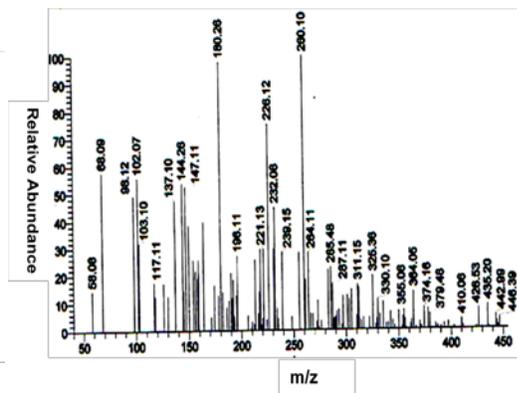


Fig. 4; Mass spectrum of DAHP

The mass spectrum of the ligand (DAHP) shows ion peak at $m/e = 446$ as the molecular peak. The ion peak at $m/e = 426.53$ is due to $M^+(C_{25}H_{20}N_2O_3P)$. The ion peak at $m/e = 355.06$ corresponds to $M^+(C_{19}H_{18}N_2O_3P)$. The ion peak at $m/e = 325.36$ is due to $M^+(C_{19}H_{18}NO_2P)$, while the ion peak at $m/e = 260.1$ (100%) corresponds to $M^+(C_{13}H_{11}NO_3P)$ which is the base peak, while the ion peak at $m/e = 232.08$ corresponds to $M^+(C_{12}H_{10}O_3P)$. The ion peak at $m/e = 226.12$ corresponds to

$M^+(C_{13}H_{12}NOP)$. The ion peak at $m/e = 137.1$ corresponds to $M^+(C_7H_6OP)$. The ion peak at $m/e = 103.1$ corresponds to $M^+(C_6H_4N_2)$ and the ion peak at $m/e = 58.08$ corresponds to $M^+(CH_2NP)$. The fragmentation patterns of DAHP are shown in Scheme (2); Figure 4.

The IR and 1H -NMR and mass spectral data suggest the structure of the phosphonate ligands as shown in Figure 5.

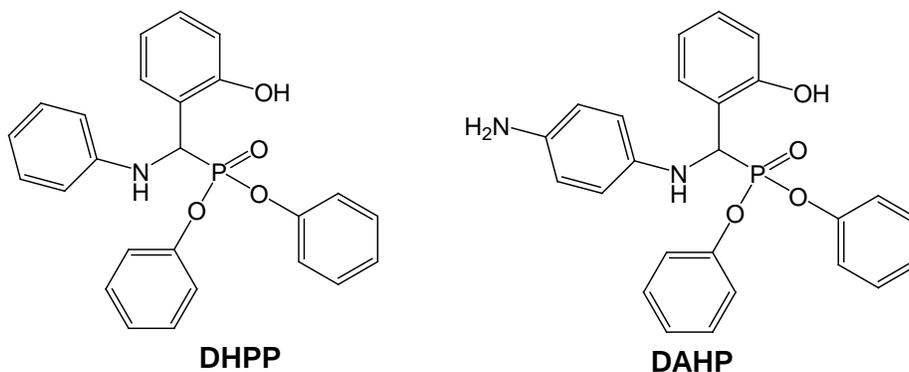


Figure 5. Structure of the phosphonate ligands

IR spectra of the copper (II) complexes were recorded to give more information about their structures. The vibrational mode assignments of the metal complexes were compared with the vibrational frequencies of the free ligands (Figure 1). By comparing the IR spectral data of the prepared ligands with their copper (II) complexes, it is found that the phosphonate ligands are coordinating with the copper ion by P=O oxygen and NH nitrogen atoms. This suggestion is supported by shifting in the position of ν P=O band from 1215 cm^{-1} in the ligands to $1229\text{--}1254\text{ cm}^{-1}$ in the Cu^{II} -DHPP and Cu^{II} -DAHP, respectively. At the same time, the position of ν NH was shifted to 3260 cm^{-1} and 2930 cm^{-1} in Cu^{II} -DHPP and Cu^{II} -DAHP, respectively. The binding with NH is supported by shifting in the position of NH bending from 1641 to 1629 cm^{-1} in the copper (II) complexes.

3.3. Electronic spectra

The electronic spectra of the prepared ligands DHPP and DAHP were recorded in ethanolic solution and showed two

bands at ~ 335 and $\sim 490\text{ nm}$ assigned to $\pi \rightarrow \pi^*$ and $n \rightarrow \pi^*$ electronic transitions, respectively. The magnetic moment (1.93 and 1.86 BM) of the $Cu(II)$ complexes Cu^{II} -DHPP and Cu^{II} -DAHP, respectively at room temperature corresponds to one unpaired electron [31]. The copper(II) complexes with d^9 configuration are expected to experience Jahn-Teller distortion which leads to further splitting of the 2E_g and $^2T_{2g}$ levels. Moreover, they give rise to the $^2B_{1g} \rightarrow ^2A_{1g}$ (ν_1), $^2B_{2g}$ (ν_2) and 2E_g (ν_3) transitions which are expected to be close in energy and generally appears as a broad band. The electronic spectra (not shown) of the copper complexes Cu^{II} -DHPP and Cu^{II} -DAHP in ethanolic solution, show a broad band at $\sim 700\text{ nm}$. The a broad band centered at $\sim 700\text{ nm}$ is assigned to the envelope of $^2B_{1g} \rightarrow ^2A_{1g}$, $^2B_{2g}$ and 2E_g transitions [32]. This band with the magnetic moment value, support a distortion octahedral geometry around copper (II) in the complex.

3.4. Thermal analysis

The thermodynamic activation parameters of decomposition processes of the copper (II) complexes, namely activation energy (E^*), entropy (ΔS) and Gibbs free energy change of the decomposition (ΔG) were evaluated graphically by employing Coats–Redfern method [33]. The results obtained by applying this method (Table 1) give some information about the stability of the copper (II) complexes. The high values of the activation energies for Cu^{II} -DHPP and Cu^{II} -DAHP reflect the thermal stability of these complexes [34] due to their covalent bond character [35]. The entropy ΔS gives information about the degree of disorder of the

Table 1; Thermodynamic parameters for copper complexes.

Cu^{II} -DHPP				
	Ea	ΔH	ΔS	ΔG
53-150 °C	12861	9926	-35.62	22503
163-270 °C	16345	12279	-36.67	30213
820-990 °C	26288	16328	-42.22	66909
Cu^{II} -DAHP				
	Ea	ΔH	ΔS	ΔG
41-103 °C	23129	20277	-33.59	31802
167-318 °C	13942	10134	-37.67	27391
679-915 °C	21882	12753	-40.05	56732

system. According to the kinetic data the entropy of activation was found to have negative values in all decomposition steps for all complexes. The negative ΔS values indicate that all studied complexes are more ordered in their activated states [36] and the decomposition reactions proceed with a lower rate than the normal ones. It also reveals that the complexes are formed spontaneously [34,37]. The enthalpy ΔH gives information about the total thermal motion. Gibbs or free energy gives information about the stability of the system. The positive sign of ΔG for the investigated complexes reveals that the free energy of the final residue is higher than that of the initial compound, and all the decomposition steps are non spontaneous processes.

The thermal analyses of the prepared complexes were investigated in order to give fully characterization of their chemical structure by measuring and confirming the solvent inside/or outside the coordination sphere. At the same time the thermal analyses give more information about the stability of the metal complexes. The correlations between the different decomposition steps of the complexes with the corresponding weight losses are discussed in terms of the proposed formula of the complexes. The TGA curves are given in Figure 6 . The weight losses for each complex are calculated within the corresponding temperature ranges

The copper complex Cu^{II} -DHPP is thermally decomposed in four stages of mass loss from 25-1000 °C. The first stage at the

temperature range of 53-150 °C with weight loss of (Calcd. 5.98%, found 5.57%) corresponding to two water molecules. The second stage in the temperature range of 163-270 °C with weight loss of (Calcd.19.15%, found 19.49%) corresponding to $\text{PhOH} + \text{NH}_3$. The third and fourth stages are corresponding to removal of one Ph molecule with one molecule of HCl. with weight loss of (Calcd. 19.03 %, found 19.17%). The total weight loss of the $\text{Cu}(\text{II})$ complex Cu^{II} -DHPP is 44.23% and the remaining weight is 55.77%, indicating that the complex is stable till 1000 °C. The TGA of Cu^{II} -DAHP complex (Figure 7) shows four degradation stages. The first stage in the temperature range of 41-103 °C is assigned to removal of two water molecules (Calcd. 5.83%, found 5.93%). The second stage in the temperature range of 167-318 °C is assigned to removal of two NH_3 molecules with weight loss of (Calcd. 5.50%, found 5.63%). The third stage in the temperature range of 345-522 °C with weight loss of (Calcd. 11.82%, found 11.59%) is corresponding to removal of two molecules of HCl. The fourth decomposition stage in the temperature range of 679-915 °C is related to removal of two Ph molecules with weight loss of (Calcd. 25.49%, found 25.45%). The remaining weight is 51.40%, indicating that the complex is stable till 1000 °C.

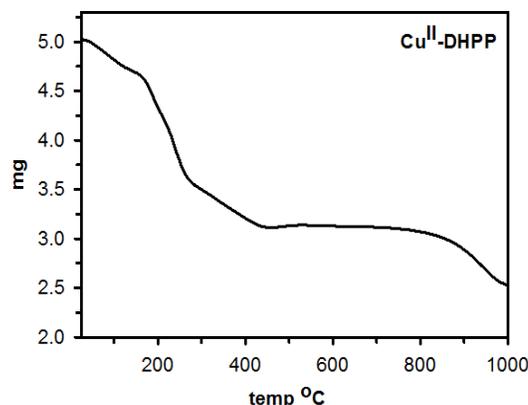


Fig. 6; TGA for Cu^{II} -DHPP.

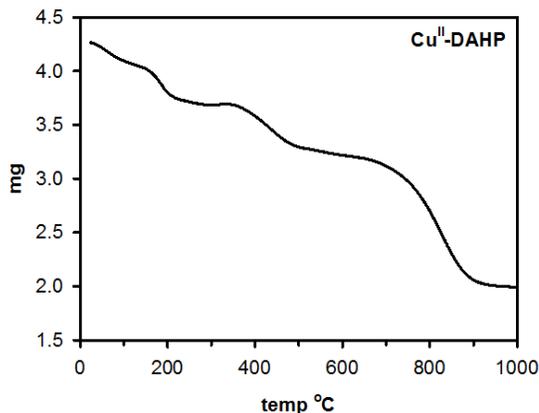


Fig. 7; TGA for Cu^{II} -DAHP.

The elemental analysis, IR and electronic spectral data with thermal analyses support the chemical structure of the prepared copper (II) complexes as $[\text{CuL}(\text{H}_2\text{O})_2\text{Cl}_2]$ where L = DHPP and DAHP respectively, (Figure 8).

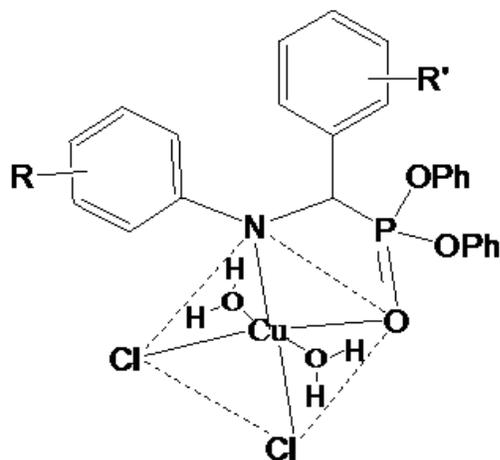


Fig. 8; The chemical structure of Cu^{II} -DHPP ($\text{R} = \text{H}$, $\text{R}' = \text{OH}$), and Cu^{II} -DAHP ($\text{R} = \text{NH}_2$, $\text{R}' = \text{OH}$).

3.5. Gel electrophoresis

The interactions of DNA which is considered as an important target of antitumor drugs with transition metal complexes are important for the design of effective drug entities [38]. Particular attention has been devoted to transition metal complexes endowed with planar aromatic side groups, which can bind with DNA by both metal ion coordination and intercalation of the aromatic moiety [39]. The activity of the prepared ligands and their copper (II) complexes towards the DNA cleavage was determined by incubating the prepared compounds in different concentration with 100 ng genomic DNA for 24 hours at 37 °C. The samples were run in 1.0 % agarose gel in TBE (tris– Borate-EDTA) buffer of pH 7.4 at 2 V/cm for 30 min.

The gel was stained with EtBr and photographs were taken in a syngene gel documentation system. It was observed (Figure 9) that complex Cu^{II} -DAHP exhibits potent nuclease activity at concentration range from 1nM to 1mM, followed by the complete conversion of supercoiled DNA to its open circular form[40] after 24 h incubation. On the other hand when the genomic DNA was incubated with 100 μM copper complex Cu^{II} -DAHP for interval times from 30 mins to 12 h (Figure 10), the complex revealed strong cleavage showing the supercoiled DNA band. In this time course the supercoiled DNA hasn't been converted into its open circular form and the linear form doesn't appear. It was found that the more concentration of the copper (II) complex the more strongly cleavage effect on the genomic DNA. It is clear that the cleavage of the genomic DNA is dependent on the number of metal ions as well as the presence of an aromatic ring.

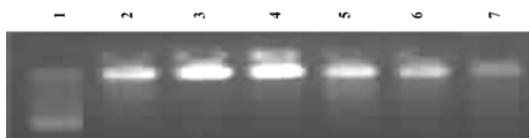


Fig. 9; Various concentrations of complex Cu^{II} -DAHP (0, 1 nM, 10 nM, 100 nM, 1 mM, 10 mM, 100 mM) were incubated with genomic DNA (100 ng) for 24 hours at 37 °C. DNA was

electrophoresed in 1% agarose gel stained with ethidium bromide for 30 minutes and photocopied on Syngene gel documentation system.

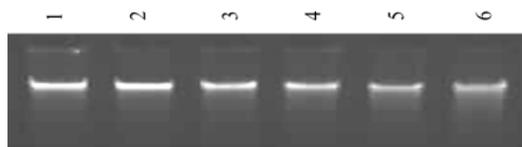


Fig. 10; Time dependant effect of the complex Cu^{II} -DAHP on DNA binding activity. Cu^{II} -DAHP (100 mM) was incubated with genomic DNA for 0, 30 min, 1, 2, 6 and 12 hours for lanes 1-6, respectively, at 37 °C. DNA was electrophoresed in 1% agarose gel stained with ethidium bromide for 30 minutes and photocopied on Syngene gel documentation system.

IV. CONCLUSION

The phosphonate ligands DHPP and DAHP were synthesized and characterized by different physicochemical tools. The copper (II) complexes of these phosphonates were also synthesized and characterized. The mode of binding was studied and the thermal analysis of these complexes showed that the Cu^{II} -DAHP is more stable than Cu^{II} -DHPP. The activity of these complexes towards the DNA cleavage was investigated and showed that Cu^{II} -DAHP reveal the highest ability to cleavage the genomic DNA.

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Strategy of Indonesia Textbook Publishing Industry Facing the Digital Era

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Abstract- The digital era has influenced the business environment in the world for becoming more dynamic, the growth of digital technology encouraged the textbook publishing industry for keeping society needs. The growth of digital era makes the society demands of textbook publishing product become increasing, both from the quality, price, accessibility, and other aspects. The study of textbook publishing industry strategy to face the digital era in Indonesia is done by some purposes which is: mapping the textbook publishing industry nationally, formalizing the national textbook publishing industry to face the digital era, giving the recommendation strategy for national textbook publishing industry. The analysis methods that is used in this study is SWOT (Strength, Weakness, Opportunities, and Threats), to simplify and accelerate the process of decision-making by using Analytic Hierarchy Process (AHP) and BOS (Blue Ocean Strategy). The results of this study is expected to give benefits for stakeholder such as publishing company, publishing industry, government, society, as well as: (1) become a basic reference and input for textbook publishing industry in formulating strategies to face the digital era, (2) get the proper formulating strategies for the growth of textbook publishing industry in the digital era, (3) improving and developing the national textbook publishing industry in the digital era. (4) preparing the textbook publishing industry to face the digital era, (5) giving contribution to government in determining the regulations in national textbook publishing industry.

Index Terms- Strategy, Textbook Publishing Industry, Digital Era, SWOT, AHP

I. BACKGROUND

Nowadays, the era of information has influenced the business sector for becoming more dynamic. The growth of information technology encouraged the textbook publishing industry for keeping society needs of quality literature. Moreover, followed by the growth of digital era, it creates a huge demand from the society, and at a same time change their reading habit. A competitive strategic planning is increasingly needed, proven by the demands of the corporate to have a guideline to prioritize their decision-making, both in the corporate level, business level, or functional level. This strategy, according to Gurowitz (gurowitz.com/articles/strategy.pdf) has a definition as "a futuristic orientation plan to interact with competitive environment to achieve the goal"

The strategy is a forward step to achieve an organizational goal, set the strategic goal and corporate financial, also by setting that, it is expected to give the best results. Morton (1996) stated that there is an affinity which is mutually supported each other from the organization structure and corporate culture, technology, individual role, organization structure and management process that is influenced by external socio-economic environment and external technology environment in forming strategy methodology.

Therefore, there is some steps that should be conducted as a follow, (1) identify the environment that will be included by industry in the future, (2) do the environment analytic both internal and external to measure the strength and weakness as well as the opportunity and threat that will be opposed by the corporate in running their goals and take the competitive advantage, (3) formalizing the important factors of success (key success factors) based on the environment transition that will be faced, (4) determine the goals, identify and evaluate the alternative strategy and formalizing the chosen strategy to reach that goals and success.

Data of the publishing corporate in Indonesia 2015 shows 1.328 the numbers of publisher in the table 1.

Table 1. Composition of Publishing Corporate is Divided into 3 Big Regions (Geographic) in 2015

Number	3 Big Regions	Total	(%)
1	Jakarta Capital City	504	38%
2	Java (Non Jakarta Capital City)	687	52%
3	Outside Java	137	10%
TOTAL		1.328	100%

Source: Indonesian Publisher Association Yearly Report –2015

The data is found by examining the Indonesian Publisher Association report, which is found that mostly the publisher publish their book by not more than 50 titles in each their books every year. A new book produced by national publishers, it is found that the number of book that is published by an active publishing company in Indonesia in 2015 is vary enough. There are 80% publisher publish new book within 10 to 50 titles. 17% publisher publish their books within 50 to 200 title, and there are 3% publisher publish their book more than 200 titles in 2015 (data from Indonesia Publishers Association, 2015). The producing of a new national title, in the last two years' data (2013 - 2014), it is found that the number of book publishing in Indonesia is more than 30.000 titles within a year. Besides from national publishers, these books are published by publisher who has corporate legality, as a book publisher from government institution and State-Owned Enterprises. For example, the government institution in Indonesia that publish book, for example Indonesia Supreme Audit, Corruption Eradication Commission, and another ministry

The significant growth from Internet User in Indonesia create a prospective selling of digital book in Indonesia. Some publisher has published their books in electronic format or another digital format. It reflects that there is an emerging need of electronic book in Indonesia and also supported by some book marketplace on the Internet. Even though it grows significantly, the e-book selling is not more than 2% in local market (Indonesian Publisher Association reports, 2015). Internet nowadays is on the state of being growth rapidly, stimulated by the demands side that is in line with the growth of wealth level in middle class, which means without this growth the internet selling is getting stagnated. According to Internet Service Provider Association in Indonesia 2014, it is listed that there are 88,1% internet user. This data is continuously growing from year to year, because the growth of Internet user in Indonesia is rapid enough, as provided by table 2.

Table 2 The Number of Internet User Penetration in Indonesia 2005 - 2014

Year	The Number of Indonesia Population (million)	The Number of Internet User (million)	% Internet User Penetration
2005	206,3	16,0	7,8%
2006	212,7	20,0	9,4%
2007	219,2	20,0	9,1%
2008	225,6	25,0	11,1%
2009	232,1	30,0	12,9%
2010	238,5	42,0	17,6%
2011	242,0	55,0	22,7%
2012	245,5	63,0	25,7%
2013	248,9	71,2	28,6%
2014	252,4	88,1	34,9%

Source: Internet Service Provider Association in Indonesia (APJII)

The supporting factor that should be considered in this case is, three fundamental key that support the continuing growth in the internet market:

1. Economic growth that is powerful and consistent within 6% per year, and personal expense ratio currently is growing more than 10% per year.
2. The middle class in Indonesia is growing rapidly, that bring a huge demands of technology device and online service.
3. A tight competition between mobile company (mobile operator) that play an important role for lowering the fare and also improving customer awareness through their massive campaign and advertisement.

Nevertheless, it is believed that mostly market players underestimate the growing of internet user at the future in Indonesia, and they miscalculate the two-key dynamic in Indonesia market above, so they will be left by the aggressively of this market that devour all of the content that is provided in internet. Hence, the focus in this study is to: (1) map of national textbook publishing, (2) arrange the strategy of national textbook publishing in the case of facing the digital era, (3), give the recommendation strategy for national textbook industry.

II. RESEARCH METHOD

This study is conducted in textbook publishing company that lies in Indonesia within July to September 2016. The publishing company that is sampled is limited only in textbook publishing company. To strengthen the results of this study, we do in depth interview with the head of Curriculum and Bookkeeping Department (Puskurbuk), Ministry of Education and Culture (Kemendikbud RI) and the head of Publishers Associate (Indonesia Publishers Association)

The sampling technique that is done in this study is using purposive sampling methods, in which taking the sample intentionally. The respondent that is chosen by the writer is based on a consideration in which the determining of these textbook publishing industry strategies is chosen 6 practitioners, who is Director and CEO from textbook publishing company in Indonesia.

Data Examining and Analysis Technique

The analysis and examining technique of this data that is use to support this research is :

1. Internal and External Analysis

This analysis is purposed to know the internal and external critical factors of national textbook publishers. These internal and external critical factors then will be scored after it is previously valued and rated. The scoring value of each internal and external critical factors is done by using pairwise comparison

2. SWOT Analysis (Strength, Weakness, Opportunities, Threats)

SWOT Analysis is a strategic planning methods that is used to evaluate the strengths, weaknesses, opportunities, and threats in a project or business speculation. These four factors that shape SWOT acronym (Strengths, Weaknesses, Opportunity, and Threats). From these critical factors then it is analyzed by using SWOT (Strength - Weakness - Opportunity - Threats) metrics to determine the alternative strategies for company. To support an effective decision making of strategic planning in national textbook publishing industry to face the digital era, thus, this study will use Analytic Hierarchy Process (AHP) to simplify and quicken the decision-making process.

3. Analytic Hierarchy Process (AHP)

Analytic Hierarchy Process is a fluid model that facilitate the chance for individual or organization to build the idea and define the problem by making their own assumption and get the problem solving that is expected (Saaty, 1990).

4. Blue Ocean Strategy (BOS)

Blue Ocean Strategy, according to Kim dan Mauborgne (2006), define this term as “a strategy with determination to find the obtainable market that is not-covered yet, in order to create potential demands and chance for a huge growing of the profitability”. It is shaped well in unlimited industrial environment. Blue Ocean is formed inside the Red Ocean by expanding and penetrating the market limit in the industry.

III. RESEARCH OUTCOME

Industrial Mapping in Indonesia Textbook Publishing

In this study the textbook publishing company in Indonesia is a dominant respondent since they established in 1970 that is 66%, textbook company that established in 1980 is 17%, and textbook company that established in 2000 is 17%. Mostly textbook publishing company publish elementary school book as much as 30%, 25% senior high school book, 20% junior high school book, 15% kindergarten book and 10% university level book.

According to respondent, stated that 70% condition of the current textbook publishing company considered as mature condition, and 30% of the current textbookpublishingcompany considered as decline condition. Mostly the respondent argues that 83% of them stated that the use of electronic textbook product (e-book) to replace the printed textbook in Indonesia is cannot be predicted for the next several years. And the rest 17% argues that within the next 10 years the use of printed textbook compared to electronic textbook (e-book) is 9:1. It means the value of printed textbook is higher compared to electronic textbook. It indicates that the selling of printed textbook is consisting of variable cost that is measurable for example Cost of Goods Sold (COGS), pre-production cost, and after production cost.

Textbook Publishing Industry Strategy

EFE matrix in SWOT analysis is consisted in order to facilitate the execution of the strategy so that it can simplify and evaluate the information based on indicators that include in external factors such as from the side of opportunity and threat. The results of EFE matrix summed up from the expert scoring give an analysis outcome as it's depicted in Table 3. Based on the identification of EFE matrix by giving value from the scale of 1 - 4, it is found that the total score of opportunity (1.587) is higher than the total score of threats (0,959). This score explained that opportunity inside the publishing industry is huge compared to the threats, so that if the opportunity can be functionalized or captured in good manner, the textbook publishing industry will significantly able to compete in the digital era (score 0,427). This opportunity can be utilized by publishers' industry considering that there is an immense internet connections speeded in Indonesia nowadays, but still unequal, thus in the learning process, particularly in schools it still difficult to get attuned or to update the trend of technological growing by using electronic book (e-book). The emerging of new technology in the case of textbook printed (score 0,426) is also become an opportunity that is had by textbook publishing industry in which they still have efficiency in producing a new book.

Table 3.The Matrix of External Factor Evaluation (EFE)

External Factors	Value	Rating	Total Score
Chances			
The growing of internet understanding in society	0,122	3,17	0,385
The emerge of new technology in publishing	0,128	3,33	0,426
Huge Society needs of quality product in low-price	0,116	3,00	0,348

Population growth	0,128	3,33	0,427
Total			1,587
Threats			
Low level of reading habit in society	0,063	1,67	0,106
The spread of population which is uneven in Indonesia islands	0,070	1,83	0,128
The growing of competitor that produce digital product	0,077	2,00	0,155
Multimedia apps variation that become more interesting	0,077	2,00	0,155
The internet era where user can cheaply buy it and get the information easily	0,077	2,00	0,155
The printing cost which getting higher	0,077	2,00	0,155
Computer accessibility	0,064	1,67	0,106
Total			0,959

The threat that is appear is equally shown by the score 0,155 which coming from the progress of the competitor that results digital product. There are multiple multimedia apps that is getting interesting, internet era where the user just pay for the internet cost is now getting easier to enjoy the crowds of the information, the cost of printing is getting more expensive. This threats can be anticipated by continuously producing the textbook because the nature of Indonesian student, particularly in remote area is tend to use paper book instead of electronic book especially for elementary level, and for Junior and Senior High School, they are now used to get in touch with electronic book (e-book). It still more socialization needed and continuous using for the future regarding the accepting of electronic book in the future. Printed book can be concluded still has important role as a main option to be used by students and schools.

A concise step to do a strategic management audit is by making Internal Factor Evaluation Matrix (IFE). This strategic formulation tool is concise and evaluation priority strength and weakness inside multiple functional fields in the organization. This matrix is also considered as a fundamental core to identify and evaluate the relationship between these fields. The intuitive scoring is needed to create the IFE matrix. Thus, this approach that seems scientific do not need to put as the most potent technique. Just like EFE matrix, this matrix can be expanded as in table 4. Based on the IFE matrix results in Table 4, it results total score of the strength is 2,770 and weakness is 0,443. The weakness score is smaller than strength score so that according to the experts, the strength factors or indicators become more dominant comparing to weakness that become internal factor. Table 8 shows that for the main strength of the textbook publishing industry, era digital factor (score 0,494), then added by secondary strength, it is found that textbook publishing industry apply an effective marketing segmentation (score 0,491). Whereas the main weakness of the textbook publishing industry can be known as a material inside the product that is provided on average is merely same between the competitor, it is not efficient in production, and product costing that is gradually increasing with the score 0,148.

Table 4. Matrix of Internal Factor Evaluation (IFE)

Internal Factors			
Strength	Value	Rating	Total Score
Funding Strength	0,127	3,50	0,446
Company Positioning in the Market	0,127	3,50	0,446
Effective Implementation of Marketing Segmentation	0,134	3,67	0,491
Technology Growth	0,127	3,50	0,446
Information Management System	0,127	3,50	0,446
Product Diversification	0,135	3,67	0,494
Total			2,770
Weakness			
Book material product which still standard	0,074	2	0,148
Inefficient in production	0,074	2	0,148
Production cost which gradually increasing	0,074	2	0,148
Total			0,443

Based on the SWOT results, where the score value of the opportunity (1,587) is greater than threats value (0,959) and the strength score 2,779 is greater than weakness score 0,443. Hence, the recommended strategy is S-O strategy (Strengths - Opportunity). This SO strategy is a strategy that is made based on the object road map, in which by using the whole strength to grab and exploits the chance as extensive as possible. These four strategies is mapped into SWOT Matrix (Table 4) to get the whole picture of alternative

strategy that can be chosen by textbook publishing industry. Besides the internal and external SWOT factors that already existed, the other factor that play an important role in the textbook publishing industry is the excessive cost or rebate that is implemented by bookstore. In side of government (regulator); the consistency of their regulation, textbook regulation that is inclined with the industry, good and realistic planning and proper public choosing. From the industry side; the cohesiveness and commitment to publish and distribute the quality textbook by using proper ways and can be accepted by all stakeholder. This government consistency, bookstore & distributor that give a high discount, the society who are still low-awareness towards the improvement of their education supported with quality book. The quality of the education is not a main prior in the society, slow payment from distributor, book politicization by government.

The interview results from the head of Curriculum and Bookkeeping Department (Puskurbuk) Ministry of Education and Culture Indonesia, stated that the draft of the regulation for the country, society, publishers, and stakeholder interest in case of anticipating and expanding the book in the textbook digital era and electronic book (e-book) will be soon executed. This is done because Puskurbuk manage and assess the educational and enrichment textbook (non-textbook, to support student needs), the government in this concern is Puskurbuk control the quality and standard of the book content. There lies government five main plan to improve the educational textbook quality in the future, such as: (1) writer open recruitment, (2) assessment of textbook from private publisher, (3) beauty contest, appointing competent publishers, and book that is valued to be distributed as a learning material (4) appointing the associates of the experts of their study field to write education textbook, (5) book translator (book from outside).

Textbook publishing company in Indonesia

Nowadays that is still existing, mostly of them is mature company (established within 1970 - 2000). Particularly that has huge capacity in funding and investment, stable company organization has some impact, despite certainly the experience of co-operating with Government and good relationship / broad connection with the market / school that has already built and educated for several years. These factors is difficult to be had by new player, unless they have huge funding and good relationship and broad connection with school through certain business field, for example tutoring.

Mostly textbook publishing company publish book for Elementary school, Junior high school, and Senior High School. Publisher that published the textbook for university level is relatively small comparing to publisher that publish book for Elementary School, Junior High School, And Senior High School, because the opportunity to grab the market is far bigger for school or low education level. The number of student in Elementary School is bigger than Junior High School, and the number of student in Junior High School is bigger than Senior High School. The number of Senior High School is bigger than university students. Besides that, the books that is used in university level is usually different for each university. The textbook in university is usually use from overseas writer or written by their lecture and is not obligated to be used by other university. The university textbook is tended to be decreasing because of the hijacking trend that still has no solution up to know and the growth of electronic book (e-book).

Table5. SWOT Matrix of the Textbook Publishing Industry

Intern al Extern al	Intern al	Strength 1. Product diversification 2. An effective implementation of marketing segmentation 3. Powerful funding 4. Company positioning at the market 5. Sophisticated technology 6. <i>Management Information System</i>	Weakness 1. The content on the product is provided with a same standard with the competitor 2. Inefficient in production 3. Production cost that tend to be increasing
	Opportunity 1. Population that is rapidly growing 2. New technology emerge in printing 3. The improvement of the society understanding towards the internet	SO Strategy 1. Do the investment to purchase a new printing technology 2. Do and expand the digital marketing channel (<i>online</i>)	WO Strategy 1. Do the electronic book (e-book) publishing 2. Publish printed book bundled with CD Rom, multimedia and interactive link.

Threats	ST Strategy	WT Strategy
1. Competitor improvement that resulting digital product	1. Improving the creativity and innovation in textbook publishing	1. Give input about bookkeeping regulation in digital era
2. The variation of multimedia apps that getting more interesting	2. Utilize the growing of technology to reach the customer that is geographically spread	2. Improve the business value of the electronic textbook
3. The internet era where it is only paying cheaply then can enjoy more information easily	3. Do the diversification and innovation in facing the digital product competitor	3. Improve the product innovation that is need by customer in digital era
4. Production cost that tend to be increasing		4. Efficiency in production and distribution cost to become more competitive
5. Unequal spread of the population in each island in Indonesia		

According to the respondent, total 70% argues that the growing of printed book nowadays is maturity, and other 30% argues that the growing of printed book lies on decline condition. One of the causes is because the growing of digital technology that more sophisticated and the internet connection become broader and easily to be accessed that enable people to get more information needed without buying the book (printed). Besides that, the interest of reading (book) in Indonesia still low that become a main cause. The results, comparison of the printed book business value is 9:1. It means business value of printed book still has important role which is lies higher comparing to the business value of electronic book. According to the head of Indonesia Publishers Association, from this information that is happened on the field the electronic book is not significantly give the results, particularly in business point of view. Some publisher reports that the profit of electronic book still lies below 5%. To improve the business value of the electronic book, it should be made a new business model that is profitable for the publisher. Up to now the business model of electronic book is made by electronic book platform company, the publisher is only follow the desire and calculation from the electronic book platform. In other words, the bargaining power of the publisher still lower than the businessman of electronic book platform. The implementation of an efficient marketing segmentation has great value and rating which valid in much industry, not only in textbook industry. The more we know how is our segment, it is better because we will focus on creating the product and service that is needed by the market. The more we know our customer, we will able to satisfy them, the bigger chance customer will be back again and buy our product.

The political factor related to the national bookkeeping by government still happened up to now, even the essence is different comparing to the regulation of previous government. Previous government campaigned a cheap book concept. Meanwhile current government is more focus on the book procurement in clean, transparent, and cashless, it can be seen from the government regulation by involving Goods and Services Policy Board (LKPP) and online purchasing of textbook by schools. Government is now slightly open to the inputs from the publisher, so that Government still continuously keep the role as a textbook publisher, even it has been proven by the textbook release by the government which does not means eliminate / reduce the content mistakes inside the book and / or inappropriate with the government regulation itself, for instance it happens in the textbook publishing of current curriculum.

The government should play a role just as a regulator and facilitator, no longer as a book publisher. Textbook publishing should be returned to the publisher, after through an assessment by the government. Business transformation / business model for the improving of textbook publishing industry in the digital era as a follow such as book should be served in the printed form, because somehow printed book has its own advantages that is not owned by electronic book. Textbook publisher is a private sector that the publisher and their books has been qualified from the government assessment. The government step as alternative that book can be bought by schools through online bookstore that is selected by LKPP. Those books that have been selected and bought by the students based on their desire and need by using Smart Indonesia Card through the exhibition, physical bookstore, or even in available online bookstore. The value-added tax (VAT) is removed only the income tax that is charged.

Decision Making Strategy in Textbook Publishing Industry

Below is the analysis of the compounding hierarchy from 6 respondents that can be vertically explained



Figure1. AHP Hierarchy Structure of The Chosen Strategy

The results of the hierarchy analysis sourced from 6 respondents in the assessment of national textbook publishing industry strategy in facing the digital era is can be seen from the role-playing actor, supporting factors and proper strategy. The compounding outcomes from 6 respondents result the decision for the actor that become a main priority which is publisher with the value score 0,38, then who has already become a second priority which is Government with the value score 0,26. Government has a role to determine the valid curriculum as a basis-textbook in Indonesia. Government is not yet having the mechanism regarding about textbook publishing by textbook publishing industry in the digital era and will soon prepare it to that direction. Government is now still having a plan to do a co-operative breakthrough with PUSTEKOM regarding to the textbook that will be uploaded in pdf form. Government as an actor in this role still limited on digitalizing the textbook, not yet coming inside to the e-book making. The third priority with value score 0,16 lies on writer criteria. The fourth priority with the value score 0,12 lies on distributor criteria and the last priority is for the society with value score 0,08. From the AHP result with the consistency requirement less than 0,1 , the results of 6 compounding respondents for the actor criteria result the consistency score 0,05, this score is lesser than 0,1 so that can be concluded that after meet the consistency requirement of six respondents in assessing the attribute from the actor.

The result of six compounding respondents' hierarchy for priority factors in resulting the national textbook industry strategy to face the digital era by a main priority that is human resource factor that has value score 0,30. Second priority is the infrastructure factor with the value score is 0,28 and the third priority is the technology growth which has value score 0,23. The lowest value score 0,18 is the regulation. From the AHP result with consistency requirement less than 0,1, the compounding of six respondents for resulting consistency value by 0,02, consistency value 0,02 is lesser than 0,1 so that it can be said that it has meet the consistency standard from the six respondents in assessing the attribute from the factors. The results of compounding six respondents' hierarchy for the priority strategy in resulting the national textbook industry strategy in facing the digital era with the main priority is cost-leadership strategy that has value score 0,33. The second priority is on the focus strategy with value score 0,30 and the third priority with the score value 0,21 is on the diversification strategy. Factor with the smallest value score 0,16 is on joint venture strategy. From the AHP results with the consistency requirement less than 0,1 , the result of six compounding respondents for the factor that resulting consistency value 0,01 , this 0,01 value is lesser than 0,1 so that can be concluded meet the consistency requirement from the six respondents in assessing the attribute from the strategy. Cost leadership has the highest value, this efficiency can explain how to make product more competitive and able to compete.

The business manager does the evaluation and chose the strategy that enable them to make their business successful and also has competitive excellence. The success of building the business is based on the cost leadership that force their business to be able to provides the product with the lesser cost comparing to the result that is achieved by another competitor. The excellence of low-cost is relying on a certain capability that is unique enough to reach and hold the lower cost position. For example, the capability is having the raw materials supplier which is rare and guaranteed, lies on the dominant position at the market, or has a huge funding. The low-cost producer is usually lead on the saving and cost efficiency. These companies maximize the economical scale, implement the cost-saving technology, emphasize the reducing of overhead and administration, and use selling technique volume to scale up the position in the profit curve (Pearce and Robinson, 1994). National textbook industry strategy which facing digital era that become a priority in AHP result is the cost leadership. The leading strategy in textbook publishing in low-cost production should be able to use the cost excellence to bargain lower the price. By doing this strategy, company can be effectively stay their position in price-war, able to compete the book competitor with digital based (e-book) with the low-cost to grab the market. Through this ability and resource, they have, a textbook industry should finish one or more activity in their value chain, such as buying the raw materials, then processing it into a book, promoting, and distribute those textbooks. The excellence cost strategy previously has been implemented by Mizan publisher, that inside their cost excellence they have a goal to reach a bigger profit (Pratiwi, 2014).

Common strategy focus to become a further prior strategy that should be concerned in textbook industry. Through a focus strategy, both based on low-cost or differentiation is aim to fulfil certain market segment. The most likely segment chosen is the segment that is ignored by the attractive marketing on the accessible market, to certain customer, or customer who has common use for the product (Aisyah, 2007). Company who implement this focus strategy will be able to serve the isolated geographical regions, to fulfil customer needs with financial, readiness, or certain service problem or change the product to satisfy the unique needs from the customer in middle low. Those companies that is used focus strategy gain the profit from the readiness to serve their customer segment who usually ignored or underestimated. Textbook industry who play focus strategy should be able to find the market segments that has limited to access the internet. This limitation is not only about the absence of the internet by the middle and low society, but also internet access for the society which categorized as a very low. Industry player of textbook publishing should be always renewing their idea and package it creatively. This concern is caused by the earnings from the book that still far bigger comparing to the electronic book.

The differentiation strategy become a third prior to the national textbook industry strategy in facing digital era. These strategies rely on the differentiation that is designed to attract customer that has certain sensitivity for a product attribute. By emphasizing on the attribute more than other product qualities, company is trying to build customer loyalty. Often, this loyalty is interpreted as a company ability to give premium price for their products. Product attribute also can be a marketing channel in which company deliver their brand image through their excellence, feature that is owned and supporting connection. As an impact for the important of these attributes, a new emerging competitor tend to face the perception barriers whenever customer from the success company who do the differentiation is not able to see that the products is likely identical and able to substitute (Sulistiani, 2014). The differentiation strategy that should be implemented in the textbook industry is not only in the form of digital product, but also service quality.

Government become a second priority in this textbook industry in Indonesia, because the textbook industry in Indonesia is depends on the government regulation, particularly the regulation about curriculum and book procurement. Other actor that influencing is book assessment, that can be appear from the government itself or society who is counted have competencies. If the book assessment is definitely from the competent and integrity people, thus the mistakes in book assessing can be minimized, if it is not possible to be eliminated. Textbook is expected can to be affordable, in order to make it affordable, thus, one thing that should be done is massive production and distribute it efficiently and effectively, for example the distribution in a huge amount to certain region, so that distribution cost can be pushed down. Focus strategy is done by focusing on the products that definitely needed by the customer in most area, so that not all of the product is produced. The choosing of the focus strategy for textbook publishing is not needed make a options printed book or electronic book for example, just provide the printed book. Especially for the textbook it is not needed to have a kind of product, just focus on certain book product in order able to be produced massively and distributed simultaneously so that the price is affordable. The joint venture strategy has a low value score because it is not easy to do the joint venture between company and government, moreover related about textbook, that has high sensitivity value. When company has a difficult risk to determine who is should be responsible, for example: who is should be responsible if there is a content mistakes that may give an impact in book withdrawal and caused loss for the company. The head of Indonesia Publishers Associate evaluate that the textbook publishing will be more correct if it is returned by the operator to a private publisher in this case is textbook industry.

The Decision-Making of The Textbook Publishing Industry

The textbook publishing industry can strengthen the leadership cost according to the AHP analysis result stated that the leading low-cost strategy become a prioritized strategy in the textbook publishing industry to face the digital era. This concern is supported by the experts' perception said that the leading low-cost strategy can be implemented with the existing of opportunity in emerging a new technology in printing machine. The emerge of this new technology makes the textbook publishing industry able to finish one or more activities in its own chain value, for instance buying the raw materials, then processed it to become book product, then the applying of an effective marketing segmentation that becomes a strength owned by textbook publishing industry. The head of Curriculum and Bookkeeping Department (Puskurbuk), added that to expand the national textbook publishing industry to face the digital era, government should have one of the role as the actor that will draft a national bookkeeping ecosystem, that inside of it collaborate with publisher, writer, editor, printing, distributor, stakeholder, and also other ecosystem member to be able to grow together, collaborative and responsible of each role.

The innovation that has been done in the digital era nowadays is there are a lot of online / digital transaction in the selling and buying books, yet again in the utilizing holistically from the e-book product itself. To enter inside the blue ocean strategy, the textbook publishing industry in facing the digital era, should do the product innovation by bundling the printed book with the CD-ROM, multimedia, and provide the link to deepen the book content.

Managerial Implication

The core assessment of this textbook publishing in Indonesia according to the curriculum should meet 4 book assessment components from government to assess whether the book is feasible or not to be distributed, that is content (contextual, up to date), language, delivery (interesting), graphic. The legal protection of national textbook is regulated in Indonesia Government Regulation number 32 year 2013 about Education National Standard and Ministry of Education Indonesia regulation number 8 year 2016 about book that is used by education institution, further will be followed by textbook regulation. Government Regulation particularly in the regulation draft that will be managed as a macro in book transaction will be adjusted based on tax regulation, copyright regulation ,and transaction regulation. The book problem should be regarded as a sublime cultural issue so that needs to be accompanied because the

literation rank in Indonesia is that sink compared to other country. By this reason, government, in this case is President should be supported by an institution that has role to accelerate the book industry in Indonesia, generally in the people literacy that especially for students in education environment.

The technology growth at the future will transform the book appearance by the main element is content, including in transforming the business transaction into digital (online). The born of Z generation is predicted to be likely familiar and habituated in using electronic book (e-book), that of course become a phenomenon that should be alerted, so that in a book institution it is needed to innitiate some strategies to strengthen the book reading awareness and book writing in youngster by concerning also to the growth of technology and information and digital technology. Besides that, only at once the book previously as a society effort in Indonesia needs to be protected as a part of strengthening the core of our culture from the outside negative impact that entering to Indonesia. The industry of national textbook that will be an upright of the society literacy, needs innovation & support from government to face the digitalization. Government as an important actor that drafting a national textbook ecosystem, that inside of it involves publisher, writer, editor, printing, distributor, stakeholder, and other ecosystem member for growing synergy together and responsible of each functions. So that, people can gives a monitoring about the content, where the government only facilitate it. Society can choose and filter the book properly, for instance by the book that is needed. Thereby, we minimizing the limitation of cleaverness and creativity. Moreover, the book is a part from creative industry in Inonesia that should be elevated at the future

IV. CONCLUSION

The evolution of this business inside the textbook publishing industry is more clearly seen since the emerging of digital publishing nowadays. In the mapping and strategic planning of the national textbook publishing in facing the digital era, the main prior is the cost leadership strategy. The leading textbook publishing strategy in low production cost should be able to use their cost excellence to offer a competitive price, able to compete with the digital-base book with the low price to grab their market. The textbook industry can strengthen their leadership cost based on the analysis results of AHP revealed that the low cost excellence strategy that should be prioritized in textbook publishing strategy to face the digital era. This is supported by the experts perception stated that the leading strategic cost can be implemented by the existing of the new technology opportunity that is sophisticated and efficient in the case of textbook publishing.

There is an innovation that has been done in the digital era by using online transaction (digital) in the selling and buying book (both print and electronic), the using of this digital transaction can be scale the market up widely and unlimited by geographic. This textbook publishing industry strategy is facing the digital era which also prior to diversification and focus, besides preparing the e-book product, it also should be followed by product innovation, for instance by producing printed book and bundled it with CD-ROM, multimedia, interactive link to deepen the material as a value added. Thus, it can create a bigger business value compared to other products.

The emerge of new technology in the textbook publishing industry will not finish up one to another activity in the same chain value, for instance by buying the raw materials of book-making, then processed become a book, and also the implementation of marketing segmentation that effectively play important role for providing a strength that is owned by textbook publishing industry. The textbook publishing industry should expand the market channel based on the on-line (digital) instead of still using the conventional marketing.

Government has a role to determine the valid curriculum as a basis-textbook in Indonesia. Government is not yet having the mechanism regarding about textbook publishing by textbook publishing industry in the digital era and will soon prepare it to that direction. Government as an actor in this role still limited on identifying the textbook, not yet coming inside to the e-book making. The recommendation of this study is merely to emphasize that the government regulation should be collaborated with the textbook publishing industry. This study is also focus on the business strategy of the digital publishing, in which it is better to have a further and deeper examination about the publishing chain in Indonesia after the digitalization give some impact to the printed book. This study still needs some advice and in-depth regulation from the government of Indonesia and still needs specific information from the experts in the textbook publishing industry in Indonesia, particularly in their own company. It is necessary to have further study to see the impact of the draft of a bookkeeping ecosystem in Indonesia, which inside of it there is publisher, writer, editor, printing, distributor, stakeholder, and another ecosystem member that later can be developed together, collaborate and responsible of each role.

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Effects of Sodium Azide and Potassium Chromate on the Morphological Characters of *Colocasia esculenta* (L.) Schott. and *Xanthosoma maffafa* (L.) Schott. Accessions in Nigeria

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Abstract- The morphological assessment of five accessions of *Colocasia esculenta* (NCe 001, NCe 002, NCe 003, NCe 004 and NCe 005) and three accessions of *Xanthosoma maffafa* (NXs 001, NXs 002 and NXs 003) exposed to different concentrations of sodium azide and potassium chromate was carried out using 2.5, 5, 7.5, 10 mg/kg and the unpolluted accessions were used as the control. Results showed that accessions treated with sodium azide had higher mean plant height, mean leaf area and mean yield when compared to the accessions treated with potassium chromate. However, the differences in height, leaf area and girth between treatments were not significant at 5 % but these differences between the accessions were significant at 5 %. Albeit, the difference in yield between treatments was significant at $P=0.05$ but the difference in yield between accessions was not significant at $P=0.05$. Malformed leaves, chlorosis, change in stem colour including plant deaths were some of the variations observed in the accessions treated with these chemicals. Further studies were encouraged for a clearer understanding of the potentials of these chemicals in crop mutation breeding programs.

Index Terms- Sodium azide, potassium chromate, *Colocasia esculenta*, *Xanthosoma maffafa*

I. INTRODUCTION

Oil field chemicals are those chemicals that are in use during oil exploration and production activities. Drilling operations can introduce oil and a wide range of other complex chemical compounds into the environment through drilling fluids and muds (Kloff and Wicks, 2004). When these fluids find their way into the environment the physical, chemical and microbiological properties of the soil are affected (Ekundayo *et al.*, 1989). This discharge has its own peculiar chemistry and plants respond to it differently (Okonokhua *et al.*, 2007); some of such responses could be visible (signs of stress, morphological distortions, fertility and eventually the death of the plant) or invisible (anatomical, physiological, biochemical and genetical compositions).

To examine the impact of oilfield chemicals in the environment, the World Bank recommended Strategic Environmental Assessment (SEA) in the oil exploration and

exploitation locations. Over the years, plants have been used as bioassay to study environmental chemicals with mutagenic/genotoxic potentials (Maluszynska and Juchimiuk, 2005; Nkwocha and Duru, 2010; Olayinka and Arinde, 2012 and Ohanmu *et al.*, 2014). Sodium azide and potassium chromate are two oilfield chemicals of interest to this study. Sodium azide is a biostat used for preventing biofouling of wells. It is used for controlling bacteria that interfere with the production operations of the oil and gas industry; potassium chromate on the other hand, is a corrosion inhibitor that forms a non-reactive thin surface on the metal that prevents access of corrosive substances to the metal surface, thereby inhibiting further corrosion.

Cocoyam (*Colocasia esculenta* and *Xanthosoma maffafa*) belong to the Araceae family and widely cultivated in the Niger Delta region of Nigeria where oil exploration and production activities as well as their associated crude oil pollution frequently take place. In Nigeria, cocoyam is the third most important tuber crop apart from yam and cassava and provides a cheaper yam substitute especially in the eastern part of the country (Azeez and Madukwe, 2010). Apart from being a source of food, cocoyam is used as raw material in food and biotechnology industries (Owusu-Darko *et al.*, 2014), in the production of biofuel (Braide and Nwaoguikpe, 2011 and Adelekan, 2012) and also has therapeutic potentials (Kundu *et al.*, (2012). Ten distinctive groups (7 for *Colocasia sp* and 3 for *Xanthosoma sp*) have been reported in the germplasm of the National Root Crop Research Institute (NRCRI) (Mbanaso, 2010).

This study therefore is limited to investigating the effects of sodium azide and potassium chromate treatments on the morphological characters of cocoyam accessions. This study would also establish if cocoyam can serve as a reliable environmental bioindicator.

II. MATERIALS AND METHODS

3 accessions of *Xanthosoma maffafa* (NXs 001, NXs 002 and NXs 003) and 5 accessions of *Colocasia esculenta* (NCe 001, NCe 002, NCe 003, NCe 004 and NCe 005) were identified and collected from the National Root Crops Research Institute (NRCRI), Umudike Abia State, Nigeria. NCe stands for Nigeria *Colocasia esculenta* and NXs means Nigeria *Xanthosoma* species. Each accession was planted in 4 different

concentrations: sodium azide 2.5, 5, 7.5 and 10 mg/kg and potassium chromate 2.5, 5, 7.5 and 10 mg/kg. These chemical concentrations resulted to 0.25, 0.5, 0.75 and 1 % w/w in soil on weight basis. Unpolluted soil was used as the control experiment. Each of these accessions was planted in polythene bags containing 10 kg soil and the chemicals were applied by mixing each concentration with 400 ml of water. This mixture was used in watering the plants immediately after planting, kept in the open and monitored regularly. The plants were watered with 200 ml of water when needed as this experiment was done during the rainy season. Weeding was done by hand picking. This experiment was set up was in a Randomized Complete Block Design and kept at the Ecological Research Centre of the University of Port Harcourt.

Morphological characters of the control and the treated plants were carried out five months after planting. Plant heights were obtained by measuring the plants from the soil level to the collar of the uppermost leaf. The leaf areas were determined by measuring the length and width (at the widest point) of each leaf. The product of this was multiplied by a correction factor of 0.75 to cater for leaf shape (Okonokhua *et al.*, 2007). The girths were

also measured, while the number of malformed leaves, leaves with chlorosis and different stem colours were visually scored. At maturity, the corms were harvested and weighed.

Data generated were exposed to two way analysis of variance (ANOVA) and the means were separated using the HSD test at 5 %.

III. RESULTS

Effects on plant height: The effects of sodium azide and potassium chromate treatments on the heights of different accessions were shown in Table 1. The difference in mean plant heights between different treatments was not significant at $P=0.05$ but the difference in mean plant heights between different accessions was significant at $P=0.05$. Investigation also showed that NXs 001 of *X. maffafa* was mostly affected by sodium azide treatment, having a mean height of 23.8 cm while NCe 004 of *C. esculenta* was mostly affected by potassium chromate treatment, having a mean height of 13.88 cm (Figure 1).

Table 1: Effects of sodium azide and potassium chromate treatments on the plant height (cm) of different accessions

Chemical treatment	Conc. (mg/kg)	NCe 001	NCe 002	NCe 003	NCe 004	NCe 005	NXs 001	NXs 002	NXs 003
Control		29.1	34.0	33.8	28.3	31.0	24.5	26.0	30.2
Sodium azide	2.5	33.0	29.0	37.8	–	32.0	27.5	34.5	35.5
	5	41.6	34.0	29.5	35.0	27.8	26.2	34.8	39.3
	7.5	43.8	37.5	38.0	41.5	28.0	22.5	26.5	43.3
	10	43.0	28.2	29.5	29.0	26.0	19.0	27.0	34.5
Potassium chromate	2.5	34.0	30.0	32.8	28.0	26.5	21.7	22.5	34.5
	5	39.0	–	34.3	27.5	23.5	27.5	27.0	36.0
	7.5	36.0	–	35.0	–	26.0	21.0	32.0	34.5
	10	30.0	33.5	26.0	–	29.5	16.0	4.5	36.0

Effects on leaf area: The effects of these oilfield chemicals on the leaf area of various accessions under study were summarized in Table 2. The difference between different treatments was not significant at $P=0.05$ but the difference between difference accessions was significant at $P=0.05$.

Moreover, it was observed that the leaf area of NXs 002 was mostly affected by sodium azide treatment, having a mean leaf area of 146.2 cm² while potassium chromate treatment badly affected NCe 004 (Figure 2), with a mean leaf area of 61.9 cm².

Table 2: Effects of sodium azide and potassium chromate treatments on the leaf area (cm²) of different accessions

Chemical treatment	Conc. (mg/kg)	NCe 001	NCe 002	NCe 003	NCe 004	NCe 005	NXs 001	NXs 002	NXs 003
Control		113.1	139.5	194.5	160.5	201.5	149.5	121.5	201.7
Sodium azide	2.5	72.9	158.4	212.3	–	175.3	172.3	181.6	233.4
	5	154.9	150.5	119.1	203.0	176.7	192.2	167.9	477.5
	7.5	198.7	170.7	223.1	331.1	208.8	133.5	105.4	375.2
	10	227.1	178.1	113.9	150.1	171.7	110.3	129.9	217.0
Potassium chromate	2.5	110.9	132.0	187.3	90.1	190.2	66.2	112.3	246.2
	5	154.3	–	146.5	157.5	145.2	202.5	98.6	229.4

7.5	62.7	–	179.3	–	168.3	107.1	198.5	211.5
10	94.3	105.0	116.9	–	300.9	56.1	11.3	384.8

Effects on girth: The summary of the effects of these chemicals on the plant girth was captured in Table 3. The difference between different accessions was significant at $P=0.05$ but the difference between different treatments was not significant at $P=0.05$. However, analysis showed that the girth of

NCe 001 was mostly affected by sodium azide treatment, with a mean girth of 4.32 cm. On the other hand, potassium chromate treatment badly affected NCe 002 as it had a mean girth of 1.88 cm (Figure 3).

Table 3: Effects of sodium azide and potassium chromate treatments on the girth (cm) of different accessions

Chemical treatment	Conc. (mg/kg)	NCe 001	NCe 002	NCe 003	NCe 004	NCe 005	NXs 001	NXs 002	NXs 003
Control		5.7	6.2	7.2	5.1	5.3	5.7	5.0	6.2
Sodium azide	2.5	3.0	4.0	5.1	–	6.9	5.5	7.5	4.5
	5	4.5	5.5	4.5	6.2	4.5	4.0	7.3	5.3
	7.5	5.3	4.8	6.0	7.5	5.6	4.2	5.0	6.5
	10	4.5	3.5	5.0	6.0	5.9	5.0	6.5	5.5
Potassium chromate	2.5	4.4	4.0	5.0	5.0	6.8	4.6	5.6	5.9
	5	5.0	–	4.5	4.1	6.8	5.3	6.0	4.5
	7.5	3.5	–	5.2	–	4.3	6.0	7.5	5.5
	10	3.0	3.5	4.3	–	7.0	4.5	1.2	6.0

Effects on yield: The effects of sodium azide and potassium chromate treatments on the weight of yield of various accessions were summarized in Table 4. The difference in mean yield between different treatments was significant at $P=0.05$ meanwhile the difference between various accessions was not significant at $P=0.05$. Albeit, NCe 002 had the least mean yield

as it produced 67.5 g and 17.5 g in sodium azide and potassium chromate treatments respectively. Assessment between the two chemicals also showed that sodium azide treatment influenced the accessions to have higher yield than potassium chromate treatments (Figure 4).

Table 4: Effects of sodium azide and potassium chromate treatments on the weight of yield (g) of different accessions

Chemical treatment	Conc. (mg/kg)	NCe 001	NCe 002	NCe 003	NCe 004	NCe 005	NXs 001	NXs 002	NXs 003
Control		150 ^a	150 ^a	100 ^a	75 ^a	100 ^a	50 ^a	25 ^a	200 ^a
Sodium azide	2.5	70 ^a	35 ^a	130 ^a	0 ^a	200 ^a	150 ^a	150 ^a	180 ^a
	5	160 ^a	100 ^a	150 ^a	50 ^a	150 ^a	50 ^a	100 ^a	150 ^a
	7.5	230 ^a	50 ^a	170 ^a	500 ^a	80 ^a	70 ^a	100 ^a	200 ^a
	10	80 ^a	85 ^a	160 ^a	25 ^a	200 ^a	50 ^a	100 ^a	150 ^a
Potassium chromate	2.5	50 ^a	50 ^a	90 ^a	50 ^a	170 ^a	80 ^a	150 ^a	220 ^a
	5	100 ^b	0 ^b	50 ^b	200 ^b	80 ^b	100 ^b	30 ^b	120 ^b
	7.5	50 ^b	0 ^b	60 ^b	0 ^b	100 ^b	50 ^b	40 ^b	150 ^b
	10	40 ^b	20 ^b	80 ^b	0 ^b	100 ^b	60 ^b	10 ^b	50 ^b

Values with different superscripted alphabets within column are significantly different at 5 %

Effects on leaf surface: Potassium chromate treatment induced malformed leaves in NCe 003, NXs 002 and NXs 003 (Plate 1). Interestingly, when these malformed leaves either fell

off or are excised the new leaves that emerged were observed to be normal.

Other effects: Different variations observed on the morphology of various accessions included chlorosis, change in stem colour, change in the number of leaves per plant.



Plate 1: Malformed leaves: a) Control leaf of *Colocasia sp.*, b) Control leaf of *Xanthosoma sp.*, c) NXs 002 treated with 7.5 mg/kg of potassium chromate, d) NXs 002 treated with 5 mg/kg of potassium chromate, e) NXs 003 treated with 10 mg/kg of potassium chromate, f) NCe 003 treated with 5 mg/kg of potassium chromate

IV. DISCUSSION

Plant heights of these accessions responded differently to the chemical treatments. Morphologically, it was expected that the controls would perform better than the treated accessions but it was not so as some of the treated accessions even with higher concentrations had taller plants than the control. Calculating the mean height, it was observed that the total mean height of accessions treated with sodium azide (Figure 1) produced taller plants than with potassium chromate treatment. This trend was also reported by Warghat *et al.* (2011) in *Abelmoschus moschatus*. They observed that treatment with sodium azide even in higher concentrations produced plants that were taller than the control. The significant difference between different accessions indicates that each accession has its own unique chemistry and way of dealing with environmental chemical (Osuji and Nwala, 2015). Increased plant heights in relation to the control were also reported in *Colocasia esculenta* polluted with crude petroleum oil (Bamidele and Sijuade, 2012).

The responses of these accessions to leaf area and girth also follow the trend of the plant height. It was observed that the differences between different treatments were not significant at 5 % but the differences between different accessions to these parameters were. Al-Qurainy (2009) on *Eruca sativa*, also reported increased leaf area even at higher concentration of sodium azide. The comparison between sodium azide and potassium chromate treatments across these parameters showed that sodium azide treated plants had better vegetative attributes. This indicates that potassium chromate is a toxic environmental chemical and, suppresses vegetative vigour of these accessions more than sodium azide. Reduced leaf area has been attributed to limitation of nutrients uptake necessary for expansion of leaf area occasioned by high level of pollutants (Adu *et al.*, 2015).

The mean yield difference between different accessions was not significant but the mean yield difference between treatments was significant. Different accessions treated with sodium azide produced more yield than those treated with potassium chromate, even when compared with the controls (Table 4). Sodium azide with 7.5 mg/kg produced the highest yield in NCe 004 (500 g) and NCe 001 (230 g) as compared with their controls that produced 75 g and 150 g respectively. Meanwhile, potassium chromate treatments produced the highest yield in NXs 003 (220 g) treated with 2.5 mg/kg and NCe 004 (200 g) treated with 5 mg/kg; their controls however, produced 200 g and 75 g respectively. Al-Qurainy (2009) reported that at 3 mM concentration of sodium azide, the yield after 60 days was

found to be very high even when compared to untreated plants. In the same vein, Eze and Dambo (2015) reported that *Zea mays* treated with 0.02 mM of sodium azide produced the best yield in terms of vigour and size when compared to the control. They suggested that sodium azide is a chemical with the potential to induce targeted variability in plants and induces point mutation in plants bringing about robust and improved characters in plants. This suggestion is evident in the responses of these accessions to sodium azide treatments.

Malformed leaves are one of the first signs that indicate a plant under stress; this character was seen in some accessions treated with potassium chromate. Obute *et al.* (2007) attributed the development of malformed leaves to chromosome fracture, decline in the auxin level and change in ascorbic acid concentration. The formation of normal leaves after the excision of the malformed leaves confirmed that potassium chromate had genotoxic potential and the potency of the chemical subsided after awhile. The reduction of the efficacy of potassium chromate after its introduction into the environment was also reported by Ajah and Obute, (2017). Chlorosis and change in stem colour are some of the effects of these chemicals on the accessions. Gnanamurthy *et al.* (2011) and Warghat *et al.* (2011) also reported similar result with sodium azide treatments. They attributed it to decline in the chlorophyll content of plants; this decline causes nutrient restrictions and interferences that decrease the rate of photosynthesis leading to poor yield in plants. The change in the number of leaves was also reported by Adu *et al.* (2015) on *Vigna unguiculata* with spent and unspent engine oil; they credited this phenomenon to the inability of treated plants to absorb water due to a change in the physical, biological and chemical properties of the soil.

Plant deaths were observed in some accessions following treatments with these oilfield chemicals. Potassium chromate and sodium azide treatments caused the death of some accessions: NCe 004 treated with 2.5 mg/kg of sodium azide, NCe 002 treated with 5 and 7.5 mg/kg of potassium chromate and NCe 004 treated with 7.5 and 10 mg/kg of potassium chromate did not germinate at all. Omusun *et al.* (2008) with crude oil on *Amaranthus hybridus* reported plant death and credited the death of plants to poor wettability and aeration of the soil which causes loss of seed viability. The presence of these oilfield chemicals alters the chemistry of the soil, kills the microbes, and truncates the cell division that leads to growth thereby killing the corms which led to lack of germination at all.

This study showed that potassium chromate treated plants have more severe effects than sodium azide treated plants

(Figures 1, 2, 3 and 4). This indicates that potassium chromate is a chemical with xenobiotic potentials and is capable of causing the arrest of enzymatic activities, infertility, decay of vital plant parts and eventually plant deaths. More studies have to be carried out using this chemical so that its potentials can fully be understood. Sodium azide on the other hand, has been applauded by many researchers who advocated inculcating this chemical into plant breeding programs because it has produced robust characters in plants just like colchicine. In this study also, some treated accessions were observed to have higher yields than the controls; this trend is disturbing as the chemical composition of these yields may contain traces of these chemicals. This brings to mind what would happen if some of these yields were consumed by man?

V. CONCLUSION

The effects of these oilfield chemicals have been seen on the morphology of cocoyam but for a more definitive stance on whether to include these chemicals especially sodium azide in mutation breeding program the cuticular, proximate analysis and cytological studies have to be carried out as well. This study has shown that cocoyam is not a good environmental bioindicator because some treated accessions even in higher concentrations had more vegetative vigour than the control accessions. Therefore, it is pertinent to carry out soil assessment/monitoring (physico-chemical analysis) on plots of land where cocoyam would be planted so as to ensure that the soil is not compromised (polluted with chemicals) hence, ensuring the safety of our food source.

APPENDIX

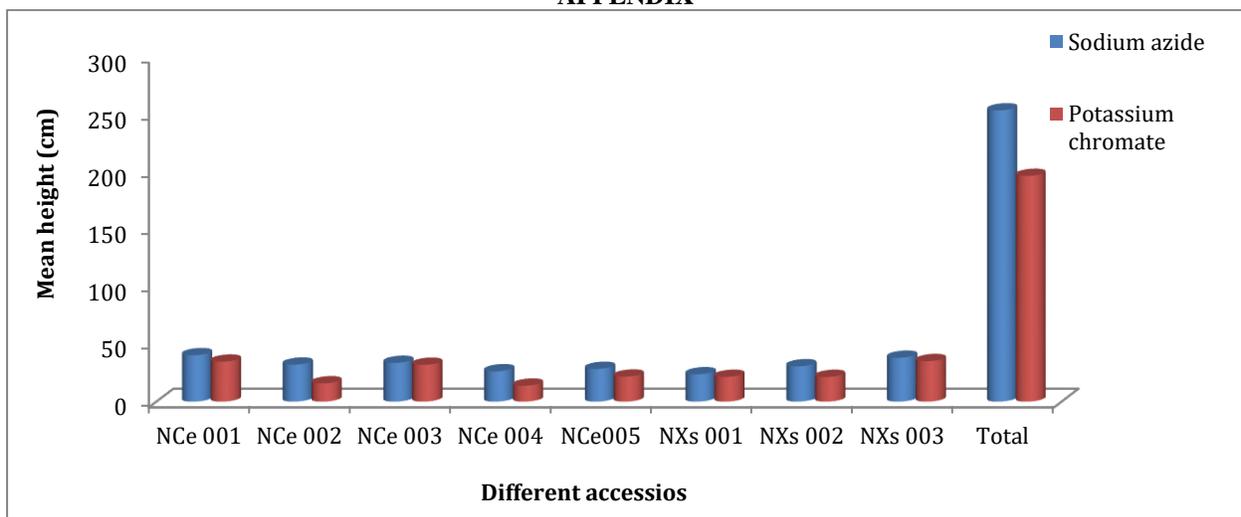


Figure 1: Effects of sodium azide and potassium chromate treatments on the mean height off different accessions

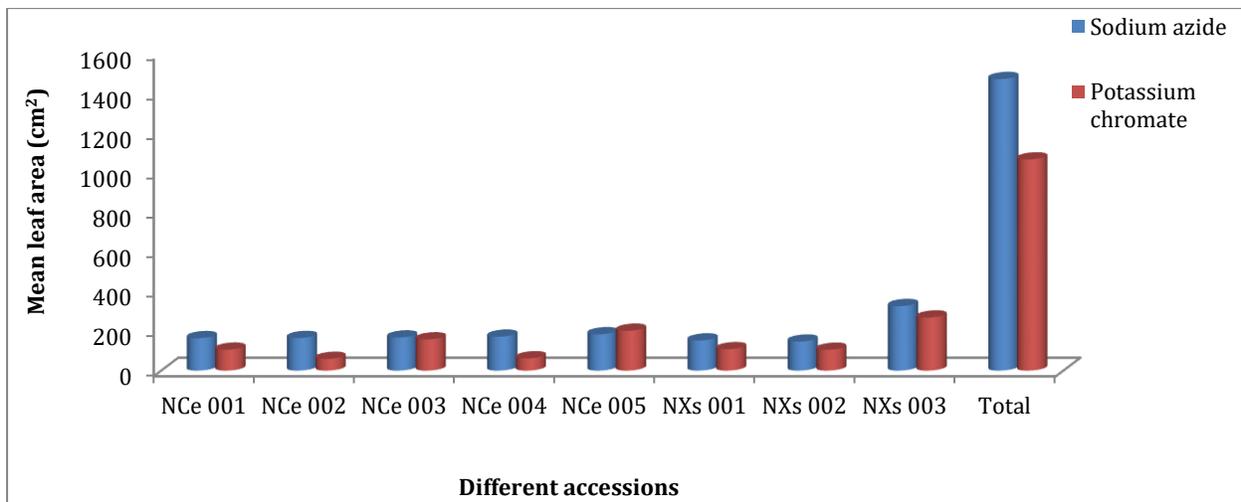


Figure 2: Effects of sodium azide and potassium chromate treatments on the leaf area means of different accessions

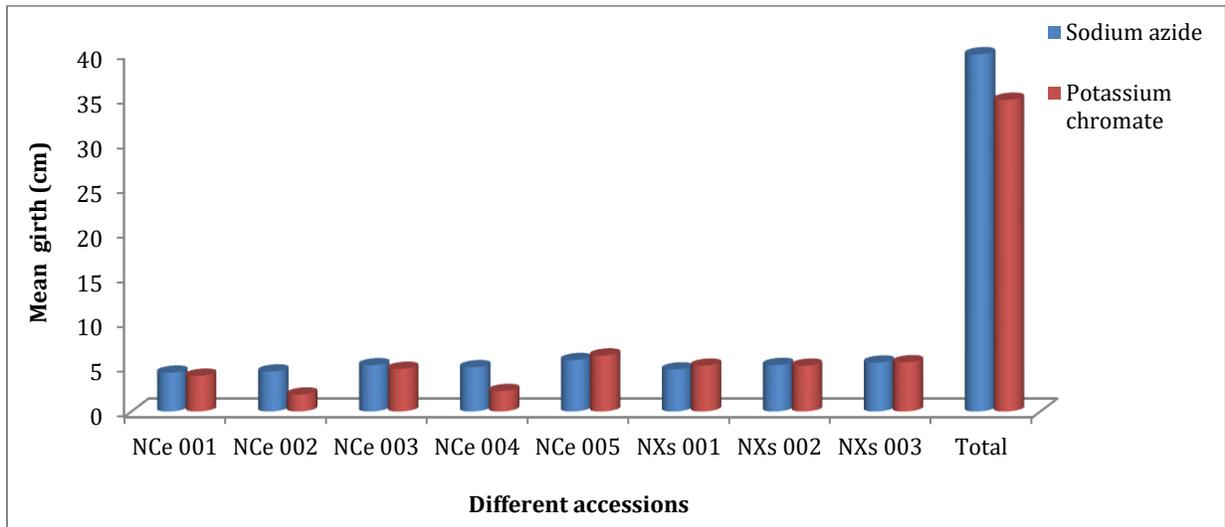


Figure 3: Effects of sodium azide and potassium chromate treatments on the means of girth of different accessions

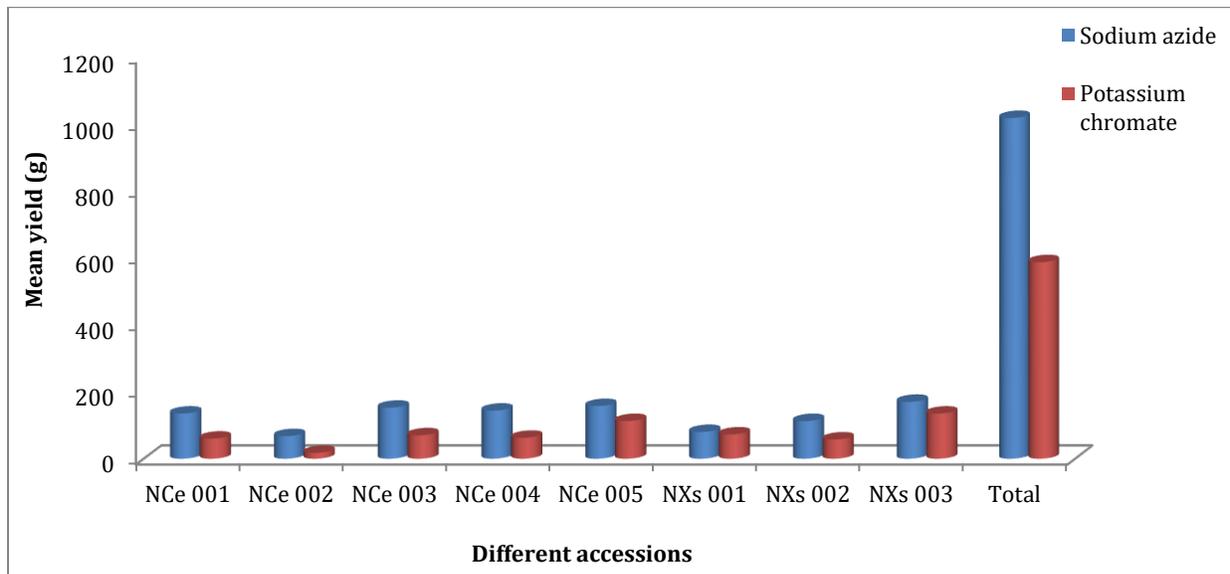


Figure 4: Effects of sodium azide and potassium chromate treatments on the mean yield of different accessions

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Producing and Evaluation of New Hybrid of Rosa (Rosa spp.) in Central Sudan

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Abstract- This study was conducted at private nursery, Khartoum North, Sudan, during the season 2004 – 2009, to produce a new variety of rose can be used as cut flower, landscaping and adapted to warm climate. The Parent was selected from the commercial varieties, the first parent (P1) belonging to the floribunda roses group and the second parent (P2) belonging to the hybrid tea roses group. Hybridization was applied between the two parents to produce the hybrid (F1). The best hybrid were selected and sown to produce mothers of plants. After one year, cuttings were taken from the hybrid and parents and planted to produce mother plants. After six month from planting, hybrid and its parents were evaluated *based on* plant height, number of branches, number of buds, number of flowers, carrying capacity of flowers, number of petals , flower diameter and length of flower stalk. The statistical analysis showed significant difference between the hybrid and parents in the characters under study. The hybrid recorded the highest number of branches (31.8), number of buds (61.6), number of leaves (175.4), number of flowers (71.8 flower/ plant) and flowers clusters.

Index Terms- Rosa, F1, hybrid tea, Floribunda hybrid, Heterosis.

I. INTRODUCTION

Roses (*Rosa spp.*) are an important economic crop worldwide as they are cultivated for cut flowers, essential oil and landscape use [1]. It is the most popular of all the flowers because of its beauty and fragrance and is called the “Queen of Flowers” [2]. Roses are immensely important for landscaping and no garden is considered complete without roses [3]. The tremendous variation in the types of roses was resulted from hybridization between varieties and the multiplicity of hybridization between different varieties can give new varieties of Roses which increases the different uses [4]. Rose breeding provides a regular source for development of new cultivars and unique germplasm for the garden and cut flower industry. In conventional breeding, progeny selection is made on the basis of superior morphological traits [5].

In Sudan Roses are the most popular ornamental plants. They are grown in garden beds or in pots for general landscape purposes [6]. Floribunda hybrids are very good as landscape shrubs and the tea hybrids are grown for the glory of their flowers. They are not attractive as landscape plants. Hybrid tea is susceptible to low temperature and favours warm climate [7]. No research work has been done on rose breeding in Sudan. Therefore, this study aimed to produce a new hybrid of rose with

high quality attributes, suitable for using in cut flower and landscape industries and adapted to warm climate.

II. MATERIALS ANDMETHODS

Field experiments were conducted at private nursery in Khartoum North, Sudan, during the period from April 2004 to April 2009.

The first parent FR46 was selected from floribunda group, a new group, with features of white flower color and with yellow corona in center of flower, highly number of petals, small flower size, highly number of flowers, flowers single and in clusters, dense plant growth, medium plant high, and length of flower stalk were medium. The second parent HR57 was selected from Hybrid Tea group. This cultivar with features of pink flower color with a yellow corona in the center of flower, medium number of petals, large size of flowers, flowers single, highly plant and a few number of branches and buds [8].

In blooming season, the best flowers in both parents were selected and covered before opening by paper bags. The cultivar FR46 was selected as the female parent, and flower was emasculated manually. The cultivar HR57 was selected as male parent. Crossing was applied by taking the pollens from the male parent (P1) by a soft brush to the female parent (P2). After hybridization, flowers were covered by paper bags and crossing was repeated in fifty plants [9].

After fruit ripening, the fruits were harvested and dried in the shade for a month and seeds were separated manually. Seeds were put in four degree centigrade for six months [10] and then sown in soil mixture of sand and Nile-silt. The seedlings were irrigated frequently till new leaves were appeared. The seedlings were transplanted to the field in lines with one meter spacing after forming four leaves [11].

The best hybrid was selected depend on dense vegetative growth, flower color before and after opening, high number of branches, buds and flowers, and flower in cluster. When the hybrid mothers were a year old, cuttings at length 25cm were taken from hybrid and parent mothers. The cuttings were treated with growth hormone and sown in green house. After formation of three leaves the seedling were adapted and transplanted in the field with 75cm spacing [12]. All recommend cultural practices were applied.

Description

Description of the hybrid , P1 and P2 included size of leaf , leaflet shape , flowers carrying capacity , size of flower ,

flower shape, flower color before opening and after opening were done [13].

Evaluation

After six months from planting, data were collected every month. Evaluation included plant height (cm), number of branches, number of buds, number of leaves, flowers carrying capacity (single or in clusters), number of flowers per plant, length of flower stalk (cm), flower color, flower diameter (cm) and number of petals.

Heterosis (hybrid vigor) was estimated based on the following equation [14].

$$\text{Heterosis} = \frac{\text{F1 value} - \text{average value of parents}}{\text{average value of parents}} * 100$$

The experiments were arranged in a randomized complete block design with four replications, Data were subjected to analysis of variance using M StatC computer program. Mean separation was done according to Duncan's Multiple Range Test (DMRT).

III. RESULTS AND DISCUSSION

Description:

Data regarding qualitative characteristics of leaves and flowers is presented in Table 1. Leaves and flowers characters varied visually among all hybrids. F1 hybrid showed medium leaf size as same as P1 while P2 showed large size. Leaflet shape was global in F1 and P1 compared with triangular shape in P2. Leaves colour of P1 and F1 hybrid was same as light green. Leaves colour of P2 was dark green. These results are in agreement with those reported by [15] who worked in nine *Rosa hybrida* cultivars and found that there was variation in colour of foliage from dull green to pale green.

Flowers in F1 hybrid were carried in clusters while, in P2 were single and P1 showed the two types. Along the same lines, [15], who reported that there was different inflorescence type in *Rosa hybrida* cultivars. F1 hybrid and P1 showed medium flower size while P2 showed large size. Flower colour before opening in F1 was white and white yellow while the parents showed white and pink in P1 and P2, respectively. Flower color after opening in F1 showed White with yellow corona and pink tone colour. The P1 showed white with yellow corona and P2 showed Pink with yellow corona color. The variation in colour of rose was also observed by [16] who worked in forty four rose cultivars and put them in nine groups in according to their colour

Vegetative growth parameters

Vegetative growth parameters of F1 hybrid and the parents during three seasons are shown in Table 2. Plant height is an important growth trait related to morphological characters of plant. The hybrid and parents showed significant differences in vegetative growth parameters during the three seasons. P1 showed the highest values in plant height in all seasons. These findings are in line with [17] who reported variation in plant height in different rose cultivars. F1 hybrid recorded the highest values in number of branches and the number of leaves. These findings are in line with [18] who evaluated two rose cultivars Amalia and Anjeeleq and reported that the cultivar Anjeeleq

produced higher number of branches per plant (6.55) and maximum number of leaves (217) as compared to Amalia.

Flowering parameters

Flowering parameters F1 hybrid and the parents during three seasons are shown in Table (3). There were significant differences in all parameters measured in three successive seasons. The hybrid recorded the highest number of buds and number of flowers in the three seasons. This finding is in line with [16] who stated that numbers of flowers/plant varied in different rose variety. Difference in number of flowers per plant is linked to frequent blooming habit depend on their genetic makeup [19]. In this study, highest number of flowers might be due to increase in morphological parameters like number of branches and number of leaves which lead in production of more photosynthates resulting in greater accumulation of dry matter which in turn helps to production of more number of flowers per plant [20]. The highest values of number of petals were obtained in the F1 followed by P1. This corresponds with the hypothesis of [21] that there is difference in number of petals among various *Rosa* species and number of petals (doubleness) is controlled by dominant gene and has quantitative inheritance. The degree of dominant gene with more alleles contributes to more flowers petals i.e dddd having five petals and DDdd having medium number of petals and DDDD having maximum number of petals. Double-flowered cultivars have more petals or "petaloids" than the basic five petals and this increment in number of petals seems to be due to conversion of pistil and stamens into petals and petaloids. These findings are in line with [15] who stated that maximum number of petals (61) was exhibited by the cultivar "Casino" followed by "Gruss-an- Teplitz" (57) and the minimum number of petals per flower was recorded in the cultivar "Autumn Sunset" and "Angel Face" (16). Also, variation in number of petals/ flower was observed in rose by [16]. P2 scored the biggest flower diameter flowed by F1 hybrid. Flowers stalk length is one of the important traits for evaluation of quality cut roses. P2 showed highest values of flowers stalk length in the three seasons followed by F1. The highest stalk length was recorded in case of tallest hybrid. These results are line with [20].

Heterosis

Table (4) showed significant difference variation among parents and the hybrid indicates the diversity in the hybrids tested. All the heterosis values of hybrid for measured parameters showed positive values toward the desirable values. The heterosis value of number of leaves was 48.1%, number of branch 71.9 %, number of buds 72.7 % and number of flowers and 121.1 %. These results showed the superiority of the hybrid in the traits has been measured. These findings are in line with many studies showed the superiority of the first generation as a result of the heterosis [22].

IV. CONCLUSION

The F1 hybrid which produced in this study has a good vegetative growth with a large number of flower and beautiful colour. All this parameters give the hybrid chance to be the best cultivar in land escape and cut flower industry. More research

must be done in this hybrid to evaluate it performance in all part
of country.

Table (1) Description of qualitative parameters of F1 hybrid and its parents (P1, P2)

Quantitative traits	leaf Size	Leaflet Shape	Leaves colour	flower carrying capacity	Flower Size	Flower color before opening	Flower color after opening
Hybrids							
P1	Medium	Global	Light green	Single and in clusters	Medium	White	White with yellow corona
P2	Large	Triangular	Dark Green	Single	Large	Pink	Pink with yellow corona
F1	Medium	Global	Light green	In clusters	Medium	White and white yellow	White with yellow corona and pink tone

Table (2) Vegetative growth parameters of F1hybrid and the parents during three seasons

Parameters	plant height (cm)				Number of branches				Number of leaves			
	2006/07	2007/08	2008/09	Means	2006/07	2007/08	2008/09	Means	2006/07	2007/08	2008/09	Means
P1	60.4c	88.6 c	72.4c	73.8	29.8b	15.0b	22.3 b	22.4	146.0b	133.2b	142.6 b	141.6
P2	135.8a	170.0 a	154.0a	153.3	18.6c	10.5c	14.6 c	14.6	88.3c	95.6 c	101.9 c	95.3
F1	98.3b	129.2 b	110.7b	112.9	35.2a	29.6a	30.5 a	31.8	183.2a	167.7a	175.3 a	175.4
Mean	98.2	129.3	112.4		39.5	27.9	22.5		139.2	132.2	139.9	127.4
Sig.lev.	*	*	*		*	*	*		*	*	*	
S.E. +-	0.12	0.12	0.10		0.13	0.12	0.10		0.13	0.15	0.22	

Means within columns followed by the same letter(s) are not significantly different at P<0.05 level according to Duncan's Multiple Range Test.

* indicates significance at P≤0.05.

Table (3) Flowering parameters F1 hybrid and the parents during three seasons

Parameters	Number of buds				Number of flowers				Number of petals per flower			
	2006/07	2007/08	2008/09	Means	2006/07	2007/08	2008/09	Means	2006/07	2007/08	2008/09	Means
P1	36.4 b	45.0 b	40.2 b	40.5	38.4b	45.7b	35.4 b	39.8	30.3a	29.0a	31.5a	30.3
P2	25.1c	36.8c	30.9 c	30.8	25.5c	29.3c	20.4 c	25.1	25.0b	25.8b	25.6 b	25.5
F1	55.2a	69.2 a	60.4 a	61.6	78.8a	71.2a	65.5 a	71.8	32.2a	32.5a	33.1a	32.6
Mean	38.9	50.3	43.8	44.3	39.9	37.7	38.1	45.6	29.2	29.1	30.1	29.5
Sig.lev.	*	*	*		*	*	*		*	*	*	
S.E. +-	0.11	0.10	0.13		0.12	0.09	0.13		0.12	0.11	0.12	

Means within columns followed by the same letter(s) are not significantly different at P<0.05 level according to Duncan's Multiple Range Test.

* indicates significance at P≤0.05.

Table (3) Continued

Parameters	Flower diameter (cm)				Flower stalks length			
	2006/07	2007/08	2008/09	Means	2006/07	2007/08	2008/09	Means
P1	4.8b	4.9b	5.0 b	4.9	43.8c	48.6c	45.4 c	45.9
P2	7.6a	7.9a	8.1 a	7.9	60.3a	65.1a	62.5 a	63.6
F1	5.2b	5.4b	5.5 b	5.4	50.2b	59.2b	55.8 b	55.1

Mean	5.9	6.1	6.2	6.1	51.4	57.6	54.6	54.9
Sig.lev.	*	*	*		*	*	*	
S.E. +-	0.11	0.10	0.13		0.11	0.09	0.10	

significant Means within columns followed by the same letter(s) are not significantly different at $P < 0.05$ level according to Duncan's Multiple Range Test.

* indicates significance at $P \leq 0.05$.

Table (4) performance of F1 hybrid and the parents hybrids heterosis for the measured parameters in rose

Parameters	Plant High	No. of branch	No. of leaves	No. of buds	No. of flowers	No. of petals	Diameter of flower	Length of flower Stalk
Heterosis (%)	0.8	71.9	48.1	72.7	121.1	17	15.6	6.2

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The Important of Leadership Role in Achieving High Quality of Higher Education in the Era of Asean Economic Community

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Abstract- The establishment of Regional Cooperation so called the ASEAN Economic Community (AEC) will certainly have many implications to both economic as well as non-economic well-being of the people in Indonesia. Of these implications, higher education systems will no doubt be affected by the establishment of the AEC. As a consequence, leadership at higher educational level becomes important to minimize negative impacts of the AEC on the higher education systems. This is partly because higher education is the key to national development particularly in producing a high quality human resources and qualified professionals. These conditions will further increase the nation's competitiveness and productivity of the economy. This paper aims at examining the role of leadership in achieving high quality of higher education in facing the ASEAN Economic Community (AEC). Data and information collected were heavily based on secondary data and government regulation advanced in the literatures. The study argued that the leadership factor plays significant role in achieving high quality of higher education al institution. Therefore, leadership of higher education or universities needs to be improved as it can improve the quality of universities.

Index Terms- Leadership, university, Organization, Quality Management System

I. INTRODUCTION

University as an organization in the process of its development will no doubt face the external dynamic challenges associated with the establishment of ASEAN Economic Community (AEC). To face these challenges, university that has three missions as the teaching, research, and advocating institutions or so called Tri Dharma should be properly managed by a quality management system. By having this quality management system, the university will be able to reach the vision and mission, and hence is able to become competitive university for a long-term. The competition faced by the university is not only between state and private universities, but also with foreign universities operating in Indonesia. For this reason, any universities should be able to increase the quality of their education personnel and their leadership in running the university. These improvement should be done continuously and sustainably in order to be able to compete at the national level and at international level. These kind improvements need to be intensified especially as Indonesia takes part in the regional economic cooperation of AEC.

To carry out the mission and function, universities need to able to act as an institution that produces high quality human resources. By having this, university will be able to actively participate in national development activities as well as able to become a high caliber institution in the global competition in science and technology. However, to realize these objectives, universities must be well-managed professionally, efficiently and effectively. The management towards high quality university involved not only inputs and processes, but also able to perform better outputs and outcomes. These conditions can only be achieved if and only if there are leadership and leaders who have skills in managing the university based on quality management system and good governance of university. Therefore, leaders and leadership are two important factors in realizing university that capable to compete in the era of globalization and ASEAN Economic Community.

This brief paper aims at discussing two things. The first is to examine how can leaders in the university improve the quality of the lectures and the human resources available in the university. The second is to discuss whether or not university is important to obtain the certification standard of ISO 9001? However, before these two matters are examined, the following section 2 deals with the review literature. The third section will be followed by discussion. Finally, concluding note will be given in section 4. Note that the sources of data and information used throughout this study were based on secondary data especially the regulation issued by the government and information taking from lectures as well as experience as a lecturer many universities in Indonesia.

II. LITERATURE REVIEW

2.1 Organizational Theory

As mentioned above, human resources are considered as the main components of an organization. This is partly because human resources play active roles in the planning and organizing the institution. They do not only have thoughts, feelings, desire, and status, but they have also different educational background, age, gender brought into the organization. Human resources certainly do not like a machine, money and materials that are passive and can be controlled and regulated to fully support the achievement of organizational goals.

According to Wikipedia, the organization is a group of people who have a common goal. In social sciences, organization was learnt by researchers from many disciplines such as sociology, economics, political science, psychology, and

management. Studies on organization are often called the study of organization, organizational behavior or the analysis of the organization. Organization is basically used as a place or a place for people to come together, work together in a rational and systematic, planned, guided and controlled, in utilizing the resources (money, material, machine, method, environment), infrastructure, data and etc. that are used efficiently and effectively to achieve the objectives organization.

2.1.1 Classical Organizational Theory

This theory is called the "traditional theory" or also called "machine theory" which have developed since the early 1800s. Organization according to this theory was defined as the structure of relationships, powers, objectives, roles, activities, communication and other factors when people work together. This classical organization fully outlines the anatomy of a formal organization. There are four main elements that are found in the formal organization:

- a. Coordinated Activity system;
- b. Group of people;
- c. Cooperation; and
- d. Power and leadership.

However, according to classical school of thought, an organization depends on four key conditions, namely, power, serve one another, doctrine, and discipline which are used as the important pillars in the formal organization. These pillars are:

- a. The division of labor for coordination;
- b. Switch process and functional (vertical and horizontal of growth process);
- c. Structure (the relationship between activities); and
- d. Span of control (how many bosses can control subordinate).

1.1.2 Neo-Classic Organizational Theory

This theory is simply known as the Human Relations Movement theory. This theory emphasizes the importance of psychological and social aspects of the employees as individuals and as part of a working group. The development of neoclassical theory was inspired from experiments conducted in Hawthorne and from the writings of Hugo Munsterberg. The experiments were carried out from 1924 to 1932 that marked the beginning of the development of the theory of human relations and a crystallization of neoclassical theory.

In the division of labor, the neoclassical theory suggests the need of the following things:

- a. Participation;
- b. Work Expansion;
- c. Bottom up Management.

1.1.3 Modern Organizational Theory

This modern theory usually referred to as an analysis system on organization. This theory considers that all elements of the organization is integrated and interdependence, in which it was argued that the organization is not a closed system that is associated with a stable environment, but the organization is an open system. This modern theory was developed in 1950.

The modern approach argued that the present theory of organization was not a theory, but it is a theory about the way of thinking about the organization, how to view and analyze more precisely and depth, which are done through the order or regularity of organizational behavior, which only applies to a certain environment or condition.

The characteristics of Modern Theory, among others are as follows.

1. Sometimes called the analysis of organizational systems
2. Considers all elements of organization
3. View the organization as a system,
4. Self-adjustment, that is, the organization can survive if it is able to adapt to the changing environment;
5. The organization and its environment must be seen as interdependent.

Furthermore, the nature of the Modern Theory are:

1. Looking at an organization as a system that consists of five main parts, namely: input, process, output, reverse flow, and the environment,
2. Dynamism,
3. Multi-level and multi-dimensional,
4. Multi motivation,
5. Multi-disciplinary,
6. Descriptive;
7. Multi variable,
8. Adaptive.

The modern theory shows three activities about universal relationship that can always appear in the human system in organizational behavior, namely: 1. Communication; 2. Balance concept; and 3. Decision making process. The objectives of organizational development are :

1. Creating a harmonious working relationship between the leadership with the staff members of the organization;
2. Creating an organizational problem-solving skills are more open.
3. Creating transparency in communication;
4. As the morale of members of the organization and the ability to self-control.

2.1.4. Theory of leadership

An organization certainly needs a leader who is able to lead and manage their organizations, and so there is a need to have someone who is active, skilled and competent in the lead and can succeed in an organization.

Leadership originates from the word lead which containing two major issues, namely the leader as a subject, and people who are led as the object towards the success of the work activities of them. There are theories of leadership as follows.

1. Theory of Personality or Personality Characteristics (Trait theories).

This theory departs from the premise that the success of a leader is determined by the properties, temperament or traits owned by the leaders, Based on this premise, there is assumption that to be a successful leader is determined by the ability of the leader. This ability is meant as a person's quality with a variety of properties, temperament or other characteristics.

Ideal characteristics that need to be owned by a leader, according to Siagian (1994) are as follows. First, she/he has a broad general knowledge, good memory, rationalistic, objectivity, pragmatism, flexibility, adaptability, future orientation. Second, she/he has inquisitive nature, a sense of time, sense of high cohesion, sense of relevance, exemplary, firmness, courage, anticipatory attitude, a willingness to be a good listener, and integrative capacity. The third is that she/he has ability to grow and develop, analytic, determine priorities, distinguish between urgent and important, the skills to educate, and effective communication.

However, the trait theory has many weaknesses. These weaknesses among others are too descriptive, there is no relevancy between properties which are superior to the effectiveness leadership, and regarded as classical theory, but if we reflect moral values and morals contained therein regarding the various formulations of the nature, characteristics or temperament leader, these are vitally needed by the leadership that applies the principles of moral values.

2. Theory of Behavior

The rationale of this theory is that leadership is an individual's behavior when conducting direction of a group towards the objective's achievement. In this case, the leader has the description of the behavior:

a. Consideration and Structure initiation.

This is a behavior of leader who tend to attach importance subordinates characterized by a friendly, want to consult, supportive, defend, listen, accept the proposal and keep thinking the welfare of subordinates and treat others like him/her self. Apart from that, there are also other leadership behavioral that are more concerned on organizational tasks.

b. Oriented to subordinates and production

A behavior leader who has great concern to his/her subordinates. This is characterized by an emphasis on superior-subordinate relationship, personal attention of leaders at satisfying needs of subordinates and accept differences in personality, ability and behavior of subordinates. While leader behavior who has production orientation is a leader who has a tendency to emphasis on the technical aspects of work, prioritizing the implementation and completion of tasks and goals' achievement.

3. Situational theory

The success of a leader according to the theory of situational leadership is determined by the characteristics of the specific behaviors that are tailored to the situation that demands leadership and organizational situation faced by taking into account the factor of time and space. Situational factors that influence the style of a particular leadership according to Siagian (1994: 129) is:

- a. Types of work and work complexity;
- b. The shape and nature of the technology used;
- c. Perceptions, attitudes and leadership styles;
- d. Norms adopted by the group;
- e. Span of control;
- f. Threats from outside the organization;
- g. The level of stress;
- h. organizational environment

4. Great Man theory and the Big Bang theory

These theories argue that leadership is an innate talent or it is brought from the birth. Bennis and Nanus (1990) described that this theory assumes that leaders are born, but not made. Power was owned by a certain number of people, who through the process of inheritance has the ability to lead or because of luck they have talent to occupy a position as a leader. An individual who become King, his son certainly has the talent to become the King to lead the people. While the Big Bang theory argued that an individual become a leader as a result of a major event. This theory integrates between the situation and the followers. Situation according to this theory includes revolution, chaos / riot, rebellion, and reform. Because of this situation, an individual become a leader, while the followers are those who personifying a person and willing submissive and obedient.

2.1.5 Theory of Leadership Styles

Leadership is the process of influencing or giving examples to followers in an effort to achieve organizational goals. Most people still tend to say that effective leaders have a nature or characteristics of certain very important example. These include charisma, long-term outlook, the power of persuasion and intensity. Indeed, if we think of the heroic leaders like Gen. Sudirman, Soekarno, Napoleon, Washington, Lincoln, and so we must recognize that the nature as it is attached to them and have them use to achieve the goals they want.

There are several styles of leadership the figure of the leader. These among others are as follows.

1. Autocratic Leadership style. This leader tends to self-centered or directive. In other words, a leader who only determine their own decisions, and does not need subordinate in making any plans and decisions.

2. Democratic leadership style. The style of leadership in which he/she has ability to influence others to be willing to cooperate in achieving the objectives that have been defined in various ways or activities that may be held jointly determined between subordinates and leaders.

3. Delegation style. This is a leader who has characteristics in which he/she is rarely in providing direction. Thus, the decision made by this leader is handed to subordinates, and a member of the organization is expected to resolve all the problems itself.

4. Bureaucratic style. It is a leadership style that manage their organization based on the available regulation. Thus, this leader is characterized by the rigor of the implementation of a procedure that has been in effect for the lead and his/her subordinates.

5. Laissez Faire style. This is a leadership style that encourage members' ability to take initiative.

6. Charismatic Style. This is a leadership style that use his/her charisma to attract people. People will be fascinated by the way the leader talked that will excite and motivate them. Usually, leaders with this kind of personality style will be visionaries. They also are very fond of the changes and challenges.

7. Authoritarian style. This style of leaders tend to concentrate all the decisions taken and policies made by him/herself.

8. Diplomatic style. This style of leadership are those who like to take advantage from others without making other losing.
9. Moralistic Style. The style of leadership in this context is generally warm and polite to everyone. They have a high empathy to all problems of the subordinates, patient, generous. Any form of virtues exist in this type of leaders.
10. Administrative style. The leadership style of this type would seem less innovative and quiet rigid in the sense that they tend to use the rules in making policy decisions. His/her attitude is very conservative and is afraid in taking risks and they tend to be as safety leader.
11. Analytical Style. In this type of leadership style, typically the decision-making is based on a process of analysis, especially analysis of the logic of any information obtained.
12. Assertive leadership style. This leadership style is more aggressive and is keen to give attention so much on a personal control compared with other styles.
13. Entrepreneur style. This leadership style puts on power and the end result and less emphasis on the need for cooperation. This model of leadership style usually will always find a competitor and set a high target.
14. Visionary Style. This style in which the leaders like to show what he/she has done gives meaning to the work and effort that needs to be run jointly by the members of the company by giving direction and meaning of a work and the work done by the clear vision.
15. Situational style. The style of leadership that like to show that a leader is able to many different things, depending on the level of readiness of the followers.
16. Militaristic style. The leadership style is type of leaders who are very similar to the type of authoritarian leader. She/he tend to acting as a dictator against members of the group.

2.1.6 Quality Management System

ISO 9001QMS is a quality management system standard that is recognized internationally. ISO 9001 is the global benchmark for quality management system which has issued more than one million worldwide. ISO 9001 can be applied in all types of organizations irrespective of size or location where the organization is. One of the major strengths of ISO 9001 is the ability to attract all types of organizations. The focus of ISO tend to be more on processes and customer satisfaction rather than procedures. The ISO 9001 can also be applied in services.

Gasperz (2002: 10) defined a quality of management system as follows: " a set of documented procedures and standard practices for management system that aim to ensure the suitability of the process and the products (goods / services) to the needs or requirements are determined or specified by the customer or organization ". Stephen (1997: 196), however, defined ISO 9001: 2000 as a quality system which is composed of an organizational structure, documented procedures, and tools. The goal is to present the attributes of the organization's structure, procedures and / or tools that must be present in order to satisfy the requirements of ISO 9001: 2000. Therefore, a quality management system of the ISO 9001: 2000 relates to

quality management that consists of organizational structure, documentation, procedures and tools contained in the organization. The goal is to provide transparency regarding the organizational structure, procedures, and organizational tools to give satisfaction to the consumers.

III. DISCUSSION

Efforts to improve the quality of higher education is becoming more important in order to answer the many great challenges in the era of globalization as well as in facing the enactment of the ASEAN Economic Community (AEC). The main realistic challenge in this century is changes and the progress in science and technology. This challenge emerged as a result of globalization of the world, the movement of educators and professionals such as teachers, lawyers, doctors, and foreign labor. These conditions lead to the need to improve higher education institutions to have leaders who have high integrity, competent, and skilled in their field. By having these, the universities as public institutions that provide educational services to the community, can produce graduates who are qualified and have the skills ready to compete in the free market. To achieve the above conditions, it is a must for higher education institutions to have a better university governance based on international quality management, managerial skills, effective leadership that is able to build up, encourage, and seek a strong character. These are important to achieve success in the organization. These notions have been mandated in the Article 31 paragraph (3) of the Constitution of the Republic of Indonesia. Besides that, universities are expected to carry out a strategic role in advancing civilization and welfare of mankind.

According to Government Regulation of the Republic of Indonesia Number 4 Year 2014 on the Implementation of Higher Education and Higher Education Management CHAPTER III Part General Article 21, it was mentioned that the Higher Education Management Arrangements consists of the following. First, autonomous universities that is university need to have autonomy to manage their own institution based on University Pillars locally called Tri Dharma. Second, pattern of university management.

In terms of the management autonomy, this consists of academic autonomy and non-academic autonomy. The academic autonomy include the establishment of norms and operational policies and the implementation of Tri Dharma. While the non academic autonomy include the establishment of norms and operational policies and the implementation of organizational, financial, student affairs, energy, and other infrastructures.

Moreover, in implementing the management autonomy, the university should be based on the principle of accountability, transparency, near-profit, quality assurance and effectiveness and efficiency. In the context of higher education institution, at least the following elements are important, namely, development of policy, academic units, supervisors and quality assurance, academic support or learning resources, and implementing administrative staffs.

In terms of the structure of university organization, there are four elements that should be provided. The first is a university/ academy senate that drawn from representatives of lecturers representing fields of science and technology, or groups

of fields of science and technology developed in universities as set in university statute. The second is leaders, consisting of: a. Rector of the university; b. Chairman; c. Directors. The third is the Internal Controller unit, and the fourth is a board of Trustees or other names depending on the scope of the university tasks.

In terms of lecturers and academic staff, the leader or the chairman of university can be divided into two groups, namely: structural leaders such as Rector and his staff, Dean and his staff; and scientist leaders who led the science groups and has followers regarding his field including students, researchers and other stakeholders.

University organization is an organization that regulates the division of tasks, functions, authority, responsibility, and working relationships of each unit of work in universities, which arranged according to the needs and development of the university referring to the guidelines of the organization. This university should be determined by the Minister of Education and Culture after obtaining approval from the Minister who held government affairs in the field of utilization of the State apparatus and bureaucratic reforms (see, Article 1, paragraph 2 in conjunction with Article 3 of Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 139 of 2014 on Guidelines for the Statute and the organization of Universities).

However, one important factor of success of the university as an organization is that the role of human resources in an organization. In this regard, the human resources in the university should be managed properly in order to realize the vision and mission of the university. But finding the right person with the right skills to the right positions is the most fundamental challenges in human resource management in the university in Indonesia. Therefore, leader in universities must have the managerial ability to organize the university properly.

IV. CONCLUDING NOTES

Leadership in higher education institution play important role in facing the globalization era as well as the ASEAN economic Community. The role of leadership would not only affect the employment situation, the performance of teachers are professionals and educators, nature, relationships of humanity among others, but also affect the quality of the work achieved by the institution. However, every leader in the university has his/her own manner and style. This leadership style will affect the success and the failure of the leader in bringing the university achieving its vision and mission.

Therefore, leaders and leadership are critical for the success of the university in facing globalization. This is because by having good leader and leadership, the university will be able to develop and build a conducive environment to produce high productivity of the human resources work in the institution. The leader should also able to execute the principles of good university governance based on ISO 9001 as well as the quality standards made by the National Accreditation Board of Higher Education (BAN-PT).

In addition, concern on the quality of the institution is also the main agenda. This is because by having a good quality the university will be able to compete in the global area not to mention only the ASEAN economic Community. Thus, much

remain to be done to improve the quality of leaders and leadership in the higher education institutions in Indonesia. Failure to do these, the university in particular and the higher education institutions in general will not be able to compete with other higher education institutions in the global arena.

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MODELING AND ANALYSIS OF A TRUCK MULTI-LEAF TANDEM LEAF SPRING USING FEA

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Abstract- In four wheelers, heavy weight trucks, railways automobiles the leaf spring is one of the main components and it provides a good suspension and it plays a vital role in automobile application. It carries lateral loads, brake torque, driving torque in addition to shock absorbing. The leaf spring assembly serves to absorb and store energy, and then to release. Leaf springs are made out of flat plates usually of semi-elliptical shape.

The truck multi-leaf tandem leaf spring is modelled in Creo Parametric 2.0 and analysis is carried out by using ANSYS15.0. A comparative study has been made between composite and steel leaf spring with respect to weight, cost and strength. The steel tandem leaf spring is compared with composite tandem leaf spring, composite master leaf tandem leaf spring, and steel master leaf tandem leaf spring. The later is compared with the composite mono leaf spring. The modal and harmonic analysis for the five different variations is performed and compared.

Index Terms- *Creo parametric 2.0, design optimization, lateral loads, leaf spring, weight reduction.*

I. INTRODUCTION

A leaf spring is a simple form of spring commonly used for the suspension in wheeled vehicles. Originally called a laminated or carriage spring, and sometimes referred to as a semi-elliptical spring or cart spring, it is one of the oldest forms of springing, dating back to medieval times.

A leaf spring takes the form of a slender arc-shaped length of spring steel of rectangular cross-section. The centre of the arc provides location for the axle, while tie holes are provided at either end for attaching to the vehicle body. For very heavy vehicles, a leaf spring can be made from several leaves stacked on top of each other in several layers, often with progressively shorter leaves. Leaf springs can serve locating and to some extent damping as well as springing functions. While the interleaf friction provides a damping action, it is not well controlled and results in stiction in the motion of the suspension. For this reason some manufacturers have used mono-leaf springs.

A leaf spring can either be attached directly to the frame at both ends or attached directly at one end, usually the front, with the other end attached through a shackle, a short swinging arm. The shackle takes up the tendency of the leaf spring to elongate when compressed and thus makes for softer springiness. Some springs terminated in a concave end, called a spoon end (seldom used now), to carry a swivelling member.

There were a variety of leaf springs, usually employing the word "elliptical". "Elliptical" or "full elliptical" leaf springs referred to two circular arcs linked at their tips. This was joined to the frame at the top centre of the upper arc, the bottom centre was joined to the "live" suspension components, such as a solid front axle. Additional suspension components, such as trailing arms, would usually be needed for this design, but not for "semi-elliptical" leaf springs as used in the Hotchkiss drive.

II. PROBLEM IDENTIFICATION

Due to its large volume production, it is only logical that optimization of the tandem leaf spring for its weight or volume will result in large-scale savings. It can also achieve the objective of reducing the weight of the vehicle component, thus reducing inertia loads, reducing vehicle weight and improving vehicle performance and fuel economy. So considering automobile development and importance of relative aspect such as fuel consumption, weight, riding quality, and handling, hence development of new material is necessary in the automobile industry.

In spite of different configurations of the leaf spring assembly for each type of vehicle suspension, the assembly is intended to play a common role in all type, and that is to accommodate the service loading. Mass or weight reduction is becoming important issue in vehicle manufacturing industry. Weight reduction will give substantial impact to fuel efficiency, efforts to reduce emissions

and therefore, save environment. Weight can be reduced through several types of technological improvements, such as advances in materials, design and analysis methods, fabrication processes and optimization techniques, etc.

III. MODELING OF TANDEM LEAF SPRING ASSEMBLY

The modeling of the tandem leaf spring assembly is done in Creo Parametric 2.0.

Introduction to Creo Parametric:

Creo Parametric is a computer graphics system for modeling various mechanical designs and for performing related design and manufacturing operations. The system uses a 3D solid modeling system as the core, and applies the feature-based, parametric modeling method. In short, Creo Parametric is a feature-based, parametric solid modeling system with many extended design and manufacturing applications.

Creo Parametric is the first commercial CAD system entirely based upon the feature-based design and parametric modeling philosophy. Today many software producers have recognized the advantage of this approach and started to shift their product onto this platform.

The model is as shown in the figure 1 as shown below:

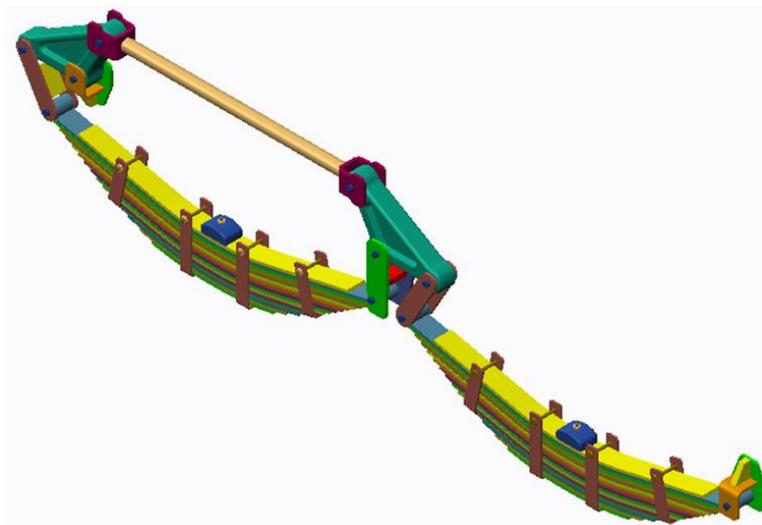


Fig 1. Tandem Leaf spring assembly model

Creo Parametric was designed to begin where the design engineer begins with features and design criteria. Creo Parametric's cascading menus flow in an intuitive manner, providing logical choices and pre-selecting most common options, in addition to short menu descriptions and full on-line help. This makes it simple to learn and utilize even for the most casual user. Expert users employ Creo Parametric's "map keys" to combine frequently used commands along with customized menus to exponentially increase their speed in use. Because Creo Parametric provides the ability to sketch directly on the solid model, feature placement is simple and accurate.

IV. ANALYSIS OF TANDEM LEAF SPRING ASSEMBLY

The analysis of the Tandem Leaf Spring Assembly is done in Ansys 15.0 and the analysis reports are as shown below. The geometry and the mesh model in Ansys are as shown in the Fig.2 and Fig. 3 below respectively.

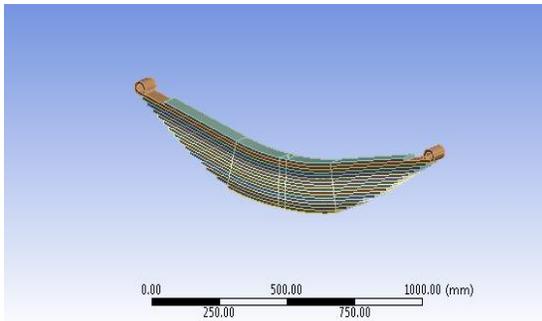


Fig. 2 Geometry of the leaf spring

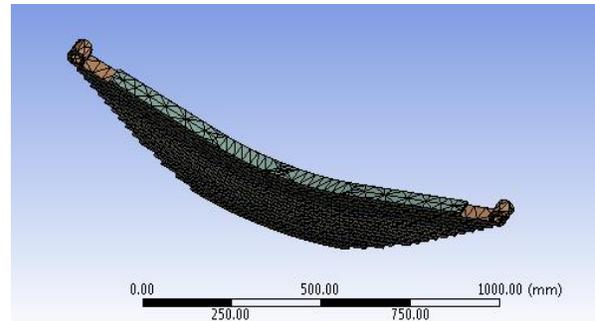


Fig. 3 Mesh of the leaf spring

The analysis is carried out for the Structural steel material and the composite material for the leaf spring assembly. The Boundary Conditions are given as the force of 62275N and is shown in the Fig . The base material is Structural steel.

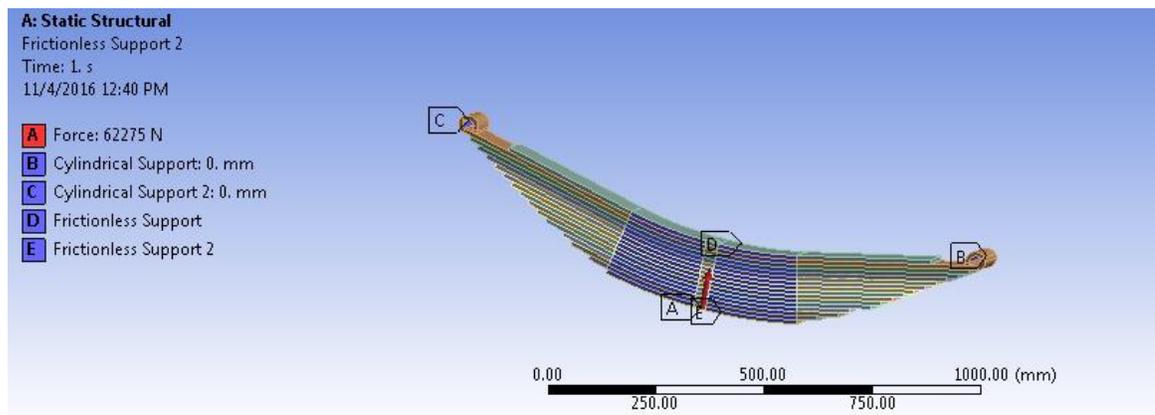


Fig. 4 Boundary conditions of the leaf spring

The deformation and Equivalent Stress reports for the steel leaf spring are as shown in the Fig. 5 and Fig. 6 respectively.

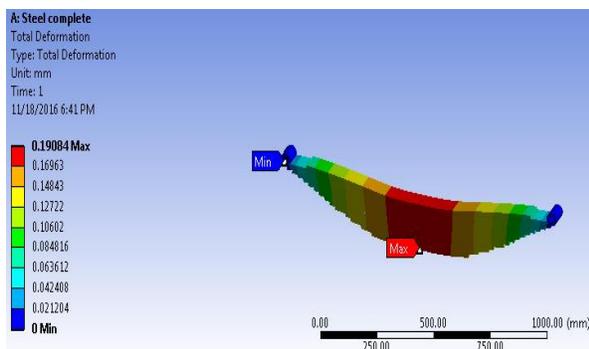


Fig. 5 Deformation of the steel leaf spring

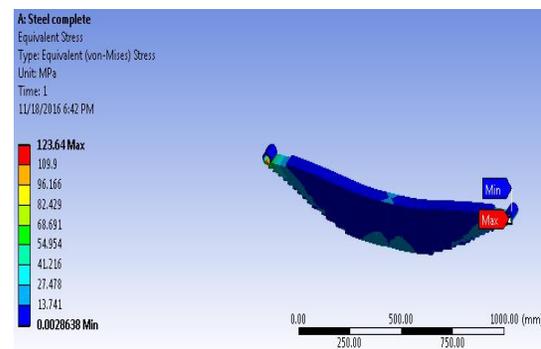


Fig.6 Equivalent Stress of the steel leaf spring

The deformation and Equivalent Stress reports for the composite leaf spring as shown in the Fig. 7 and Fig. 8 respectively.

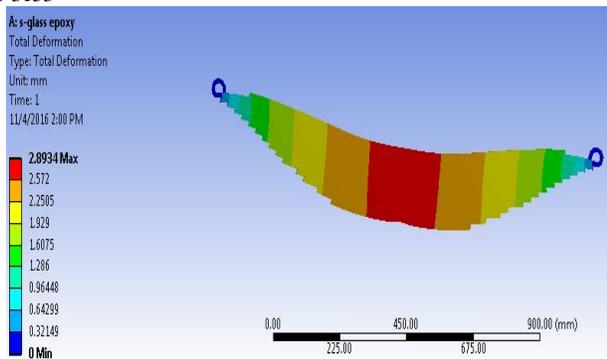


Fig. 7 Deformation of the composite leaf spring

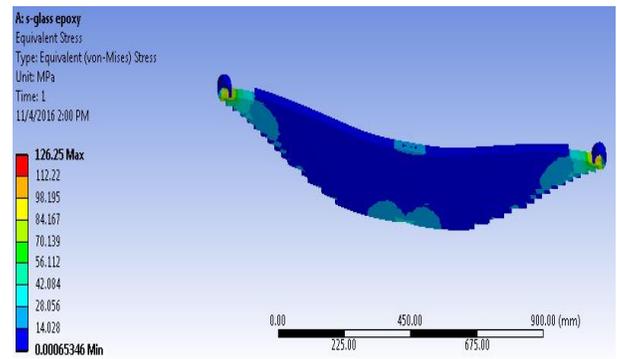


Fig.8 Equivalent Stress composite leaf spring

Also the analysis is carried out for the leaf spring assembly which consists of different shape optimisations. The deformation of and the Equivalent Stress reports for the master composite leaf spring are shown in the Fig. 9 and Fig. 10 respectively.

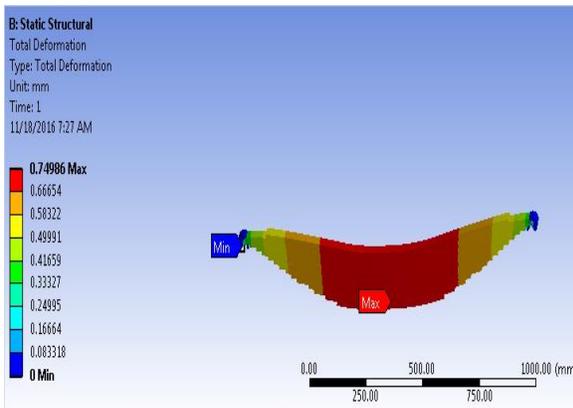


Fig. 9 Deformation of the master composite leaf spring

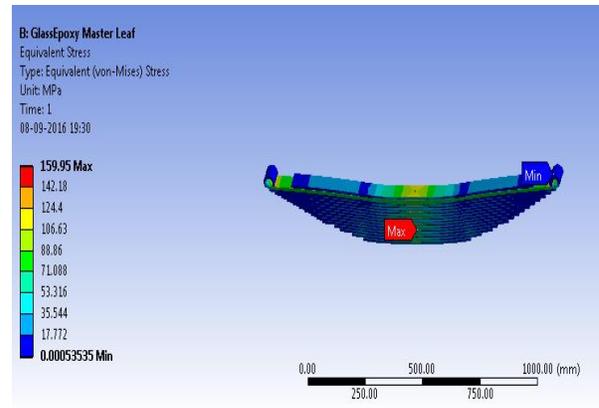


Fig.10 Equivalent Stress of the master composite leaf spring

The Glass Epoxy properties are as shown in the Fig. 11

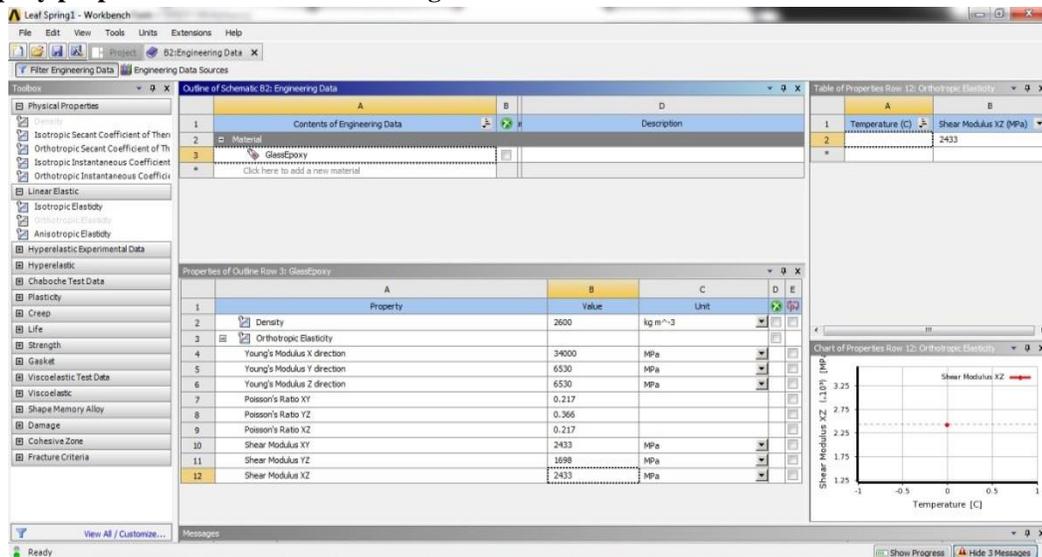


Fig. 11 Glass Epoxy material properties

V. RESULTS AND DISCUSSION

The analysis of leaf spring assembly is done. The modal and harmonic analysis is carried out in Ansys 15.0. The results for the leaf spring assembly for various considerations are as shown below:

S. No.	Materials	Weight (N)	Total Deformation(mm)	Equivalent Stress (N/mm ²)
1	Structural Steel Multi leaf spring	840.59	0.190	123.64
2	Composite multi leaf spring (S Glass Epoxy)	278.13	2.893	126.25
3	Composite master leaf spring (S Glass Epoxy) & remaining steel	785.76	0.749	159.95
4	Steel master leaf spring & remaining composite (S Glass Epoxy)	332.45	1.347	138.73
5	Composite mono leaf spring (S Glass Epoxy) (105mm Thickness)	269.20	4.815	111.68

VI. CONCLUSION

The modelling of the Tandem Leaf spring is done in Creo Parametric 2.0 modelling software and the analysis is performed using Ansys 15.0. The analysis results obtained for master composite leaf spring are comparably better than Steel leaf spring. Taking weight into consideration, Composite leaf spring assembly results are better than that of Steel Leaf spring assembly. But as there might be friction between two surfaces which may cause to wear and tear situation, it may not be practically possible to use a complete composite leaf spring assembly. Taking stress and deformation into consideration, master composite leaf spring can be used as the stress results and deformation results are better compared to the steel leaf spring assembly. Further, mono composite leaf spring is modelled and analysis is performed. Mono composite leaf spring is giving better results compared to the master composite leaf spring with respect to strength, weight and deformation. Modal analysis and Harmonic analysis is done on all the cases to check the frequencies for various modes and mode shapes. Composite mono leaf spring is observed to be better than the steel leaf spring assembly.

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