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The Effect of Profitability, Good Corporate Governance and Company Risk on Tax Avoidance

(Case Study on The Mining Industry Listed on The IDX For The 2019-2021 Period)

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Abstract: This study aims to determine the effect of profitability (Return On Assets), corporate risk, and good corporate governance on tax avoidance studies on 33 mining companies listed on the IDX in 2019–2021. The sampling technique used is simple random sampling with a proportion of 5%, meaning that mining companies listed on the IDX by randomizing the largest companies from 2019–2021 OJK data found 33 samples. Data analysis used the Lisrel Student 8.8 tool to analyze YoY annual income data as a dimensional variable used to measure simultaneous regression using SPSS 25. The results of this study indicate that Return on Assets is 199.65%, company risk is 280.56%, and good corporate governance is 304.59%. The effect of testing the coefficient of determination is 3.09%, indicating that the multiple effect of profitability (Return On Assets), corporate risk, and good corporate governance on tax avoidance is 3.09%. The implication of this research is the need for attention to 33 mining companies that are being played by the government as audits in an effort to increase tax payments. Tax avoidance because the range of 2020 and 2021 is relatively low in the efforts of 33 mining companies in implementing taxpayers registered on the IDX.

Keywords: Profitability, Company risk, Good Corporate Governance and Tax Avoidance

I. Introduction

Business in its operations is never separated from the high interest of entrepreneurs in efforts to achieve business prosperity for the goals of their company. The main purpose of a company is to maximize the wealth of shareholders (Febrianti, 2012), because it may reflect the achievement of a better profit level in the future (Febrianti, 2012: 146), but it is undeniable that one of the high interests of the business is also included in the operations of mining companies in Indonesia, which subsequently listed the mining company's financial data on the Indonesia Stock Exchange (IDX) so as to achieve a value high for the company

As stated by Sujoko and Soebiantoro in Fadhilah 2014, a company's market value can be defined as an investor's perspective relative to a company's profitability threshold when allocating capital to next year's share price. As a result, the highest value of a company can also signify a business operating at a level consistent with its core values. As reported by Hidayat Setiaji on November 13, 2019, at 10:48 WIB, about Netflix, a company that has not paid taxes in Indonesia, amounting to IDR 1.802 trillion. In the future, there will be some studies for business companies that are competitively strong, but do not pay taxes under the guidance of Tempo newspaper on July 19, 2011 on 15 Oil Companies Underpaying Taxes (in US\$).

Table 1 15 Oil Companies Underpay Taxes (In US\$)

1. CNOOC SES Ltd	94,2 million
2. ConocoPhillips (Grissik)	84,7 million
3. PetroChina International Indonesia Ltd (Blok Jabung)	62,9 million
4. Mobil Exploration Indonesia Inc (Blok Sumatera Utara Offshore)	59,9 million
5. VICO	42,9 million
6. ExxonMobil Oil Indonesia Inc	41,7 million
7. Premier Oil (Laut Natuna A)	38,3 million
8. BP West Java Ltd	35,1 million
9. Star Energy	17 million
10. PT Pertamina EP	16,9 million

11. Chevron Makassar Ltd (Blok Makassar Strait)	16,7 million
12. JOB Pertamina-Golden Spike Indonesia Ltd	11 million
13. Premier Oil Natuna Sea BV	9,2 million
14. Chevron IND (Area East Kalimantan)	8,7 million
15. PetroChina International (Area Tuban)	7,6 million

Source: ICW, Processed from BPK & BPKP audit result

Table 15 of the companies mentioned above shows that in the implementation and enforcement of taxes many entrepreneurs are subject to and do not carry out taxpayers, thus seeking to escape payment obligations.

Tax avoidance carried out by taxpayers, that is, companies / entities in the context of tax avoidance, is indeed possible or in this case does not conflict with applicable laws or legal provisions, because it is more considered (Erly,2011). According to Erly (2011), taxpayers for entrepreneurs who own entrepreneurs can take action to change tax requirements which is also known as resistance or avoidance related to taxes. Therefore, it is very important to create a planning tax in order to minimize the amount of expense tax that occurs (tax planning).

However, there is still input as a solution in order to meet government regulations for mining companies in paying taxpayers in Indonesia, although there are still differences in reporting with company practices, said by Desai and Dharmaphala (2007) differences reported to shareholders or investors using GAAP / Financial Accounting Standards while to the Tax Service Office with Tax Regulations, this difference is known as the book tax gap (Desai and Dharmaphala, 2007). Thus, many mining companies in Indonesia have reduced tax payments without avoiding taxpayer payments (Tax avoidance), according to Annisa and Kurniasih (2012: 124) interpreting Tax avoidance as an aggressive tax strategy carried out by companies in minimizing the tax burden.

According to Annisa (2012:122) said that in recent years the tax authorities seem to have tried their best not only to enforce a clear boundary between tax avoidance and tax evasion in tax planning efforts, but also to prevent taxpayers from entering into the ambiguity loopholes created by tax regulations (Bovi, 2005).

However, in Indonesia itself, in accordance with the Philosophy of the Tax Law, paying taxes is not just an obligation; rather it is a necessity for every citizen to participate in the form of a role and support national development initiatives. However, despite the fact that tax avoidance is an official method of payment, there are still many factors that negatively affect this practice. Rizky & Puspitasari (2020:113), for example, mentions several factors that negatively affect aggressive tax avoidance, including business risk, asset intensification, and business size.

Research Study on Swingly and Sukartha (2015) states that company risk has a positive effect on tax avoidance. According to Oktamawati's research (2017) states that company risk has a significant positive effect on tax avoidance and Dewi and Jati research (2014) proves that company risk has a significant effect on tax avoidance. Furthermore, empirically proven by Mulyani, Wijayanti and Masitoh (2018: 336) based on the results of their research that there is an influence of 48.7% between corporate governance on tax avoidance strengthened by the results of research Annisa & Kurniasih (2012: 133) which shows that there is a significant influence of the audit committee and audit quality on tax avoidance, then Sari & Devi (2018) proves that Profitability affects Tax avoidance.

Based on the problem of tax avoidance with empirical evidence of relevant research, it is hoped that this research can be an input and reference material for mining companies to pay taxes (Tax Avoidance) by paying attention to factors that affect Tax avoidance such as profitability, Good Corporate Governance and Company Risik derived from the company's financial statement data. Therefore, in this study, researchers are interested in taking the title The effect of profitability, good corporate governance and company risk on tax avoidance (a case study on the mining industry listed on the IDX for the 2019-2021 period).

2. Literature Review

Compliance theory is a theory about an individual's willingness to obey laws or other binding precedents. According to Tyler (1990), there are two perspectives in the social science literature relating to the law of obedience: instrumental and normative. Due to personal concerns and tangents over various changes that have to do with risk, everyone's perspective on an issue is taken into account holistically. The normative perspective has to do with something that is considered moral and has personal rights as its law. Due to its ability to be consistent with internal norms and standards, individuals can more easily understand the law.

According to Tahar & Rachman (2014), taxpayer compliance in carrying out tax obligations is one of the responsibilities of the government and the people such as taxpayers, where they have rights and obligations that must be owned by the government and the people As citizens of a country that follows the law, the manners of taxpayers in carrying out their duties must be used as a form of responsibility.

According to Titus (2014), taxes are obligations that must be fulfilled by both individuals and business entities.

Tax is an obligation that must be fulfilled by both individuals and business entities. "The tax on compulsory contributions to the state owed by private persons or entities coerced under the law, by not obtaining imbalances directly and used for state purposes for the prosperity of the people" (Purwono 23: 2010).

Jensen and Meckling (1976) define agency theory as a contract between a principal and an agent to perform services on his behalf, including delegation, authority, and decision-making. The difference in interests between principles and agents can affect some policies related to a company, such as taxation. In Indonesia, the government gives taxpayers the authority to calculate, pay, and self-report their taxes. The taxpayer, as the party's agent, can take several steps to reduce the amount of tax paid. One of the actions related to tax policy is to do tax avoidance

Tax avoidance

Taxpayers practice tax avoidance to reduce debt. Tax avoidance is more in accordance with the law that can be done without violations or applicable laws and regulations. The law collects taxes to obtain state income from large tax revenues. However, many loopholes in tax law allow Taxpayers to avoid taxes. The practice of tax avoidance does not violate the law, but it does not support the purpose of the establishment of the tax law (www.pajak.go.id). With tax planning follows the process of engineering business and transactions Taxpayers, taxpayers are within the minimum but still within tax regulations (Suandy, 2008).

In Tax Avoidance for companies studied in this study, it is more common to design the company's financial statements, which can be predicted based on business transactions that have occurred, then divide some tax burdens so that they can be calculated according to the country's tax laws.

Thus, to measure tax avoidance, Handayani (2015) recommends using the company's CETR (Cash Effective Tax Rate), which is cash issued for tax payments and divided by cash before corporate tax. Frank et al. (2009) explain that ETR is used because it can still distinguish between book and fiscal laboratories. The Effective Tax Rate (ETR) is calculated using the ETR formula and Income tax expense in pre-tax income. The study examined 33 construction companies listed on the IDX from 2019 to 2021.

Profitability

According to Sutrisno (2009:16), "profitability is the ability of a company to make a profit with all the capital working in it. Profitability, according to Sofyan Syafri Harahap (2009:304), is "Describing the company's ability to make a profit through all existing capabilities and resources such as sales activities, cash, capital, number of employees, number of company branches, and so on". "Profitability is the end result of a number of policies and decisions made by companies," says Brigham and Houston (2009:109).

According to the theory of the Agency, profitable managers use profitability information for personal gain. Risk management studies show no correlation between enterprise profitability and risk management 25. Atanasovski et al. (2015). Profitable companies will face higher risks and may be able to report more risk information. Algifri & Hussainey (2007) found that profitable companies share more information. Mousa & Elamir (2013) also found that profitability and risk-capture levels correlate significantly. Profitability is the ability of an enterprise to generate income using its own resources.

Thus, the profitability ratio can be reduced by using Return On Asset (ROA), which Cashmere defines (2012:201) as "a ratio that shows the yield on the amount of assets used in the company". Toto Prihadi (2008) states that ROA is used to assess a company's ability to use assets to generate income and calculate overall income for all creditors and shareholders as a source of capital. ROA and profit after payment can be considered (Cashmere, 2015). The study examined 33 construction companies listed on the IDX from 2019 to 2021.

Good corporate governance

Corporate Governance is the study of how directors, managers, employees, shareholders, customers, creditors, and shareholders interact with companies and each other (Hendra: 2012). The Cadbury Committee, as cited by the Forum for Corporate Governance in Indonesia (FCGI), defines Corporate Governance as a set of rules governing the relationship between shareholders, managers, creditors, governments, employees, and others. Then refer to the Regulation of the State Minister of State-Owned Enterprises Number PER-01 / MBU / 2011 concerning the Implementation of Good Corporate Governance. Corporate governance can build trust, foster teamwork, and create a shared vision so that issues such as agency can be avoided. However, economic, legal, social, and cultural factors greatly influence the implementation of GCG in any country. Because of the economy, GCG must be carried out jointly. According to Hamdani (2106, 25), the Board of Commissioners must apply basic principles as an organ of the company's joint duties and responsibilities to advise directors and ensure that the company implements GCG. The Board of Directors as an organ of the company and is responsible for collegial in managing the company. The audit committee includes external auditors and reports to the Board of Commissioners.

According to Singgareddy (2018:53-56), the attributes of corporate governance can be seen by looking at the size of the board and the independence of the board, as well as the number of directors on the board and the formula greater than or equal to 5 in 1:0 . This means that to measure GCG in Indonesia, it can be seen the number of people in a company such as the Board of Audit Committee, Board of Commissioners Structure, and Audit Quality (independent board). In this study, the authors examined 33 mining companies listed on the IDX in 2019–2021.

Company Risk

In 1990, the American Institute of Certified Public Accountants (AICPA) reported on corporate risk disclosures. AICPA illustrates that users of financial statements change needs, so companies are expected to add 18 information contained in financial statements by providing future-oriented information, including information about uncertainty and risk mitigation (Linsley & Shrives, 2006).

According to ICAEW (2002), a company's risk is a condition in which it feels uncertainty about its future results, which may be positive or negative. According to Linsley & Shrives (2006), companies face financial, operational, empowerment, strategic, technological, and integrity risks when conducting operations. ICAEW (2002) states that there are no specific standards governing how companies calculate risk. Some describe that companies with large sizes have a tendency to expose more risk than small companies, and a complete company presents risks that will be followed by its ability to avoid risk.

According to Abdillah and Nurhasanah (2020:86), company risk is a reflection of company policy, which can indicate risk-taking or risk aversion. According to Djohanputro (2012: 17), "Company risk can be calculated by dividing income before income tax by total assets. Measuring company risk in research using the formula Risk with Profit before tax in the total asset split. This study examined 33 construction companies listed on the IDX during 2019–2021.

Links between variables

Profitability to Tax avoidance

According to Sutrisno (2009:16), profitability is the ability of a company to make a profit with all its working capital, including in tax avoidance practices that do not violate the law but do not support its intentions. Sari & Devi (2018) found that profitability affects tax avoidance.

Good corporate governance to Tax avoidance

Corporate Governance, is a set of laws governing the relationship between shareholders, company management, creditors, governments, employees, and other parties who have rights and responsibilities. Wijayanti and Masitoh (2018:336) found a 48.7% correlation between corporate governance and tax avoidance.

Company risk to Tax avoidance

Company risk in conditions where there is uncertainty about the consequences that will be faced, can be in the form of profits or losses so that in obtaining profits and minimizing losses when doing tax avoidance is an effort that can be done but does not violate the provisions or laws and regulations of taxpayers the practice of avoidance tax to reduce debts. Dewi and Jati (2014) found that company risk affects tax avoidance.

Hypothesis development

Based on empirical evidence from the relevant research results, said Rizky & Puspitasari (2020: 113) which mentions several factors that influence the existence of aggressive tax avoidance, namely company risk, intensity of fixed assets and company size

H1 : Profitability has a significant effect on Tax avoidance

to maximize the profitability of the enterprise. The profitability of the enterprise means the ability of the enterprise to make a profit. The profit that the company earns, in this case after the tax burden, can provide peace of mind for shareholders.

The purpose of the company is to make a profit. The company's ability to make a profit through the profitability ratio. The profitability ratio in some studies uses Return On Assets (ROA) to measure its relationship with tax collection.

ROA describes a company's ability to generate revenue. When ROA increases, it indicates a high corporate profit and a good use of assets to generate revenue. Lestari & Asfar (2020), Olivia & Dwimulyani (2019), and Rinaldi & Cheisviyanny (2015) found that profitability has a positive impact on tax avoidance because companies can be said to be efficient if they can pay less tax, resulting in lower tax rates.

Based on research by Sari & Devi (2018), profitability as measured by Return on Assets affects tax avoidance. If the company's ability to make a profit increases, operating profit will also increase and the tax value will also increase because of this, profitability affects tax avoidance, but if profit increases, tax avoidance decreases, this is due to the company not taking efficiency measures in paying its taxes (2014).

H2 : Good corporate governance has a significant effect on tax avoidance

Corporate Governance is a mechanism that regulates and directs a company through relationships between shareholders, management, creditors, government, employees, and other stakeholders to increase its value.

Good corporate governance (GCG) maintains a balance between economic and social goals and protects the company from bad management that causes problems (Dwitridinda in Hendra: 2012). GCG is related to ownership structure, transparency, audit committees, and independent board representatives. The board of commissioners that supports the company's performance and improves monitoring activities is measured using the percentage of the board (Siallagan: 2006).

If a company is audited by the Big Four Public Accounting Firms (KAP), it will be more independent because it can withstand management pressure to report customer complaints (Watts in Kurniasih: 2007). Khurana and Moser (2009) found that a company's aggressive tax policy is influenced by the size of its institutional shareholder base, with short-term shareholders increasing it and long-term shareholders lowering it.

H3 : Company risk has a significant effect on tax avoidance

CEO who are willing to take risks are more likely to make risky decisions. "Company risk is a reflection of the policies taken by company leaders so that it can provide an indication of the character of risk takers or risk averse," said Coles (2004: 16).

This research supports the findings of Budiman & Setiyono (2012) and Dewi & Jati (2014: 256) that "the magnitude of the risk of companies that have a tendency to corporate leadership affects tax avoidance". The risk-taking or risk aversion of a company leader depends on the risks of the company (Budiman and Setiyono, 2012: 15). As corporate risk increases, executives become risk-takers. However, when a company's risk decreases, executives become risk aversion..

Research shows that corporate risk affects tax avoidance. This study found that the quality of audits has no effect on tax avoidance or avoidance. This research found that the audit committee had no effect on tax avoidance in manufacturing companies listed on the Indonesia Stock Exchange in 2015-2018. (Abdillah, Nurhasanah) (2020)

H4 : Profitability, Good corporate governance and Corporate risk have a simultaneous and significant effect on Tax avoidance

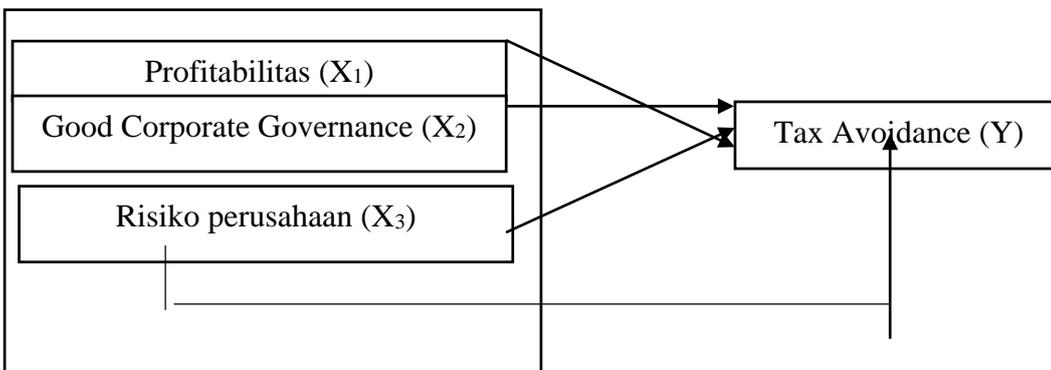
The tax actions taken by a number of companies in Indonesia are not for tax evasion, but rather for the purpose of saving the amount of tax paid by companies by exploiting loopholes in the 2008 tax regulation). The practice of tax avoidance does not violate the law (statute), but does not support the purpose of the formation of the tax law (www.pajak.go.id). "Compulsory contribution tax to the state owed by individuals or entities forced under the law, by not getting an imbalance directly and used for the needs of the state for the greatest prosperity of the people".

This led to some mandatory tax avoidance practices. Tax avoidance is a lawful way for taxpayers to lower their tax bills. Tax avoidance is said to be a complicated problem and because on the one hand it is considered not to violate the law, but on the other hand it is undesirable because it harms the state from state revenue (Nandasari, 2015).

Ginting (2016) found that business governance can affect tax avoidance. Corporate governance is a system for managing and directing a company, according to the Organization for Economic Cooperation and Development (Fadhilah, 2014). Sartori's research (Winata, 2014) shows that companies with well-structured corporate governance mechanisms will perform better in fulfilling their legal obligations. Furthermore, ROA is the profitability ratio. This ratio is most often highlighted in the analysis of financial statements because it is able to show the success of the company in making a profit. Return on Asset (ROA) measures a company's ability to generate revenue from its assets. When Return On Asset (ROA) increases, the company's profit increases (Dewinta and Setiawan, 2016). Several studies on business governance and tax avoidance have yielded promising results

Sartori (2010); Fries, Link, and Mayer (2006); Chen and Chu (2010); Bovi (2005); Chai and Liu; Kim, Li, and Li (2010); Crocker and Slemrod (2003); Khurana and Moser (2009); Ralf and Chatelain (2010); etc. Some believe that corporate governance and tax avoidance are negatively related. Another study found that corporate governance and tax avoidance have a positive relationship when accompanied by low agent and transaction fees (Sartori, 2010). Several international studies have shown that business governance negatively impacts tax avoidance.

The framework of thinking in this research is:



3. Research Results

The research method used quantitative research with secondary data from the financial statements of mining companies listed on the IDX 2019-2021, the sampling technique used is simple random sampling with a proportion of 5% meaning that the largest company since 2019-2021 based on Financial Services Authority data is 33 samples. Data analysis using the Lisrel student 8.8 tool to analyze YoY annual gain data as a dimension variable used to measure regression simultaneously using SPSS 25 to determine the partial and multiple influence between the free variables of profitability, good corporate governance, and company risk on tax avoidance.

Operational variable measurement ratio

Table 2 Operational Variable

Variabel	Pengukuran	Skala
Tax Avoidance	$ETR = (\text{Income tax expense}) / (\text{income before tax})$	Ratio
Profitability	$ROA = (\text{Income after tax} / \text{Total assets} \times 100\%)$	Ratio
Good corporate governance	<i>CGPI</i> (Corporate Governance Perception Index) Assessment of Audit Committee Rating, Board of Commissioners Structure and Audit Quality (independent board)	Ratio
Company risk	$\text{Company risk} = (\text{earning before tax (EBIT)}) / (\text{Total assets})$	Ratio

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STATISTIC TESTING RESULTS

In testing the results of data analysis, this research is categorized into several stages of data analysis such as data normality testing, data validity testing, data reliability testing and partial and multiple regression testing, previously the data in the frequency description test were recapitulated into the following table:

Descriptive frequency ratio of data of 33 mining companies listed on the IDX in 2019-2021

Table 3 Testing Data frequency description

Variable	Profitability	Company risk	Good Corporate Governance	Tax avoidance

Mean	1.61	1.73	33.82	6.43
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Data processing sources for journals 2022

In the table above, it is known that the mean value score or average gain for profitability data above or ROA > 1% which means that the value of 1.61 ROA in 33 mining companies on the IDX in 2019-2021 is classified as very healthy.

In the table above, it is known that the mean value score or average gain for the company's risk data above or the Risk < 10% which means that the value of 1.73 company risks in 33 mining companies on the IDX in 2019-2021 is classified as unlikely or can occur during extreme circumstances so it can be said that the company's risk has rare criteria with a level of 1 < 10% with a qualitative frequency index.

In the table above, it is known that the mean value score or average gain for Good Corporate Governance data above or the CGPI rating < 55 which means that the value of 33.82 GCG in 33 mining companies on the IDX in 2019-2021 is quite reliable.

In the table above, it is known that the mean value score or average gain for tax avoidance data above or TAX avoidance worth 6.43 if at a percentage of 6.43% which means that the implementation of Tax avoidance in 33 mining companies on the IDX in 2019-2021 is relatively high because the higher the percentage rate of tax avoidance that can be minimized will reduce the value of taxpayers paid with efficiency of 6.43% in three years

Normality testing

Table 4 Normality test

Variable	Profitability	Company risk	Good Corporate Governance	Tax avoidance
Asymp. Sig. (2-tailed)	0.016 ^c	0.007 ^c	0.200 ^{c,d}	0.001 ^c

Data processing sources for journals, 2022

In the table above, the test results obtained normality test data for profitability data of 0.016 < 0.05 which means the receipt of H1 data is not normally distributed, In the table above, the test results of obtaining normality test data for company risk data of 0.007 < 0.05 which means that the receipt of H1 data is not normally distributed, In the table above, the test results of the normality test data for Good Corporate Governance data are 0.200 > 0.05 which means the receipt of H0 normally distributed data and in the table above, the test results of obtaining normality test data for Tax avoidance data of 0.001 < 0.05 which means that the receipt of H1 data is not normally distributed, the results of testing normality data show that the data is nonparametrix meaning that the data is relatively low and in testing the ratio data is not influenced in the form of normal data. So that the data can be continued in the next research.

Validity testing

Tabel 5 Item testing instrumen validity

Variable	Konfirmasi			Interpretasi
	Rcount	Rtable >0.3440	Sig.< 0.05	
Profitability (ROA)				Valid & Signifikan
ROA2019	0.851	0.3440	0.000	Valid & Signifikan
ROA2020	0.725	0.3440	0.000	Valid & Signifikan
ROA2021	0.905	0.3440	0.000	Valid & Signifikan
Company risk				
RISKP2019	0.624	0.3440	0.000	Valid & Signifikan
RISKP2020	0.760**	0.3440	0.000	Valid & Signifikan
RISKP2021	0.845**	0.3440	0.000	Valid & Signifikan
Good corporate Governance				
GCG2019	0.956**	0.3440	0.000	Valid & Signifikan
GCG2020	0.975**	0.3440	0.000	Valid & Signifikan
GCG2021	0.909**	0.3440	0.000	Valid & Signifikan
Tax Avoidance				
TAXAV2019	0.268	0.3440	0.152	Tidak Valid
TAXAV2020	0.562**	0.3440	0.000	Valid & Signifikan
TAXAV2020	0.531**	0.3440	0.000	Valid & Signifikan

Data processing sources for journals, 2022

In the table above, the test results of profitability data acquisition consist of 2019 data showing valid and significant data, 2020 data showing valid and significant data and 2021 data showing valid and significant data.

In the table above, the test results of the company's risk data acquisition consist of 2019 data showing valid and significant data, 2020 data showing valid and significant data and 2021 data showing valid and significant data

In the table above, the test results of Good corporate Governance data consist of 2019 data showing valid and significant data, 2020 data showing valid and significant data and 2021 data showing valid and significant data.

In the table above, the test results of tax avoidance data consisting of 2019 data show invalid and insignificant data due to the acquisition of $R_{count} < R_{table}$ scores and sig values > 0.05 so that the data in the drop, 2020 data shows valid and significant data and 2021 data shows valid and significant data. The results of this test show that the research variable data is classified as valid so that it can be continued in the reliability test

Reability testing

Tabel 6 Percentage of reability testing

Variable	Konfirmasi		Interpretasi
	Cronbach Alpha	Table alpha	
Profitability (Return On Asset) 3 butir	0.659	$\alpha > 0.6$	Acceptable
ROA2019	0.622	$\alpha > 0.6$	Acceptable
ROA2020	0.652	$\alpha > 0.6$	Acceptable
ROA2021	0.752	$\alpha > 0.7$	Acceptable
Company risk for 3 years	0.729	$\alpha > 0.7$	Acceptable
RISKP2019	0.617	$\alpha > 0.6$	Acceptable
RISKP2020	0.589	$\alpha > 0.5$	Acceptable
RISKP2021	0.813	$\alpha > 0.8$	Acceptable
Good corporate Governance for 3 years	0.960	$\alpha > 0.9$	Excellent
GCG2019	0.950	$\alpha > 0.9$	Excellent
GCG2020	0.915	$\alpha > 0.9$	Excellent
GCG2021	0.954	$\alpha > 0.9$	Excellent
Tax Avoidance for two years	0.659	$\alpha > 0.6$	Acceptable
TAXAV2020	0.655	$\alpha > 0.6$	Acceptable
TAXAV2021	0.711	$\alpha > 0.7$	Acceptable

Data processing sources for journals, 2022

In the table above, the results of testing Profitability data (Return On Asset) 3 items $\alpha > 0.6$ which means Acceptable, company Risk data 3 items $\alpha > 0.7$ which means Acceptable, Good corporate Governance data 3 items $\alpha > 0.9$ which means Excellent and Tax Avoidance 2 items $\alpha > 0.6$ which means Acceptable. The test results show that the variable data in this study has an acceptable level of reliability so that hypothesis testing can be continued.

In the table above, the results of testing Profitability data (Return On Asset) 3 items $\alpha > 0.6$ which means Acceptable, company Risk data 3 items $\alpha > 0.7$ which means Acceptable, Good corporate Governance data 3 items $\alpha > 0.9$ which means Excellent and Tax Avoidance 2 items $\alpha > 0.6$ which means Acceptable. The test results show that the variable data in this study has an acceptable level of reliability so that hypothesis testing can be continued.

Regression equation testing

Tabel 7 Percentage of equations in regression

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	524626731.917	843508352.198		0.622	0.539
	Return On Asset	1.413	2.299	.256	0.614	0.544
	Company risk	-1.675	1.956	-.355	-0.857	0.399
	Good Corporate Governance	-55.195	242.515	-.042	-0.228	0.822

a. Dependent Variable: Tax Avoidance

Data processing sources for journals, 2022

Based on the test results in the table above, the results of regression testing with the equation Return On Asset of 1,413 or 199.65% and the acquisition of company Risk of (-) 1,675 or 280.56% and the acquisition of Good Corporate Governance of (-) 55.19 or 304.59%. This means that if the Return on Asset is increased in a one-percentage increase, it will increase Tax avoidance by 199.65% with company risk and Good Corporate Governance remaining.

In the table above, if the company's risk is increased by one percentage, it will increase Tax avoidance by 280.56% with a fixed Return on Assets and Good Corporate Governance

In the table above, if Good Corporate Governance is increased in a one-percentage increase, it will increase Tax avoidance by 304.59% with Return On Assets and fixed company risk.

Coefficient of determination testing

Tabel 8 Determination Testing Percentage

Model Summary ^b				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.176 ^a	0.031	-0.069	1476016500.746
a. Predictors: (Constant), Good Corporate Governance, Company risk, Return On Asset				
b. Dependent Variable: Tax Avoidance				

Data processing sources for journals, 2022

Based on the test results in the table above, the results of the coefficient of determination test of 0.176 or 3.09%, show that the effect of multiple profitability (Return On Asset), company risk and Good Corporate Governance on Tax avoidance is 3.09%.

Testing path diagrams

2019 ROA on Profitability of 33 mining companies listed on the IDX

Based on the results of the Lisrel test output, estimated ROA1, the gain of 0.387 or 14.97% shows profitability in 2019 if calculated the value of profits achieved by 33 mining companies of 14.97% means that profitability is categorized as good so that tax avoidance can be made.

2020 ROA on Profitability of 33 mining companies listed on the IDX

Based on the results of the Lisrel test output, the estimated ROA2 gain of 0.778 or 60.52% shows profitability in 2020 if calculated the profit value achieved by 33 mining companies of 60.52% means that the profitability that is categorized is very good so that tax avoidance can be made.

ROA in 2021 on Profitability of 33 mining companies listed on the IDX

Based on the results of the Lisrel test output, the estimated ROA3 gain of 0.399 or 15.92% shows profitability in 2021 if calculated the profit value achieved by 33 mining companies of 15.92% means that profitability is categorized as good so that tax avoidance can be made.

2019 Risk to Company risk in 33 IDX-listed mining companies

Based on the results of the Lisrel test output, the estimated RISKP1 gain of 0.516 or 31.36% shows that RISK1 in 2019 if calculated the value of the risk experienced by 33 mining companies of 31.32% means that the company's risk that may lie at level three is likely to occur and may have appeared so that tax avoidance has not been made.

2020 Risks to Company risks in 33 IDX-listed mining companies

Based on the results of the Lisrel test output, the estimated RISKP2 gain of 0.856 or 73.27% shows that RISK2 in 2020 if calculated the risk value experienced by 33 mining companies of 73.27% means that the company's risk that is likely to occur company risk lies at level four categories that are likely to occur easily, may appear in the most frequent circumstances so that tax avoidance can be made.

2021 Risks to Company risks in 33 IDX-listed mining companies

Based on the results of the Lisrel test output, the estimated RISKP3 gain of 0.501 or 25.10% shows that RISK3 in 2021 if calculated the risk value experienced by 33 mining companies of 25.10% means that the company's risk that is unlikely to occur company risk lies at the second level of the category has not occurred but can appear at a time so that tax payments can be made (Tax Avoidance).

GCG in 2019 on Good Corporate Governance in 33 mining companies listed on the IDX

Based on the results of the Lisrel estimated GCG1 test output of 0.743 or 55.20% shows GCG1 in 2019 if calculated the value of Good corporate governance carried out by 33 mining companies of 55.20% means that Good corporate governance in the CGPI ranking is trusted enough so that tax avoidance can be made.

GCG in 2020 on Good Corporate Governance in 33 mining companies listed on the IDX

Based on the results of the Lisrel test output, the estimated GCG2 gain of 1.02 or 104.04% shows that GCG2 in 2020 if calculated the value of Good corporate governance carried out by 33 mining companies of 104.04% means that Good corporate governance in the CGPI ranking above is very reliable so that tax avoidance can be made.

GCG in 2021 on Good Corporate Governance in 33 mining companies listed on the IDX

Based on the results of the Lisrel test output, the estimated GCG3 gain of 0.761 or 57.91% shows GCG3 in 2021 if the calculation of the value of Good corporate governance carried out by 33 mining companies is 57.91% meaning that Good corporate governance in the CGPI ranking is trusted enough so that tax avoidance can be made.

2019 Tax on Tax Avoidance on 33 mining companies listed on the IDX

Based on the results of the Lisrel estimated TAXAV1 test output, the gain of 4.62 or 2,134.44% shows that the Tax in 2019 if tax payments are made with a tax avoidance approach of 2,134.44% meaning that the tax efficiency carried out has a very good category

2020 Tax on Tax Avoidance on 33 mining companies listed on the IDX

Based on the results of the Lisrel estimated TAXAV2 test output, the gain of 0.0682 or 0.465% shows that the Tax in 2020 if tax payments are made with a tax avoidance approach of 0.465% meaning that the tax efficiency carried out has a fairly good category..

2021 Tax on Tax Avoidance on 33 mining companies listed on the IDX

Based on the results of the Lisrel estimated TAXAV3 test output, the gain of 0.00169 or 0.0002% shows that the Tax in 2021 if tax payments are made with a tax avoidance approach of 0.0002% meaning that the tax efficiency carried out has a poor category.

5. Conclusion

According to Swingly & Sukartha (2015), corporate risk has a positive effect on tax avoidance. According to Oktamawati (2017) and Dewi & Jati (2014), company risk has a positive effect on tax avoidance. Furthermore, empirically proven by Mulyani, Wijayanti and Masitoh (2018: 336) based on the results of their research that there is an influence of 48.7% between corporate governance on tax avoidance and the results of Annisa & Kurniasih (2012: 133) which shows that the significant audit committee and audit quality on tax avoidance, furthermore Sari & Devi (2018) prove that Profitability is influential According to Tyler (1990), the sociological literature on legal ethics has two perspectives: instrumental and normative. Meanwhile, to increase tax payments in the form of Tax Avoidance, it is important to pay attention to the role of the government as an external auditor with regulations and direct supervision to mining companies based on the results of processing financial statement data listed on the IDX.

The limitation in this study is relatively low sampling so that data testing has not met the expectations of this study, where low data will be included as nonparametric data analysis, although the ratio data calculated in this study is low but can still prove the influence in the application of tax avoidance to 33 mining companies listed on the IDX 2019-2021. For further research, it is possible to use YoY on the IDX for at least the last five years with a sample of above 100 companies and take secondary data from financial statements with more ratio calculations compared to the ratio data of this study.

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Analysis of The Social Innovation Program "Mamanda Village" In Balida Village, Balangan Regency the Year 2022

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Abstract- The "Mamanda Village (Independent & Empowered Community)" program is a form of community development carried out by PT Adaro Indonesia's CSR, which began in 2018. The Company seeks to change the mindset and behavior of the community with the Mamanda Village program. The Mamanda Village Program develops local cultural arts, eco-tourism, business development, and biodiversity development. These activities can absorb labor, develop local institutional capacity and improve the environment's quality. The Mamanda Village Program synergizes several significant potentials in Balida Village, such as active cooperation, the self-help pattern that is still growing, and the existence of local (endemic) plants. This average population is aware of education and high school graduates. The method used in this study is analysis with primary data in the form of in-depth interviews and Focus Group Discussions conducted on three elements, namely representatives from companies, governments, and Civil Social Organizations (CSOs), calculation of social return on investment (SROI) and secondary data from stakeholders. Interested. Based on qualitative analysis, the Mamanda Village Program has been based on the Vision, Mission, and Values as well as the Company's CSR Policy, Social Problems, Community Needs, and Local Potential, meets the element of novelty, is evident from the results of the transfer of knowledge and skills from the Company to the community (Core Competency), aligned with the Company's Life Cycle Assessment analysis, has a positive impact (creating market access, empowering vulnerable groups, Quantitatively, based on the calculation of the Social Return On Investment (SROI) ratio that has been carried out, it is known that for every 1 Rupiah invested, you get a benefit of Rp. 5.41 means that the value of the Mamanda Balida Village Program benefit is greater than the investment value. The payback period is short enough that for an investment of IDR 715,000,000, it will take only 6.65 months before a value equivalent to that investment is realized.

Index Terms- CSR, Mamanda Village, Balida Village, Adaro Indonesia

I. INTRODUCTION

PT Adaro Indonesia is a limited liability company under the PT Adaro Energy, Tbk group of companies. PT Adaro Indonesia's coal mining activities have started since the signing of the IUPK (Special Mining Business

Permit) Number SK 11/1/IUP/PMA/2022 on September 13, 2022, with an area of 23,942.00 Ha. Looking at the strategic aspects and values of Coal produced since 2007, PT Adaro Indonesia has become one of the National Vital Objects (OBVITNAS). It was confirmed by the

Minister of Energy and Mineral Resources No. 1762 K/07/MEM regarding the Protection of vital national objects in the Energy and Mineral Resources Sector at PT Adaro Indonesia. The mining locations are in Tabalong Regency and Balangan Regency, South Kalimantan Province.

The mining industry must implement community empowerment programs to benefit the environment and socio-economic community around the mine. So, in addition to carrying out production operations, coal companies also carry out corporate social responsibility activities, also known as Corporate Social Responsibility (CSR), by creating unique programs in the community based on resources owned by the region. It is carried out to provide positive feedback to the community around mining operations, which are directly or indirectly affected to increase independence and welfare in terms of environmental, economic, and social aspects.

Along with business activities that are in the midst of society with all its dynamics, the Company's awareness arises to be involved in community life as a corporate social environment, namely through the implementation of Corporate Social Responsibility (CSR) which is increasing from time to time, not only because of the existence of corporate social responsibility. Juridical demands with the presence of laws and regulations governing the implementation of CSR, but also because of the Company's desire to participate in creating sustainable development goals through various CSR programs carried out by the Company together with the surrounding community so that the Company gets social benefits in the form of trust (trust) for community acceptance. It implements programs that are the community's needs in building independence [1].

The Mamanda Tourism Village Program is a form of PT Adaro Indonesia's CSR community development which started in 2018. The Mamanda Tourism Village (Advanced and Empowered Community) is an integrated program that aims to solve village problems around the operational area through increased participation in sustainable community empowerment following the potential village by prioritizing the role of BUMDes. The Mamanda Village Program in Balida Village has carried out village tourism activities since 2019 through the development of the Racah Ablelang Cultural Market with the attraction of traditional arts through cultural market events, educational tours through endemic flora conservation, and family tourism facilities. This program has positively impacted the socio-economic context of

the community, where residents who are members of the Tourism Awareness Group formed from BUMDes have received additional income since the Racah Capablelang Cultural Market on January 21, 2020, by the Balangan Regency Government. In addition to regional art performances, the Racah Kalianlang cultural market also provides an excellent opportunity to improve the economy of local MSME business actors.

The Mamanda Balida Village Program, through racah bisalang tourism, also contributes to the environment through rice field tours with a 350-meter bamboo bridge in the cultural market area, conservation of 20 endemic tree species, and seven bamboo variants.

Based on PT Adaro Indonesia's Rapid Environmental Assessment on Disaster Study, the Mamanda Village Program is one of the programs that PT Adaro Indonesia continues to foster disaster sensitivity for the empowerment of small and medium enterprises (SMEs) in the Company's operational areas with a focus on racah bisalang tourism which can be a source of improvement in the community's economy after COVID-19.

The Corporate Social Responsibility (CSR) program in implementing sustainable development plays an important role. First, CSR program shows the concern of the Company to participate in thinking and developing the community both in terms of the social empowerment program and in terms of setting aside part of the Company's profit funds that are intended for empowering programs. Second, the CSR program shows the Company's participation in preserving the environment when exploiting and exploring natural resources so that the Mamanda Village program supports the SDGs Indicators.

Based on the results of research on the implementation of PT Adaro Indonesia's Corporate Social Responsibility Program as a Community Empowerment Effort, it is stated that the success of the CSR Program implementation has a high enough level, as evidenced by the Company's awareness that the programs provided must be able to empower and encourage community independence. The CSR team innovates and continues implementing programs tailored to the community's needs to realize each program sustainably. To minimize program failures, the CSR team conducts research first before implementing and continuing program planning [2].

II. RESEARCH METHODS

a. Social Innovation Study

1. Primary Data

The primary data was an In-depth Interview and Focus Group Discussion (FGD). In-depth interviews were conducted with three elements, namely representatives from companies, government, and Civil Social Organizations (CSOs), to obtain qualitative data related to the positive Impact of the Mamanda Village Program based on community needs. The program can solve community social problems, increase community capacity, create roles and relationships in social life, in developing community capacity, in providing environmental impact, in providing economic impact, in delivering health impacts, in producing assets and human resources (HR), and in the sustainability of the Community Development Program. FGDs were conducted on three elements, namely representatives from companies,

2. Secondary Data

The data is related to PT Adaro Indonesia's 2018 Operational Village Social Mapping document, Life Cycle Assessment (LCA) Document, Eco-Innovation Bamboo Conservation Program Document, Rapid Environmental Assessment on Disaster (REAOD) Document, and SDG's Indicator Document.

b. Study of Social Return On Investment (SROI)

SROI was developed from social accounting and cost-benefit analysis (cost-benefit analysis). SROI places a monetary value on social benefits and then compares the benefits received by the public and private to the costs incurred.

c. Analysis Type

Evaluative, carried out retrospectively and based on actual results that occurred during 2019 – 2022.

d. Formulation

$$\text{SROI} = \frac{\text{Net Present Value of Benefits}}{\text{Net Present Value of Investment}}$$

e. Study Parameters

This research was conducted concerning the SROI measurement methods, principles, and guidelines initiated by The SROI Network UK. These phases are by setting the scope and identifying stakeholders, mapping the outcomes of each stakeholder, setting indicators and values for each product, fixing impacts, calculating SROI, and reporting SROI.

f. Principles of Analysis

The principles of analysis of the Social Innovation Study and SROI are as follows:

1. Engaging Stakeholders;
2. Understand what changed;
3. Give value (Rp) to the essential things;
4. Include only significant relevant changes;
5. Don't claim changes are too different (deadweight, attribution, displacement, drop off);
6. Transparent;
7. Verify calculation results.

In the analysis should also pay attention to the following:

1. Measuring the magnitude of the impact that is the result of the Organization's activities to reduce the risk of over-claiming;
2. Positive impact = (outcomes) – (deadweight, attribution, drop off, displacement);
3. Deadweight: any changes that will happen without you doing any intervention/activity or not;
4. Attribution: changes obtained from the intervention of other parties;
5. *Drop off*: calculate how much the effect of the activity will decrease over time;
6. *Displacement*: occurs when the benefits obtained are at the expense of others outside the program.

g. Data collection

Data collection was carried out primarily through semi-structured interviews using the funnel technique. Namely, the interview pattern was arranged as a funnel or funnel.

h. Research Respondents

The study respondents consisted of 3 elements: the government, elements of civil society organizations (CSOs), and elements of companies.

III. RESULTS

Introduction to environmental conservation

Racah Capablelang Tourism introduces environmental conservation in the form of 20 endemic tree species with a total of 549 trees, including:

Table 1. Types of Endemic Trees

No	Local Name	Latin name	Number of Plants
1	Iron / Iron Wood	<i>Eusideroxylon zwageri</i>	5
2	Agarwood	<i>Aquilaria malaccensis</i>	5
3	Maranti	<i>Shorea sp</i>	20
4	Sungkai	<i>Peronema canescens</i>	40
5	Kalangkala	<i>litsea angulata</i>	5
6	Ramania	<i>Bouea macrophylla</i>	5
7	maritime	<i>Naphelium Ramboutanake</i>	4
8	Binjai	<i>Mangifera caesia</i>	5
9	Papakin	<i>Lahia kutejensis</i>	10
10	Durian	<i>Durio sp</i>	10
11	Rambai	<i>Baccaurea motleyana</i>	10
12	Langsat	<i>Lansium domesticum</i>	20
13	Nets/Jengkol	<i>Archidendron pauciflorum</i>	100
14	Mangosteen	<i>Garcinia mangostana L.</i>	10
15	Crystal Guava	<i>Psidium guajava</i>	50
16	Soursop	<i>Annona muricata</i>	50
17	Pucuk Merah	<i>Syzygium Oleana</i>	50
18	Trobesi	<i>Samanea Saman</i>	50
19	Eucalyptus	<i>Melaleuca leucadendra</i>	50
20	Ketapang	<i>Terminalia catappa</i>	50
Amount			549

In addition, there are also seven varieties of bamboo planted with a total of 360 bamboo trees, including the following:

Table 2. Types of Bamboo Trees

No.	Local Name	Latin name	Number of Plants
1	Paring Manis	<i>Bambusa sp</i>	200
2	Betung	<i>Dendrocalamus asper</i>	20
3	Haur	<i>Bambusa tuldoides</i>	10
4	Jakarta Bamboo	<i>Gigantochloa atter</i>	40
5	Chinese Bamboo	<i>Bambusa multiplex</i>	40
6	Paring Rope	<i>Gigantochloa smear</i>	40
7	Yellow Reed	<i>Bambusa vulgaris</i>	10

Table 3. Potential of Bamboo Stands on the Halong Riverbank

No	Types of Bamboo	D(cm)	Y'	Y''	X'	X''	Y'''
1	Local bamboo	12.7	9	9	1	19	167
2	black bamboo	14.3	6	6	1	19	122
3	Thai bamboo	12.3	9	9	1	10	90
4	Yellow haur bamboo	13.2	5	5	1	18	82
5	Green haur bamboo	14.1	6	6	1	20	125

Table 4. Calculation of Biomass Sampling and Carbon Stock of Bamboo Stands on the Halong Riverbank

No	Types of Bamboo	Biomass			Carbon		
		Per reed (kg)	Total (kg)	Per hectares (kg/ha)	Per reed (kg)	Total (kg)	Per Hectares (kg C/ha)
1	Local bamboo	5.4	31,583.9	136.7	2.5	14,844.4	1,427.3
2	black bamboo	3.1	1,285.5	5.6	1.5	604.2	58.1
3	Thai bamboo	3.1	3,912.0	16.9	1.5	1,838.7	176.8
4	Yellow haur bamboo	1.2	658.5	2.8	0.6	309.5	29.8
5	Green haur bamboo	0.2	201.0	0.9	0.1	94.5	9.1

Table 5. Estimated Biomass and Carbon Stock of Bamboo Stands (30,000 Clumps) in the Tabalong Watershed (DAS) in Halong Village, Kuranji Hamlet, Tanta, Karangan Putih, Masukau and Sulangai

No	Local Name	Latin name	Amount Seed plant	Biomass (W)	Carbon Stock (Tons)	Price Conversion Value (Rp)*
1	black betung	<i>Dendrocalamus asper</i>	5600	415,17	1,092.73	1,558,841,835.65
2	Thai betung	<i>Gigantochloa atter</i>	2600	564.21	689.46	983.555.133.48
3	Haur	<i>Bambusa tuldoides</i>	8000	400.18	1,504.68	2,146,509,609.79
4	Chinese Bamboo	<i>Bambusa multiplex</i>	6500	470.09	1,436.12	2,048,712,965,13
5	Yellow Reed	<i>Bambusa vulgaris</i>	7300	546.38	1,874.61	2,674,247,712.75
Amount			30000	2,396.02	6,597.60	9,411,867,256.81

Table 6. Calculation of Carbon Stock in Endemic Trees

No	Local Name	Latin name	Number of Plants	Specific gravity*	Bio-mass	Carbon Stock	Price (Rp)
1	Iron / Iron Wood	<i>Eusideroxylon zwageri</i>	5	1	7,459	0.018	25,074,315
2	Agarwood	<i>Aquilaria malaccensis</i>	5	0.45	3,357	0.008	11,283,442
3	Maranti	<i>Shorea sp</i>	20	0.86	6,415	0.060	86,255,644
4	Sungkai	<i>Peronema canescens</i>	40	0.53	3,953	0.074	106,315,096
5	Kalangkala	<i>litsea angulata</i>	5	0.45	3,357	0.008	11,283,442
6	Ramania	<i>Bouea macrophylla</i>	5	0.85	6,340	0.015	21,313,168
7	maritime	<i>Naphelium Ramboutanake</i>	4	0.54	4,028	0.008	10,832,104
8	Binjai	<i>Mangifera caesia</i>	5	0.45	3,357	0.008	11,283,442
9	Papakin	<i>Lahia kutejensis</i>	10	0.65	4,849	0.023	32,596,610
10	Durian	<i>Durio sp</i>	10	0.58	4,326	0.020	29,086,205
11	Rambai	<i>Baccaurea motleyana</i>	10	0.67	4,998	0.023	33,599,582
12	Langsat	<i>Lansium domesticum</i>	20	0.45	3,357	0.032	45,133,767
13	Nets/Jengkol	<i>Archidendron pauciflorum</i>	100	0.58	4,326	0.203	290,862,055
14	Mangosteen	<i>Garcinia mangostana L</i>	10	0.67	4,998	0.023	33,599,582
15	Crystal Guava	<i>Psidium guajava</i>	50	0.75	5,594	0.131	188,057,363
16	Soursop	<i>Annona muricata</i>	50	0.46	3,431	0.081	115,341,849
17	Red Top	<i>Syzygium Oleana</i>	50	0.76	5,669	0.133	190,564,795
18	Trobes	<i>Samanea Saman</i>	50	0.48	3,580	0.084	120,356,712
19	Eucalyptus	<i>Melaleuca leucadendra</i>	50	0.76	5,669	0.133	190,564,795
20	Ketapang	<i>Terminalia catappa</i>	50	0.59	4,401	0.103	147,938,459
Amount			549		93,464	1,189	1,701,342

Table 7. Value of Benefits of PT Adaro Indonesia's Mamanda Balida Village Program

No	Program Benefit Value		Total	%
1	Environment			
	<input type="checkbox"/>	Increased carbon stock (carbon stock) from endemic tree planting activities	11523.132	0.3%
2	Economy			
	<input type="checkbox"/>	Income from renting a place to sell MSMEs	32,611,093	0.8%
	<input type="checkbox"/>	Earn income from the sale of visitor admission tickets	113.671.572	2.9%
	<input type="checkbox"/>	Income (turnover) from the sale of products sold in the Tourism Village	421.752.145	10.9%
	<input type="checkbox"/>	Earn income from ticket sales revenue sharing	2,568,140	0.7%
	<input type="checkbox"/>	Earning income from performing arts in Mamanda Balida Village	28,417,893	0.1%
	<input type="checkbox"/>	Income from Mamanda's tourism management technical support	102.712.744	2.6%
	<input type="checkbox"/>	Get additional income from renting farmland	16,929,114	0.4%
	<input type="checkbox"/>	Earning income from the construction of Mamanda Balida Village	39,619,426	1.0%
	<input type="checkbox"/>	Increased ease of access to tourist attractions	152.177.816	3.8%
	<input type="checkbox"/>	Increasing Village Original Income	14,628,266	0.4%
3	Social			
	<input type="checkbox"/>	Changes in the mindset of MSME actors about the importance of tourism service skills	32.101.752	0.8%
	<input type="checkbox"/>	Improved service skills for tourists	17,976,981	0.5%
	<input type="checkbox"/>	Get referrals for unique and interesting village management models with multi-stakeholder collaboration	598,358,232	15.1%
	<input type="checkbox"/>	Have a sense of pride in being a resident of Balida Village after the fame of Mamanda Balida Balida Village	1,913,264.443	48.4%
	<input type="checkbox"/>	Obtain unique and interesting news material with the Mamanda Balida Village Program	2,334,946	0.1%
	<input type="checkbox"/>	The decrease in complaints/demos from the Balida community regarding the Company's operational issues	422,268,744	10.7%
	<input type="checkbox"/>	Increased public awareness of the Mamanda Balida Balida Village Program as a tourism village fostered by Adaro Indonesia.	21,368,822	0.5%
Amount			3,868,531,863	100%

IV. DISCUSSION

1. Program Based on the Vision, Mission and Values , and CSR Policy of PT Adaro Indonesia

An essential vision as the embodiment of a leading company is to realize corporate social responsibility and obtain a social license to operate. The Company's mission to develop rural communities in Indonesia is currently using the IDM (Developing Village Index) benchmark, in which there are IKS (Social Performance Index), IKE (Economic Performance Index), and IKL (Environmental Performance Index). Currently, Balida Village is in the category of a Developing Village. Many things must be improved to become an Advanced and Independent Village. The state of Indonesia is currently intensively increasing the value of the HDI (Human Development Index). The Mamanda Village Program is part of PT

Adaro Indonesia's contribution to support efforts to increase HDI.

One of the Mamanda Village Program's activities is environmental conservation by planting and maintaining 20 endemic tree species and seven bamboo varieties to strengthen reforestation, reduce erosion rate, and benefit the carbon stock. This activity is a form of PT Adaro Indonesia's concern for environmental sustainability.

The Corporate Social Responsibility (CSR) program in implementing sustainable development plays an important role. The CSR program shows the concern of the Company to participate in thinking and developing the community, both in terms of social empowerment programs and in terms of setting aside part of the Company's profit funds that are intended for empowering programs. The CSR program shows the Company's

participation in preserving the environment when exploiting and exploring natural resources.

2. Programs Based on Social Problems, Community Needs, and Local Potential

Based on the Balida Village Social Mapping document conducted in 2019, there were several personal and structural social problems. Besides that, there is also related potential. Based on this, the Mamanda Village Program is part of the solution to social issues, and a means to develop existing potential. The Mamanda Village Program develops local cultural arts, eco-tourism, business development, and biodiversity development. These activities can absorb labor, develop local institutional capacity and improve the environment's quality.

The Mamanda Village Program synergizes several significant potentials in Balida Village, such as active cooperation, the self-help pattern that is still growing, and the existence of local (endemic) plants. This average population is aware of education and high school graduates. Some of these essential potentials are combined in building Mamanda Village to solve several personal and structural social problems.

3. The Novelty Element of Social Innovation

a. New things implemented in Balida Village

• Environmental Conservation

Racah Capablelang Tourism introduces environmental conservation in the form of 20 endemic tree species with a total of 549 trees. The types of trees planted in the Racah Capablelang Tourism area are local vegetation types to support biodiversity and reduce global warming with carbon stocks (carbon emissions absorption) that can be absorbed by plants planted in Mamanda Village, Balida Village of 1,189 Tons. In addition, seven varieties of bamboo are grown with a total of 360 bamboo trees.

• Educational Outbound rides

Racah Ablelang Tourism introduces educational outbound rides with children's dexterity arenas, shipwreck playgrounds, creative educational toy arenas, and a 48-meter-long rope bridge between trees to support creativity, increase adrenaline and support the development of tourists' motor skills.

• New Innovations in Social Entrepreneurship

The Mamanda Village Program shows innovations in social entrepreneurship by developing various village potentials to solve social problems in Balida Village. This program provides an opportunity for the community to be involved as business actors,

both local Food and Beverage MSMEs, Handicraft MSME actors, and so on in tourist locations as an alternative solution for people who have difficulty getting jobs.

• Windmill Attraction (Circle/Cup)

The Mamanda Village Program also has an attraction in the form of thousands of colorful windmills installed in front of the location of the Racah Ablelang Cultural Market. The installed windmill is made of waterproof material so that it can last a long time as one of the components that attract the attention of tourists when entering the tourist area.

b. Applied in a New Way

• A New Way of Packaging Travel

Making the rice fields a tourist attraction with ten attractive photo spots, a 350-meter bamboo bridge around the rice fields, a viewing tower with a height of 7.5 meters to monitor rice field tours, and a cafe/bar in the middle of the rice fields where previously the rice fields were only used for rice cultivation. In addition to rice fields tourism, in the Racah Ablelang tourist area, there is also local vegetation in the form of 20 endemic flora types with a total of 549 trees and seven bamboo varieties planted with a total of 360 trees which help in absorbing carbon emissions so that they make a positive contribution in facing global warming.

• A New Way to Enjoy Coffee With a Rice Field Tour

A cafe in the middle of the rice fields that sells a variety of drinks and food from the traditional to the contemporary supports the habits of young people in the modern era who tend to like relaxing activities while enjoying coffee to increase productivity and find inspiration, supported by the delicate nuances of the rice fields, making it an added value in tourist sites.

c. Elements of Originality and Unique

• Utilization of Bamboo as the Main Material for Tourist Spots

In the Mamanda Village program in Balida Village, Bamboo is the primary material in tourist spots in the Racah Ablelang Cultural Market area, where this utilization is realized in the form of making the main stage for Banjar cultural arts performances. This bamboo bridge surrounds a 350-meter-long rice field, a viewing tower, poles lanterns, stalls selling MSME products, cafes in the middle of rice fields, interesting photo spots, gates, coin exchange counters, public

toilets, the primary material for windmills and the main material for making pinishi boats.

- Independent Banjar Cultural Arts Performance

The existence of the Racah Ablelang Cultural Market presents Banjar cultural arts performances carried out independently by the Balida Art Studio and in rural areas. *The various staged cultural arts are wayang gong, kuntu, panting music, gipang horses, and dance (Mandi-Mandi dance and begandah nyiru).*

- Biodiversity

The Mamanda Village Program in Balida Village presents an element of originality and uniqueness in supporting biodiversity and reducing global warming with the presence of local vegetation in the form of 20 endemic flora species totaling 549 trees and seven bamboo varieties planted with 360 trees contributing to the absorption of carbon emissions.

- Unique Buying and Selling Transaction Method

Existence, The Racah Ablelang Cultural Market also presents a typical Banjar rural culinary market with shopping transactions using racah coins. This method is unique because to make a transaction; tourists are required to exchange rupiah for coins made of wood first. The process of exchanging racah coins is carried out at the counter available at the Racah Ablelang Cultural Market. Coins that can be exchanged for rupiah have two versions: a square shape worth IDR 2000 and a round shape worth IDR 5000.

4. Elements of Main Competency (Core Competency)

a. There is a transfer of knowledge and skills of the Company's Core Competencies

Elements of social innovation core competency can be seen from three indicators, namely 1) transfer of knowledge or core competency skills; 2) developed based on the analysis of the interpretation of the life cycle impact assessment; and 3) have elements of sensitivity and responsiveness to crisis conditions in the community due to disasters.

- Knowledge or Skills Transfer Indicator

The roles of transfer of knowledge or skills conveyed are:

- a) Bamboo Cultivation Training starts from planting and caring for post-harvest processing of bamboo products into financial products for the Balida Community, which manages the Racah Ablelang Tourist Spot.

- b) QR Code (Barcode)-based local vegetation identification training to facilitate local vegetation education for the general public via mobile phones.
 - c) Provide additional local Vegetation collections that have the potential to be developed at the Racah Ablelang Tourist Spot to enrich Biodiversity in Balida Village.
 - d) Together with the Balida Community, they planted Local Vegetation in Balida in the form of endemic flora, including bamboo.
 - e) Facilitating visits/Comparative Study of Australian Newcastle Students to Balida to learn about post-mining patterns and community empowerment programs by Adaro Indonesia in Balida Village, especially about local culture and vegetation developed in Balida Village.
 - f) Institutional assistance and village tourism management.
 - g) Physical construction assistance for processed bamboo products for tourist spots at the Racah Ablelang Cultural Market, such as the construction of bamboo bridges, flyovers, art stages, and others.
 - h) Assistance in the management of household waste around the Racah Ablelang tourist spot.
 - i) Help change people's behavior to be more environmentally friendly and maintain the COVID-19 protocol, one of which is by shopping using coins at the Racah Ablelang Cultural Market.
 - j) Mobilizing various elements of society such as Bumdes, Pokdarwis, Youth Organizations, PKK, Children's Forums, and other details to be actively involved in the Racah Ablelang Cultural Market.
 - k) Facilitate making promotional media through social media on Instagram, Facebook, and Youtube so that the wider community increasingly knows this tourist spot.
 - l) Facilitating the Mamanda Village Program to gain recognition from independent parties at the national level.
- b. Relationship of Life Cycle Assessment (LCA) with Mamanda Village Program

Based on the 2022 LCA study, the largest processing units for the Impact of Global Warming Potential are the OB stripping, hauling, and dumping process units at 53.3%, coal hauling PIT to ROM at 13.7%, and coal processing & loading at 3.6%,

resulting from the use of large amounts of fuel. Adaro has implemented a net zero emissions program through energy management ISO 50001:2018, energy audits, and an energy efficiency eco-list program in process units that are hotspots.

Through the community empowerment program, Adaro started the carbon offset program by developing bamboo plants in the community. In 2012, Adaro began trying to provide socialization to the community about the importance of bamboo plants for environmental sustainability. Based on the results of the Adaro Team's assessment together with the Tabalong Regional Government, Adaro conducted community development to be able to produce bamboo seedlings.

In 2019, Adaro continued community development in the context of environmental conservation. The Mamanda Village (Independent and Empowered Community) program is implemented in Balida Village, Paringin District, Balangan Regency, South Kalimantan. Adaro is trying to solve village problems around the Company's operational area by increasing participation in sustainable community empowerment through the environmental potential in the village by prioritizing the role of Village-Owned Enterprises (Bumdes). The Mamanda Village Program in Balida Village carries out village tourism activities through the development of the Racah Ablelang Cultural Market with the attraction of traditional arts through cultural markets, educational tours through the conservation of various endemic flora variants, and family tourism facilities.

Racah Ablelang has a bamboo tour in the form of a bridge that is 350m long and has 10 photo spots made of the primary material of bamboo. There is also a viewing tower with a height of 7.5 meters to monitor rice fields; there is a cafe/bar in the middle of the rice fields that sells a variety of drinks and food from the traditional to the contemporary.

The use of bamboo is dominant in the Mamanda Village program, especially in the Racah Ablelang Cultural Market. Adaro and the community develop bamboo cultivation in tourist spot areas for the main function of reforestation and the ease of obtaining bamboo raw materials if there is a need in the Cultural Market. So far, seven varieties of bamboo have been cultivated, namely paring sweet bamboo, betung bamboo, haur bamboo, Jakarta bamboo, china bamboo, paring tali bamboo, and yellow reed bamboo. In addition, there are already more than 30 types of

endemic flora that have been cultivated previously, such as Langsat, Durian, Pampakin, Rambutan, Rukam, Sangkuang, Tatap, Ginalon, Guava, Chocolate, Coffee, Rumbia, Hanau, Mangosteen, Ketapi, Binjai, Tandui, Sangkuang, Rambai, Rmania, Level, Kulipisan, Hampalam, Hambawang, Kueni, Taraf, Kulipisan, Kapok, and Jengkol. Based on the environmental analysis that has been carried out of the many vegetation that has been developed in the Mamanda Village Program, it can contribute to the Carbon Offsite. The ability to absorb carbon emissions from 20 species of trees and seven types of bamboo is 9,885 tons of carbon stock with a total price of around Rp. 14,140,483,241.

The availability of carbon stocks (carbon sequestration) that can be absorbed by plants grown in Mamanda village, Balida village is 1,189 tons, which when converted to world carbon prices (European Union standard is 96 Euros or equivalent to Rp. 1,430,431.68), then the benefit value is Rp. 1,701,342,426,- (One million seven hundred one three hundred forty-two, four two six rupiahs).

c. Program Link with Eco-Innovation

Some of the changes made as eco-innovation are subsystem changes by planting bamboo species. Prior to the innovation, revegetation activities in the post-mining area used Legume Crop Cover (LCC) plants, fast-growing plants, and insert plants and did not use bamboo plants as Non-Timber Forest Products (NTFPs) with flexible and elastic stem properties, cruising range of roots that are many roots and economic value.

Several Eco-Innovation programs in the document "Improvement of Diversity & Bird Habitat in Post-Mining Land on Bamboo Vegetation" were also carried out in Balida Village, including Bamboo Cultivation Training starting from planting, care to process post-harvest bamboo products into financial products to the Balida Community, construction assistance physical materials for processed bamboo products for tourist spots at the Racah Ablelang Cultural Market such as the construction of bamboo bridges, flyovers, art stages, and others.

d. Elements of Sensitivity

Some of the REAOD implementations of the Mamanda Village program, namely currency exchange tools that were replaced using racah coins at the Racah Ablelang Cultural Market, Providing business capital assistance for the development of the Racah Ablelang Cultural Market by implementing the COVID-19

protocol, the Company providing aid to local MSMEs for the production of sasirangan cloth masks three layers so that MSMEs can survive during the COVID-19 pandemic, planting bamboo trees in the village of MAMANDA Balida to preserve the environment and increase carbon absorption.

e. Responsiveness to Critical Conditions in Society

The intervention of environmental conservation activities by planting 20 endemic tree species and seven bamboo varieties has produced carbon stock that is able to absorb carbon emissions of 9,885 tons of carbon stock with a total price of around Rp. 14,140,483,241 and will be even more significant in the future. This will help improve air quality and contribute to climate improvement. Future developments will have the potential to absorb water so that it will increase groundwater reserves and also the ability to withstand the rate of erosion so as to reduce the chance of disaster in Balida Village.

5. Elements of Social Innovation Status

The sustainability of the Mamanda Village Program's social innovation can be seen from the management capacity and supported by market opportunities for tourist visits. The power of tourism management under the Balida Village BUM, Pokdarwis, Balida Art Studio, and Village Children's Forum is an essential reinforcement for program sustainability because this capacity allows tourism management to run well, including creativity and innovation.

a. Sustainability Indicator

The Mamanda Balida village program, in terms of Mastery of program management techniques and institutional capacity building, is the principal capital for the sustainability of the program, then added unique types of tourism that do not yet exist in the area and information that has spread is an essential factor in the opening of the tourist visit market and management capacity—and supported by market opportunities for tourist visits to provide good sustainability value for the program. With the formation of the mamanda village program, the village BUM Institution becomes the leading manager of the Tourism Village, which embraces various village elements so that the community feels welcomed and protected, which results in more harmonious social conditions that become the capital start for sustainability.

b. Indicators of Scaling/Replication

Replication of the program or part of the activities of Mamanda Balida Village occurs in the form of replicating the concept of a tourist village to Padang Panjang Tourism Village (Laburan Park Padang Panjang) and Jaro Tourism Village (Jaro Village Embung Sawah Tour, 2. Scaling also emerged when Balida Village became a center for Banjar culture education for local and international communities.

c. Systemic Change Indicators

The systemic changes that occurred in Balida Village with the Mamanda Village Program were also evident in changing mindsets, changing behavior, increasing personal and institutional capacity, increasing income, increasing job opportunities, increasing social roles in the community, and increasing the village's original payment. This is certainly different from the conditions before the program intervention, which experienced limitations in terms of capacity and income.

d. The Massive Impact of the Mamanda Village Program

The Mamanda Village Program has a massive impact on the environmental, social, and economic aspects of the Mamanda Village Program. One of the enormous impacts that have a significant effect on environmental elements is the contribution to the handling of global warming through conservation activities of planting endemic trees and several bamboo varieties that have an impact on carbon sequestration.

The massive impact that significantly influences the social aspect is the number of job opportunities or opportunities for the community to be involved in the Mamanda Village Program so that they are able to overcome social problems for people who have difficulty finding work. The massive impact that has a significant effect on the economic aspect is the opening of opportunities for MSMEs to market their products so that they can support the increase in daily income.

6. Positive Impact of the Mamanda Village Program

a. Programs Can Create Market Access

The mamanda village program does not only have a direct impact on government organizations and organizations in the community. With the existence of Mamanda Balida Village, various activities have emerged in it, such as developing local cultural arts, eco-tourism, local business development, and biodiversity development. These activities are able to absorb labor, develop local institutional capacity and contribute to improving the quality of the environment. Therefore market access and new jobs have been created for the community, which are indeed very helpful in meeting the needs of life. In terms of sustainability, the Mamanda Balida Village Program can also be seen from the management capacity and supported by market opportunities for tourist visits. Tourism management capacity under the Balida BUMDES, POKDARWIS,

b. Programs Can Create New Opportunities/Jobs for Local Communities

After the program intervention, members of MSME actors receive tourism service training so that they are able to participate in tourist services and improve service quality in Tourism Villages. with an income of IDR 100,000 per day, members of MSME actors receive tourism service training so that they are able to participate in tourist services and improve service quality in Tourism Villages. with an income of IDR 350,000 per piece, income earned by local builders from the development process of Racah Capableang Tourism with a gain of IDR 100,000 per day, income earned by artists from performances at Wisata Racah Ablelang with an income of IDR 50,000 per person, services obtained from involvement with income Rp 15,000-20,000 per person, services obtained on the participation with income Rp 15,000-20,000 per person,

c. Programs can empower vulnerable communities

The mamanda village program also contributes to improving the welfare of vulnerable groups around the program area. This is due to the duplication of programs in several areas, namely through the process of transferring knowledge and

skills from PT Adaro to the surrounding communities in need. PT Adaro's social care does not recognize people's backgrounds and regions. Share information both in person and online. Some of them include vulnerable groups, namely poor households, the unemployed, and orphans, as noted.

d. Programs Can Improve Capabilities and Cohesiveness of Vulnerable Communities (Marginal Communities)

The existence of the mamanda balida village has increased the capacity of the Balida village community. Currently, the number of community elements in Balida village has increased from 3 organizations to more than six organizations involved in the program. The district also has the ability to provide friendly services for tourists. Another ability that is increasing is the ability in the field of entrepreneurship. The community is creative in creating products that can be used as souvenirs by tourists visiting Mamanda village. Balida village has excellent product SMEs such as rattan and bamboo handicrafts in the form of miniature phinisi boats and Madu kelulut, which collaborate with various elements of society.

e. Programs Can Create Social Transformation in Society

- PT Adaro Indonesia has a core competency of business in the coal mining sector, which in its operational activities has an obligation to carry out reclamation and post-mining activities. Therefore, the Company already has competent Human Resources (HR) in the development of reclamation within the scope of restoring the initial post-mining ecosystem.
- The Company also has human resources in the field of CSR, who have competence in community and institutional development
- HR competencies owned by the Company are actively involved in coaching and mentoring the Mamanda Village Program
- There has been a transfer of knowledge or skills from PT Adaro Indonesia to stakeholders of the Mamanda Village Program.

- After holding training on bamboo planting by PT Adaro so that the community participates in planting bamboo and caring for endemic trees as a form of concern for the environment and now there is the planting of 20 endemic tree species and seven types of bamboo, which is a form of carbon offset as an effort to reduce global warming potential impacts of the Company's operations, currently there are 467 endemic trees and 350 bamboo trees that are growing healthy and have been able to absorb carbon.
 - The mamanda village program by PT Adaro in which there is a Racah Ablelang Cultural Market with the presentation of a Banjar cultural art performance which is carried out independently by the Balida Art Studio accompanied by a typical Banjar rural culinary market with shopping transactions using racah/coin (each coin is worth: square shape Rp. 2000 IDR 5000) to make it easier to calculate, manage finances, change people's behavior to be more environmentally friendly and maintain the Covid-19 protocol.
 - The Mamanda Village Program provides benefits not only to those directly involved in the program (such as the Balida Art Studio, MSMEs, Pokdarwis, and BUM Desa) but also has a positive impact on many stakeholders (such as the Balida Village Government, Village Children Forum, Balida Village community, tourists). Local, environmental, and PT Adaro Indonesia).
 - The local community can change the rhythm of the social life of the people who used to live relying on the agricultural sector with limited communication between individuals, so now the community is busy with tourism activities to meet their needs and for tourists, so that there is a change in lifestyle, dress and better communication.
 - After the waste education in Mamanda village, there was awareness in the surrounding community about the importance of the impact of waste, and now people throw garbage with tourism activities into one place in the garbage dump that has been made by Mamanda village itself.
- f. Programs Can Create New Roles And Relationships In People's Social Life
- Balida Village BUMDes-POKDARWIS Balida Village: Balida Village BUMDes play a role in managing businesses, utilizing assets, developing investment and productivity, providing services, and providing other businesses for the welfare of the Balida village community in its application to the Mamanda Village Program assisted by the Balida Village POKDARWIS so that the implementation process in the management of Racah Ablelang tourism can run optimally.
 - Youth, Sports, and Tourism Office-POKDARWIS Balida Village: The Youth, Sports and Tourism Office of Balangan Regency establishes a cooperative relationship with the Balida Village POKDARWIS in promoting and monitoring Racah Ablelang tourism so that the potential for tourist visits can increase on a regular basis.
 - The Land and Environment Office of Balangan Regency-POKDARWIS Balida Village: The Balangan Regency Land and Environment Office have established a cooperative relationship with the Balida Village POKDARWIS to monitor endemic tree vegetation as a form of support for the Mamanda Village program, which has a positive contribution to carbon emission absorption through the program conservation of several bamboo varieties and 20 endemic flora species developed in Balida Village.
 - BUMDes Desa Balida-UMKM Desa Balida (local and non-regional SMEs): BUMDes Desa Balida establishes a cooperative relationship with the SMEs in Desa Balida to carry out product marketing activities in stalls available in the Racah Ablelang Cultural Market area.
 - Rice Land Owners-POKDARWIS Balida Village: Rice Field Owners have a cooperative

relationship with Balida Village-POKDARWIS to rent out their rice fields so that they can be managed as ecotourism-based rice field tourism spots.

- Rice Land Owner-Balida Village Government: Rice Field Owners establish a cooperative relationship with the Balida Village Government to rent out their rice fields so that they can be managed as ecotourism-based rice field tourism spots as well as coordinate the legality of cooperation.
- PT Adaro Indonesia-Local Government of Balangan Regency: PT Adaro Indonesia cooperates with the Regional Government of Balangan Regency to realize the Mamanda Village Program in Balida Village by building a partnership pattern to be able to increase the potential of local tourism in Balangan Regency.
- PT Adaro Indonesia-Balida Village Head: PT Adaro Indonesia collaborates with the Balida Village Head to realize the Mamanda Village Program in Balida Village by building a partnership pattern to be able to increase the potential of local tourism in Balida Village.
- PT Adaro Indonesia-BUMDes Desa Balida: PT Adaro Indonesia establishes a cooperative relationship with BUMDes Desa Balida to realize the Desa Mamanda Program in Desa Balida by building a partnership pattern, where BUMDes Desa Balida will play an active role in managing the business, utilizing assets, developing investment and productivity, providing services, as well as providing other businesses for the welfare of the Balinese village community.
- Balangan Regency Government-Balida Village Head: The Balangan Regency Government collaborates with the Balida Village Head to realize the Mamanda Village Program in order to develop ecotourism-based local tourism potential in Balangan Regency, especially in Balida Village.
- Balida Village Artists -POKDARWIS Balida Village: Balida Village Artists collaborated with Balida Village POKDARWIS in performing Banjar cultural arts at Racah Ablelang Market as

one of the parties that are able to increase tourist attraction by prioritizing aspects of local crafts.

- g. Analysis of PT Adaro Indonesia's CSR Policy Program Against SDGs. Indicators

The Mamanda Village Program supports SDGs Indicators in particular indicator 1 (No Poverty), indicator 2 (No Hunger), indicator 8 (Decent Work and Economic Growth), indicator 9 (Industry, Innovation, and Infrastructure), indicator 10 (Reducing Inequality), indicator 11 (Sustainable Cities and Settlements), indicator 13 (Climate change management and indicators), indicator 15 (Maintaining terrestrial ecosystems) and indicator 17 (Partnerships to Achieve Goals).

Related programs are creating decent jobs in the MAMANDA Balida Village program, reducing people living in poverty, and employing marginalized communities. The MAMANDA Balida Village program opens jobs other than the agricultural sector, such as parking guards, ticket guards, photographers, and others. And so on, so that people are able to meet their daily needs, are able to create decent jobs, entrepreneurship, creativity, and innovation, and growth of micro, small and medium enterprises such as shops selling honey and rattan and bamboo handicrafts.

Mamanda Village activities are able to increase the existence of culture and create jobs for artists, provide economic impact for the surrounding community with many guests who come to visit so as to increase the income of the surrounding community. The Balida MAMANDA Village Program supports economic development and human welfare by creating jobs for the local community. The surrounding community, the Mamanda Village Program has an impact on climate change through environmental conservation, namely the planting of endemic plants and bamboo trees, the preservation of more than 20 endemic plant varieties and seven kinds of bamboo plants, the formation of an artificial ecosystem of rice fields so as to provide improvements to sustainable development, The MAMANDA Balida Village Program is able to create collaboration between the

surrounding community and several parties, namely PT Adaro Indonesia and the Regional Government. 6.65 months before a value equivalent to that investment is realized.

V. CONCLUSION

The Mamanda Desa Balida Program, which is the Company's Social Innovation Program, was developed based on environmental and social issues and based on community needs that are able to synergize with sustainable development and play a role in disasters, increase community capacities and capabilities, new roles and relationships in social life and develop assets and resources local people. Based on the calculation of the SROI ratio, it is known that for every 1 Rupiah invested, a benefit of Rp. 5.41 is obtained, which means that the value of the benefit of the Mamanda Balida Village Program is greater than the value of the investment. The payback period is short enough that for an investment of IDR 715,000,000, it will take only

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Impact Measurement of The "Mamanda Village" Program in Balida Village 2019-2021 Using Method *Social Return On Investment(SROI)*

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Abstract- The Mamanda Balida Village Program is a social investment program from the Corporate Social Responsibility (CSR) program by PT Adaro Indonesia. This integrated program aims to solve village problems around the operational area through increasing participation in sustainable community empowerment following village potential by prioritizing the role of BUMDes. The assessment method used is the Social Return on Investment (SROI) method referring to the principles and guidelines for the assessment of SROI Network UK & Social Value International. Data collection using Focus Group Discussion (FGD) techniques, in-depth interviews, and secondary data reviews from companies. As for the measurement results SROI of the Mamanda Balida Village Program in 2019 was 0.41; in 2020 was 19.73; in 2021, it was 2.75, with an average SROI value of 5.41. With this value, it means that for every investment of IDR 1. The Mamanda Balida Village Program has a social, economic, and environmental impact. The economic impact is 23.6%, the social impact is 76.1%, and the environmental impact value is 0.3%. Although the value of the environmental impact is still small, many environmental development activities have been carried out, both in terms of capacity building and empowerment in the form of planting and caring for endemic trees and bamboo. With the increasing number of endemic trees and bamboo and the expansion of planting, the value of the impact on the environment will increase over time.

Index Terms- Mamanda Village, SROI, Adaro Indonesia

I. INTRODUCTION

PT Adaro Indonesia was a limited liability company under the PT Adaro Indonesia group on

November 16, 1982, but the exploration activity only started a year later.

PT Adaro Indonesia, in its operations, upholds the principles of good corporate governance

and complies with applicable laws and regulations, including those related to Corporate Social Responsibility. According to Cahya (2011), CSR is a company's obligation as a responsibility to the community related to business operations. PT Adaro Indonesia realizes that an appropriate and sustainable Corporate Social Responsibility (CSR) program is essential for the Company to obtain a social license to operate (SLTO). In addition, the Company also wishes to participate in creating sustainability through various CSR programs that bring the Company together with the surrounding communities [1,2].

Balida Village is located in Paringin District, Balangan Regency. Geographically and administratively, the boundaries of Balida Village are to the north by Lasung Batu Village, to the south by Barus Bahinu/Parsel Village, to the east by Murung Ilung Village, and the west by the East Paringin Village. Balida Village is an area affected by ring 1 of the mining business of PT Adaro Indonesia. Therefore, as a form of PT Adaro Indonesia's social responsibility, social mapping was carried out in 2019 as a means for proper program planning.

Mamanda Balida Village Program is a social investment program. Social investment needs to be evaluated on its performance impact achievements to see how far the programs that have been implemented can be felt by the benefits for stakeholders, including the community. Measurement of the impact of social investment can be done qualitatively or quantitatively. There are several methods for measuring program impact, both qualitative and quantitative, or combining both approaches.

The development of measurement methods for social investment programs is also developing towards quantitative measurement with a financial measurement approach (monetization). This measurement model is carried out by providing "value for money" for all benefits (benefits) of the

outputs/impacts generated by the program, both financial and non-financial. This method can provide a comparative picture of the financial profile of the inputs and the results. So in terms of financial feasibility, a social investment program can be analyzed using standard business calculations such as calculating the return on investment. This method became known as Social Return On Investment (SROI). Strategic reasons are the cause of social reporting. Therefore, PT Adaro Indonesia wishes to measure the impact of the Mamanda Balida Village Program using the SROI method [3].

Destination

The primary purpose of assessing the impact performance of the Mamanda Balida Village Program using the Social Return on Investment (SROI) method is to measure the SROI ratio value of the activities carried out.

Output

The main outputs of this work are:

1. Report book of SROI calculation results for the assessed programs, namely the Mamanda Balida Village Program (Advanced and Empowered Communities);
2. Recommendations for evaluation and improvement (room for improvement) outcomes for the program (as part of the program impact measurement results).

II. METHOD

Methodology

The assessment methodology used the Social Return on Investment (SROI) method, which refers to the principles and guidelines for the assessment of SROI Network UK & Social Value International. This impact assessment is carried out in an evaluative manner. The evaluative calculations are based on program achievements and impacts that stakeholders have stated.

SROI is a program impact measurement method with a financial quantification

(monetization) calculation approach. This method is intended to measure the value of the program's impact financially by comparing the value of the impact with the value of program costs invested.

In the impact assessment study of this program, six stages must be carried out, namely:

1. Identification of program/project scope;
2. Identification of key stakeholders;
3. Understand the theory of change being implemented;
4. Identification of inputs, processes, and outcomes;
5. Rating;
6. SROI calculation.

Impact Assessment Scope

This measurement was carried out in PT Adaro Indonesia's CSR program. Namely, the

$$\text{NPV} = [\text{Present value of benefits}] - [\text{Value of investments}]$$

$$\text{SROI Ratio} = \text{Present Value} / \text{Value of Input}$$

Village Program Mamanda Balida, carried out by *BUM Desa Balida, Pokdarwis, Balida Art Studio, Village Teenage's Forum*, and several other relevant stakeholders. This program's impact assessment is evaluative and measured from 2019 to 2021.

Data Retrieval Method

The data used to analyze SROI are obtained from:

1. Report documents and evaluation results of PT Adaro Indonesia's CSR program, whether carried out alone or by other parties who provide reports related to the program
2. Data/Reports contained in the group
3. The results of interviews and discussions with key stakeholders.

Measuring Value

The data that has been collected is then grouped and tabulated. Data that has a fixed and precise rupiah quantification value, is directly inputted as financial value; however, for some components that are still underestimation, either due to lack of recording or because the calculated objects

cannot be accurately assessed, such as the value of benefits from increasing knowledge, changing mindsets, and benefits in the form of services; then the calculation is carried out according to the context of the existing program.

The projected value is attempted to be as close as reasonable as possible by providing assumptions and examples of similar matters or using the size and standard of prices prevailing in the community by the context of the program.

For multi-year data use the formula:

In this calculation, the interest rate (r) refers to the interest rate set by Bank Indonesia in 2019, the

Present Value	=	Value of impact in	+	Value of impact in						
		<u>Year 1</u>		<u>Year 2</u>		<u>Year 3</u>		<u>Year 4</u>		<u>Year 5</u>
		$(1+r)$		$(1+r)^2$		$(1+r)^3$		$(1+r)^4$		$(1+r)^5$

average interest rate is 5.63% and in 2020 the average interest rate is 4.23% and the average interest rate is 4.23%. BI's average in 2021 is 3.58%.

III. RESULTS

Table 1. Beneficiaries of the Mamanda Balida Village Program

Group name	Number of Communities Involved	Role and function
BUM Desa Balida (Noble Business)	Four people	Mamanda Village Program Manager
Balida Village Small and Medium Enterprises	17 SMEs	Business actors in tourist locations, namely: food and cake stalls, bamboo boat artisans, and kelulut honey producers
POKDARWIS (Tourism Awareness Group) Balida	Six people	Mamanda Village technical manager
Balida Art Studio (Balida Satria)	60 People	Art Activists performing art performances in Mamanda Village
Village Children Forum	15 people	Technical support in Mamanda's tourism management, such as ticket guard, cleaning, toilet management, etc
Rice Farmer	Four people	Paddy Rice Land Owner rented for rice field tourism location
Local Builder	15 people	Builders of main buildings such as stages, halls, stalls, prayer rooms, toilets, and tourist photo spots
Local travelers	33,600 people	Local visitors who get alternative tours
Comparative study students	7 Institutions	The parties who make Mamanda Balida Village a place for comparative studies
Balida Village Community	894 people	Benefit indirectly from the program
Mass media	13 Media	Disseminate information about Mamanda Balida Village to the public independently
Balida Village Government	Ten people	Facilitator of Mamanda Balida Village Program development and get direct benefits
Balangan Regency Government	15 people	<i>attribution</i> in Mamanda Village Program
PT Adaro Indonesia	20 people	Program coaches and companions and obtain social benefits

Table 2. Impact Calculation and Monetization Approach

No	Impact	Approach Calculation	Approach Monetization	Source Information
1	Income from renting a place to sell MSMEs	Calculating the amount of BUM Desa income from renting a place to sell by MSMEs at the location of Wisata Racah Ablelang	<p>Multiplying the number of MSMEs by the rental time and the cost of renting a place to sell</p> <p>2020 Effective from January to April(4 x 29), weekdays with a rental fee of IDR 5,000/day(4 x 1) market days with a rental fee of 10% of the profit. Note: the profit of each MSME every market day event is around Rp. 500,000/day</p> <p>2021 Effective from January to December (4 x 30), weekdays with a rental fee of IDR 5,000/day. During 2021 there will be no market day events.</p>	Interview with the Head of BUM Desa "USAHA MULIA"

No	Impact	Approach Calculation	Approach Monetization	Source Information
2	Earn income from the sale of visitor admission tickets	Calculating the amount of BUM Desa income obtained from ticket sales for visitors to the Tourism Village location	<p>Multiplying the number of visitors by the price of the entrance ticket and the profit-sharing ratio of BUM Desa</p> <p>The entrance ticket price is Rp. 5,000/person</p> <p>BUM Desa is 80% and Pokdarwis 20%</p>	Balida Village BUM Interview
3	Income (turnover) from the sale of products sold in the Tourism Village	Calculating the amount of income (turnover) generated from selling products - food and beverages - miniature boat crafts - kelulut honey	<p>Multiplying income (turnover) by the time-frequency of sales</p> <p>2020 Adequate sales time from January to April. 1. Food and beverage SMEs - normal day income IDR 100,000 per day. The frequency of sales time is 4 x 29 market days earning IDR 500,000 per day. Frequency of sales time 4 x 1 day 2. SMEs craft miniature boats Per month can sell about two products. The price is IDR 350,000 per piece. Frequency of sales time four times 3. MSME honey kelulut Product sales are about 6 liters per month. The price is IDR 260,000 per liter. Frequency of sales for four months effective</p> <p>2021 Adequate sales time from January to December. 1. Food and beverage SMEs - normal day income IDR 50,000 per day. Frequency of sales time 12 x 30 market days income Rp 2. SMEs craft miniature boats Per month can sell about two products. The price is IDR 350,000 per piece. Frequency of sales time 12 months 3. MSME honey kelulut Product sales are about 6 liters per month. The price is IDR 260,000 per liter. Frequency of sales for 12 months effective</p>	SMEs FGD
4	Changes in the mindset of MSME actors about the importance of tourism service skills	Counting the number of MSMEs that have changed the mindset of tourism services	<p>Multiply the number of MSMEs experiencing changes in the mindset of tourism services multiplied by training costs related to changes in mindset.</p> <p>The cost of the ESQ Way 165 Leadership Center training package Ary Ginanjar Rp 2.5 million per person</p>	https://harga.web.id/cost-trainingsq-way-165-leadership-center-2018.info
5	Improved service skills for tourists	Counting the number of POKDARWIS members who already have service skills for tourists based on the tour guide's abilities, such as the ability to explain photography.	<p>Multiply the number of Pokdarwis members receiving guidance by the rate for similar workshops.</p> <p>The Pokdarwis training rate is IDR 3,500,000 per person</p>	https://jtcc.co.id/closest-training/

No	Impact	Approach Calculation	Approach Monetization	Source Information
		The roles and duties of the Balida Village POKDARWIS - Tour guide - Tourist counter guard- Cleaning guard Working Hours 07.00 WITA - 15.00 WITA		
6	Earn income from ticket sales revenue sharing	Calculating the amount of income that Pokdarwis earns from the revenue sharing of entrance tickets	Multiplying the number of ticket sales by the ticket price and dividing the ticket sales Entrance ticket price: IDR 5,000 Share 20% of ticket sales	Pokdarwis interview
7	Earning income from performing arts in Mamanda Balida Village	Calculating the amount of income that Balida Art Studio members earned during performances in Mamanda Balida Village	Multiplying the number of performances by the number of people performing and the fee received Note: Per stage, you get a fee of IDR 50,000 per person	Interview with the Head of Balida Art Studio
8	Income from Mamanda's tourism management technical support	Calculating the total income of the Village Children's Forum	Multiplying the number of working days by the services obtained and the number of FAD children involved 2020 Effective time of 4 months (January-April)- Weekdays: 4 x 29- Market Days: 4 2021 Effective 12 months (January-December)- Weekdays: 12 x 30 Services obtained on weekdays: Rp. 15,000 - IDR 20,000 per child Market day IDR 100,000 per child	FAD Chair Interview
9	Get additional income from renting farmland	Calculating the income from the rented rice field area.	Multiplying the number of rice fields rented by the rental price by the length of the lease. The rental price is IDR 2,500,000 per year per plot for the rice field bridge tourist spot	Rice farmer interview
10	Earning income from the construction of Mamanda Balida Village	Calculating the amount of income earned by local craftsmen from the development process of Racah Capablelang Tourism	Multiply the number of handymen involved by the time involved and the cost of the handyman's services. Builder fee: IDR 100,000/day	Interview with local builders
11	Increased ease of access to tourist attractions	Calculating the ease of access to tourist attraction locations based on the distance from the location of local tourists who come from around Balangan Regency.	Multiplying the number of local tourists by the savings in transportation costs The number of local tourists is about 70% of the total tourists Year 2020=70% x ((4 x 29 x 100) + (4 x 1 x 1000))= 10,920 Year 2021=70% x (12 x 30 x 50)= 12,600	Interview with the Head of BUM Desa "USAHA MULIA"

No	Impact	Approach Calculation	Approach Monetization	Source Information
12	Referrals for unique and exciting village management models with multi-stakeholder collaboration	Counting the number of parties conducting comparative studies in Mamanda Balida Village	Calculate the cost to create a center for arts and culture and local potential similar to Mamanda Balida Village. The assumption is that if there is no Mamanda Balida Village, there is no object of a similar reference center that can be used as a comparative study. Count once when Mamanda Village becomes a learning reference	2019-2021 program input documents
13	Have a sense of pride in being a resident of Balida Village after the fame of Mamanda Balida Balida Village	Counting the number of villagers in Balida Village who are proud of the famous Balida Village with its Tourism Village. A sense of pride is shown by the behavior of not being shy anymore to saying the name of Balida Village with confidence. Including a sense of pride in Mamanda Balida Village.	From the results of interviews, the alternative assessment of pride there is 3:1. Go on Hajj. Owns 3 ha of rubber land. Become an employee of an agency with a salary of IDR 5,000,000 In this study, the third alternative pride perspective is used	Balida Village Head Interview
14	Obtain unique and exciting news material with the Mamanda Balida Village Program	Counting the number of reports related to Mamanda Balida Balida Village carried out by the relevant mass media	Multiplying the amount of news coverage by the cost of journalist coverage of Rp. 250.000,-/coverage	Interviews from various sources of media actors
15	Increasing Village Original Income	Calculating the amount of profit sharing allocated to PAD from the results of the management of Mamanda Balida Village	Multiplying BUM Desa income from the management of Mamanda Balida Village with a 10% contribution to Balida's PAD income	Contribution to Balida PAD 10% of the total income of the Tourism Village in accordance with the Balida PERDES
16	Increased carbon stock (carbon stock) from planting endemic bamboo trees	Calculating the projected amount of carbon absorbed by healthy-growing endemic trees Planting is carried out in early 2021 so that the age of a healthy growing tree is about one (1) year	Multiplying the carbon stock produced by the carbon trading price The world carbon trading price is 96 Euros per tonne or equivalent to IDR 1,392,960 per ton	https://katadata.co.id/happyfajrian/economy-green/6200c21168a88/harga-carbon-eropa-sentuh-96ton-tertinggi-sejak-launched-2005
17	The decrease in complaints/demos from the Balida community	Calculate the decrease in the number of complaints/demos from the Balida	Multiply the demo drop amount by the IDR 100 million minor demo handling fee	Dept. Security & Community Relations

No	Impact	Approach Calculation	Approach Monetization	Source Information
	regarding the Company's operational issues	community. PT Adaro's activities in Balida Village are the construction of clean water installations, development of village health posts, production of fish feed, assistance for early childhood education facilities, installation of electricity for art studios, road construction, art studio sound systems, bamboo conservation, and cultural development.		
18	Increased public awareness of the Mamanda Balida Balida Village Program as a tourism village fostered by Adaro Indonesia.	Counting the number of reports related to Mamanda Balida Balida Village	Multiplying the number of viewers by the cost of publication through online media (running text) The tariff for one time online media publication in the form of running text is IDR 100,000	Rates for online media news in the form of running text

Table 3. Investment Value of Mamanda Balida Village Program

No.	Description	2019	2020	2021	Total
A.	Input				
1.	PT Adaro Indonesia	95,000,000	125,000,000	495,000,000	715,000,000

Table 4. Present Value of Program Impact (*Outcome*) and SROI Ratio of Mamanda Balida Village Program

No	Outcome		2019	2020	2021	Total
1	BUM Desa Balida "BUSINESS MULIA"					
	1.1	Income from renting a place to sell MSMEs	-	9800,354	22,109,424	31,909,779
	1.2	Earn income from the sale of visitor admission tickets	-	52,268,557	58,958,465	111,227,022
2	Balida Village Small and Medium Enterprises Pelaku					
	2.1	Income (turnover) from the sale of products sold in the Tourism Village	-	178,450,213	243,301,933	421.752.145
	2.2	Changes in the mindset of MSME actors about the importance of tourism service skills	-	31,411,392	-	31,411,392
3	POKDARWIS (Tourism Awareness Group) Balida					
	3.1	Improved service skills for tourists	-	17,590,380	-	17,590,380

No	Outcome	2019	2020	2021	Total
3.2	Earn income from ticket sales revenue sharing	-	13,067,139	14,739,616	27,806,755
4	Balida Art Studio (Balida Satria)				
4.1	Earning income from performing arts in Mamanda Balida Village	-	2,512,911	-	2,512,911
5	Village Children Forum (FAD)				
5.1	Income from Mamanda's tourism management technical support	-	34,175,595	66,328,273	100,503,868
6	Rice Farmer				
6.1	Get additional income from renting farmland	-	8,376,371	8,188,676	16,565,047
7	Local Builder				
7.1	Earning income from the construction of Mamanda Balida Village	38,767,396	-	-	38,767,396
8	Local travelers				
8.1	Increased ease of access to tourist attractions	-	69,974,530	78,930,645	148,905,175
9	Comparative Study Learners				
9.1	Get referrals for unique and exciting village management models with multi-stakeholder collaboration	-	-	585,490,313	585,490,313
10	Balida Village Community				
10.1	Have a sense of pride in being a resident of Balida Village after the fame of Mamanda Balida Balida Village	-	1,872,118,971	-	1,872,118,971
11	Mass media				
11.1	Obtain unique and exciting news material with the Mamanda Balida Village Program	-	1,465,865	818,868	2,284,733
12	Balida Village Government				
12.1	Increasing Village Original Income	-	6,206,891	8,106,789	14,313,680
13	Environment				
13.1	Increased carbon stock (carbon stock) from endemic tree planting activities	-	-	11,275,323	11,275,323
14	PT Adaro Indonesia				
14.1	The decrease in complaints/demo from the Balida community regarding the Company's operational issues	-	167,527,425	245,660,271	413,187,696
14.2	Increased public awareness of the Mamanda Balida Balida Village Program as a	-	1,256,456	19,652,822	20,909,277

No	Outcome	2019	2020	2021	Total
	tourism village fostered by Adaro Indonesia.				
	Amount	38,767,396	2,466.203.050	1.363.561.418	3,868,531,863
	Interest rate	r=5.63%	r=4.23%	r=3.58%	
	Total Outcome	38,767,396	2,466.203.050	1.363.561.418	3,868,531,863
	Annual Investment	95,000,000	125,000,000	495,000,000	715,000,000
	SROI Value	0.41	19.73	2.75	5.41

Table 5. Value of Benefits of PT Adaro Indonesia's Mamanda Balida Village Program

No	Program Benefit Value	Total	%
1	Environment		
	<input type="checkbox"/> Increased carbon stock (carbon stock) from endemic tree planting activities/	11523.132	0.3%
2	Economy		
	<input type="checkbox"/> Income from renting a place to sell MSMEs	32,611,093	0.8%
	<input type="checkbox"/> Earn income from the sale of visitor admission tickets	113.671.572	2.9%
	<input type="checkbox"/> Income (turnover) from the sale of products sold in the Tourism Village	421.752.145	10.9%
	<input type="checkbox"/> Earn income from ticket sales revenue sharing	2,568,140	0.7%
	<input type="checkbox"/> Earning income from performing arts in Mamanda Balida Village	28,417,893	0.1%
	<input type="checkbox"/> Income from Mamanda's tourism management technical support	102.712.744	2.6%
	<input type="checkbox"/> Get additional income from renting farmland	16,929,114	0.4%
	<input type="checkbox"/> Earning income from the construction of Mamanda Balida Village	39,619,426	1.0%
	<input type="checkbox"/> Increased ease of access to tourist attractions	152.177.816	3.8%
	<input type="checkbox"/> Increasing Village Original Income	14,628,266	0.4%
3	Social		
	<input type="checkbox"/> Changes in the mindset of MSME actors about the importance of tourism service skills	32.101.752	0.8%
	<input type="checkbox"/> Improved service skills for tourists	17,976,981	0.5%
	<input type="checkbox"/> Get referrals for unique and interesting village management models with multi-stakeholder collaboration	598,358,232	15.1%
	<input type="checkbox"/> Have a sense of pride in being a resident of Balida Village after the fame of Mamanda Balida Balida Village	1,913,264.443	48.4%
	<input type="checkbox"/> Obtain unique and interesting news material with the Mamanda Balida Village Program	2,334,946	0.1%
	<input type="checkbox"/> The decrease in complaints/demos from the Balida community regarding the Company's operational issues	422,268,744	10.7%
	<input type="checkbox"/> Increased public awareness of the Mamanda Balida Balida Village Program as a tourism village fostered by Adaro Indonesia.	21,368,822	0.5%
	Amount	3,868,531,836	100%

IV. DISCUSSION

Mamanda Balida Village Program SROI Value

Based on the period, the SROI value of the Mamanda Balida Village Program is: in 2019, it was 0.41; in 2020 was 19.73; in 2021, it is 2.75. Meanwhile, the average SROI value of the Mamanda Balida Village Program from 2019 to 2021 is 5.41. With this value, it means that for every investment of IDR 1.

Impact Distribution Based on Program Benefit Value

Based on the results of grouping the program's impact, the value of economic benefits is 23.6%, the value of social benefits is 76.1%, and the value of environmental benefits is 0.3%.

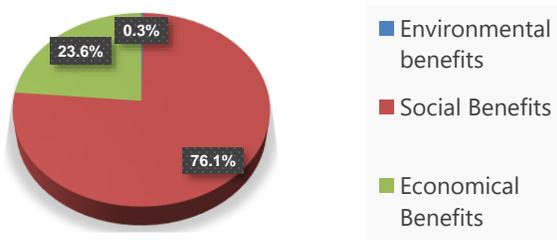


Image 1. Value-Based Program Impact Program Benefits

Although the percentage related to the environment is still tiny, many environmental development activities have been carried out, both in terms of capacity building and empowerment in the form of planting and caring for endemic trees and bamboo. Activities related to the environment are part of an essential process in the Mamanda Balida Village Program, which will continue to be developed in the future.

Payback Period Calculation

The *payback period* is calculated from the total social investment inputs divided by the average net present value divided by 12 months.

$$\text{Payback period} = \frac{\text{Total Input}}{\text{RNPV} : 12 \text{ bulan}} = \frac{\text{Rp } 715.000.000}{1.289.510.621 : 12 \text{ bulan}} = 6,65$$

Based on the calculation of the payback period above, it is known that it is pretty short. The results show that an investment of IDR 715,000,000 will take only 6.65 months before an equivalent value of the investment is realized.

V. CONCLUSION

From the description and discussion in the previous chapters, conclusions can be drawn:

1. The Mamanda Village Program (Independent and Empowered Community) in Balida Village, Paringin District, Balangan Regency, South Kalimantan Province, has been ongoing since 2019 and will continue to take place sustainably towards achieving the expected conditions and independence;

2. The SROI study of the Mamanda Balida Village Program is evaluative. The SROI value of the Mamanda Balida Village Program from 2019 to 2021 is above one (>1), which is 5.41. It means for every investment of Rp. 1, - you get a benefit of Rp. 5.41. The benefit value of the Mamanda Balida Village Program is greater than the investment value, and this program continues to exist even though the COVID-19 pandemic hit it;
3. The Mamanda Balida Village Program has a positive impact on several stakeholders, namely: 1) BUM Desa Balida "Usaha Mulia"; 2) Balida Village MSME actors; 3) Balida POKDARWIS (Tourism Awareness Group); 4) Balida Art Studio (Balida Satria); 5) Village Children Forum (FAD); 6) Rice Farmers; 7) Local artisans; 8) Local Tourists; 9) Comparative study students; 10) Balida Village Community; 11) Mass media; 12) Balida Village Government; 13) Environment; 14) PT Adaro Indonesia;
4. The impact Mamanda Balida Village Program has an economic benefit value of 23.6%, a social benefit value of 76.1% and an environmental benefit value of 0.3%;
5. From the calculation of all impact values, it appears that the Balida Village Community has the greatest impact value with an impact ratio of 45.8%. Meanwhile, the impact value received by Balida Art Studio has the lowest impact value ratio of 0.1%. While the ratio of the value of the impact received by the environment related to the increase in carbon stock is 0.3%.

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Investigation on Logistics Management Systems effectiveness and Improvements for Operational Synergy in the Kenyan Market, A Case of Logistics Systems Collaborative Integration.

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Abstract- Small and Medium Enterprises (SME) constitutes 90% of businesses in developing countries like Kenya, they exhibit poor supply chain structures and weak logistics Management Systems (LMS). In Kenya, SMEs experience supply chain collaboration barriers in form of technological, logistical, and financial challenges. The purpose of this study was to investigate the effectiveness of logistic management systems for operational synergy among the Kenyan SMEs.

The study employed a qualitative approach to investigate the manner and form in which SME within the Kenyan market apply LMS as a management tool in addressing business operations. Qualitative method is applied in simplifying, coding, analyzing and finally presenting the results in an accessible and understandable form by the Kenyan SME and other interested consumers. A sample size of fifteen respondents was selected among SME firms under investigation, distributed across five categories including: households retailing, goods distribution, and importation, warehousing, and service industry.

The research found out the SME in Kenya, are ill equipped in terms of elaborate structures and financing, leading to reduced technology uptake in form of mobile applications, internet-based transactions and other LMS technological essentials. To overcome the challenges, the research recommended that simplified mobile applications, internet and other IT based packages are specifically configured, availed and training offered among the target SME users through shared platforms. The individual business units stand to gain from improved LMS without heavy financial investment. The same add to the body of knowledge for those interested in tapping into the research findings and recommendations.

I. INTRODUCTION

Investigation on Logistics Management Systems effectiveness and Improvements for Operational Synergy in the Kenyan Market, A Case of Logistics Systems Collaborative Integration

According to Kenya National Statistics Bureau (July 6, 2017), there are more than fifty thousand SME's operating in the country and over one million Micro, Small and Medium

Enterprises (MSME) registered in Kenya, majority of which face multiple problems like poor financing, weak systems, and business sustainability. The MSME include all enterprises of one to one hundred employees, out of which those with ten to one hundred employees are SME. The well-being of businesses under this category is worth the research effort due to their potential to impact on the entire Kenyan economy. Based on findings by Moenga (2016), there is minimal application of the supply logistics practices particularly in Kenyan SMEs, a situation that leads to poor long-term relationship with the customers, suppliers and among themselves, resulting to multiple challenges which threaten long term growth and survival of the enterprises.

The study endeavors putting together experiences collected from fifteen sampled respondents among SMEs in Kenya, supplemented with available publications obtained from authentic internet sites and Kenyan government data base. Upon analysis, the research outcome provides an input to a well package, simplified and readily accessible solutions for the consumption of all interested parties. The research feeds into the process that avails the final product in form of check lists, transactional forms, simple demonstrations, references and contacts list for the Kenyan SME proprietors to enjoy a self-service office facility without having to invest in a physical office. The resultant package therefore empowers SME through promotion of information sharing, capital cost reduction, harmony, profitability, simplicity, and enhanced confidence to readily undertake small to large scale business ventures. Additionally, this opens avenues for collaborative management among the SME players in effect to compliment on their respective areas of weakness and strength.

II. PROBLEM STATEMENT

According to Ong'olo and Odhiambo (2013), the Kenyan economy was characterized by a huge population of SMEs, where most of the businesses engaged in informal business structures with very limited application of formal Supply Chain Management. Further to these findings, Kenya National Statistics Bureau (July 6, 2017), indicated that they experienced severe

limitations in terms of weak business structures, low capital and lack of sustainability.

In summary, the various researchers have underlined the potential the SME in Kenya has in impacting the economy and by extension the wellbeing of Kenyan people. As a highlight to the task at hand, Wekesa et al (2014) defined the problem and referred to it as the “missing middle”. This is the gap between the formation of numerous enterprises and the subsequent collapse of the majority before the realization of their full potential in the market. The “missing middle” phenomenon is therefore the puzzle involving multiple factors ranging from SME formulation, support infrastructure, Logistics Management systems, market forces, to enterprises’ collaboration

III. SIGNIFICANCE OF THE STUDY

SME category of businesses in Kenya forms a significant sector in the economy and therefore their sustained performance is of importance to the entire country’s wealth and by extension the well-being of the Kenyan people. According to Kenya National Bureau of Statistics (July 6, 2017), there exists over fifty thousand small and medium sized business in the country, who face challenges due to various factors including logistics limitations. Upon effective handling of the SME operational challenges, the overall economic growth and thus the Gross Domestic product (GDP) of Kenya is expected to improve significantly. As per the report, in terms of contribution to the Kenyan GDP, in the year 2015, businesses under this category contributed an estimate of Thirty Million US Dollars (USD) against the national output of Ninety-Seven Thousand Million USD which was over 33% share. Additionally, the SME businesses employed close to fifteen million Kenyans thus providing employment to over 35% of Kenyan population. The report farther indicated that: within the previous five years, over 73% of the registered business under the SME category closed down since they could not survive the various challenges including: low profitability, operational crisis and financing, leaving less than 30% of the enterprises operating. Based on the findings, research efforts towards investigating and resolving problems facing the SME are of significance in Kenyan economy as a whole and specifically, the lives of the individual business owners.

In the literature review, the researcher starts by introducing the Kenyan SME from the definition and experiences based on past studies done in the country. The introduction also includes SMEs’ impact and thus their significance to both the economy and the lives of Kenyans. Reports on other SME from other parts on the African continent and various global blocks like Europe, Asia and America were used as supplement literature and also for the purpose of comparison. Additionally, the SME are introduced from the theoretical understanding of fundamental phenomenon including supply chain management, logistics management, and business collaborations. This is for the purpose of creating a rich base for well-informed research work which accurately focuses on areas requiring further interrogation for practical recommendations that would benefit the Kenyan SME.

The LMS applicable in Kenyan SME have been explained in the context of supply chain theoretical framework. This forms

the framework on which the SME in Kenya can be analyzed, missing links identified, and the solution packaged in a form palatable to the users concerned. In line with this, aspects like business environment, entrepreneurship, LMS and business collaborations provide the input into the discussion in expanding the understanding on SME.

Based on literature reviewed on the SME in other countries within and outside Africa, it is apparent that every market has had its challenges. However, there is much to borrow in terms of overcoming strategies relevant to Kenya. Within the African continent, there is similarity in the type of challenges and manner in which the SME impact on the national economy. On the contrary, in regions characterized by progressive economic trends like USA, Europe and to some extent Asia, there is application of sound technological innovations and operational logistics systems worth adopting. Past attempts to get Kenya out of the phenomenon described as the “missing middle”, have been made by the Kenyan government as entrenched in the Vision 2030 (2017) but, going by Mutua (2018), findings reveal that there still exists a gap between the proposed policies and the actual implementation among individual SME players in terms of training and thus effective assimilation into business operations on the ground. It is upon this theoretical understanding of the national, regional and international historical background that the research efforts are aligned with the aim of providing technically feasible and sustainable solutions relevant to the Kenyan ailing SMEs.

IV. SUMMARY OF RESULTS

The chapter presented the findings from the interview of fifteen SMEs operating in Nairobi County, Kenya. Presentation of the results was done in three parts in accordance to the themes and the research questions.

After analysis, various themes emerged based on the research questions, as explained below. Six themes were selected to address the first research question; “*What logistical functions does your organization apply in accomplishing the main business transactions from product source to respective final customers?*” These themes included ordering, inventory control, warehousing, transportation, material handling, and logistical packaging. The majority (50%) of the respondents reported that computerized systems helped them order their goods efficiently. Regarding inventory control, 80% of the participants said that they managed to optimize their stocks through the management system and trained staff. Warehousing played a critical role in keeping inventories, as evidenced by 87% of the respondents, who indicated that they used stores of different sizes to house their stocks. The majority (73%) of the respondents used road transport to ferry their merchandize from the suppliers’ side to their stores. On material handling, quite a number (67%) of participants reported that they relied on their trained employees to achieve efficiency in handling stocks. Finally, the study established that 40% of the participants packed their products before delivering them to their customers.

Also, six themes, e.g., mission and vision, policies and procedures, unit of purpose, information sharing, meeting with suppliers and customers, and consultation answered the second research question; “*in the applicable logistical functions, in what*

ways has there been internal or external integration of Logistics Management Systems (LMS)?” The first three themes addressed internal integration and the other three answered external integration.

From the study, 60% of the respondents indicated that their mission was to offer high-quality customer service to their customers, while 40 % indicated that their vision was to become market leaders in Nairobi County. Regarding policies and procedures, most of the SMEs (73%) adhered to their internal regulations while running their businesses. To foster unit and teamwork, the majority (60%) of the respondents held regular departmental meetings to train and sensitize their employees on customer service and teamwork. In order to enhance information sharing, quite a number of the participants said that they posted their strategic information on their websites for their customers and suppliers.

Finally, four themes, such as limited resources, lack of ordering system, transport inefficiency, and inadequate storage emerged to address the third research question; in what ways have the LMS challenges if any, could be or have been addressed in the organization to benefit the business operations?

From the results, many respondents indicated that limited resources, such as inadequate capital and shortage of staff, hindered them from accomplishing their goals. From the findings, 20% of the respondents encountered inefficiencies in making orders because they had not automated their operations. Also, insufficient funds made some respondents to opt for the slowest mode of transport despite the urgency or the nature of stock they were dealing with. Finally, lack of storage was also found to be a hindrance to SMEs’ business operations.

V. SUMMARY OF THE RESULTS

SMEs are defined as enterprises with less than one hundred employees, characterized by poor business support, weak information infrastructure, informal in nature, and, therefore, vulnerable to diverse threats affecting business survival (Wekesa, Bwisa, & Namusonga, 2014; KNBS, 2017). SMEs sector is crucial to the Kenyan economy. For instance, in 2016, SMEs contributed 33% to the GDP and provided employment opportunities to 35% of Kenya’s working population (CBS-GoK, 2012). In Kenya, SMEs are engaged in informal business structures with limited application of formal supply chain management (Ong’olo & Odhiambo, 2013). According the Kenya National Bureau of Statistics (2017), SMEs experienced various challenges, such as insufficient capital and lack of sustainability. In South Africa, SMEs face not only the financial constraints, but also other challenges, such as lack of education, crime, and reduced economic growth.

The purpose of the study was to find out how SMEs apply logistical management functions in accomplishing their business transactions. Also, the study sought to know how SMEs practiced various types of integrations, and the challenges faced by SMEs in implementing LMS functions. In this study, a qualitative approach was used to investigate how the Kenyan SMEs applied LMS in dealing with their business operations. According to Houé and Murphy (2017), this method is appropriate when a research involves establishing the relationship between variables in logistics networks or supply chain management. The study

focused on different business operations, such as product distribution, warehousing, importation, purchasing, and transportation.

The research used open-ended interview questions to interview respondents through face-to-face interactions. Random sampling was used to select a sample of 15 respondents for interrogation among the firms from different categories, such as household retailers, good distributors, importers, warehousing, and service industry. These categories were purposefully selected for the qualitative study. Data was analyzed thematically in line with Alhojailan (2012), who argued that this method is suitable when classifying and presenting themes that relate to the data.

The research sought to find out the logistical functions used by SMEs in accomplishing their business transactions. From the results, 50% reported that computerized systems helped them to be effective in ordering stocks from suppliers, 12% ordered through suppliers websites, 19% made their orders via emails, and 19% through telephone. Regarding inventory control, 80% of the participants said that the management system aided them to keep their merchandize at optimal levels, while 20% reported that they controlled their stocks manually. The study further established that internal integration had been made possible through various aspects, such as mission and vision, policies and procedures, and unit of purpose. For instance, 60% of the respondents indicated that their mission was to offer high-quality customer service to their customers, while 40% reported that their vision was to become market leaders in Nairobi County. Moreover, external integration was achieved via information sharing and regular meetings with suppliers and customers.

The study revealed that limited resources, such as inadequate capital and shortage of staff, hindered SMEs from accomplishing their goals. For instance, 80% had websites and expected improvement in their ordering process while 20% had no websites and found it challenging to make orders because they had not automated their operations. Also, lack of sufficient funds made some respondents to opt for the slowest mode of transport despite the urgency or the nature of stock they were dealing with.

VI. DISCUSSION OF RESULTS

From the findings, it was noted that the majority (50%) of the respondents found it efficient to order their goods from suppliers through computerized systems.

Regarding external integration, SMEs collaborated with their customers and suppliers in different ways, such as sharing information and holding regular meeting. For example, 60% of the participants reported that they posted their strategic information on their websites in order to share it with their customers and suppliers. Also, 33% of the participants reported that they held frequent meetings with their suppliers and customers to deliberate on the issue of marketing and inventory management. This study agrees with Peterson et al. (2017), who opined that effective collaboration with suppliers was critical to avoid the threat of resource dependence.

On LMS challenges, many respondents indicated that limited resources, such as inadequate capital and shortage of staff, hindered them from accomplishing their goals. Regarding ordering, 20% of the respondents found it inefficient to make orders because they had not automated their business operations.

These findings are in line with Louise (2016), who revealed that South African SMEs are constrained not only by financial factors, but also specifically by non-financial factors such as lack of education, crime and slow economic growth.

VII. CONCLUSIONS AND PRACTICAL RECOMMENDATIONS

The study sought to investigate logistic management system effectiveness and improvement for operational synergy in the Kenyan Market. From the results, 50% reported that computerized systems made the ordering process convenient for them. The findings of this research indicate that a large proportion (46.7%) used non-computerized systems. A big gap therefore exists among Kenyan SME's that could be reduced with further technology uptake in the form of mobile applications, internet-based transactions and other IT related methods that are easily available and accessible in urban centers in Kenya such as Nairobi. Quite a number (80%) of the respondents said that they efficiently controlled their inventories through the Logistics Management Systems (LMS) and help of trained staff. Staff training is thus an essential ingredient in improving LMS efficiency. As a result, few companies that have not yet incorporated training on their LMS ought to be encouraged to do so in order to enjoy the benefits thereof.

The study established that internal integration was practiced in different ways – through mission and vision, policies and procedures, and teamwork. For example, 60% of the respondents indicated that their mission was to offer high-quality customer service to their customers, and 40 % indicated that their vision was to become market leaders in Nairobi County. Also, 73% of the respondents had policies and procedures that governed their business operations. Externally, SMEs collaborated through information sharing and holding regular meetings with suppliers and customers.

Furthermore, the study sought to investigate on LMS related challenges amongst the Kenyan SMEs and established that inadequate capital hindered them from accomplishing their goals. In this case sufficient efforts need to be put by Micro finance and banking institutions that develop loan packages targeting specific areas within the LMS such as fleet acquisition and technology upgrades, to enable a bridge of these critical gaps. Also, 20% of the participants said that they encountered inefficiencies in making orders because their businesses were not automated. A continual technology uptake by SME in the LMS chain is further required to realize efficiencies whilst handling orders to avoid loss of customers or increase of future customers for SME thus resulting to better SME turnovers.

With the understanding that financial resources remain to be a challenge among SMEs under investigation, it is therefore

recommendable that simplified mobile applications, internet and other IT based packages are specifically configured, availed and training offered among the target SME users. This role is better undertaken by county government business promotion organs in effort to elevate all SMEs to a level they can overcome logistical limitations and achieve the synergy for better outcome.

VIII. RECOMMENDATION FOR FURTHER RESEARCH

Further study should be carried out to establish the relationship between logistic management functions and financial performance of SMEs in Nairobi County, Kenya.

Based on the gap discovered in this research, an investigation on technology uptake by SMEs within Nairobi County on their LMS should be investigated to establish the degree and impact of improvement in SMEs business.

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Curb-65 Score And Sofa Score Sensitivity And Specificity (Accuracy) As Mortality Predictors In Covid 19 Patients Admitted To Haji Adam Malik Medan Central General Hospital

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Abstract:

Background: SARS-CoV-2 or severe acute respiratory syndrome coronavirus 2 is the most recent strain of the coronavirus responsible for the late-2019 pneumonia epidemic. Initial clinical manifestation of COVID-19 disease is pneumonia. About 15 percent of patients with mild-to-moderate symptoms develop severe pneumonia, and 5 percent develop acute respiratory distress syndrome (ARDS), septic shock, and multiple organ failures. Therefore, clear and objective risk stratification criteria are required for early diagnosis of patients at high risk of clinical deterioration, so that physicians can predict outcomes and make treatment-related decisions. This study aims to compare the sensitivity and specificity (accuracy) of the CURB-65 and SOFA scores as predictors of mortality in COVID-19 patients admitted to the Haji Adam Malik Central General Hospital in Medan.

Method: The study used an observational analytic design with a consecutive sampling technique. This study was conducted between March and July 2021 at the Haji Adam Malik Central General Hospital using patient medical records.

Results: This study revealed that the optimal cutoff value for predicting mortality using SOFA scores was 3.5, with a sensitivity of 73.5% and a specificity of 87.5%. The SOFA score can predict mortality by 82%. The optimal CURB-65 score threshold for predicting mortality is 1.5, with a sensitivity of 80.9% and a specificity of 81.3%. The CURB-65 score can accurately predict mortality by 82%.

Conclusion: CURB-65 scores are more accurate and sensitive at predicting mortality than SOFA scores.

Keywords: SOFA Score, CURB 65, COVID 19.

Background

SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) is the most recent strain of the coronavirus that caused the outbreak at the end of 2019 and was first discovered in Wuhan, China.¹ The World Health Organization (WHO) declared COVID-19 a pandemic after numerous victims were infected and deaths occurred across the globe.¹

COVID-19 clinical manifestations include fever, dry cough, and fatigue. Headache, dizziness, abdominal pain, nausea, and vomiting are uncommon symptoms. A few days prior to fever, anosmia (loss of smell), dysgeusia (taste distortion or loss), nausea, and diarrhea may also be present. Although severe lung injuries can occur at any age, the virus is more likely to cause severe

interstitial pneumonia, ARDS, and subsequent multiorgan failures, which are responsible for severe acute respiratory failure and a high mortality rate, in high-risk individuals, such as the elderly or those with comorbidities^{1,2}. The majority of COVID-19 patients exhibit mild-to-moderate symptoms, but approximately 15% develop severe pneumonia and 5% develop acute respiratory distress syndrome (ARDS), septic shock, or multiple organ failure^{3,4}.

Several demographic studies on severe COVID-19 have been published previously. The study in Gabon identified 31 (3.7 percent) out of 837 patients with severe COVID-19⁵. Out of 1094 positive RT-PCR cases in Pakistan, 5.2% of patients had severe COVID-19. 61% of patients are 50 years of age or older, while only 5% of patients are in their 20s.⁶

Clear and objective criteria must be used for risk stratification and early diagnosis of patients at high risk of clinical aggravation. The scoring system used for this purpose is a useful tool that assists doctors in predicting outcomes and guiding treatment-related decisions⁷. Assessing mortality risk in COVID-19 patients is a challenge for physicians. Among the available tools are the CURB-65 and the SOFA score. In prior research, the CURB-65 and SOFA scores were utilized to determine the severity and mortality of COVID-19 patients⁸⁻¹¹.

Thus, due to the high morbidity and mortality rate of COVID-19 cases and the fact that no studies have ever been conducted at RSUP H. Adam Malik Medan, the author aims to investigate the sensitivity and specificity (accuracy) of CURB-65 and SOFA scores in predicting mortality in COVID-19 patients at RSUP H. Adam Malik Medan.

Methods

This study employed an observational analytical method with a diagnostic test design, as well as non-probability sampling consecutive sampling techniques. This study was conducted at the Adam Malik Haji Center General Hospital with the approval of the FK USU Research Ethics Commission. This study's sampling period was January 2022 to March 2022, and it used medical record data from patients treated between March 2021 and July 2021. Patients infected with SARS COV-2 were included in the study, as evidenced by RT-PCR. The study sample came from a patient who tested positive for SARS COV-2 via RT-PCR. In addition, the inclusion and exclusion criteria must be met. Inclusion criteria included being over the age of 18 and having SARS-COV2 confirmed via RT-PCR. Patients who died within 24 hours, did not complete treatment at RSUP Haji Adam Malik Medan, did not have complete medical record data, patients with comorbidities such as chronic kidney disease, hepatic cirrhosis, acidosis, malignancy, NYHA III-IV heart failure, and HIV stage III-IV are excluded from this study. Patient personal data collected includes name, gender, age, medical record number, address, religion, occupation, marital status, and laboratory examination results. The obtained results will be recorded on the data collection sheet. After collecting the data, the researcher processes and analyzes it using the SPSS data management application.

Results

Table 1. The characteristics of the patients

	Survival					
	Total	Alive	%	Deceased	%	p
Age						
<65 year old	151	95	52,8	56	31,1	0.66
≥65 year old	29	17	9,4	12	6,7	
Gender						
Male	89	50	27,8	39	21,7	0.098

Female	91	62	34,4	29	16,1	
Grade of COVID-19						
Mild	111	101	56,1	10	5,6	0.001
Moderate	44	8	4,4	36	20,0	
Critical	25	3	1,7	22	12,2	
GCS						
15	170	111	61,7	59	32,8	0.001
<15	10	1	0,6	9	5,0	
Others' comorbid						
Metabolic disorder						
No	131	85	47,2	46	25,6	0.228
Yes	49	27	15,0	22	12,2	
Cardiovascular disorder						
No	104	73	40,6	31	17,2	0.010
Yes	76	39	21,7	37	20,6	
Lung disorder						
No	168	106	58,9	62	34,4	0.366
Yes	12	6	3,3	6	3,3	
BUN						
≤19	91	67	37,2	24	13,3	0.001
>19	89	45	25,0	44	24,4	
Bilirubin						
<1,2	127	88	48,9	39	21,7	0.002
≥1,2	53	24	13,3	29	16,1	
Platelet						
≥ 150.000	164	103	57,2	61	33,9	0,606
< 150.000	16	9	5,0	7	3,9	
Respiratory Rate						
<30	157	107	59,4	50	27,8	0.001
≥ 30	23	5	2,8	18	10	
PaO2/FiO2						
≥ 400	69	60	33,3	9	5,0	0.001
< 400	111	52	28,9	59	32,8	
Creatinine						
< 1,2	119	82	45,6	37	20,6	0.010
≥ 1,2	61	30	16,7	31	17,2	

In this study, the number of men and women was nearly equal, with 49.4 percent of men and 50.6 percent of women participating. 39 of the 89 men who were treated died (21.7%). This figure is higher than the 29 deaths among the 91 women treated (16.1%). However, statistical tests of the study's findings revealed no significant relationship between sex and mortality ($p = 0.098$). The number of patients who died with abnormal BUN and creatinine levels was 44 (24.4%) and 31 (17.2%), respectively. The statistical test results of the relationship of these four variables are significant with p values (0.001, and 0.01). This study's 180 samples contained 49 (27.2%) metabolic disorders, 12 (6.7 percent) pulmonary disorders, and 76 (42.2%) cardiovascular disease disorders. Patients with cardiovascular disease had the highest mortality rate, with 37 (20.6 percent) dying. Statistical tests on these three comorbid variables revealed a significant relationship in cardiovascular disease ($p = 0.01$).

Table 2. Analysis of SOFA with mortality

Survival						
	Total	Alive (n=104)	%	Deceased (n=76)	%	p
SOFA						
0 – 2		87	48,3	10	5,6	0.001
3 – 5		16	8,9	36	20,0	
6 – 8		8	4,4	18	10,0	
> 8		1	0,6	4	2,2	
SOFA						
Resiko rendah	115	97	84,3	18	15,7	0.001
Resiko tinggi	65	15	23,1	50	76,9	

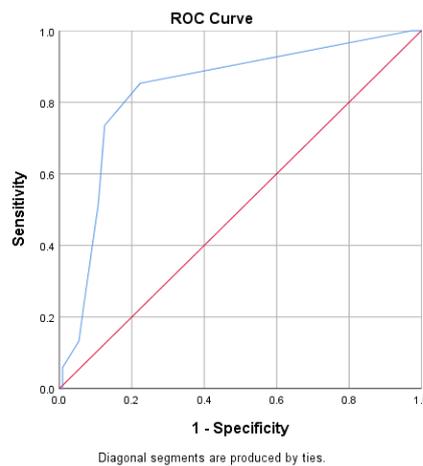


Figure 1. ROC Curve of SOFA Score with mortality

According to the findings of this study, the best cut off value for SOFA scores in predicting mortality was 3.5, with a sensitivity value of 73.5% and a specificity value of 87.5%. SOFA scores >3.5 can predict mortality by 82%.

Table 3. Analysis of CURB-65 with mortality

Survival					
Total	Hidup (n=104)	%	Meninggal (n=76)	%	p

CURB-65

0 – 1	91	50,6	13	7,2	0.001
2	20	11,1	29	16,1	
≥ 3	1	0,6	26	14,1	

CURB-65

Resiko rendah	104	91	87,5	56	37,09	0.001
Resiko tinggi	76	21	27,6	12	41,38	

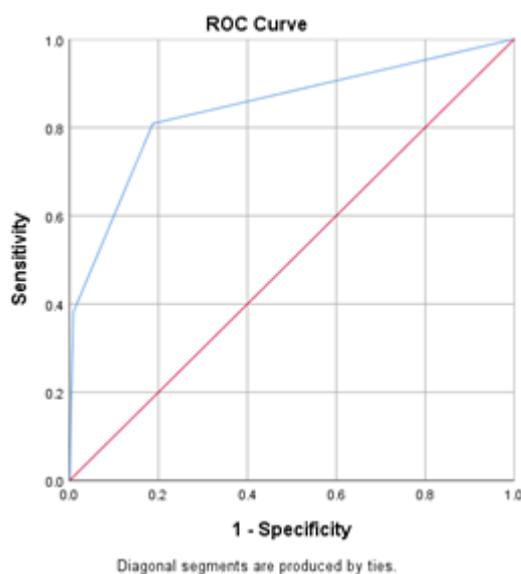


Figure 2. ROC Curve of CURB-65 with mortality

According to the findings of this study, the best cut off value for the CURB-65 score in predicting mortality was 1.5, with a sensitivity of 80.9% and a specificity of 81.3%. The CURB-65 score has an 82% accuracy in predicting mortality.

Discussion

WHO reported 3,931,221 new cases in the past week (September 6-12) for a total of 224,180,421 cases as of September 14, 2021. In the past week, more than 62,000 deaths were reported worldwide, a decrease from the previous week. As of 16 September 2021, there were 3,145 new cases and 237 fatalities in Indonesia, where the trend of cases has begun to decline. The total number of reported COVID-19 cases in Indonesia is 4,181,309, with 139,919 deaths attributable to COVID-19.¹² As of October 3, 2021, there have been 4,796,171 deaths worldwide (CFR: 2.0%) in 204 Infected Countries and 151 Community Transmission Countries, while in Indonesia alone there have been 142,171 deaths (CFR: 3.4%) attributed to COVID-19 and 4,044,235 patients have recovered from the disease.¹³

In severe cases of rapid and progressive deterioration, such as ARDS, septic shock, difficult-to-correct metabolic acidosis, and bleeding or dysfunction of the coagulation system within a few days. Some patients exhibit mild symptoms that are not even accompanied by fever. The majority of patients have favorable prognoses, with only a small proportion of those in critical condition dying. Here are the various degrees of clinical syndromes that can result from infection.¹⁴

In COVID-19 patients, CURB-65 can serve as a useful prognostic marker that can be used to rapidly triage severe patients in primary care or general practice settings. CURB-65 ≥ 2 values can be used as the prediction threshold for hospital deaths. A high CURB-65 score may aid in the early identification of COVID-19 patients with a poor prognosis.¹⁰

The CURB-65 score performed better than the ISARIC-4C and COVID-GRAM scores in predicting hospital mortality and the need for ICU care in COVID-19 patients. 7. The PSI and CURB-65 scores did not differ statistically in their ability to

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predict mortality (AUROC 0.835 vs 0.825, $p = 0.112$) and were superior to the qSOFA and MuLBSTA scores (AUROC 0.728 and 0.715, respectively, $p < 0.001$ for both compared to PSI and CURB-65). Critical degree COVID-19 patients with a SOFA score of greater than 3 had a higher likelihood of death at 28 and 60 days ($p < 0.05$)¹⁵. The optimal SOFA cutoff of 3 has a sensitivity, specificity, positive prediction value, and negative prediction value of 90%, 83.18%, 50%, and 97%, respectively.¹⁶ This study determined that the optimal cutoff value for the CURB-65 score to predict mortality was 1.5, with a sensitivity of 80.9 percent and a specificity of 81.3 percent. The CURB-65 score can accurately predict mortality by 82%.

Patients with critical degree COVID-19 and a SOFA score of > 3 were associated with increased mortality at 28 and 60 days ($p < 0.05$)¹⁵. The optimal SOFA cutoff of ≥ 3 has a sensitivity, specificity, positive prediction value, and negative prediction value of 90%, 83.18%, 50%, and 97%, respectively.¹⁷ In the study by Yang et al., the AUC score for SOFA was 0.908 (95% confidence interval: 0.857–0.960) with a diagnostic cut-off value of 2 and sensitivity and specificity values of 85.20 and 80.40 percent, respectively. These results indicate that scores ≥ 2 on the SOFA scale can predict the severity of COVID-19 in patients.¹⁸ According to the findings of this study, the best cut off value for SOFA scores in predicting mortality was 3.5, with a sensitivity value of 73.5% and a specificity value of 87.5%. SOFA scores > 3.5 can predict mortality by 82%.

Conclusion

This study concludes that CURB-65 is more accurate and better at predicting mortality. However, more research on the sensitivity and specificity (accuracy) of the CURB-65 score and sofa score as predictors of mortality in COVID-19 patients in a larger population is required.

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The Prevalence and Characteristic of Dead Victim in Dr. Pirngadi General Hospital In Medan City In 2019-2021

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Abstract: Murder victim or domestic violence victim can be found in many forms, either blunt trauma, sharp object trauma, etc, either multiple wounds or single wound. Many dead victims were treated in the forensic department, the victims usually had a contusion, abrasion or lacerated wound, stab wound, or gunshot wound. This was a descriptive study using the cross-sectional retrospective design, in which the author only record the samples once using the secondary data based on the *Visum et repertum* record of the forensic department in Dr. Pirngadi General Hospital in Medan. Based on the result of this study, from 88 samples, we found that the most common group of age for dead victim was in between 41-50 years old which were 19 victims (21.6%), 71 of the samples were male (80.7%), 63 of them were occupied (71.6%), the highest prevalence of the dead victims was an unnatural death, which were 83 victims (94.3%), the most common crime scene found was in Medan Labuhan sector which were 56 victims (63.6%), from 83 samples that had a mechanical trauma, 80 of them had a blunt trauma (94.3%).

Keywords: Forensic, Dead Victims, Study

INTRODUCTION

Murder victim or domestic violence victim can be found in many forms, it could be a blunt trauma, sharp object trauma etc, either multiple wounds or single wound. Dead victims were often treated in the Medical Forensic department, at these cases the victims often experienced a contusion wound, abrasion wound, incised wound stab wound, gunshot wound, etc.¹

In performing an examination to a dead victim, it is crucial for the doctor to be able to clarify the questions about death.¹

Either government or private hospital, or public health center, every month there were hundreds of examinations that doctor had to perform to create a visum required by law enforcement, the most common cases were wound from a fight, violence, traffic accident, followed by visum for sexual

violence or rape, and then visum for dead victims. Other visum such as psychiatric, visum for intoxicated victims, or determining the biological father of a child, even though there weren't many, could also be performed by a doctor.²

Every year, 1.4 million people worldwide lost their life due to violence. violence is the 5th most common cause of death in the world, and in the people under 40 years old, this is the most common cause of death. From all dead victims caused by violence, 56% were suicide and 33% were murder. More than 90% of death related to violence occurred in middle to low-income countries.³

Based on the data from the *Badan Pusat Statistik* (BPS), from 2015-2018 the number of physical violence in Indonesia was fluctuant with the trend of decreasing. In 2015, there were 27,128 records of incidents (the highest from the last

four years). This number decreased in 2016 to 46,701 incidents, and 42,683 incidents in 2017, and decreased again to 39,567 in 2018. The police department (Polda) that recorded the highest incidents of physical trauma in 2018 is the North Sumatera Police Department (5,240 incidents). The police department that recorded the lowest incidence was in North Kalimantan and Bangka Belitung Archipelago with the number of incidents were 39 and 96 each respectively (BPS, 2019).⁴

Based on the *Riskesdas* in Indonesia in 2013, the prevalence of injury nationally was 8.2%. The proportion of the type of injuries in Indonesia were dominated by contusion wound 1 which was 70.9%. The second highest type of wound was sprain, with the mean amount was 27.5%. Lacerated wound was the third highest type of injury. The proportion of the type of injury in Lampung province that had a contusion wound was 76.3%. And the proportion for the crime scene was mostly in home which was 44%, on the road which was 33.4%. The prevalence of injuries from sharp/blunt object were 7.9%, burnt wound 0.4%, fall 43%, and crushed 2%.⁵

Based on the data and information obtained from the North Sumatera Police Department (Polda), the highest number of criminal cases during the Covid-19 pandemic were fraud, thievery and violence, and vehicle stealing and drug abuse. Prior to this, law enforcers always strive to eradicate this criminality through strategies and policies that had been formulated (*Direktorat Reseres dan Kriminal Umum*, 2021).⁶

Based on the result of a study and data analysis about the prevalence of mechanical trauma and the characteristic of death victim with wound in Dr Pirngadi General hospital in Medan city in 2019-2021, the most common cause of death were traffic accidents which was 84.2% in Medan city, and 15.8% outside of Medan city.⁷

This violence is enticing for the author to study about the characteristic of dead bodies in Medan city and its surrounding. Based on this, the author wanted to study about the characteristic of dead victims in Dr. Pirngadi General Hospital in Medan city from 2019-2021.

METHOD

This is a descriptive study using a cross-sectional retrospective design, in which the sample data was only taken once from the secondary data obtained from the *visum et repertum* from the forensic department of Dr. Pirngadi general hospital in Medan. This study was conducted from Februari 2022 to September 2022. The samples were obtained using the total sampling method from the population obtained from the secondary data which were the VeR of the dead victims from 1st of January 2019 – 31st of December 2021. Data was collected from a secondary data using all the VeR document of a dead victims from the *Visum et Repertum* record in Dr. Pirngadi General Hospital in Medan from the 1st of January 2019 – 31st of December 2021. In the VeR record, there were several variables that will be studied in prior to the specific aim of this study. The VeR documents were collected and documented and tabulated depending on each respective variables studied.

RESULT AND DISCUSSION

This study was conducted on 88 samples from Dr. Pirngadi General Hospital in Medan from year 2019 – 2021, the title of this study is the prevalence and characteristics of dead victims in Dr. Pirngadi General Hospital in Medan from 2019 – 2021. The characteristic in this study were age, sex, and occupation, which can be seen in **table 1**.

Table 1. The Distribution Of Age, Sex And Occupation Of The Samples.

No.	Characteristic	Frequency	Percent age
1	Age (Years)		
	< 10 y.o.	2	2.3
	11-20 y.o.	13	14.8
	21-30 y.o.	15	17.0
	31-40 y.o.	16	18.2
	41-50 y.o.	19	21.6
	51-60 y.o.	15	17.0
	60 y.o.	8	9.1
2	Sex		
	Male	17	19.3
	Female	71	80.7
3	Occupation		
	Unoccupied	25	28.4
	Occupied	63	71.6

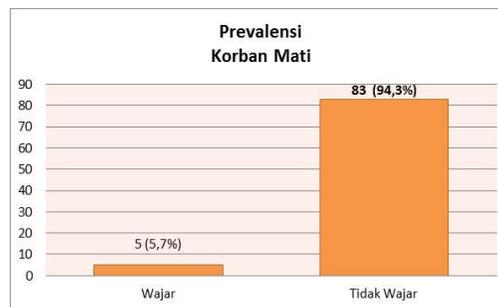
	Total	88	100.0
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The result of descriptive analytic showed that most of the samples in this study were victims from 41-50 years old group which was 21.6%, and the lowest incidents was in the group age < 10 years old which was 2.3%. High mortality rate in a productive age group resulted in a disadvantage to the economic system. Prior to this, a good prevention strategy specifically designed to this productive age group is crucial. On the other hand, the lowest incidents were in the group age < 10 years old which was 2.3%. This was because in the group age < 10 years old, the mobilization is low.

The result of descriptive analytic showed that most of the samples in this study were male, which was 80.7%. While female victim was 19.3%. this result was similar with prior study from Ulin in Medan city (2013) which found that the proportion of dead victims from traffic accidents were mostly male which was 82.4%, while female victims were 17.6%. Male plays an important role as the backbone of the family, which is why they are most likely to have an activity outside of their house. Also, male is more prone to take risk in driving compared to female.

The result of descriptive analytic showed that most of the samples in this study were an occupied victim which was 71.6%. Only 28.4% of the samples were unoccupied. This was because most of the dead victims administered to Dr. Pirngadi General Hospital is in the region of Medan city which is an industrial region in Medan Labuhan district, with many of the residents work in a workers/private workers.

The prevalence of the dead victims treated in the Forensic department in Dr. Pirngadi General Hospital in Medan City is divided into 2 types, a natural and an unnatural death with the distribution frequency can be seen in **Graphic 1**.



Source: Study result 2022 (processed data)

The prevalence of mechanical trauma from the dead victims in the Forensic department in Dr. Pirngadi General Hospital in Medan City can be divided into 2, which were sharp object trauma and blunt trauma, with the distribution frequency can be seen in Graphic 2.



Source: Study result 2022 (processed data)

The result of descriptive analytic showed that most of the samples in this study were unnatural death which were 83 victims (94.5%) of traumatology. Dead victims from natural chronic disease were 5 victims (5.7%). This was because from 2017, most of the dead victims were administered to Bhayangkara Hospital Medan compared to Dr. Pirngadi general hospital so that the dead victims with unnatural death from non-mechanical trauma such as hanging, strangulation, drowning, smothering were not found in Pirngadi general hospital from 2019 – 2021. Trauma is the most common cause of death in productive age group, under 40 years old, and the 3rd highest cause of death in the world, after cardiovascular diseases and malignancy. Trauma that resulted in death was 26% and more

than half of this number were in their productive age, which will significantly result in economic condition.⁸

The result of descriptive analytic showed that most of crime scenes of the samples in this study were in the Medan Labuhan district which were 56 victims (63.6%) followed by Percut Sei Tuan district which were 16 victims (18.2%).

The result of this study was different from prior study by Silaban (2018) about the characteristic of dead victims caused by traffic accidents in the Forensic department in Dr. Pirngadi general hospital in Medan city from 2016 – 2017 which found that dead victims administered in the Forensic department in Dr. Pirngadi general hospital in Medan city from 2016 – 2017 from Medan city was 84.2% and from the other city was 15.80%.

The high rate of dead victims in Medan Labuhan district correlates with the wide region of the district and the high number of big transport vehicles in the traffic such as oil truck and other big truck which resulted in high criminal rate which threatened life.

CONCLUSION AND SUGGESSTION

The highest prevalence of dead victims with wound in Dr. Pirngadi general hospital in Medan city from 2019-2021 was unnatural death, which was 94.3%. From their sex, it was found that from the 88 samples, 17 victims (19.3%) were female, and 71 victims (80.7%) were male. From their age group, the result of this study showed that from 88 samples, 2 victims (2.3%) were < 10 years old, 13 victims (14.8%) were people from 11-20 years old group, 15 victims (17.0%) were people from 21-30 years old group, 16 victims (18.2%) were people from 31-40 years old group, 19 victims (21.6%) were people from 41-50 years old group, 15 people (17.0%) were people from 51-60 years old group and 8 victims (9.1%) were people with > 60 years old. The result of this study showed that from 88 samples, 25 victims (28.4%) were unemployed, and 63 victims (71.6%) were employed. The crime scene with was in the Medan Labuhan district, which were 56 victims (63.6%) followed by Percut Sei Tuan district which were 16 victims (18.2%). The type of the traumatology in this study, from 83

samples were, 3 victims (5.7%) experienced blunt and sharp mechanical trauma and 80 victims (94.3%) experienced blunt mechanical trauma. The author concluded that most of the samples in this study had experienced blunt mechanical trauma, which was 80 victims (94.3%).

The Role of Health Expenditure on Health Outcomes: Evidence From West Africa Countries

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Abstract: *This study investigates the role of health expenditure on health outcomes in West Africa countries. Using the Grossman theoretical framework, other variables that affect health outcomes were also examined. Sixteen countries of West Africa with yearly data spanning between the period of 19 years (2000-2019) was used in this study. The health outcomes examined include life expectancy and neonatal and under-5 mortality rates. The regressors used in the study include domestic government health expenditure per capita, domestic private health expenditure per capita, external health expenditure per capita, carbon-dioxide emission metric ton per capita, human immunodeficiency virus (HIV), unemployment, GDP per capita, tuberculosis, fertility rate, malaria and carbon-dioxide emission from gaseous fuel consumption. The study used the mixed effect regression model. The study revealed that the domestic government health expenditure per capita does not have significant impact on life expectancy and under-5 mortality; however it has a contradicting effect on neonatal mortality rate. Domestic private health expenditure per capita has significant impact on life expectancy, and external health expenditure per capita has insignificant impact on life expectancy. With respect to the neonatal mortality rate, the domestic government health expenditure per capita, domestic private health expenditure per capita, and the external health expenditure per capita are statistically significant. With respect to the under-5 mortality rate, domestic government health expenditure per capita is statistically insignificant; however, domestic private and external health expenditure are statistically significant. The study recommends that the government and the stakeholders in the health sectors should make conscious efforts to allocate more resources to health sectors to improve health outcomes. There should be more emphasis on access to health care facilities in rural areas given that a good number of the population in West Africa live there. The introduction and proper management of health insurance to enable proper private health care access will help improve the significant impact of domestic private health care.*

Keywords: Health Expenditure, Life Expectancy, Under-5 Mortality Rate, Neonatal Mortality Rate, Health Outcomes

1. Introduction

In recent years, improving health care has been the key focus of the government of different countries and policy makers (Boachie et al., 2016). Health care investment is a key factor for countries that are development focused. To keep improving the human capital stock, the health sector of the economies must be functional and accessible by those who require health care. The quality of the health care determines the quality of the health outcome of a country. Health outcome in this case includes life expectancy, infant mortality rate, under-5 mortality rate and neonatal mortality rate (Grossman, 1972). Life expectancy is the number of years which an individual is expected to live if current death rate does not change (OECD, 2021). It is the statistical measure of the average time an organism is expected to live based on the year of birth, current age, and other demographic factors. Neonatal mortality rate is the number of deaths of infants that occur between 0 and 28 days per 1000 live births. The infant mortality rate is the number of deaths of infants that occur under age 1 year. Under-5 mortality rate is the number of deaths that occur under-5 years old.

Some children die at birth while several of them die before year 5 (WHO, 2020). Most of the deaths are associated with diseases such as measles, diarrhea, and other forms of diseases. Several of them could have escaped death if there were sufficient provision of health facilities and personnel. The availability of adequate health care facilities and personnel helps reduce the rate of mortality among adults and children. Adequate health care investment by the government and the private sector will improve health care outcomes (Anyanwu and Erhijakpor, 2007). Government and private bodies have invested in the health sectors, the effect of which has been a general decline in the rate of mortality.

Recently, people live longer due to the presence of vaccines, antibiotics, and other advanced medical equipment (Jacqueline et al., 2018). These factors among others account for the quality of health services. These services are made possible by the provision of adequate funding by the government and other stakeholders both in the private and external sectors of the economy. Recently studies have found that health care expenditure has different impact on health outcomes of different countries in different years. Most studies found a positive and significant relationship between health expenditure and life expectancy. Some of this research, among others is Crémieux et al., (1999), Lichtenberg (2000), and Nixon and Ulmann (2006). However, some studies fail to establish an explicit relationship between health expenditure and life expectancy; some of the studies; among others, include Hitiris and Posnett (1992) and Barlow and Vissandjee (1999).

1.1 The Objective of the Paper

This paper investigates the impact of health expenditure on health outcome such as life expectancy, under-5 mortality rate, and neonatal mortality rate in West Africa countries. Other factors that affect health outcome were also investigated. Yearly data spanning a period of 19 years, (2000-2019) from was used in the study. This study is aimed at informing the government and policy makers on the implication of health care expenditures on health outcomes.

1.2 Research Questions

The research intends to answer the following questions:

- What is the effect of general government expenditure per capita on health outcomes (life expectancy, neonatal mortality rate, and under-5 mortality rates)?
- What is the effect of private health care expenditure per capita on health outcomes?
- What is the effect of external health care expenditure per capita on health outcomes?
- What is the effect of the incidence of malaria on health outcomes?
- What is the effect of HIV prevalence on health outcomes?
- What is the effect of GDP per capita on health outcomes?
- What is the effect of unemployment on health outcomes?

1.3 Hypotheses of the Study

- H₁: There is statistically significant relationship between public health expenditure and health outcomes.
- H₂: There is statistically significant relationship between private health care expenditure and health outcomes.
- H₃: There is statistically significant relationship between external health care expenditure and health outcomes.

2. Empirical And Theoretical Review

2.1 Empirical Literature Review

There are several studies that have investigated the relationship between health expenditure and health outcome with different methodologies, periods, and countries.

Deshpande et al. (2014) compares health care expenditures to life expectancy using data for 181 countries. They used per capita expenditure on health as the measure of health care spending. The authors also controlled for the effects of per capita GDP, literacy rates, and density of physicians. A simple regression model between life expectancy and per capita health expenditure was estimated and a value of 0.66 was found, showing reasonably good measure of fit. In their regression results, they find that health care expenditure does not play much of a role in life expectancy in developing countries, but that health care has a significant impact on increasing the life expectancy of developed nations. In fact, for some developing countries, they find negative relationships between health care spending and life expectancy. They hypothesize that this is due to the quality of health care expenditure.

Jacqueline et al. (2018) examined the relationship between health care expenditure as a percentage of GDP and life expectancy for both males and females. They used data from 120 countries. The fixed-effect model was used, and they found a positive and significant relationship between life expectancy of both men and women and health care expenditure.

Devdatta and Linden (2019) examined the effect of public and private health expenditures on life expectancy at birth and infant mortality. They used data from 195 countries, ranging from 1995-2014. They used the GMM estimator and found that public health is more health promoting than private expenditures.

Sango-Coker and Bein (2018) investigated the private and public health care expenditure of West Africa. They obtained data from 16 West Africa countries from the World Bank and World Health Organization between 1999-2014 and used pooled regression and pairwise correlation. The pairwise correlation showed that public health care expenditure correlates positively with life expectancy at birth for females, life expectancy at birth for males and life expectancy in total, whereas the health care private expenditure has a negative correlation with life expectancy at birth for females, life expectancy at birth for males, and life expectancy in total.

Kiros et al. (2020) studied the effects of health expenditure on infant mortality in sub-Saharan Africa. Data was collected from World Development Indicators of 46 Africa countries between 2000-2015 was utilized in the study. They used the random-effect model and found that both public and external health spending have a significant negative relationship with infant and neonatal mortality.

Boussalem and Taiba (2014) investigated the causality and cointegration relationship between public spending on health and economic growth in Algeria between 1974 to 2014 using the annual data. They found that there is a long-run causality from public spending on health to economic growth.

Xu, Saksena and Holly (2011) carried out a study to determine the trajectory of health expenditure in developing countries. They used the panel data from 14 countries over 14 years from 1995 to 2008. Fixed-effects and dynamic models were used to explore the factors associated with growth of total health expenditure. They found no difference in health expenditure between tax-based and insurance-based health financing mechanism. The study also shows that external aid for health reduces government health spending from domestic sources.

Onofrei et al. (2021) investigate the relationship between public health expenditure and health outcomes among the European Union (EU) developing countries. They used the regression and factor analyses. The researchers find that public health expenditure and health outcomes have a long-run equilibrium relationship, and the status of health expenditure can improve life expectancy and reduce infant mortality.

Boachie et al. (2016) examined the effect of public health expenditure on health status of Ghana. The author used annual time series data on infant mortality rate, real GDP per capita, literacy, level, and female labor force participation rate between 1990 and 2012. The OLS estimation technique was utilized. The authors find that there is a negative relationship between per capita income, health expenditure, education, female presence in the labor market, and infant mortality rate. Hence, they conclude that public health expenditure and literacy improve health status by reducing infant mortality.

Sango-Coker and Bein (2018) investigate the private, public, and public-private health care expenditure in West Africa. The authors used pooled regression and pairwise correlation. They find a negative relation between health care expenditure and life expectancy.

Answar and Ali (2012) examined the long-run and short-run relationship between government investment in health and returns in the period 1975-2009 in Pakistan. Life expectancy at birth and infant mortality rate were used as proxies for return on health investment. The authors find that per capita government health expenditure and number of maternal and child health centers and doctors significantly affect the infant mortality rate and life expectancy at birth.

Bein et al. (2017) examine the relationship between health care expenditure and health outcomes for eight East Africa countries. The authors used the panel data regression analysis using data between 2000-2014. The result suggests that there is a positive relationship between total health care expenditure and total life expectancy. The study further revealed that there is a stronger relationship between female life expectancy and health care expenditure than male life expectancy. They also find a negative relationship between health care expenditure and neonatal, infant, and under-5 mortality rates.

Anyanwu and Erhijakpor (2007) examine the relationship between per capita income, total health expenditure, and per capita income on infant mortality rate and under-5 mortality rate. The authors used data from 47 Africa countries between 1999 and 2004. They find a significant relationship between health care expenditure and infant and under-5 mortality rates.

Arthur and Oaikhenan (2017) examine the effect of health expenditure on health outcomes in sub-Sahara African (SSA) countries. The study used 40 countries in SSA. They employ the use of fixed-effect for the empirical analyses. The findings suggest that health expenditure has a significant impact on health outcomes by reducing mortality rate and increasing life expectancy at birth.

2.2 Theoretical Literature Review

The theoretical background of this topic can be traced back to 1972 when Michael Grossman developed the Grossman model of health demand:

$$H = f(X) \tag{2.1}$$

In the equation above, H is a measure of individual health output and X represents the vector of individual inputs to the health production function. The elements of the vector include nutrient intake, income, consumption of public goods, education, time devoted to health-related procedures, initial individual endowments like genetic makeup, and community endowments such as the environment (Grossman, 1972). The Grossman model was then further specified by Fiyissa and Gutema (2005).

$$H = F (Y, S, V, D) \tag{2.2}$$

The major difference between the two equations is that the original theoretical model analyzes health production on the microlevel while the revised model analyzes the production at the macrolevel. H is still a vector of health outcomes such as life expectancy at birth, infant mortality rate, under-5 mortality rate, and neonatal mortality rate. Y is a vector of per capita economic variables. These include GDP per capital, employment, health expenditure. S is a vector of social variables such as education and population age group, V is a vector of environmental factors such as sanitation, prevalence of diseases, availability of water, and carbon dioxide emission. D is a vector of health service variables such as rate of immunization.

$$H = F (y_1 , y_2 , \dots , y_n ; s_1 , s_2 , \dots , s_n ; v_1 , v_2 , \dots , v_n ; d_1 , d_2 , \dots , d_n ;) \tag{2.3}$$

In its scalar form Equation (2.2) is represented by equation (2.3). where $Y = (y_1, y_2, \dots, y_n)$; $S = (s_1, s_2, \dots, s_n)$; $V = (v_1, v_2, \dots, v_n)$; and $D = (d_1, d_2, \dots, d_n)$. n represents the number of variables in each subgroup.

This reformation of the Grossman model is adopted to form the basis for the formation of the model we used for this research. The health outcomes used in this research include life expectancy, infant mortality rate, neonatal mortality, and under-5 mortality rates.

3 Empirical Method

3.1 Data and Methodology

Panel data was used, which is the combination of time series data and cross-sectional data, which implies that the results came from multiple time periods for various countries. Because of cultural factors, the difference in business climate, and natural amenities that vary across countries but are not observable, as well as factors that change over time, such as national policies, government regulations, and international agreements, a mixed-effects regression is the appropriate estimation methodology. The use of the ordinary least square where the heterogeneous factors are not put into considerations the results will bias the results. Therefore, the main reason people use mixed-effects methods is its ability to control all the characteristics of the individuals gathered; this then allows them to eliminate all the potentially significant biases (Jacqueline et al., 2018).

Table 3.1 Definition of Variables

VARIABLES	DEFINITIONS
LE	Life expectancy. (total years)
NMR	Neonatal mortality rate (per 1000 live births)
UMR	Under-5 mortality rate (per 1000 live births)
DGEPC	Domestic general government health expenditure per capita (current US\$)
DPHEPC	Domestic private health expenditure per capita (current US\$)
EHEPC	External health expenditure per capita (current US)
GDPC	Real GDP per capita
TUB	Incidence of tuberculosis (per 1000 persons)
HIV	HIV prevalence (per 1000 uninfected persons)
MAL	Incidence of malaria (per 1000 population at risk)
CO2	Carbon-dioxide emissions (metric tons per capita)
UN	Unemployment rate (% of total labor force)
CO2K	Carbon-dioxide emission from gaseous fuel consumption (% of total)
FR	Fertility rate (births per woman)
MEASLES	Immunization, measles
δ	Country-specific effect
λ	Time-specific effect

The descriptive statistics of the variables used in the empirical analyses are provided in Table 3.2 below. It shows the mean life expectancy in West Africa to be at 57.57. The mean of neonatal mortality rate stood at 34.23 per 1000 live births; this indicates that for every 1000 live births in West Africa region about 34 die before the 28th day. The mean value of under-5 mortality rate is 108.15; this indicates that for every 1000 live births about 108.15 die before the 5th birthday. The mean domestic government health expenditure per capita is 0.01256 US dollars as a proportion of GDP. The mean domestic private health expenditure per capita is 0.01100 US dollars as proportion of GDP. The mean external health expenditure per capita is 0.01100 US dollars as proportion of GDP. The mean value of HIV prevalence per 1000 people uninfected persons is 0.93; this indicates that about 7% of every 1000 persons are infected by HIV.

The mean value of GDP per capita is 1007 US dollars and the mean value of GDP per capita adjusted to the 2010 CPI level of each country is 1052. The mean incidence of malaria is 311.2456 per 1000 people. This means that for every 1000 persons about 311.2456 persons are exposed to the risk of malaria. The carbon-dioxide emission per metric ton per capita is 0.350 metric ton. The mean value of unemployment rate is 5.39%. The mean value of carbon-dioxide emission from gaseous fuel consumption is 4.048%. The mean fertility rate is 5.27 per woman. That is, on the average, women give birth to five children. The tuberculosis mean infection rate is about 167.55 for every 1000 people in West Africa.

Table 3.2 Descriptive Statistics

Simple Statistics						
Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
LE	320	57.56737	6.06377	18422	39.44100	72.98100
NMR	320	34.23219	8.11090	10954	9.00000	54.70000
UMR	320	108.15406	41.87822	34609	14.90000	227.70000
DGEPC	320	0.01256	0.00807	4.01789	0.00241	0.03794
DPHEPC	320	0.02956	0.01844	9.46044	0.00806	0.12799
EHEPC	320	0.01100	0.01318	3.52146	0.0006773	0.10453
CO2	320	0.35069	0.24570	112.21989	0.05303	1.14261
HIV	320	0.93719	0.74733	299.90000	0.05000	3.85000
GDPC	320	1052	717.71933	336740	222.82103	3836
UN	320	5.39894	3.12179	1728	0.32000	12.24000
TUB	320	167.55625	94.44325	53618	37.00000	367.00000
FR	320	5.27079	1.03260	1687	2.24200	7.67900
CO2K	320	4.04788	11.62397	1295	0	57.43494
MAL	320	311.24564	157.37201	99599	0.00761	589.32571
YEARS	320	2010	5.77531	643040	2000	2019

Source: Author's computation

To establish the direction and magnitude of relationship between the variables, we estimate the correlation coefficients, which are represented in Table 3.3 below.

Table 3.3: Correlation Matrix

Pearson Correlation Coefficients, N = 320 Prob > r under H0: Rho=0															
	LE	NMR	UMR	DGEP	DPHEPC	EHEPC	CO2	HIV	GDPC	UN	TUB	FR	CO2K	MAL	YEARS
LE	1.00000	-0.84866 <.0001	-0.91098 <.0001	0.34520 <.0001	-0.47141 <.0001	-0.13475 0.0159	0.60930 <.0001	-0.26409 <.0001	0.31733 <.0001	0.48513 <.0001	-0.44398 <.0001	-0.66665 <.0001	-0.30490 <.0001	-0.68479 <.0001	0.47238 <.0001
NMR	-0.84866 <.0001	1.00000	0.84186 <.0001	-0.37795 <.0001	0.30854 <.0001	0.08409 0.1334	-0.54377 <.0001	0.27686 <.0001	-0.36425 <.0001	-0.33791 <.0001	0.53147 <.0001	0.62381 <.0001	0.20597 0.0002	0.44643 <.0001	-0.51022 <.0001
UMR	-0.91098 <.0001	0.84186 <.0001	1.00000	-0.29215 <.0001	0.41698 <.0001	0.08424 0.1327	-0.59325 <.0001	0.11214 0.0450	-0.35308 <.0001	-0.48462 <.0001	0.33577 <.0001	0.75151 <.0001	0.09844 0.0787	0.63241 <.0001	-0.54254 <.0001
DGEP	0.34520 <.0001	-0.37795 <.0001	-0.29215 <.0001	1.00000	-0.00108 0.9847	-0.05594 0.3185	0.26529 <.0001	0.24503 <.0001	0.33826 <.0001	0.27088 <.0001	-0.06946 0.2153	-0.41932 <.0001	-0.22768 <.0001	-0.36858 <.0001	-0.05416 0.3342
DPHEPC	-0.47141 <.0001	0.30854 <.0001	0.41698 <.0001	-0.00108 0.9847	1.00000	0.38197 <.0001	-0.41082 <.0001	0.04915 0.3809	-0.24182 <.0001	-0.32502 <.0001	0.58506 0.1634	0.07809 0.5020	-0.03766 0.5020	0.20781 0.0002	-0.01984 0.7236
EHEPC	-0.13475 0.0159	0.08409 0.1334	0.08424 0.1327	-0.05594 0.3185	0.38197 <.0001	1.00000	-0.36144 <.0001	0.07077 0.2067	-0.30841 <.0001	-0.04463 0.4262	0.32901 <.0001	0.01956 0.7275	-0.17220 0.0020	0.18093 0.0012	0.07756 0.1663
CO2	0.60930 <.0001	-0.54377 <.0001	-0.59325 <.0001	0.26529 <.0001	-0.41082 <.0001	-0.36144 <.0001	1.00000	-0.05059 0.3670	0.78813 <.0001	0.52271 <.0001	-0.29437 <.0001	-0.66984 <.0001	0.11635 0.0375	-0.58674 <.0001	0.20814 0.0002
HIV	-0.26409 <.0001	0.27686 <.0001	0.11214 0.0450	0.24503 <.0001	0.04915 0.3809	0.07077 0.2067	-0.05059 0.3670	1.00000	0.09503 0.0897	0.00630 0.9107	0.44745 <.0001	0.39794 0.0039	-0.16098 0.0003	0.19968 0.0003	0.04193 0.4547
GDPC	0.31733 <.0001	-0.36425 <.0001	-0.35308 <.0001	0.33826 <.0001	-0.24182 <.0001	-0.30841 <.0001	0.78813 <.0001	0.09503 0.0897	1.00000	0.44745 <.0001	-0.12084 0.0307	-0.52520 <.0001	0.31132 <.0001	-0.39532 <.0001	-0.00201 0.9714
UN	0.48513 <.0001	-0.33791 <.0001	-0.48462 <.0001	0.27088 <.0001	-0.32502 <.0001	-0.04463 0.4262	0.52271 <.0001	0.00630 0.9107	0.44745 <.0001	1.00000	-0.22480 <.0001	-0.42147 <.0001	-0.04850 0.3872	-0.58833 <.0001	0.01772 0.7521
TUB	-0.44398 <.0001	0.53147 <.0001	0.33577 <.0001	-0.06946 0.2153	0.58506 <.0001	0.32901 <.0001	-0.29437 <.0001	0.39794 <.0001	-0.12084 0.0307	-0.22480 <.0001	1.00000	0.00896 0.8731	0.21089 0.0001	0.00864 0.8776	-0.14185 0.0111
FR	-0.66665 <.0001	0.62381 <.0001	0.75151 <.0001	-0.41932 <.0001	0.07809 0.1634	0.01956 0.7275	-0.66984 <.0001	-0.16098 0.0039	-0.52520 <.0001	-0.42147 <.0001	0.00896 0.8731	1.00000	0.03749 0.5040	0.58086 <.0001	-0.35183 <.0001
CO2K	-0.30490 <.0001	0.20597 0.0002	0.09844 0.0787	-0.22768 <.0001	-0.03766 0.5020	-0.17220 0.0020	0.11635 0.0375	0.19968 0.0003	0.31132 0.3872	-0.04850 0.3872	0.21089 0.0001	0.03749 0.5040	1.00000	0.24658 <.0001	-0.05586 0.3192
MAL	-0.68479 <.0001	0.44643 <.0001	0.63241 <.0001	-0.36858 <.0001	0.20781 0.0002	0.18093 0.0012	-0.58674 <.0001	0.04193 0.4547	-0.39532 <.0001	-0.58833 <.0001	0.00864 0.8776	0.58086 <.0001	0.24658 <.0001	1.00000	-0.26611 <.0001
YEARS	0.47238 <.0001	-0.51022 <.0001	-0.54254 <.0001	-0.05416 0.3342	-0.01984 0.7236	0.07756 0.1663	0.20814 0.0002	-0.46753 <.0001	-0.00201 0.9714	0.01772 0.7521	-0.14185 0.0111	-0.35183 <.0001	-0.05586 0.3192	-0.26611 <.0001	1.00000

Furthermore, we present a visualization of the performance of life expectancy and neonatal mortality rate. Figure 3.1 shows the life expectancy trend in West Africa. The figure shows that there is a continuous increase in life expectancy. Cabo Verde is at the top of the life expectancy trend. Life expectancy increases in five years between 2000 and 2015, the fastest increase since the 1960s. However, there was a sharp drop in life expectancy in Africa in the 1990s because of HIV prevalence. There was a later sharp increase in Africa by about 9.4 years to about 60 years. This sharp increase is a result of progress of malaria control and expanded access to antiretroviral treatment of HIV (WHO, 2020).

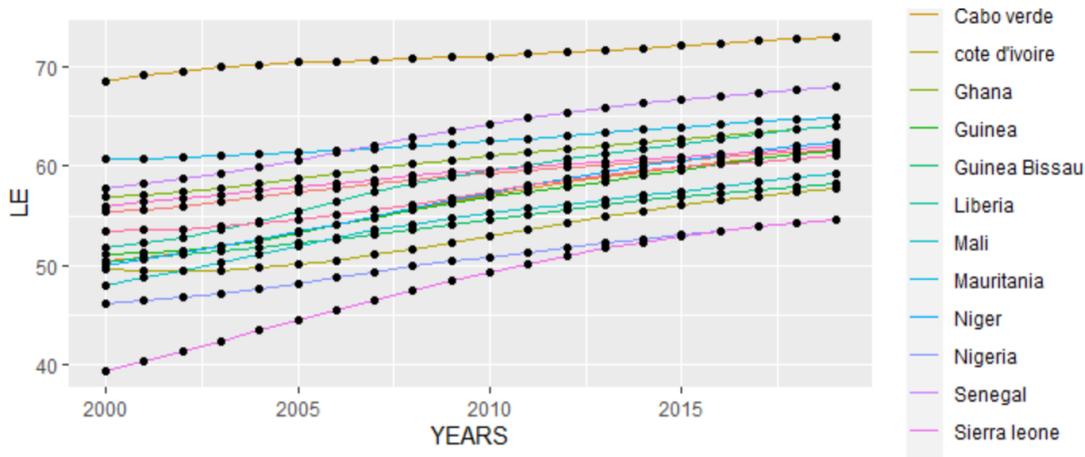


Figure 3.1: Life expectancy in West Africa.

Figure 3.2 presents the neonatal mortality trend. The figure shows a downward trend of the rate of neonatal mortality rate in West Africa region. This is attributable to improved technology, availability of antibiotics, vaccines, advanced medical equipment, and other prenatal care. According to the World Health Organization (2020), accelerated progress for neonatal survival and promotion of health and well-being requires strengthening quality of care as well as ensuring availability of quality health services for small and sick newborns. The number of neonatal deaths declined from 5.0 million in 1990 to 2.4 million in 2019. However, the decline has been slower than the under-5 mortality rate. The share of neonatal death rate among under-5 mortality rate is still relatively low in sub-Saharan Africa.

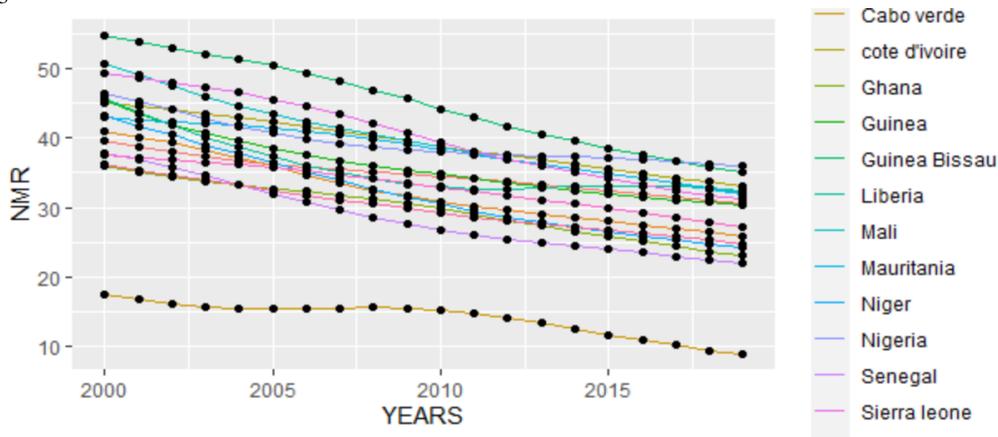


Figure 3.2: Neonatal mortality rate in West Africa.

Under-5 mortality rates in West Africa is visualized in figure 3.3 below. The line plot shows a continuous decline in the rate of under-5 mortality.

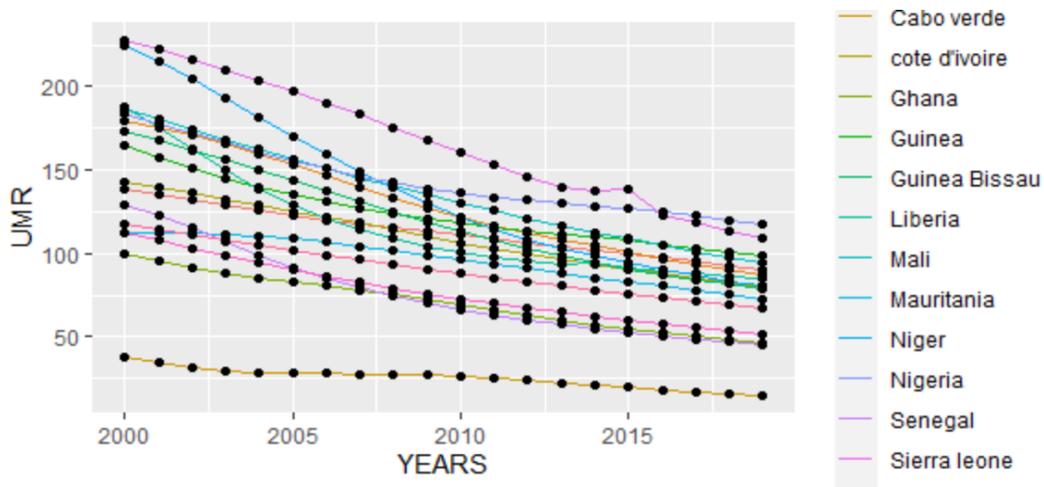


Figure 3.3: Under-5 mortality rate in West Africa.

Figure 3.4 shows the incidence of tuberculosis in West Africa region. The line plot shows that some countries' incidence of tuberculosis is very low while other countries are still very high and moving at steady levels. This trend is because of low case detection, late reporting, poor treatment and adherence leading to development of drug resistance and relapse (Asare et al, 2021).

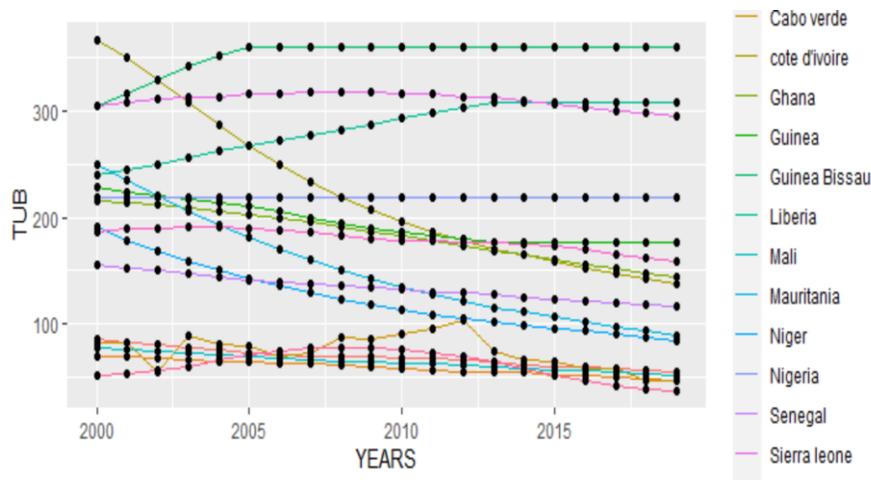


Figure 3.4: Incidence of tuberculosis in West Africa.

Figure 3.5 shows the rate of malaria prevalence in West Africa. The plot shows a downward movement of the line plot. This shows a continuous fall in the rate of malaria incidence. This is attributable to different measures taken by the government, private agencies, and international health and bilateral organizations to curb the incidence of malaria. Some of the measures include the provision of mosquito nets, medications, and medical personnel. However, most countries are still faced with some level of malaria incidence challenges; these countries have poor living environment and lack of potable drinking water. The body of water breeds Anopheles mosquitoes that spreads malaria through injection of plasmodium.

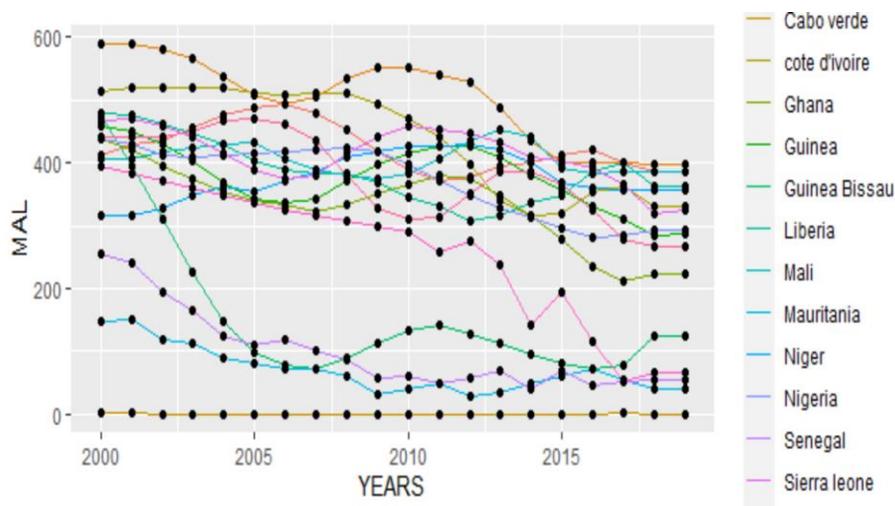


Figure 3.5: Incidence of malaria in West Africa.

3.2 Model Specification

Drawing from the theoretical reviews of Grossman (1972) and Fiyissa and Gutema (2005), we can state the equation that examines the impact of health expenditure on health outcome as proxied by life expectancy, infant mortality rate, under-5 mortality rate and neonatal mortality rate. Life expectancy is expressed in the number of years. The infant mortality rate is the number of deaths per 1000 live births. The under-5 mortality rate is the number of deaths per 1000 of population from age 5 and below. The neonatal mortality rate is the number of deaths per 1000 of live births.

$$Y_{it} = X'_{it}\beta_i + Z_i\delta + \epsilon_{it} \tag{3.1}$$

$$\epsilon \sim N(0, \delta^2 I)$$

where Y_{it} is the vector of the dependent variable and X'_{it} is the vector of the covariates, β_i is the vector of the coefficients of the covariates, Z_i is the design matrix for random effects which include intercept, δ_i is the vector of subject specific and ϵ_{it} is vector of the error terms.

We formulate the statistical model for life expectancy, neonatal mortality rate and

under-5 mortality rates are expressed as follows:

$$LE_{it} = \alpha_0 + \alpha_1 DGEPC_{it} + \alpha_2 DPHEPC_{it} + \alpha_3 EHEPC_{it} + \alpha_4 GDPC_{it} + \alpha_5 CO2_{it} + \alpha_6 HIV_{it} + \alpha_7 MAL_{it} + \alpha_8 Unemp_{it} + \alpha_9 FR_{it} + \alpha_{10} CO2K_{it} + \alpha_{11} TUB_{it} + \delta_i + \gamma_t + \epsilon_{it} \tag{3.2}$$

The model for neonatal mortality rate is developed as follows:

$$NMR_{it} = \beta_0 + \beta_1 DGEPC_{it} + \beta_2 DPHEPC_{it} + \beta_3 EHEPC_{it} + \beta_4 GDPC_{it} + \beta_5 CO2_{it} + \beta_6 HIV_{it} + \beta_7 MAL_{it} + \beta_8 Unemp_{it} + \beta_9 FR_{it} + \beta_{10} CO2K_{it} + \beta_{11} TUB_{it} + \delta_i + \gamma_t + \epsilon_{it} \tag{3.3}$$

The model for under-5 mortality rate is developed as follows:

$$UMR_{it} = \lambda_0 + \lambda_1 DGEPC_{it} + \lambda_2 DPHEPC_{it} + \lambda_3 EHEPC_{it} + \lambda_4 GDPC_{it} + \lambda_5 CO2_{it} + \lambda_6 HIV_{it} + \lambda_7 MAL_{it} + \lambda_8 Unemp_{it} + \lambda_9 FR_{it} + \lambda_{10} CO2K_{it} + \lambda_{11} TUB_{it} + \delta_i + \gamma_t + \epsilon_{it} \tag{3.4}$$

where the subscript i ($=1 \dots n$) represents the countries and t ($=1 \dots i$) represents the period (years).

3.3 Research Design and Methodology

The research design adopted for this study is a cross-country research design. Sixteen countries in West Africa were studied. The research work employed basically the secondary data sourced from World Bank development indicators. The health expenditure variables were used after adjusting for the effect of inflation using the Consumer Price Index with 2010 as base year. The period of estimation is 2000-2019.

In this study, the method of data analysis is mixed-effects (fixed and random) analysis. The mixed-effect model contains both the fixed and random effects. The selection criterion used is the Akaike information criterion (AIC) and Bayesian information criterion (BIC). The analyses were done using SAS and R statistical software.

3.4 Diagnostic Tests

To assess whether the residual in the regression analyses follows a normal distribution, we plot the density and the quantile-quantile (Q-Q), residual versus fitted, scale location and residual versus leverage plots. The life expectancy model is represented in Figures 3.6 and 3.7. The density plot follows a bell shape, so there is no need to transform the data because the residuals are normally distributed. The Q-Q plot shows the alignments of the plots along the straight line at a 45-degree angle; then we can conclude that the residuals of the data are normally distributed and consequently meet the requirement of the assumptions to confidently use the regression models. The residual versus leverage plot only shows a single outlier and we cannot conclude that the model does not approximate the points. The scale location plot shows that the constant variance assumption is met, so we can confidently rely on the probability values obtained.

Neonatal and under-5 mortality rates are represented in Figures 3.8 and 3.9 respectively. The Q-Q plots show that residual of the model is normally distributed, so there is no need to transform the models. There is no evidence for outlier in the residual versus leverage plots for both models. We can conclude that the models well approximate the points. The scale location also shows the constant variance assumption is met; hence, we can confidently rely on the probability values obtained in the two models.

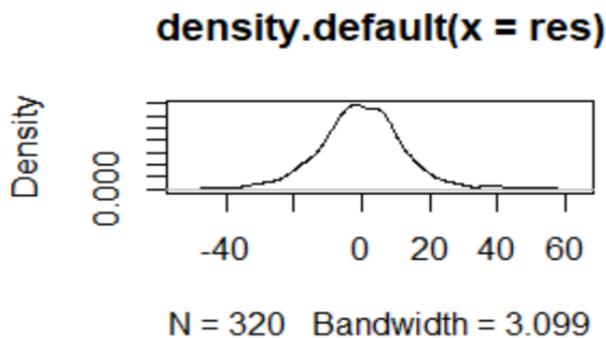


Figure 3.6: Normality test for Model 3.2.

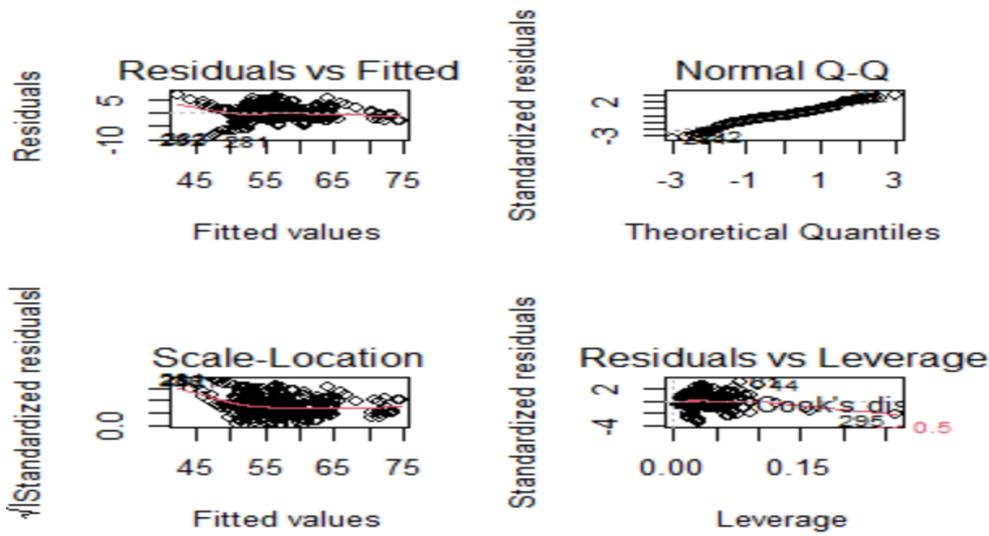


Figure 3.7: Diagnostic test for Model 3.2.

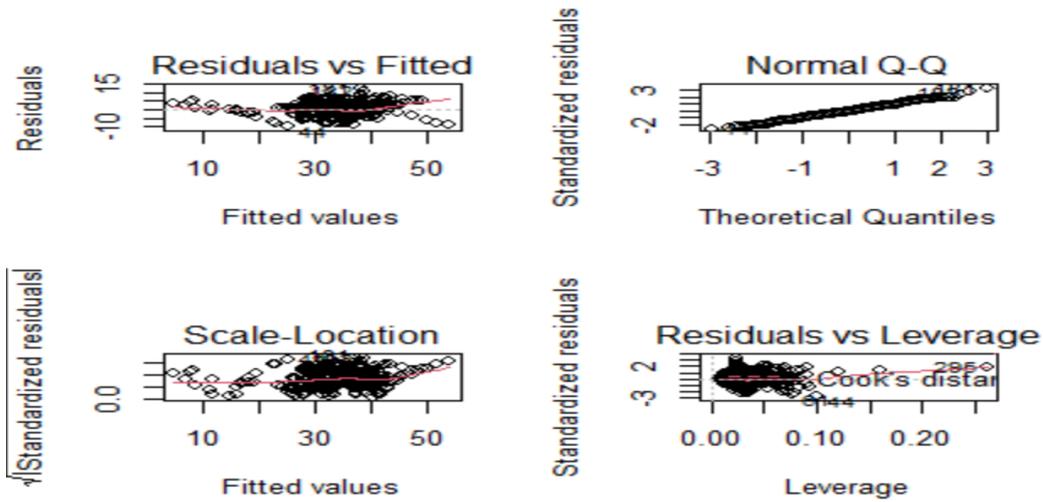


Figure 3.8: Diagnostic test for Model 3.3.

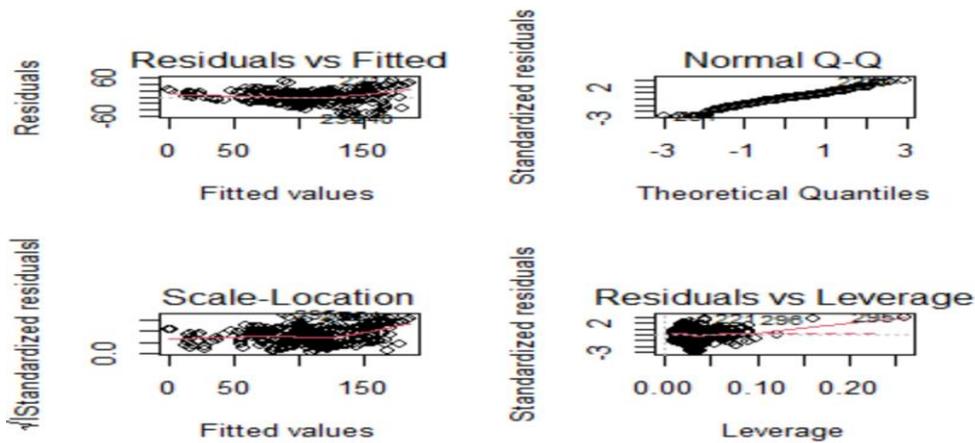


Figure 3.9: Diagnostic test for Model 3.4.

4 Presentations of Empirical Results

This study focuses on West Africa countries. We utilized the cross-section of 16 West Africa countries for the period of 2000-2019. The study utilized the mixed-effect regression model for life expectancy and neonatal and under-five mortality rate. In addition, the Akaike information criterion (AIC) and Bayesian information criterion (BIC) are used for model selection.

Model One

Table 4.1 shows the GLM result from Model 3.2. It has F-value of 735.6 with probability value of less than 0.05. Hence the overall impact of the covariates on life expectancy is statistically significant. The R-squared is 0.985506. This indicates that about 98% of the systematic variations in life expectancy is explained by the covariates. We can conclude that the model has a good fit. The coefficient estimates from Model 3.2 is presented in Tables 4.1-4.2 and Appendix A.1. The model explains the impact of certain hypothesized variables on life expectancy. We choose the random-effect model with autoregressive structure because the AIC, AICC, and BIC are smallest, so it explains the model better. The residual variance is 0.04477. From the model, the domestic government expenditure per capita and the external health expenditure per capita are statistically insignificant. This implies that they do not significantly have effect on life expectancy. The domestic private health expenditure per capita with coefficient of 1.4269 is statistically significant at 5% level. This suggests that a unit increase in domestic private health expenditure per capita will result in increase in life expectancy by 1.4269. Carbon-dioxide metric per capita is statistically insignificant, so it has no impact on life expectancy. HIV with coefficient of -0.02826 is statistically significant. This indicates that a unit increase in HIV will decrease life expectancy by -0.02826. GDP per capita is statistically insignificant, so it does not significantly impact life expectancy. Unemployment and tuberculosis are statistically insignificant; so they do not affect life expectancy. Fertility rate with a coefficient of 0.1236 is statistically significant at 5 % level. This indicates that a unit increase in fertility rate will result to 0.1236 increase in life expectancy. Carbon-dioxide emission from gas and fuel is statistically insignificant. Malaria with a coefficient of -0.00028 is statistically significant at 5% level. This indicates that a unit increase in malaria will decrease life expectancy by -0.00028. The year-specific effect is statistically insignificant.

Table 4.1: GLM Regression Result

The GLM Procedure

Dependent Variable: LE

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	27	11559.38935	428.12553	735.36	<.0001
Error	292	170.00252	0.58220		
Corrected Total	319	11729.39186			

R-Square	Coeff Var	Root MSE	LE Mean
0.985506	1.325439	0.763021	57.56737

Parameter	Estimate		Standard Error	t Value	Pr > t
Intercept	61.05750382	B	2.52604742	24.17	<.0001
DGEPC	6.18369544		9.72195466	0.64	0.5252
DPHEPC	-13.00196003		6.12758863	-2.12	0.0347
EHEPC	31.86129286		5.44723050	5.85	<.0001
CO2	-7.17642216		0.75524963	-9.50	<.0001
HIV	0.53636306		0.13667114	3.92	0.0001
GDPC	-0.00012862		0.00014435	-0.89	0.3736
UN	-0.02006031		0.04211134	-0.48	0.6342
TUB	0.00430732		0.00218851	1.97	0.0500
FR	-2.27225252		0.40494849	-5.61	<.0001
CO2K	-0.01517829		0.00871736	-1.74	0.0827
MAL	0.00237490		0.00098989	2.40	0.0171
index	0.46869593		0.02968565	15.79	<.0001
COUNTRY Benin	7.44138769	B	0.52853940	14.08	<.0001
COUNTRY Burkina Faso	3.38406758	B	0.60123421	5.63	<.0001
COUNTRY Cabo verde	17.77053802	B	1.36012749	13.07	<.0001
COUNTRY Ghana	6.15359709	B	0.53583587	11.48	<.0001
COUNTRY Guinea	2.54719564	B	0.44935242	5.67	<.0001
COUNTRY Guinea Bissau	-1.45691450	B	0.61396282	-2.37	0.0183
COUNTRY Liberia	3.36101648	B	0.50499281	6.66	<.0001
COUNTRY Mali	3.50455670	B	0.74289015	4.72	<.0001
COUNTRY Mauritania	12.31099241	B	0.64316114	19.14	<.0001
COUNTRY Niger	7.18615426	B	1.05836814	6.79	<.0001
COUNTRY Nigeria	1.31024437	B	0.47461174	2.76	0.0061
COUNTRY Senegal	12.69099162	B	0.58883423	21.55	<.0001
COUNTRY Sierra leone	-7.30702605	B	0.63835335	-11.45	<.0001
COUNTRY The Gambia	5.41598100	B	0.56578552	9.57	<.0001
COUNTRY Togo	3.25779370	B	0.54355466	5.99	<.0001
COUNTRY cote d'ivoire	0.00000000	B	-	-	-

Source: Author's estimation

Table 4.2: Random-Effect Regression Results

Covariance Parameter Estimates		
Cov Parm	Subject	Estimate
AR(1)	COUNTRY	0.9719
Residual		0.04477

Fit Statistics	
-2 Res Log Likelihood	-830.7
AIC (Smaller is Better)	-826.7
AICC (Smaller is Better)	-826.6
BIC (Smaller is Better)	-825.1

Null Model Likelihood Ratio Test		
DF	Chi-Square	Pr > ChiSq
1	637.08	<.0001

Null Model Likelihood Ratio Test		
DF	Chi-Square	Pr > ChiSq
1	637.08	<.0001

Solution for Fixed Effects					
Effect	Estimate	Standard Error	DF	t Value	Pr > t
Intercept	-0.1719	0.3174	15	-0.54	0.5961
DGEPC	-0.03288	0.9682	276	-0.03	0.9729
DPHEPC	1.4269	0.5993	276	2.38	0.0180
EHEPC	-0.07067	0.4668	276	-0.15	0.8798
CO2	-0.1054	0.07561	276	-1.39	0.1646
HIV	-0.02826	0.01320	276	-2.14	0.0332
GDPC	0.000021	0.000015	276	1.41	0.1590
UN	0.004951	0.005814	276	0.85	0.3952
TUB	-0.00045	0.000389	276	-1.15	0.2524
FR	0.1236	0.04936	276	2.50	0.0128
CO2K	0.000875	0.000818	276	1.07	0.2860
MAL	-0.00028	0.000132	276	-2.09	0.0371
index	0.003018	0.004201	276	0.72	0.4731

Source: Author’s estimation

Model Two

Table 4.3 shows the GLM result from Model 3.3. The model has F-value of 473.34 with a probability value of less than 0.05. This indicates that the overall impact of the covariates on under-5 mortality rate is statistically significant. The R-squared is 0.977662. This shows that 97.7% of systematic variation in under-5 mortality rate is explained by the covariates. We can conclude that the model has a good fit. The model explains the impact of certain hypothesized variables on neonatal mortality rate. We choose the fixed-effect model because AIC, AICC, and BIC are smallest, so it explains the model better. The result of the fixed-effect model is presented in Table 4.4. The domestic government health expenditure per capita with a coefficient of 86.0403 is statistically significant. However, it does not possess the a priori expectation. Domestic private health expenditure per capita and external health expenditure per capita with

coefficients of -35.4925 and -44.8486 respectively indicate that a unit increase in private health expenditure per capita and external health expenditure per capita will result to a decrease in neonatal mortality rate by -35.4925 and -44.8486 respectively.

Carbon-dioxide emission metric ton per capita with coefficient of 7.6078 is statistically significant. This indicates that a unit increase in a carbon-dioxide emission metric ton per capita will increase neonatal mortality rate by 7.6078. HIV and GDP per capita are statistically insignificant. Unemployment and tuberculosis with coefficients of 0.1423 and 0.008310 are statistically significant. This indicates a unit increase in unemployment and tuberculosis will result in neonatal mortality rate by 0.1423 and 0.008310 respectively. Fertility rate, carbon-dioxide emission from gas and fuel, and malaria are statistically insignificant. The year-specific effect is statistically significant.

The country-specific effect is statistically significant except Mali. Cabo Verde with coefficient of -33.4806 has the lowest magnitude of neonatal mortality rate, so we can conclude that Cabo Verde has the least neonatal mortality rate in West Africa. For all countries under study, Benin with coefficient of -5.4629, Burkina Faso with coefficient of -5.8156, Cabo Verde with coefficient of -33.4806, Ghana with coefficient of -12.2070, Guinea with a coefficient of -2.7195, Liberia with a coefficient of -2.9126, Mauritania with coefficient of -5.6770, Niger with coefficient of -5.8371, Nigeria with a coefficient of -2.8068, Senegal with a coefficient of -14.6616, Gambia with a coefficient of -6.7080 and Togo with a coefficient of -8.4254. However, Guinea Bissau with coefficient of 4.9804 and Sierra Leone with coefficient of 3.5247 have lower rate of neonatal mortality than Cote d'Ivoire. From the estimate we can conclude that neonatal mortality rate is significantly decreasing in West Africa.

Table 4.3: GLM Regression Result

The GLM Procedure					
Dependent Variable: NMR					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	27	20517.20150	759.89635	473.34	<.0001
Error	292	468.77697	1.60540		
Corrected Total	319	20985.97847			

R-Square	Coeff Var	Root MSE	NMR Mean
0.977662	3.701324	1.267044	34.23219

Parameter	Estimate		Standard Error	t Value	Pr > t
Intercept	44.47544943	B	4.19466186	10.60	<.0001
DGEP	86.04025790		16.14392199	5.33	<.0001
DPHEPC	-35.49246506		10.17524934	-3.49	0.0006
EHEPC	-44.84856647		9.04547155	-4.96	<.0001
CO2	7.60779593		1.25413989	6.07	<.0001
HIV	-0.42858016		0.22695108	-1.89	0.0600
GDPC	-0.00011692		0.00023971	-0.49	0.6261
UN	0.14233271		0.06992855	2.04	0.0427
TUB	0.00830951		0.00363416	2.29	0.0229
FR	0.03861344		0.67244263	0.06	0.9542
CO2K	-0.02283528		0.01447573	-1.58	0.1158
MAL	-0.00191772		0.00164378	-1.17	0.2443
index	-0.79381893		0.04929491	-16.10	<.0001
COUNTRY Benin	-5.46287889	B	0.87767318	-6.22	<.0001
COUNTRY Burkina Faso	-5.81557524	B	0.99838751	-5.82	<.0001
COUNTRY Cabo verde	-33.48063617	B	2.25857791	-14.82	<.0001
COUNTRY Ghana	-12.20696587	B	0.88978942	-13.72	<.0001
COUNTRY Guinea	-2.71945599	B	0.74617818	-3.64	0.0003
COUNTRY Guinea Bissau	4.98041846	B	1.01952419	4.89	<.0001
COUNTRY Liberia	-2.91264564	B	0.83857258	-3.47	0.0006
COUNTRY Mali	1.28598992	B	1.23361619	1.04	0.2981
COUNTRY Mauritania	-5.67704008	B	1.06800984	-5.32	<.0001
COUNTRY Niger	-5.83714808	B	1.75748739	-3.32	0.0010
COUNTRY Nigeria	-2.80682015	B	0.78812288	-3.56	0.0004
COUNTRY Senegal	-14.66158079	B	0.97779656	-14.99	<.0001
COUNTRY Sierra leone	3.52470838	B	1.06002620	3.33	0.0010
COUNTRY The Gambia	-6.70798576	B	0.93952272	-7.14	<.0001
COUNTRY Togo	-8.42541441	B	0.90260696	-9.33	<.0001
COUNTRY cote d'ivoire	0.00000000	B	.	.	.

Source: Authors estimation

Table 4.4: Fixed-Effect Regression Result

Dimensions	
Covariance Parameters	1
Columns in X	29
Columns in Z	0
Subjects	1
Max Obs per Subject	320

Number of Observations	
Number of Observations Read	320
Number of Observations Used	320
Number of Observations Not Used	0

Covariance Parameter Estimates	
Cov Parm	Estimate
Residual	1.6054

Fit Statistics	
-2 Res Log Likelihood	1073.8
AIC (Smaller is Better)	1075.8
AICC (Smaller is Better)	1075.8
BIC (Smaller is Better)	1079.5

Solution for Fixed Effects						
Effect	COUNTRY	Estimate	Standard Error	DF	t Value	Pr > t
Intercept		44.4754	4.1947	292	10.60	<.0001
DGEPC		86.0403	16.1439	292	5.33	<.0001
DPHEPC		-35.4925	10.1752	292	-3.49	0.0006
EHEPC		-44.8486	9.0455	292	-4.96	<.0001
CO2		7.6078	1.2541	292	6.07	<.0001
HIV		-0.4286	0.2270	292	-1.89	0.0600
GDPC		-0.00012	0.000240	292	-0.49	0.6261
UN		0.1423	0.06993	292	2.04	0.0427
TUB		0.008310	0.003634	292	2.29	0.0229
FR		0.03861	0.6724	292	0.06	0.9542
CO2K		-0.02284	0.01448	292	-1.58	0.1158
MAL		-0.00192	0.001644	292	-1.17	0.2443
index		-0.7938	0.04929	292	-16.10	<.0001
COUNTRY	Benin	-5.4629	0.8777	292	-6.22	<.0001
COUNTRY	Burkina Faso	-5.8156	0.9984	292	-5.82	<.0001
COUNTRY	Cabo verde	-33.4806	2.2586	292	-14.82	<.0001
COUNTRY	Ghana	-12.2070	0.8898	292	-13.72	<.0001
COUNTRY	Guinea	-2.7195	0.7462	292	-3.64	0.0003

Solution for Fixed Effects						
Effect	COUNTRY	Estimate	Standard Error	DF	t Value	Pr > t
COUNTRY	Guinea Bissau	4.9804	1.0195	292	4.89	<.0001
COUNTRY	Liberia	-2.9126	0.8386	292	-3.47	0.0006
COUNTRY	Mali	1.2860	1.2336	292	1.04	0.2981
COUNTRY	Mauritania	-5.6770	1.0680	292	-5.32	<.0001
COUNTRY	Niger	-5.8371	1.7575	292	-3.32	0.0010
COUNTRY	Nigeria	-2.8068	0.7881	292	-3.56	0.0004
COUNTRY	Senegal	-14.6616	0.9778	292	-14.99	<.0001
COUNTRY	Sierra leone	3.5247	1.0600	292	3.33	0.0010
COUNTRY	The Gambia	-6.7080	0.9395	292	-7.14	<.0001
COUNTRY	Togo	-8.4254	0.9026	292	-9.33	<.0001
COUNTRY	cote d'ivoire	0

Source: Author's estimation

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Model Three

Table 4.5 below shows the result from the GLM from Model 3.4. It has F-value of 220.70 with a probability value of less than 0.05. This indicates that the overall impact of the covariates on the under-5 mortality rate is significant. The R-squared is 0.953287. This indicates that about 95.3% of systematic variation of under-5 mortality rate is explained by the covariates. We can conclude that the model has a good fit. We choose the fixed-effect model because the AIC, AICC, and the BIC are smallest, so it explains the model better. The result from the fixed-effect model is presented in Table 4.6. From the model, domestic government health expenditure per capita is statistically insignificant; thus, it does not significantly impact under-5 mortality rates. The domestic private health expenditure and the external health expenditure per capita with coefficients of -158.65 and -275.75 respectively have the expected signs and are statistically significant at 5% level. This indicates a unit increase in domestic private health expenditure per capita and external health expenditure will decrease under-5 mortality rates by -158.65 and -275.75 respectively. Carbon-dioxide emissions metric ton per capita with a coefficient of 72.1525 is statistically significant. This indicates a unit increase in carbon-dioxide emission metric ton per capita will lead to 72.1525 increase in under-5 mortality rates. HIV with coefficient of -5.7355 is statistically significant; however, it does not possess the a priori expectation. GDP per capita, unemployment, tuberculosis, fertility rate, and carbon-dioxide emission from gas and fuel are statistically insignificant; thus, they have no impact on under-5 mortality rates. Malaria with coefficient of -0.02566 is statistically significant; however, it does possess the a priori expectation. The year-specific effect is statistically significant.

The country-specific effect with reference to Cote d’Ivoire is statistically significant except Niger and Nigeria. Cabo Verde with coefficient of -138.7, Benin with coefficient of -16.3853, Ghana with a coefficient of -51.7583, Mauritania with a coefficient of -54.8854, Senegal with coefficient of -69.2872, Gambia with coefficient of -33.0701, and Togo with coefficient of -19.5787 performs better than Cote d’Ivoire on under-5 mortality rates. The result shows that Cabo Verde has the least under-5 mortality rates in West Africa. This supports the line plot in Figure 3.2. Burkina Faso with coefficient of 22.3177, Guinea with coefficient of 17.0202, Guinea Bissau with coefficient of 21.1071, Liberia with coefficient of 14.8177, Mali with a coefficient of 21.7404 and Sierra Leone with coefficient of 82.8554 perform well less than Cote Ivoire.

Table 4.5: GLM Regression Result

The GLM Procedure
 Dependent Variable: UMR

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	27	533323.8645	19752.7357	220.70	<.0001
Error	292	26133.7503	89.4991		
Corrected Total	319	559457.6147			

R-Square	Coeff Var	Root MSE	UMR Mean
0.953287	8.747151	9.460399	108.1541

Parameter	Estimate		Standard Error	t Value	Pr > t
Intercept	135.5505104	B	31.3194908	4.33	<.0001
DGEPC	209.8686141		120.5387781	1.74	0.0827
DPHEPC	-158.6452173		75.9736155	-2.09	0.0376
EHEPC	-275.7493404		67.5381167	-4.08	<.0001
CO2	72.1524908		9.3640498	7.71	<.0001
HIV	-5.7354738		1.6945329	-3.38	0.0008
GDPC	-0.0016782		0.0017898	-0.94	0.3492
UN	0.3879775		0.5221223	0.74	0.4580
TUB	-0.0031946		0.0271345	-0.12	0.9064
FR	4.2986602		5.0208006	0.86	0.3926
CO2K	-0.0518649		0.1080832	-0.48	0.6317
MAL	-0.0256649		0.0122733	-2.09	0.0374
index	-4.7984310		0.3680610	-13.04	<.0001
COUNTRY Benin	-16.3853055	B	6.5531568	-2.50	0.0130
COUNTRY Burkina Faso	22.3178727	B	7.4544718	2.99	0.0030
COUNTRY Cabo verde	-138.3677790	B	16.8636978	-8.21	<.0001
COUNTRY Ghana	-51.7582796	B	6.6436229	-7.79	<.0001
COUNTRY Guinea	17.0202449	B	5.5713479	3.05	0.0025
COUNTRY Guinea Bissau	21.1071155	B	7.6122890	2.77	0.0059
COUNTRY Liberia	14.8177387	B	6.2612117	2.37	0.0186

Parameter	Estimate		Standard Error	t Value	Pr > t
COUNTRY Mali	21.7404020	B	9.2108094	2.36	0.0189
COUNTRY Mauritania	-54.8854471	B	7.9743077	-6.88	<.0001
COUNTRY Niger	25.4222784	B	13.1222997	1.94	0.0537
COUNTRY Nigeria	3.6169637	B	5.8845285	0.61	0.5393
COUNTRY Senegal	-69.2871835	B	7.3007292	-9.49	<.0001
COUNTRY Sierra leone	82.8553577	B	7.9146977	10.47	<.0001
COUNTRY The Gambia	-33.0701222	B	7.0149571	-4.71	<.0001
COUNTRY Togo	-19.5786792	B	6.7393252	-2.91	0.0040
COUNTRY cote d'ivoire	0.0000000	B	.	.	.

Source: Author's estimation

Table 4.6: Fixed-Effect Regression Result

Dimensions	
Covariance Parameters	1
Columns in X	29
Columns in Z	0
Subjects	1
Max Obs per Subject	320

Number of Observations	
Number of Observations Read	320
Number of Observations Used	320
Number of Observations Not Used	0

Covariance Parameter Estimates	
Cov Parm	Estimate
Residual	89.4991

Fit Statistics	
-2 Res Log Likelihood	2247.9
AIC (Smaller is Better)	2249.9
AICC (Smaller is Better)	2249.9
BIC (Smaller is Better)	2253.6

Solution for Fixed Effects						
Effect	COUNTRY	Estimate	Standard Error	DF	t Value	Pr > t
Intercept		135.55	31.3195	292	4.33	<.0001
DGEPC		209.87	120.54	292	1.74	0.0827
DPHEPC		-158.65	75.9736	292	-2.09	0.0376
EHEPC		-275.75	67.5381	292	-4.08	<.0001
CO2		72.1525	9.3640	292	7.71	<.0001
HIV		-5.7355	1.6945	292	-3.38	0.0008
GDPG		-0.00168	0.001790	292	-0.94	0.3492
UN		0.3880	0.5221	292	0.74	0.4580
TUB		-0.00319	0.02713	292	-0.12	0.9064
FR		4.2987	5.0208	292	0.86	0.3926
CO2K		-0.05186	0.1081	292	-0.48	0.6317
MAL		-0.02566	0.01227	292	-2.09	0.0374
index		-4.7984	0.3681	292	-13.04	<.0001
COUNTRY	Benin	-16.3853	6.5532	292	-2.50	0.0130
COUNTRY	Burkina Faso	22.3179	7.4545	292	2.99	0.0030
COUNTRY	Cabo verde	-138.37	16.8637	292	-8.21	<.0001
COUNTRY	Ghana	-51.7583	6.6436	292	-7.79	<.0001
COUNTRY	Guinea	17.0202	5.5713	292	3.05	0.0025

Solution for Fixed Effects						
Effect	COUNTRY	Estimate	Standard Error	DF	t Value	Pr > t
COUNTRY	Guinea Bissau	21.1071	7.6123	292	2.77	0.0059
COUNTRY	Liberia	14.8177	6.2612	292	2.37	0.0186
COUNTRY	Mali	21.7404	9.2108	292	2.36	0.0189
COUNTRY	Mauritania	-54.8854	7.9743	292	-6.88	<.0001
COUNTRY	Niger	25.4223	13.1223	292	1.94	0.0537
COUNTRY	Nigeria	3.6170	5.8845	292	0.61	0.5393
COUNTRY	Senegal	-69.2872	7.3007	292	-9.49	<.0001
COUNTRY	Sierra leone	82.8554	7.9147	292	10.47	<.0001
COUNTRY	The Gambia	-33.0701	7.0150	292	-4.71	<.0001
COUNTRY	Togo	-19.5787	6.7393	292	-2.91	0.0040
COUNTRY	cote d'ivoire	0	-	-	-	-

Source: Author's estimation

4.1 Discussion of Results

Many people have advocated for higher health care expenditure but very few empirical works have been carried out to determine the impact on health outcomes (Anyanwu and Erhijakpor, 2007). This research provides empirical support for the advocacy for the increase in health care expenditure in West Africa region. The result shows that domestic government health expenditure per capita has a insignificant impact on life expectancy and under-5 mortality rate. However, it significantly impacts neonatal mortality rate but does not possess the expected sign. This could be attributable to the state of poor management of resources and administrative bottlenecks in West Africa. Health care resources and budgets may not be properly deployed judiciously. The domestic private health expenditure per capita has significant impact on life expectancy, neonatal mortality rate, and under-5 mortality rates. This conforms to the findings of Bein et al. (2017), Anyanwu and Erhijakpor (2007), Arthur and Oaikhenan (2017). The health resources from private donors, out-of-pocket health expenditure, and stakeholders' contribution are properly utilized. The external health expenditure per capita has no significant impact on life expectancy. However, it has significant impacts on neonatal mortality rate and under-5 mortality rate. These findings are consistent with the finds of Anyanwu and Erhijakpor (2007) and Arthur and Oaikhenan (2017). Carbon-dioxide emission does not significantly impact life expectancy. It however significantly affects neonatal and under-5 mortality rate. This suggests that carbon- dioxide emission metric ton per capita is sensitive to age. Children's health is essentially vulnerable to environmental health condition. This is consistent with the finding of Glinianaia et al. (2004). GDP per capita has no significant impact on life expectancy, neonatal, and under-5 mortality rates. This conforms to the findings of Anand and Ravallion (1993). The authors argued that social outcomes such as health status can be enhanced through the reduction in income poverty; hence, per capita income growth alone does

not matter in reducing mortality rate. This further suggests that GDP per capita does not directly affect health outcomes. It could affect health outcome through other forms of channels.

Unemployment does not significantly impact life expectancy and under-5 mortality rates; however, it affects neonatal mortality rate. Tuberculosis significantly impacts neonatal mortality rate. It does not significantly affect life expectancy and under-5 mortality rates. This is attributed to much health resources channeled to curbing the devastating effect of tuberculosis in West Africa. Fertility rate significantly affects life expectancy but does not significantly affect under-5 and neonatal mortality rates. This suggests that the number of children which a woman bears in West Africa affects the life expectancy. Carbon-dioxide emission from gas and fuel has no significant impact on life expectancy, neonatal mortality rate, and under-5 mortality rates. Malaria significantly impacts life expectancy and under-5 mortality rates. However, it does not affect neonatal mortality rates.

For country-specific effect, the results reveal that Cabo Verde has best performance in health outcomes. This suggests that Cabo Verde government and health stakeholders are efficient in the management of health care resources. This finding is also supported with the line plots.

5 Summary and Recommendations

This research investigates the impact of health expenditures on health outcomes in West Africa region. The health care expenditures examined in this study include domestic government health expenditure per capita, private health expenditure per capita, and external health care expenditure per capita. After controlling for other factors that affect health outcomes such as HIV, tuberculosis, unemployment, carbon-dioxide emission, immunization, GDP per capita, and malaria, the results revealed the importance of health expenditure on health outcomes. Hence it is recommended that government and stakeholders in the health sector in West Africa region make conscious efforts to allocate more resources to the health sector to improve health outcomes. There should be conscious efforts to improve accessibility of health care facilities both in the rural and urban areas of the countries. Increase in health care expenditures will help build primary health care centers for those in the rural areas who may not be able to access the secondary and tertiary care in the urban centers. Building and improving secondary and tertiary health care centers cannot be overemphasized. Proper funding of the health care sector will help in the training and retraining of medical personnel and the provision of vaccines and other forms of medications. The introduction of health insurance to help improve the effectiveness of the private health assessment will be of very paramount importance. The West Africa region should make conscious efforts to reduce the prevalence of HIV cases and incidence of malaria in the region through proper sex education and provision of clean and potable water and educate the citizens on the importance of living in a clean environment that will not give room for the breeding of mosquitoes.

Conflict of interest: The project was solely authored and funded by the Author.

Data availability :The Data used in this research work was obtained from the World Development indicator and the prepared data can be obtained from my GitHub account: <https://github.com/efosa24/efosa24>

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Appendix

A.1 Fixed Effect Model Result for Model 3.2

Class Level Information		
Class	Levels	Values
COUNTRY	16	Benin Burkina Faso Cabo verde Ghana Guinea Guinea Bissau Liberia Mali Mauritania Niger Nigeria Senegal Sierra leone The Gambia Togo cote d'ivoire

Dimensions	
Covariance Parameters	1
Columns in X	29
Columns in Z	0
Subjects	1
Max Obs per Subject	320

Number of Observations	
Number of Observations Read	320
Number of Observations Used	320
Number of Observations Not Used	0

Covariance Parameter Estimates	
Cov Parm	Estimate
Residual	0.5822

Fit Statistics	
-2 Res Log Likelihood	777.7
AIC (Smaller is Better)	779.7
AICC (Smaller is Better)	779.7
BIC (Smaller is Better)	783.3

Solution for Fixed Effects						
Effect	COUNTRY	Estimate	Standard Error	DF	t Value	Pr > t
Intercept		61.0575	2.5260	292	24.17	<.0001
DGEPC		6.1837	9.7220	292	0.64	0.5252
DPHEPC		-13.0020	6.1276	292	-2.12	0.0347
EHEPC		31.8613	5.4472	292	5.85	<.0001
CO2		-7.1764	0.7552	292	-9.50	<.0001
HIV		0.5364	0.1367	292	3.92	0.0001
GDPC		-0.00013	0.000144	292	-0.89	0.3736
UN		-0.02006	0.04211	292	-0.48	0.6342
TUB		0.004307	0.002189	292	1.97	0.0500
FR		-2.2723	0.4049	292	-5.61	<.0001
CO2K		-0.01518	0.008717	292	-1.74	0.0827
MAL		0.002375	0.000990	292	2.40	0.0171
index		0.4687	0.02969	292	15.79	<.0001
COUNTRY	Benin	7.4414	0.5285	292	14.08	<.0001
COUNTRY	Burkina Faso	3.3841	0.6012	292	5.63	<.0001
COUNTRY	Cabo verde	17.7705	1.3601	292	13.07	<.0001
COUNTRY	Ghana	6.1536	0.5358	292	11.48	<.0001
COUNTRY	Guinea	2.5472	0.4494	292	5.67	<.0001
COUNTRY	Guinea Bissau	-1.4569	0.6140	292	-2.37	0.0183
COUNTRY	Liberia	3.3610	0.5050	292	6.66	<.0001
COUNTRY	Mali	3.5046	0.7429	292	4.72	<.0001
COUNTRY	Mauritania	12.3110	0.6432	292	19.14	<.0001
COUNTRY	Niger	7.1862	1.0584	292	6.79	<.0001
COUNTRY	Nigeria	1.3102	0.4746	292	2.76	0.0061
COUNTRY	Senegal	12.6910	0.5888	292	21.55	<.0001
COUNTRY	Sierra leone	-7.3070	0.6384	292	-11.45	<.0001
COUNTRY	The Gambia	5.4160	0.5658	292	9.57	<.0001
COUNTRY	Togo	3.2578	0.5436	292	5.99	<.0001
COUNTRY	cote d'ivoire	0	-	-	-	-

A.2 Random Effect Model Result for Model 3.3

Covariance Parameter Estimates	
COUNTRY	70.4895
Cov. Parm	Estimate
Residual	1.6104

Fit Statistics	
-2 Res Log Likelihood	1184.1
AIC (Smaller is Better)	1188.1
AICC (Smaller is Better)	1188.1
BIC (Smaller is Better)	1189.6

Solution for Fixed Effects					
Effect	Estimate	Standard Error	DF	t Value	Pr > t
Intercept	34.7413	4.5588	15	7.62	<.0001
DGEPC	85.5156	16.1504	292	5.29	<.0001
DPHEPC	-33.3339	10.1517	292	-3.28	0.0011
EHEPC	-41.6904	8.9753	292	-4.65	<.0001
CO2	7.3229	1.2502	292	5.86	<.0001
HIV	-0.4284	0.2268	292	-1.89	0.0599
GDPC	-0.00017	0.000239	292	-0.71	0.4753
UN	0.1211	0.06955	292	1.74	0.0827
TUB	0.009786	0.003603	292	2.72	0.0070
FR	0.6095	0.6419	292	0.95	0.3432
CO2K	-0.02419	0.01446	292	-1.67	0.0954
MAL	-0.00136	0.001633	292	-0.83	0.4047
index	-0.7483	0.04715	292	-15.87	<.0001

A.3 Random Effect model Result for model 3.4

Covariance Parameter Estimates	
Cov Parm	Estimate
COUNTRY	1912.99
Residual	90.1765

Fit Statistics	
-2 Res Log Likelihood	2409.2
AIC (Smaller is Better)	2413.2
AICC (Smaller is Better)	2413.2
BIC (Smaller is Better)	2414.7

Solution for Fixed Effects					
Effect	Estimate	Standard Error	DF	t Value	Pr > t
Intercept	83.9268	31.0178	15	2.71	0.0163
DGEP	210.12	120.71	292	1.74	0.0828
DPHEPC	-125.69	75.6851	292	-1.66	0.0979
EHEPC	-240.73	66.6150	292	-3.61	0.0004
CO2	68.4321	9.3122	292	7.35	<.0001
HIV	-5.6778	1.6931	292	-3.35	0.0009
GDPC	-0.00224	0.001781	292	-1.26	0.2089
UN	0.1120	0.5170	292	0.22	0.8286
TUB	0.01153	0.02668	292	0.43	0.6659
FR	10.5769	4.5931	292	2.30	0.0220
CO2K	-0.07333	0.1079	292	-0.68	0.4973
MAL	-0.01820	0.01213	292	-1.50	0.1347
index	-4.2828	0.3381	292	-12.67	<.0001

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The Data used in this research work was obtained from the World Development indicator and the prepared data can be obtained from my Github account: <https://github.com/efosa24/efosa24>

Trade Liberalization and Performance Of Private Sector In Rwanda: A Case Study of PSF Nyagatare District

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Abstract- The objective of this study was to evaluate the effect of trade liberalization on performance of private sector in Rwanda and in Nyagatare district in particular during 2015-2017. The collected data was analyzed through SPSS software from 44 respondents selected among 120 members of PSF Nyagatare. For data analysis, SPSS21 was used for descriptive statistic and correlation analysis. The findings for the first objective shows the overall of 3.03 and standard deviation of .547 indicating that trade liberalization plays an important role on the performance of private sector in Nyagatare district during the period of study. The findings for the second objective indicated the mean 4.15 and .481 standard deviation as high mean. That means that the effectiveness of private sector in Nyagatare district depends on trade liberalization policies implemented and followed by PSF members in their doing business of importing or exporting products with neighboring countries. The third objective indicated challenges hindering private sector members including poor infrastructures, competition, poor quality products and transport cots. The overall mean of 4.23 and .513 of standard deviation, showing that they really exist and need preventing correcting measures. The Pearson's correlation obtained was 0.877 at a two-tailed level of significance at the 0.05, implying that there is a strong correlation between the level of liberal trade and the promotion of PSF in Nyagatare district. This correlation indicates that 87.7% of PSF members do better in their doing business through trade liberalism policies that facilitate in exports or imports of goods from neighbor countries. The adjusted R2 (85%) shows that trade liberalism factors including tariffs and quotas removal, free movement of people and locally produced products, subsidies influence private sector in doing business in Nyagatare district. The significance of trade liberalization factors $s .002$ is less than 0.05%, which means the predictors are significant. These results shows that trade liberalization factors have positive impact on PSF Nyagatare during the period of our study. The fourth objective was about curbing challenges hindering PSF members in Nyagatare district, the findings revealed the overall mean of 4.25 and .527 standard deviation, i.e. a high mean, implying that the given solutions i.e. improve services, using non-price competition, improving quality products and language familiarization can be used to solve efficiently the mentioned challenges.

Index Terms- Trade liberalization, private sector and performance

I. INTRODUCTION

Since the end of the Cold War and the collapse of communism in 1989, globalization has characterized international economic affairs (Hill, 2013). Increasing economic integration between national economies has led to a substantial increase in world trade. However, today's market liberalization also seeks social justice in addition to economic growth, hence a more fair distribution of the income generated. This has required better harmonization between international and national rules, and the need for well-functioning supranational institutions (Sunday, 2006).

Wacziarg et al. (2008) presented a new evidence on the time paths of economic growth, physical capital investment, and openness around episodes of trade policy liberalization. Analysis based on the new data set suggests that over the 1950 - 98 period, countries that liberalized their trade regimes experienced average annual growth rates that were about 1.5 percentage points higher than before liberalization. Post-liberalization investment rates rose 1.5 - 2.0 percentage points, confirming past findings that liberalization fosters growth in part through its effect on physical capital accumulation. Liberalization raised the average trade to GDP ratio by roughly 5 percentage points, suggesting that trade policy liberalization did indeed raise the actual level of openness of liberalizers. However, these average effects mask large differences across countries.

Austvik et al. (2012). An ideological fundament in the International Monetary Fund (IMF) and the World Bank (WB) is based on the so called Washington consensus, where one of the pillars is trade liberalization as the universal medicine for economic growth in both poor and rich countries. This idea is also supported by the World Trade Organization (WTO), established in 1995 to rule the multilateral trading system, liberal trade policies, policies that allow the unrestricted flow of goods and services sharpen competition, motivate innovation and breed success (WTO 2011).

The relationship between increased openness to international trade and labour market outcomes continues to be of considerable interest both for policy makers and researchers. At the theoretical level, free trade generates dynamic or efficiency-enhancing gains that stimulate economic growth (the classical trade theory). If markets are sufficiently flexible, opening up to international trade would induce short-term shifts of labour from previously protected sectors to those in which a country has a comparative advantage. This provides the basis for assessing the net effects of trade policy shocks on aggregate employment (Eria Hisali, 2012).

In the framework of the new growth theory, increased openness may facilitate diffusion and adoption of superior production techniques. Exposure to increased competition can also induce innovative practices and generation of knowledge (Baldwin and Charles, 2012). The spirit of the new growth theory also allows for some level of protection to certain sectors if, for example, they generate large multiplier effects or if such protection promotes more technologically dynamic sectors (Rodriguez and Rodrik, 2009). One important implication of the new growth theory is that whereas trade openness is positively associated with growth, it may impose significant adjustment costs in the labor market.

Rwanda has decided that having an open liberalized economy is a pre-condition for its economic growth. The trade policy therefore, does not look at reviewing alternatives to Rwanda's commitment to liberalization, but rather at establishing the right strategies to ensure that Rwanda benefits fully from liberalization, and to ensure that the potential negative effects are mitigated.

Effective participation in international trade represents a formidable avenue to promote economic growth and contributes towards putting the economy on a sustainable growth path. To this end, a well-articulated trade policy is needed to promote broad-based, sustainable economic growth and inclusive development that targets poverty elimination (MINICOM, 2013).

Even though the Ministry of Trade and Industry is responsible for developing trade in Rwanda, current interventions affecting trade development and competitiveness in Rwanda can be found in numerous policy documents and the implementation is performed across a number of institutions and ministries. There is therefore a need to harmonize and consolidate trade policy interventions into a coherent trade policy. The trade policy document creates a structured policy framework for the coordination of these interventions, and it provides the policy framework for the Government of Rwanda's mobilization of resources, (Rwanda Trade Policy, 2016).

The Trade policy document outlines the key objectives of Rwanda's trade policy as well as the strategic initiatives and actions to achieve the objectives. It outlines the objectives of strengthening productive capacities as well as investment into productive capacities, some of the recommended activities are the mobilization of investment for establishment of selected export-oriented industries; improving climate for attracting investment into productive activities, (Hasan and Toda, 2014). Building up capacities to meeting product standards for human, animal and

health protection, as well as environmental norms; The trade policy also proposes the objective of strengthening participation in international trade through seeking greater market access and entry opportunities by developing a National Export Strategy; supporting enterprises in finding new markets for exports of Rwanda, especially in Africa, in the EU under EPAs, in Asia and in transition economies; building up and disseminating data and information on tariff and non-tariff measures affecting exports of Rwanda among others (Greenaway et al., 2012).

1.2 Statement of the Problem

Over the last 20 years, Rwanda's economy has been growing at an average rate of 8% per annum. This has been driven in part by a significant expansion in export value, which has expanded by 20% annually in the decade up to 2014 (MINICOM, 2015). While trade has been one of the main engines of growth, a considerable share of this export growth was driven by rising prices of a small number of minerals, following a global commodity boom. When demand for such commodities fell in 2015, there was a significant decline in mineral revenues. Other exports were unable to compensate, and the total value of Rwanda's exports declined by 7% in 2015 (despite an increase in export volumes). Yet, the value of *imports* has continued to grow, and amounted to three times the size of exports in 2016.

As a result, Rwanda's trade imbalance is large and has been widening considerably in recent years. This has also reduced foreign exchange reserves, which in 2016 were projected at only 3.2 months of imports (MINICOM, 2015). Expanding exports has thus become an urgent government priority to reduce the trade imbalance, attract foreign exchange, and ensure macroeconomic stability. This is also reflected in Rwanda's strategic plans, with the national export strategy for 2015-18 proposing a 20% annual rate of export growth (MINICOM, 2015).

However, in order to realize its ambitious trade liberalization, the Government has launched detailed plans such as the Private Sector Development Strategy (MINCOM, 2013) and the revised National Export Strategy (MINICOM, 2015). More recently, special focus has been given to the 'Made in Rwanda' programme. This builds on the Rwanda's Domestic Market Recapturing Strategy (MINICOM, 2015) which aims to expand local content in domestic value chains.

Made in Rwanda is developing into an even more ambitious policy that seeks to improve perceptions of Rwandan products within Rwanda, promote nascent industries, and boost productivity of exporting sectors across regional value chains. This programme is still taking shape, and it is against this backdrop that the researcher intends to find out the effect of trade liberalization on the performance of private sector in Rwanda and the underlying challenges towards private sector performance in Rwanda.

1.3 Objectives of the study

1.3.1 General Objective

The general objective of the study is to evaluate the effect of trade liberalization on performance of private sector in Rwanda

1.3.2 Specific objectives

1. To find out the role of Trade liberalization in boosting performance of private sector in Nyagatare district during 2015-2017
2. To evaluate the effectiveness of trade liberalization in export promotion Nyagatare district during 2015-2017
3. To find out the challenges underlying trade liberalization policy in Nyagatare district
4. To find out strategies of combating the challenges of trade liberalization in Nyagatare district

1.4 Research questions

1. What is the role of trade liberalization Programme in boosting private sector performance in Nyagatare district
2. What is the effectiveness of trade liberalization in export promotion in Nyagatare district during
3. What are the challenges of trade liberalization policy in Nyagatare district?
4. What are the strategies of combating the challenges of trade liberalization policy in Nyagatare district?

II. LITERATURE REVIEW

2.1 Definition of Concepts

2.2.1 Trade Liberalization

According to the free encyclopedia, (2017), *Trade* involves the transfer of [goods or services](#) from one person or entity to another, often in exchange for [money](#). A [system](#) or network that allows trade is called a [market](#). An early form of trade, [barter](#), saw the direct exchange of goods and services for other goods and services.

Hence trade liberalization is often defined as a situation without tariff barriers or with a reduction of tariff and non-tariff barriers imposed on the inflow and outflow of goods and services. The rationale of free trade stems from the 18th and 19th centuries when Adam Smith and then David Ricardo developed the basis for international trade as part of their efforts to make a case for free trade (Pugel and Lindert 2013: 32)

2.2.2 Performance

The accomplishment of a given task measured against preset known standards of accuracy, completeness, cost, and speed. In a contract, performance is deemed to be the fulfillment of an obligation, in a manner that releases the performer from all liabilities under the contract. Performance has been defined by Fouchet, (2010:401), as the degree of accomplishment of tasks that make up an employee's job. Whereas according to Gok (2009:11) performance is the organizational ability to attain its goals by using resources in an efficient and effective manner to accomplish institutional objectives and goals.

2.2.3 Private sector

The **private sector** is the part of the economy, sometimes referred to as the **citizen sector**, which is run by private individuals or groups, usually as a means of enterprise for [profit](#), and is not controlled by the [State](#), in Rwanda private sector has formed a forum to advocate for its members and the forum is named Private Sector Federation (PSF) (MINICOM, 2014).

2.3 Theoretical Framework

Two main directions are focused on: The classical and neoclassical trade theories, which share the common conviction that trade liberalization is the "universal medicine" for economic growth. The other direction is theories which criticize the classical and neoclassical for the one size fits all comprehension. In a generic term, one calls them the heterodox theories of international trade. They are especially concerned with issues related to developing countries, and state that special treatment is needed, such as allowing for protectionist trade policies. Only in this way, it will be possible to eventually catch up with developed countries and become competitive under a system of free trade according to this view. One starts out with the first direction addressed, namely the classical and neoclassical theory of international trade, Gok (2009:14)

2.3.1 Classical and neoclassical trade theory

Within the classical and neoclassical school of thought one focuses on three theories which have been influential in the development of the theoretical framework for international trade. One starts out with the Ricardian model and the doctrine of comparative advantage. Second, presentation of the Heckscher-Ohlin model and the factor price equalization theorem which builds upon the Ricardian model, but adds additional factors of production. A common feature of these trade models is that they employ a *static* framework in the sense that free trade will increase the *level* of income. The third theory is the new trade theory which adopts a *dynamic* framework that also relates to the *growth* effects (Kaufmann et al., 2007)

2.3.2 The Ricardian Model

In order to fight the English Corn Laws, the classical economist David Ricardo demonstrated that trade is mutually beneficial through the theory of comparative advantage. This static trade theory is described in *The Principles of Political Economy and Taxation* from 1817. Ricardo's first goal was to demonstrate that trade between countries is mutually beneficial, and second, to illustrate the importance of a free trade policy (Hill, 2013).

In the Ricardian model, labor is assumed to be the only factor of production. Labor productivity is thus the measure of a country's technological level, expressed in the amount of labor needed in the production of a good. As Ricardo states, labor is "...the ultimate price which is paid for everything (Ricardo and Fogarty 2005:253). Labor was believed to be immobile, but a major advantage with international trade was the distributional effect that arose from specialization and division of labor. Ricardo argued that under a system of free trade, each country would devote its capital and labor in the most efficient and beneficial way.

The most important contribution of Ricardo to the development of international trade theory is, as we have seen above, the comprehension of *relative prices* to determine the patterns of trade. However, this theory is exposed to delimitations of how the economy functions today, as it builds a model upon a one-factor economy. In the subsequent section, the neoclassical trade theory Heckscher-Ohlin model (H-O model) will be presented and includes an additional factor to the trade model (Routledge and Robert, 2011).

2.3.3 The new trade theory

In the late 2010s, a group of theorists within the neoclassical school of thought challenged the static equilibrium models employed in international trade theory. These theorists constitute the new trade theory here presented by the work of Paul Krugman. A hallmark of this direction is the emphasize put on *dynamic* effects of economies, implying that an economy can obtain long-term growth effects due to increasing returns. This is an independent cause of international specialization and trade, and must therefore be added as a new factor for why trade arises between countries (Krugman 2013).

Ricardo and Fogarty (2005) argued that underlying differences between countries is only one reason for why trade takes place. Countries also trade because of the advantages created by specialization caused by increasing returns in one sector not related to comparative advantage. Intra-industry trade is a common feature in world trade. For instance, France exports wines to South Africa and at the same time import wine from the same country, which would not fit into a model based on comparative advantage. However, the patterns of intra-industry trade are in themselves unpredictable. This happens because of product differentiation in order to offer consumers a wider range of wines. Due to advantages of large-scale production it leads to a random division of labor among countries. Thus, new trade theory concentrates more on resource allocation rather than the production of goods as an explanation for the gains from trade (Fouchet, 2010).

Nowadays technology is a driving force for international specialization. In contrast, Ricardo's perception of technology was solely the productivity of labor, and Heckscher and Ohlin assumed that technology was the same between the trading countries. In many industries, knowledge generated through research and development (R&D) and experience can determine countries' competitive advantage.⁸ Technological innovations may also generate spill-over effects to the rest of the economy. An industry in a country can thus become more competitive in its production even though the country originally was relatively poor endowed with that specific factor of production (Krugman 2013:8).

In sum, new trade theory has updated the theoretical framework for international trade by regarding economies as dynamic rather than static. Patterns of trade are not explained by the theory of comparative advantage, but by increasing returns made possible by imperfect market structures. Since income is generated also from the relatively scarce factors, it turns out that increasing returns increases rather than reduces the gains from international trade and is therefore good for long-term growth (Krugman 2007:134). Even though Krugman considers free trade as the desired trade policy, he also accounts for advantages with protectionism.

I have now presented classical and neoclassical theories of international trade. The Ricardian model and the Heckscher-Ohlin model are static theories where the sources and patterns of trade are determined by the doctrine of comparative advantage. New trade theory emphasizes that economies are dynamic, so gains from trade arise from increasing returns instead of comparative advantage. A common stance among these theories is that free trade policies are believed to maximize the utility created by international trade (Pugel and Lindert, 2013). Based upon this part of the theoretical framework, the objectives of the study will be proved empirically later in the thesis:

2.5 Rwanda's Trade Performance

The main export earnings come from few commodities, namely, tea, coffee, Tin Ores, Niobium and Tantalum and Tungsten ores which, for the period 1997 - 2007 generated over 80% of the export earnings. All these commodity exports are resource-based and the country struggles to enter the global value addition chain due to limited or lack of a strong manufacturing sector. Dependence on commodities exports has resulted in an export decrease over the years due to international price volatilities. The service sector has been growing at a faster rate and is now an important contributor to the economy. But services exports are also limited to few sectors, especially tourism (Rodrik et al.2012).

Rwanda's merchandise exports have also increased significantly over the recent past, rising to \$268 million in 2008 from \$98 million in 2004. At the same time as this impressive growth in exports, imports to Rwanda have grown faster, from \$276 million in 2004 to \$881 million in 2008. The ratio of exports to imports has therefore remained virtually unchanged at around 30-35 per cent in the past six years. Rwanda's trade deficit (goods and services) in 2008 was therefore \$748 million and growing representing 14.2 per cent of Rwanda's GDP, down from 16.5 per cent in 2004. Rwanda's main commodity imports are motor vehicles, petroleum oils, computers and other machinery, electrical machinery, pharmaceutical products, iron, steel, cement salt, animal vegetable fats and oils, worn clothing and other made up textile articles, wheat or mesh flour, articles of iron or steel, sugar and sugar confectionery, medical appliances, plastics, paper and paperboard, cereals/maize seed/rice and furniture (Santos-Paulino, 2015).

Strengthening the participation of Rwanda in international trade will be a medium to long term process. Rwanda's current weak trade performance is largely attributable to its weak supply side capacity. It is therefore clear that Government should undertake more work on strengthening the productive capacity of the country and its trade-related infrastructure, while continuing to focus on the demand side in terms of securing more favorable market access conditions for its exports, particularly in addressing non-tariff obstacles (Gilpin, 2011).

Being landlocked constitutes a major impediment for Rwanda's trade development. Costs for trading are higher because of long land-transport routes and the high import and export freight service costs in the region. The high trading cost endures dependence on poor infrastructure and administrative procedures with neighboring countries Kenya and Tanzania. In addition, the condition of the roads and regional railways are inadequate for the

export of goods since the many delays slow down transportation (IGC Report, 2017).

2.4.2. Trade and economic growth

Economic development through trade development and promotion comprises an important strategy for generating and sustaining development. At the heart of this strategy for Rwanda is the need to build competitive and diversified productive capacities in the traditional sector of agriculture, as well as in manufactures and in services for marketing in the domestic, sub-regional, regional and international arenas (Gilpin, 2011)

Trade liberalization and export-led approaches alone, as past experience has shown especially for LDCs, are not enough to help trade and economic growth. Linked to both is the strengthening of complementary support services like infrastructure, trade facilitation, trade financing and technology among others. Therefore to better articulate a coherent approach to trade development, the development-driven Trade Policy is a form of one-stop (or umbrella) comprehensive policy, addressing both trade and other related sectoral policies including agriculture, industrial development, and intellectual property. The trade policy must be coherent with and supportive of other complementary types of policies geared towards the holistic development strategy of the country. The trade policy must also pay attention not only to the quantity of trade (which is often measured through trade openness indicators), but also to the quality of trade, which refers to the composition of both exports and imports and their impact on jobs and incomes, including equitable distribution as well as promoting the protection and preservation of the environment and becoming more gender sensitive (Gandhi, 2004).

2.4.3 Trade constraints in Rwanda

A Diagnostic Trade Integration Study was conducted for Rwanda under the Integrated Framework program in November 2005. The study identified key barriers and constraints to Rwanda's trade growth. The Rwanda DTIS was updated in December 2009. The DTIS identified the following constraints to the growth of trade in Rwanda.

I) Infrastructure

The DTIS identified weaknesses in infrastructure as a key constraint to the growth of trade in Rwanda. Two aspects of infrastructure are particularly important for Rwanda, namely energy and transport. Sufficient supply and efficient use of energy are important factors for economic development. However, the energy situation in Rwanda is not sufficient for its development: per capita energy consumption is very low and people rely heavily on fuel-wood which accounts for over 80 per cent of the energy supply. Moreover energy resources are limited and dependency on imported energy such as petroleum products is rising. Thus, it is crucial for Rwanda to aggressively pursue a secure stable supply of energy. Rwanda's electricity cost at \$0.24/Kwh is the highest in the region and more than double that of Kenya. Ultimately, this negatively affects the competitiveness of Rwandan exports and impedes Rwandan manufacturing businesses' ability to compete with imported manufactured products from the likes of Kenya. With its mountainous terrain and associated rainfall erosion, severe constraints have been placed on the country's road network – for which the maintenance cost is twice higher than that of most

Sub-Saharan countries. The country's road network of 14,000 km, spread over barely 27,000 square km of national territory, is among the densest in Sub-Sahara Africa, and far exceeds its human and financial capabilities. Recent sector surveys have found that 45 per cent of Rwanda's paved national road network in 2008 was in good condition, while around 10 per cent of earth national roads and 10 per cent of district roads were in good condition². Roads are therefore a heavy constraint on trade and commerce within Rwanda, (Edwards, 1997).

II) Trading across borders

Being a landlocked country 1,740 km from the Port of Mombasa and 1,480 km from Dar es Salaam, Rwanda's transport costs represent as high as 40 per cent of export and import values. Furthermore, there are additional costs to trade across Rwanda's Northern and Central Corridors, which are avoidable. These non-tariff barriers (NTBs) include the weighbridges and corruption found on the transport corridors. Bureaucracy at border-posts and at the ports used by Rwandan traders are also a constraint bringing additional costs and delaying the speed and turnover of trade.

III) The business environment

Paying taxes: Businesses believe that the system is difficult to understand. This forces businesses to hire additional staff which increases costs. As a consequence, numerous businesses and banks complain that tax liabilities are uncertain because it is difficult to predict what will be allowed or disallowed. This raises business risks, which in turn raises the risk premium charged by banks. Moreover, inappropriate tax assessments raise the costs of paying taxes, through both higher tax liabilities and the added cost of protesting the assessment. There is also a perception that tax administration does not offer incentives for businesses, especially SMEs, to pay taxes and recent studies cite tax as a significant hindrance to operating in Rwanda⁵.

IV) Human resources

The DTIS found that the recruitment and training of sufficiently skilled staff is seen as a major difficulty by Rwandan businesses. An adequate technical and vocational education and training (TVET) sector is crucial to overcome this difficulty and ensure that a wide range of skilled technicians and professionals are available.

V) Limited value addition of existing exports

Rwanda is heavily reliant on its traditional export sectors of tea and coffee, as well as the more recent growth industry of minerals. Together these consistently constitute around 90 per cent of exports⁷. These sectors face volatile international prices particularly coffee and minerals exports, which can lead to sharp variations in the export receipts of the country, leading to an unstable balance of payments position. Other existing exports with much smaller shares include hides and skins, horticulture including pyrethrum, as well as handcrafts. A much larger sector in services attracting huge revenues of foreign currency is the Rwandan tourism sector.

International markets for most of Rwanda's existing exports are very large and have complex chains of added value. In these international value chains, with the exception of tourism, Rwandan production is firmly towards the bottom end. Higher

value added in these sectors – for instance the roasting of coffee, or the production of leather and leather goods as opposed to exporting raw hides and skins – offers the strongest potential for Rwanda to increase its role in global trade. However, at present, Rwanda’s existing export industries face a number of constraints to value addition. These include those faced by other firms (skills, finance etc.), but also challenges specific to them. For example, in the tea sector, policy has been driven by the privatisation of tea estates and factories, in order to promote efficiency. In horticulture, cold storage was a key component of the first DTIS (2005), and is now in operation, although producers still face challenges in transporting their goods from Rwandan farms to Kigali.

VI) Limited diversification of exports

As stated above, Rwanda is still over-reliant on a limited export basket dominated by low value added commodities. Diversification of the export base is therefore required. Furthermore, with over \$1 billion of imports, there are a number of industries in which it would be beneficial if Rwandan firms could compete⁹. Entering into new export markets is a process fraught with market failures – for example a firm entering a new market takes on risks and if successful, would see the benefits accrue to other firms, hence the firm may refrain from entering the new market, hurting the Rwandan economy as a whole. There is therefore a role for Government and policy action to encourage experimentation in new markets for goods and services. RDB has undertaken work to identify clusters that have the best chance of becoming new and lucrative export markets for Rwanda. Each of these markets faces a specific set of challenges and constraints to overcome if they are to succeed. Sectors to target include business process outsourcing (BPO), specialised tourism, mining services, processed fruit and vegetables, silk textiles and dairy. Furthermore other work by the President’s Office has suggested the promotion of the pharmaceuticals, metals and bio-plastic sectors. All selected sectors will require support and capacity building in the short to medium-term to maximise the chances of success.¹⁰

VII) Lack of investment in productive sectors

Like many developing countries, Rwanda’s banks and other financial institutions do not lend at levels that meet the demands of the commercial sector. Lending is constrained by costs and risks arising from five factors: high reserve requirements, defective legal and regulatory environments, crowding out by government bonds, asymmetrical information, and inadequate skills for assessing and managing risk. Many steps are underway to address these issues, including the improvement of lending-related laws, strengthening of court enforcement systems, and creation of credit information resources. (Integrated Trade study, 2010)

III. RESEARCH METHODOLOGY

3.1 Research design

According to Kerlinger F. (2011), a research design is a plan, structure and strategy of investigation so conceived as to obtain answers to research questions. The plan is the complete scheme or program of the research. In order to achieve the successful objectives of this study, a descriptive research design was employed. According to Larry B. (2012), a descriptive study is an intensive description and analysis of single individual,

organization or events based on information obtained from a variety of sources such as interviews, documents, test results and archival records. This research design is adopted because the researcher is targeting to study a variety of entities such as Nyagatare private sector federation, Nyagatare District Administration and Kagitumba boarder post.

3.2 A profile of the study area

Nyagatare is the largest and second most populous district (akarere) in Rwanda. Located in Eastern Province, Rwanda, Nyagatare occupies the northeastern extremity of Rwanda. Its capital is Nyagatare City, the former capital of the now defunct Umutara province. Nyagatare District borders Uganda in the North, Tanzania in the East, Gatsibo District of the Eastern Province in the South, and Gicumbi District of the Northern Province in the West. Nyagatare has an area of 1741 km², what makes it the largest district in Rwanda. With a population of 466,944 in 2012, Nyagatare is the second most populated district of Rwanda only after Gasabo District of Kigali City with 530,907 inhabitants. This is an 83% increase from 2002 when the population was only 255,104. This sharp rise in the population is due to the major movement of the population from other parts of the country in search of land, (Monography of Nyagatare district, 2013).

3.3 Population of the study

According to Grinnell (1990) a “population is a total of persons or objects with which the study is concerned”. According to Carl et.al, (1991), population refers to the total group of people from whom the information is needed. A population is defined as all members of any well-defined class of people, events, or objects about which the generalization is made. It is the entire set of relevant units of analysis, or data (Nachmias and Nachmias, 1996:179). For example in a study where Rwandan adolescents constitute the population of interest, you could define this population as all Rwandan boys and girls within the age range of 12-21 Because of our inability to access every element of a population, what we do is to gather information from a ‘sample’ and then apply our findings to a broader population. The population of PSF is 120 members of which 44 were chosen for distribution of questionnaires as the sample size.

3.4 Sampling techniques

A sample is a portion of the population selected to achieve the objectives of the study. This study adopted purposive sampling procedure and used the following formula of Dagnel, to select the sample size (n) of population as quoted by HODALI A. E (2012:35-36)

$$n = \frac{z^2 \times p \times q \times N}{d^2 (N - 1) + z^2 \times p \times q} \quad (\text{Dagnel, 2006: 213})$$

Where: n= sample size, N= size of population (PSF members), Z= Normal distribution coefficient, q= probability of failure, d= margin error, p= probability of success.

The margin error varies between 5% and 10%. We used the margin error of 10%, then the confidence level of 90%, our probability of success is $p=0.5$, failure probability of $q=0.5$, as $Z_{0.25}=1.65$

For this case, the population size of 120 members of PSF Nyagatare district was sampled as follows:

$$n = \frac{(1.65)^2 \times (0.5)^2 \times 120}{(0.1)^2 \times (120 - 1) + (1.65)^2 \times (0.5)^2} = \frac{81.675}{1.870} = 44$$

3.5 Data collection methods

3.5.1 Questionnaires

A questionnaire is defined as a list of carefully structured questions, chosen after testing, with the view of eliciting reliable responses from a chosen sample. The aim of a questionnaire is to find out what a selected group of participants do, think or feel (Meyer et al., 2004:42-45).

A self-administered questionnaire was designed by the researcher. The total number of 44 questionnaires were used to gather information from the target population. A Structured questionnaire with a set of close ended questions (Yes/No questions and multiple choice questions) and Open-ended questions (Completely Unstructured questions) to be asked to the target population was used.

3.5.2 Interview

An interview is a [conversation](#) where questions asked and answers are given. In common parlance, the word "interview" refers to a one-on-one conversation between an interviewer and an interviewee (Carl et.al,1991). In this study, interview was used to gather opinions concerning the effects of liberal trade on PSF Nyagatare district where the Boarder Manager of Kagituba, the Mayor of Nyagatare district and the Chairman of PSF Nyagatare district were consulted to provide their perspectives on the same.

3.5.3. Documentation

The term documentation is generally used for the gathering and recording of information, especially to establish or provide evidence of facts or testimony. In order to get more accurate information concerning the research subject, it is very important to carry out documentation with the purpose of being aware of what information exists about the topic (Neal and Christopher, 1991).

Therefore, documentation was used as a mean to access recently compiled or published information on informal saving groups which helped to have a good literature review. Not only to get informed literature, documentation was helpful to make a good discussion of results by comparing the results from previous research against those generated by the present study; which therefore helped to draw reliable conclusions and recommendations

3.5.4. Observation

Observation is used as a research method in two distinct ways structured and unstructured (Pretzlik, 1994). In positivistic research, structured observation is a discrete activity whose purpose is to record physical and verbal behavior. Observation schedules are predetermined using categorization developed from known theory.

In contrast, unstructured observation is used to understand and interpret cultural behavior. Observation is valuable because it informs about the influence of the physical environment.

Observation also captures the whole social setting in which people function, by recording the context in which they work (Mulhall, 1997:308).

While conducting a research, it is of vital importance to check whether the responses from respondents match with the real situation. However, observation is always needed to have a real picture of what is talked from the interview against what is observed. During this study, observation was used as a means of checking whether the respondents' responses are relevant to the real situation.

3.6 Data analysis and Interpretation

Before the data were analyzed, the researcher recorded all interviews, observations, documents, journal entries and field notes. The process of recording allows the researcher to become acquainted with the data (Riesman, 1993).

3.6.1. Data processing

According to Causley. et al (2007:14) argue that data collection is not an end itself, unless the data can be processed, analyzed and converted into information in a format that can be helpful to the user. Once the set of data is collected, it must be carefully processed to get meaningful results. The data were processed through editing, coding and tabulation.

3.6.1.1. Editing

By definition, data editing is the activity aimed at detecting and correcting errors (logical inconsistencies) in data (Mulhall, 1997). Data editing was helpful to improve data quality though errors containing in data was removed. Data editing and coding was done using Statistical Package for Social Sciences (SPSS).

3.6.1.2. Coding

A systematic way in which to condense extensive data sets into smaller analyzable units through the creation of categories and concepts derived from the data (Pretzlik,1994). Data coding is also the process by which verbal data are converted into variables and categories of variables using numbers, so that the data can be entered into computers for analysis Variable was given a particular code referred to as smaller analyzable units (for example 1, 2, 3...) which allow easy analysis of data, SPSS was helpful in data coding.

3.6.1.3. Tabulation

Gilbert and Churchill Jr (1992:51) tabulation refers to the orderly arrangement of data in table or other summary format achieved by counting the frequency of responses to each question.

Tabulation is the final step in analyzing data. Tabulation is the putting together of data into some kind of statistical tables. Data tabulation was done after editing and coding. Tabulation is either done by computer (by Microsoft word for word processing, excel and SPSS for windows to make tables and graphics.

3.6.2. Data analysis

Content analyses were used to compare and analyze the state of respondents before and after being members of PSF Nyagatare, and then discover the causes and relationship in order to come with useful conclusions and suggestions.

Mean as descriptive statistics for measuring central tendency of distribution was evaluated based on the following intervals and equivalences;

5. Strongly agree [4.21-5.00] = Very high

4. Agree [3.41-4.20] = High
 3. Not sure [2.61-3.40] = Moderate
 2. Disagree [1.81-2.60] = Low
 1. Strongly disagree [1.00-1.80] Very low
- 3.6.2.1 Description of descriptive statistics**
5. $4.3 \leq \mu \leq 5.0$: Very high mean, i.e. strong evidence of the existence of the fact
 4. $3.5 \leq \mu \leq 4.2$: High mean, i.e. the fact appears more
 3. $2.7 \leq \mu \leq 3.4$: Neutrality
 2. $1.9 \leq \mu \leq 2.6$: Low mean, i.e. the fact appears less
 1. $1.0 \leq \mu \leq 1.8$: Very low mean i.e. the fact is not apparent

The standard deviation helps to measure how far or near from the mean. The Spearman's correlation coefficient is a statistical measure of the strength of a monotonic relationship between paired data.

3.7. Ethical considerations

The layout of a questionnaire should be presented in an interactive style, be easy to read, pleasant on the eye and the sequence of questions should be easy to follow (Kumar, 2005:126). The potential for mistakes increases dramatically when questionnaires are disorderly, overcrowded or disorganized (McNamara, 1998). Questionnaires were easy to respond and arranged appropriately for the purpose of not boring the participants and make sure that questions avoided negative connotations which are against the Rwandan culture.

3.8. Limitation of the study

During the course of this study, the researcher encountered some challenges during the process of data collection that sometimes made this research difficult. One of challenges faced was accessibility of respondents due to long distance of travel and financial means as well as failure of respondent to fill welcome in the research because the data were collected during working hours.

3.9. Partial conclusion

This chapter was focusing on the research methodologies that was be used during our study. In this chapter, we described the study area, study population and data collection methods and techniques used. The importance of this chapter is that it facilitates the collection of true and accurate data which result in appropriate findings helping to draw reliable conclusions and recommendations. Highlighted methodologies were thoroughly utilized for proper data collection and analysis.

IV. THE STUDY FINDINGS

4.1 Profile of respondents

4.1 The role of trade liberalization on performance of private sector in Nyagatare district

As the Melchior (2012) findings on the role of trade liberalization on private sector while it facilitate the ease movement of people, goods and services. The tariffs are removed so that there is a shift from high cost to low cost. In this study, the researcher wanted to investigate whether since the implementation of trade liberation in Rwanda, the boarder district experience the mentioned advantages quoted by Melchior. The table below shows the findings from members of PSF Nyagatare district using SPSS descriptive statistics.

The result shows the role of trade liberalization on performance of private sector in Nyagatare district. Concerning the question about "*The tariffs imposed on goods and services promote the performance of your business*" This means that the implementation of trade liberalization removed tariffs which prevented the performance of PSF members business. That is to say, the population of Nyagatare district understand very well the role of trade liberalization on their daily business activities.

On the other hand trade liberalization gave the government a task of solving the problem related to tariffs in case it is seems that it is was changed.

The results matches with Laffer theory on taxation that consider high tax level of a disincentive to work, he emphasized that "Sometimes governments impose taxes which are too high for individuals or firms to pay with ease, leading to high tax evasion and tax avoidance. This is explained by the Laffer curve which suggested that, *as taxes increased from low levels, tax revenue receives by the government would also increase. However, as tax rates rose, there would come a point where people would lead not consider working hard in order to avoid taxation*". This theory in Nyagatare district is almost applied when some businessmen attempt to tax avoidance through smuggling behavior.

In relation to the above findings, the Border Manager of Nyagatare district added that:

"Since the implementation of liberal trade, Nyagatare population benefited more from it, while people from the district cross the border using identity card instead of Pass-port or a Laisser-Passer. The cost of sibling was reduced. Again, businessman can import locally produced products from both countries free of tax that led to the availability of products of different types at low price...

These results validate the claim that trade liberalization would promote the performance of private sector in case tariffs and taxes on imported or exported goods and services are removed for members' countries. This finding agrees with those of Harrison (1994) for Cote d'Ivoire; Ackah et al. (2012) for Ghana; Adenikinju and Chete (2002) for Nigeria; and Njikam and Cockburn (2011) for Cameroon.

Rwanda's official policy desires to transform her economy away from over-dependence on agricultural and an import dependent economy to a diversified and export oriented economy by means of attaining an enviable level of structural transformation, with liberal being an integral component. Price volatility which is characteristic of the international market for primary agricultural products has made over-reliance on this sector risky. Periods of low agricultural prices have repeatedly led to deficits in the budget and spending cuts by the government. Furthermore, during such times dwindling foreign exchange earnings become insufficient in sustaining the high level of imports. The manufacturing sector provides the base on which reduction in dependence of primary sector can be built by Rwanda.

4.3 The effectiveness of trade liberalization on export promotion in Nyagatare district

According to the theoretical framework, trade liberalization encourages exports in countries through the supply side variables. In particular, liberal trade policies tend to increase exports and imports performance. If a full employment of resources is assumed, higher trade flow is expected to encourage domestic firms to focus on those activities in which it has a comparative advantage. In the line of these theories, the second objective of the study was intended to evaluate whether trade liberalization promote PSF members of Nyagatare to boost the quantity of goods and services allocated to export with neighboring countries. The summary of their opinions are presented in the table below using descriptive statistics.

The findings to know whether *“trade liberalization motivated you to increase your business activity”* have the mean of 4.12 and the standard deviation of .435 which is very high mean. This means that PSF members of Nyagatare district activities increased since the implementation of trade liberalization policies. This result matches with the Heckscher- Ohlin-Samuelson (H-O-S model of international trade) (1920s), where export is the most relevant component of total trade performance that expected to be affected by trade liberalization policies.

The results on *“the implementation of trade liberalization motivated you working harder”* have the mean of 4.18 and the standard deviation of .515 showing a very high mean between trade liberalization and hard working. The hardworking of PSF members of Nyagatare district is justified by fostering for competition with different products from neighboring countries in terms of quality, quantity and delivery time for ordering products and services. This is the evidence that open developing economies grew faster than closed economies as Paudel (2014) emphasized that, disciplined liberal economic policy contributes to the competitive domestic environment, increasing saving and attracting foreign capital to improve export.

The findings on the *“Trade liberalization reduced the cost of goods and business”* shows the mean of 4.08 and the standard deviation of .500, implying that trade liberalization entails the reduction of cost of production and that of doing business of PSF members in Nyagatare district, justified by acquiring raw materials or labor from neighboring countries members at low cost and easy movement of people and goods and services. As a result of policies liberalization, the performance of business communities improves, and country’s economy grows (Bhagwati, 2004).

The results on *“trade liberalization motivated PSF members to export more products”* presented the mean of 4.07 and the standard deviation of .435 as a very high mean between the variables i.e, more products are being exported by PSF members of Nyagatare district as the results of trade liberalization. Chang (2015) and Lall (2013) have stressed the infant industry argument when liberal trade policies repress beneficial structural change and therefore have long-term effect on export and, as a consequence on growth.

The result on *“Trade liberalization promote the private sector in Nyagatare district”* showed the mean of 5.58 and the standard deviation of 0.500, a very high mean of variables,

indicating that PSF members of Nyagatare district benefits are based on the liberal trade. Moreover, Santos- Paulino and Thirlwall, (2014) analyzed the panel data for ten period; they find a significant relationship between trade liberalization and private sector promotion. They claimed that trade liberalization raises private sector on average by 0.085- 1.91 percentage and vice-versa.

The overall mean for the second objective questions showed the mean 4.15 and .481 standard deviation as high mean. That means that the effectiveness of private sector in Nyagatare district depends on trade liberalization policies implemented and followed by PSF members in their doing business of importing or exporting products with neighboring countries.

In relation to the above findings the Mayor of Nyagatare district added that:

“That trade liberalization allowed private sector to be more competitive in the aim of meeting the demand from Uganda customers. Since its implementation, more people undertook the business of exporting locally produced products from this district that increased the level production....”

The PSF chairman added:

“The achievement of PSF members nowadays are justified by the improved trade liberal policies”

The findings here shows the opinions of PSF members of Nyagatare district in terms of means and standard deviations about challenges they face since the implementation of liberal trade. The overall mean is 4.23 and .513 of standard deviation. These findings shows that even though trade liberalization promote PSF activities in Nyagatare district, but there are challenges such as poor infrastructures, competition, lack of funds and high transport cost that still challenging and require preventive measures or to be solved. This matches with the findings of Seker (2011) on the challenges of liberal trade and different ways of solving.

In relation to the above results, “Chairman of PSF Nyagatare added that, challenges don not miss at any happen economic activities but, we are fostering in dealing with them and we hope that they will have solutions in later coming days

4.5 Strategies of overcoming the challenges of trade liberalization in Nyagatare district

Different authors and scholars proposed different solutions for trade liberalization. In this study, using open-ended questions, the researcher would to know different problems of PSF members Nyagatare district and their feasible ways of solving. The following table contains strategies of

The outcomes from the above table reveals the opinions of respondents regarding how challenges related to how trade liberalization PSF members in Nyagatare district are facing in their to day-to-day doing businesses. The overall mean average of all the proposed strategies is 4.25 and .527 standard deviation, i.e. a high mean, implying that the given solutions such as improve infrastructure, improving quality products, availing funds to PSF members and reducing the transport costs can be used to solve efficiently the mentioned challenges. This finding is in consonance with that of Yalçin (2000) for Turkey, saying that

even they exist problems in liberal trade; they must be different solution for solving them.

CONCLUSION AND RECOMMENDATIONS

The study set out to evaluate the effect of trade liberalization on performance of private sector in Rwanda, taking into account PSF members in Nyagatare district. This district was chosen while it is boarded with Uganda using Kagitumba border.

To achieve the needed growth in widening the external market the government of Rwanda at 6 July, 2009 joined East African Community market in the aim of improving the trade relation with eastern neighboring countries in terms of alleviating tariffs and quotas on import or export goods, easy movement of people and other factors of production

Many scholars and authors are in the debate regarding the effects of trade liberalization on the performance of private sectors. There are various findings conclude that there is no positive effect while others do not find significant empirical evidences.

The study has recognized that there is positive effect of trade liberalization on performance of people doing different activities of production or business of services across different sub-sectors. This is because the tax removal on imported or exported goods and services enhanced total factor productivity and motivate people working harder to meet local and foreign markets. The study revealed a strong relationship between liberal trade in terms of improving productivity in Nyagatare district through reduction of production cost and availability of heterogeneous products at feasible price.

The study established that trade liberalization leads to a more competitive domestic market through its effect in curtailing prices and excess profits of domestic private firms. Thus, trade liberalization increases competitiveness of private sector and hard working. The study revealed that the benefits from the trade liberalization are higher than the challenges, so that the preventive measures could be used to alleviate the effects underlined.

Based on the results obtained, the conclusion is that trade liberalization raises the performance of PSF members in Nyagatare district. Also the results confirm the importance of liberal trade on export leading to improved export performance. These findings are robust to the estimation techniques used and consistent with other studies showing a positive relationship between the two variables.

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Complete Testing in Agile Methodology

Binu C T

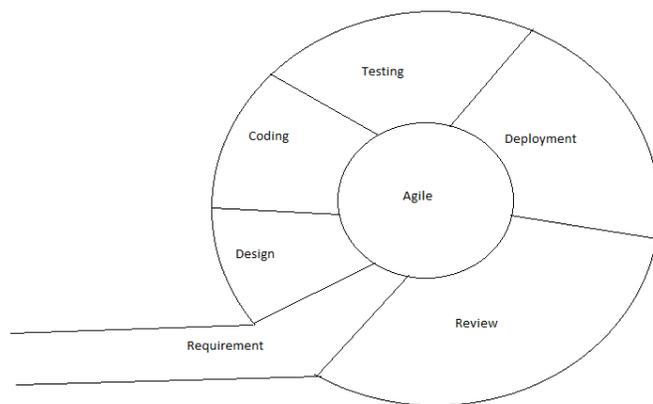
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ABSTRACT: Agile Methodology is the current methodology to develop software in better way. There are different testing techniques like regression testing, smoke testing which are based on functionality. Use case testing is based on design and the proposed testing technique complete testing otherwise called work flow testing based on sequence diagram of design. The test scenarios is prepared in Analysis of Design phase and Test case is designed based on the test scenarios in testing phase in agile methodology.

KEYWORDS: Testing, Agile, Work flow, Sequence diagram

I. INTRODUCTION

Software testing in agile methodology is the current software developing method which include requirement analysis, design and review, coding, testing, deployment and then review. The total work is divided into different time span called sprint. In Requirement analysis phase accept the requirement and convert it into user stories. Design is done in the previous sprint and do the design in next sprint and then moved to coding phase. Coding is done based on design in the coding phase. In testing phase test the application based on the test cases and report issues. The developed application is delivered to the client in the deployment phase. The client review the application and report to the team



.Fig 1. Agile Methodology

II. SOFTWARE DESIGN

Software design is the technique to validate the software before it's developed. There are different design technique available to design the software which include Use case Diagram, Sequence Diagram, Activity Diagram etc.

A. Use case Diagram:

Use case diagram contain Actors, objects and communication between them.

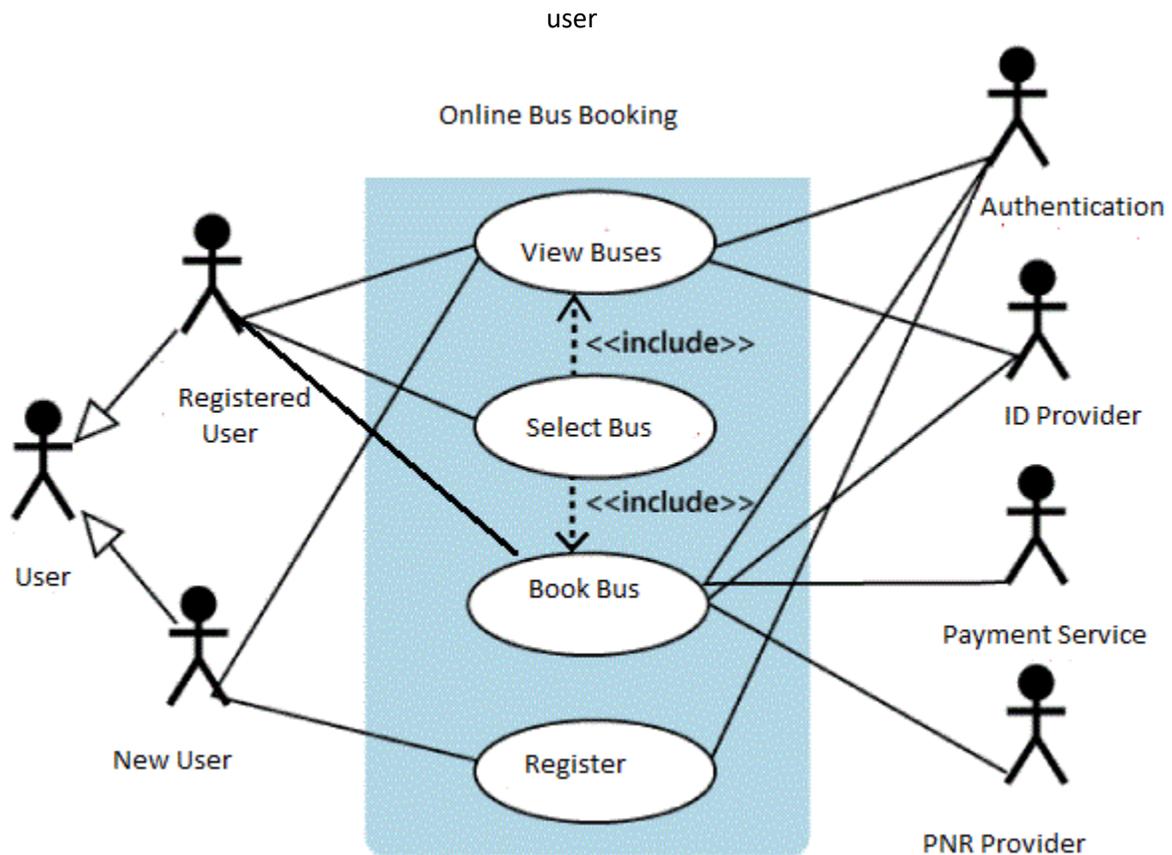


Fig.2 Use case Diagram for Online Bus Booking

The diagram is an example for use case diagram where User is an actor. The registered User is a User who can view, select and Book bus. New User can view buses and Register for bus booking service. There is also have Authentication, ID Provider, Payment Service and PNR Provider for the trusted system.

B. Sequence Diagram:

Sequence diagram highlighted on the actions which are generated while using the system.

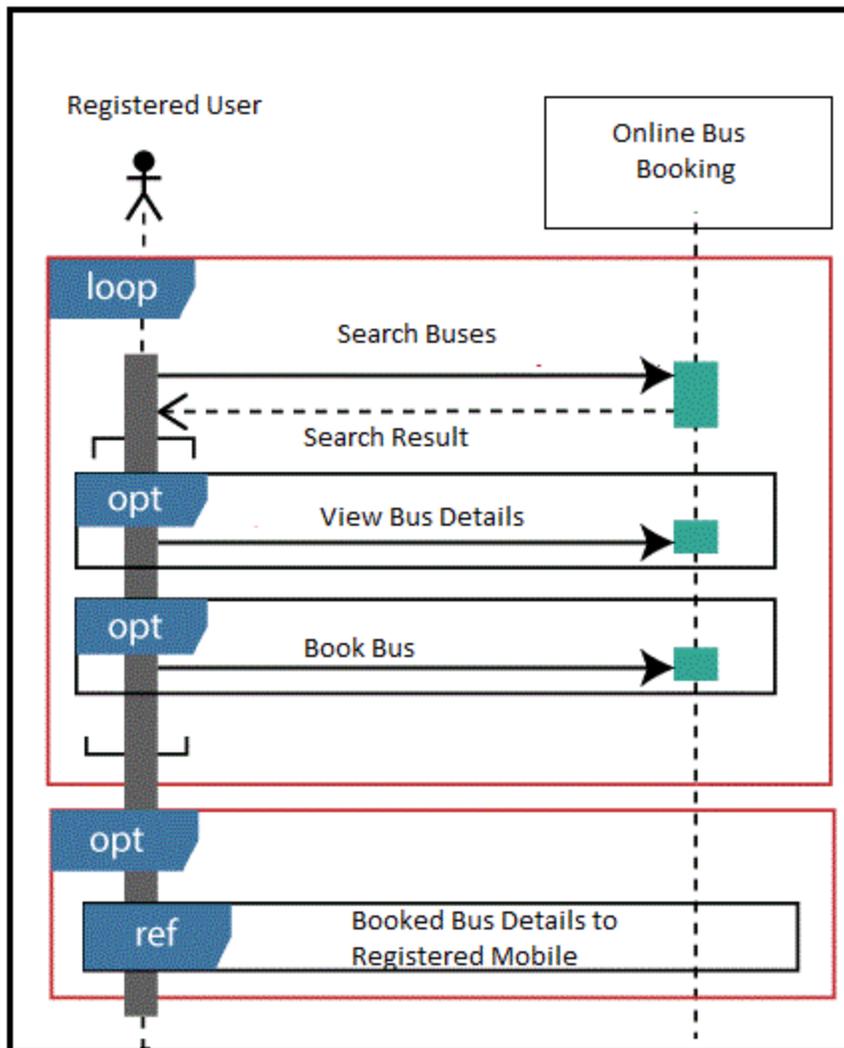


Fig.3 Sequence Diagram for Online Bus Booking

The diagram which shows the actions in online bus booking service. Registered User continuously searches the bus with keywords and the result is displayed. The user can opt services like view Bus Details and Book Bus. The reference ref is provided only for booked. PNR is send to the registered mobile number.

III. COMPLETE TESTING

Complete Testing is a type of testing technique which mainly focus on the actions in the system which are available for different actors and verifying the data of that actor. Test case preparation is based on the actions which are in order. Complete testing is otherwise called Workflow Testing. The proposed testing technique is based on the sequence diagram.

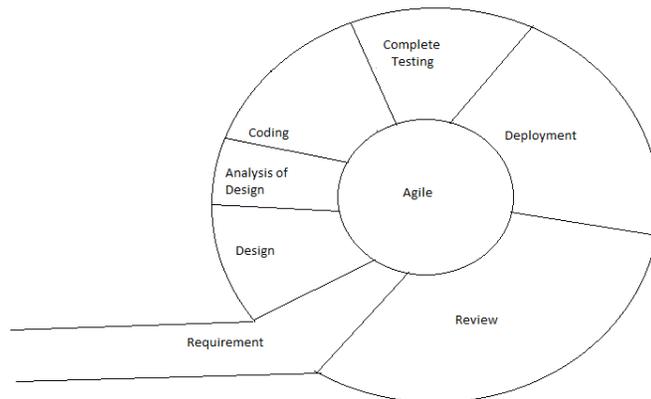


Fig.4 Complete Testing in Agile Methodology

The steps in the proposed agile methodology includes

- Requirement Analysis
 - Design
 - Analysis of Design
 - Coding
 - Complete Testing
 - Deployment
 - Review
- A. Requirement analysis: Requirement analysis include Epic and User Story Preparation and fetch in each sprint based on the requirement of the client.
 - B. Design: Design step include selection of algorithm and design of architecture for the specific application.
 - C. Analysis of Design; Tester analysis the sequence diagram and find the scenarios for each user in the application.
 - D. Coding: Developers scripts and develop the application based on the user stories.
 - E. Complete Testing: Testers prepare test cases based on the scenarios obtain in the Analysis of Design phase.
 - F. Deployment: Deliver the quality application to the client and review.
 - G. Review: The changes required for the application is discussed in this phase.

Constructivism learning theory: A Paradigm for Teaching and Learning English in secondary education in Vietnam

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Abstract- In recent years, constructivism is regarded as one of the great ideas in education. Its implications for the way teachers teach and learn how to teach are enormous. If our efforts to reform education for all are to be successful, then we must focus on the student. By far, the focus on student-centered learning may be constructivism's most important contribution. Therefore, within this article, constructivist learning theory is discussed as a paradigm of teaching and learning at high schools in Vietnam. Constructivism is a learning theory found in psychology that explains how people can acquire knowledge and learn, thereby directing application to education. Conceptual understanding of the theory as well as the basic characteristics of constructivist learning environments was discussed in more depth. Five basic principles of constructivist teaching, twelve characteristics of a constructivist teacher and six constructivist benefits have been outlined in this article. Furthermore, the significant differences between the traditional classroom and the constructivist classroom were highlighted and several implications of constructivism for teaching and learning were reviewed. Therefore, the study draw a conclusion that high-school teachers need to think about their practices in order to apply these ideas to their work, and constructivist teachers encourage students to continually assess how the activity helps them understand.

Index Terms- Constructivism, Learning theory, Constructivist teaching, Paradigm, Teaching and Learning.

I. INTRODUCTION

Nowadays, it is essential to organize the learning environment in a student-centered and democratic way that facilitates the development of students in many fields. Traditional learning environments in which students memorize information without questioning and researching lead to negative consequences. In recent years, constructivism has attracted the attention of scholars in the field of education. Contrary to previous learning theories, constructivist theories engage learners participate more in the learning process. Since teachers are an important lever in

education, they must adapt to new reforms and change the classroom environment accordingly.

Constructivist teaching is a strategy that can enable all learners to construct valid knowledge and also enable them to transmit that knowledge in different contexts. It often means encouraging students to use active techniques (experiments, real-world problem solving) to generate more knowledge and then reflect and speak about what they are doing and how their understanding is changing.

In this article, we discuss constructivism as a theory of learning in which principles of constructivist teaching, benefits of constructivist teaching and the roles of constructivist teachers are mainly focused on.

II. LITERATURE REVIEW

Constructivism as Theory of Learning

Constructivism is considered as an educational theory because it provides a framework for how students learn. The framework is similar and learning is similar for students regardless of race, cultural background or language. However, there are many educators who believe that learning is intrinsically cultural. In this article, we are concerned with constructivism as a theory of learning. Hence, we are interested in how people construct meaning and knowledge.

In constructivist educational theories, learners not only absorb information inertly, but also participate in the learning process and form new knowledge and new experiences based on existing knowledge. Constructivism stands in contrast to traditional methods where learners absorb information word-by-word from their teachers. New constructivist teaching methods have shifted understanding of the learning process to an essential form, where learners take the new ideas they have acquired in the classroom and share them with their peers. classmates. In a constructivist learning environment, learners learn best by forming their own knowledge.

Constructivist experts believe that knowledge should not be implanted in the learner's mind, but constructed through their experiences and activities. Here, teachers should inspire higher-

level thinking, where learners are encouraged to summarize concepts by analyzing, predicting, moderating and preserving their ideas (Hajal Chibani, 2017).

In the study of learning theory, Hajal Chibani (2017) summarizes the primary concepts of this theory as follows: *As learning is based on child-centered approach, students have background knowledge of the content, and they build on previous background to construct new ones. Knowledge is perceived only if the person is ready to acquire it as declarative based on tasks, concepts, vocabulary, and other information stored in the memory, procedural based on when the learner combine, incorporate or assimilate, and strategic based on when the learner*

knows how to use the first two knowledge. Remembering is very important in order for new knowledge to be acquired (p. 67).

Constructivism is a learner centered educational theory which is a view of learning based on the belief that knowledge is not a thing that can be simply given by teacher. In such context, students are actively engaged in doing something like group work, hands on, talk, project and so on.

Difference between Traditional Classroom and Constructivist Classroom

A comparison of instruction in a traditional and a constructivist-learning environment is presented in Table 1 (Brooks & Brooks, 1999).

Table 1. Comparison of Traditional and Constructivist Instruction/Teaching

Traditional Instruction/Teaching

Curriculum is presented part to whole focusing on basic skills.

Strict adherence to fixed curriculum is highly recommended.

Textbooks and workbooks are primary sources for organizing curricular activities.

Students are considered "empty buckets" on which information is filled by the teacher.

Teachers generally behave in a didactic manner, disseminating information to students.

Teachers seek the correct answer to validate/monitor student learning.

Summative assessment of student learning is focused on (mainly through mid-term tests, final tests...)

Students primarily work alone.

(Individual activities are highly recommended)

Constructivist Instruction/Teaching

Curriculum is presented whole to part focusing on big concepts.

Pursuing student questions is appreciated.

Flexible manipulative materials are main sources for organizing curricular activities.

Students are considered as thinkers with emerging theories about the world.

Teachers generally behave in an interactive manner, mediating the environment for students.

Teachers seek the students' viewpoint to understand students' present conceptions for use in subsequent lessons.

Formative assessment of student learning is focused on (mainly through student activities e.g, discussions, presentations, reports, seminars, portfolio...)

Students primarily work in groups.

(Collaboration activities such as group work, pair work are highly recommended)

As stated in table 1, the traditional view of knowledge is based on the common sense belief in the existence of a real world whether we notice it or not. In the Traditional teaching method, classes are usually dominated by lecture or direct instruction. The idea is that there is a fixed body of knowledge that the student must come to know. Students are expected to blindly accept the information they are given without questioning the instructor. The teacher seeks to transfer thoughts and meanings to the passive student leaving little room for student-initiated questions, independent thought or interaction between students. This teacher-centered method of teaching also assumes that all students have the same level of background knowledge in the subject matter and are able to absorb the material at the same pace. In contrast, in the constructivist model, teachers do not need to feed students information; teachers should encourage students to use their own thought processes to construct knowledge and solve problems.

Principles of Constructivist teaching

Constructivism is a theory about learning and knowledge. It does not provide strategies to teach but principles in teaching. Brooks and Brooks (1999) urged that constructivist practice in classrooms is imperative. They suggested teachers need to respect and encourage student autonomy and initiative, listen to student responses and teach accordingly, encourage students to ask questions, create opportunities for conversations and communications among students, and promote students to explore uncertainty of knowledge.

Figure 1 below depicts Brooks and Brooks' five central tenets of Constructivist teaching (CT), which parallel the five principles of constructivism and all of which were utilized as the underpinnings regarding CT throughout the current study.

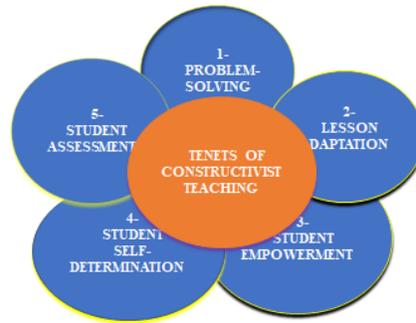


Figure 1. Dimensions of constructivist teaching

Table 2 below explains 5 central tenets of constructivist teaching in more details.

Table 2. Five central tenets of constructivist teaching

Five central tenets of constructivist teaching (CT)

Principles	Tenets of CT	Detailed explanation
Principle 1	Posing Problems of Emerging Relevance to Students (Problem Solving)	Constructivist teachers recognize that students must attach relevance to the content and curriculum. As students see relevance in assigned activities, their interest in learning grows.
Principle 2	Structuring Learning Around Primary Concepts: The Quest for Excellence (Lesson Adaptation)	Constructivist teachers structure lessons around big ideas, not small bits of information.
Principle 3	Seeking and Valuing Students' Points of View (Student Empowerment)	Constructivist teachers seek and value students' points of view.
Principle 4	Adapting to Curriculum to Address Students' Suppositions (Student Self-determination)	Constructivist teachers structure lessons to challenge students' suppositions. When educators permit students to construct knowledge that challenges their current suppositions, learning occurs.
Principle 5	Assessing Student Learning in the Context of Teaching (Student Assessment)	Constructivist teachers assess student learning in the context of daily classroom investigations. Students should demonstrate their knowledge every day in a variety of ways.

(Adapted from Brooks and Brooks, 1993)

Basic characteristics of a constructivist teacher

Constructivist teaching is based on the belief that learners actively create, interpret and reorganize knowledge. They are practically involved in a process of meaning, ideas and knowledge construction as opposed to passively receiving information. It fosters scientific critical thinking, and creates motivated and independent learning.

The following represents a summary of some suggested characteristics of a constructivist teacher (Brooks & Brooks, 1999, p. 103-118).

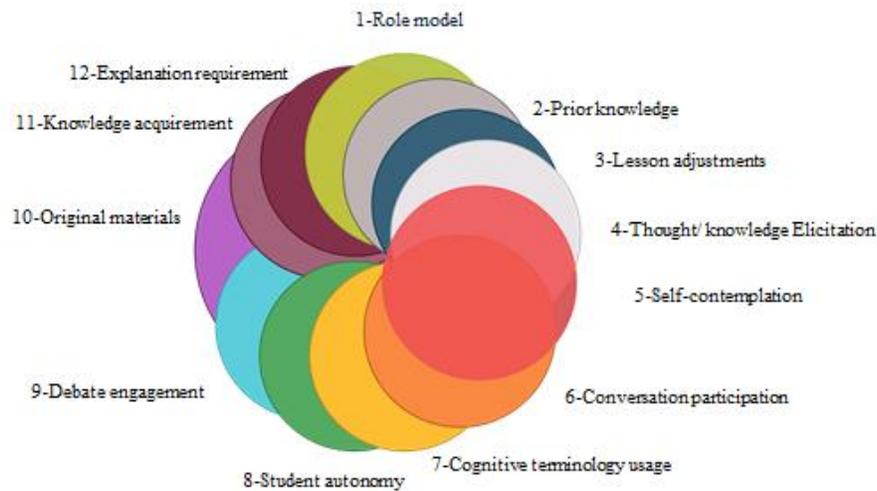


Figure 2. Basic characteristics of a constructivist teacher

The following table depicts a brief explanation of twelve characteristics of a constructivist teacher in terms of Role model, Prior knowledge, Lesson adjustments, Thought knowledge/elicitation, Self-contemplation, Conversation participation, Cognitive terminology usage, Student autonomy, Debate engagement, Original materials, Knowledge acquirement and Explanation requirement.

Table 3. Characteristics of a constructivist teacher

No	Characteristics of a constructivist teacher	Detailed explanation
1	Role model	Become one of many resources that the student may learn from, not the primary source of information.
2	Prior knowledge	Engage students in experiences that challenge previous conceptions of their existing knowledge.
3	Lesson adjustments	Allow student responses to drive lessons and seek elaboration of students' initial responses. Allow student some thinking time after posing questions.
4	Thought/ knowledge Elicitation	Encourage the spirit of questioning by asking thoughtful, open-ended questions. Encourage thoughtful discussion among students.
5	Self-contemplation	Enquire about students' understandings of concepts before sharing their own understandings of these concepts.
6	Conversation participation	Encourage students to engage in dialogue, both with the teacher and with one another.
7	Cognitive terminology usage	Using cognitive terminology such as "classify," "analyze", and "create" when framing tasks.
8	Student autonomy	Encourage and accept student autonomy and initiative. Be willing to let go of classroom control.
9	Debate engagement	Engage students in experiences that might engender contradictions to their initial hypotheses and then encourage discussion.
10	Original materials	Using raw data and primary sources, along with manipulative, interactive physical materials.
11	Knowledge acquirement	Don't separate knowing from the process of finding out.
12	Explanation requirement	Insist on clear expression from students. When students can communicate their understanding, then they have truly learned.

Benefits of Constructivism

The effect of constructivist teaching can be explained in terms of the influence of constructivism on education. Constructivism has become the leading theoretical view in education and has become a powerful force in science education (Steffe & Gale, 1995; Tobin & Tippins, 1993). The appeal of constructivism is that it provides a logically functional framework for understanding and interpreting learning and teaching experiences; In this way, constructivism serves as a powerful theoretical reference “to construct a classroom that maximizes student learning” (Tobin & Tippins, 1993, p. 7).

Constructivism has had a strong international impact on education over the past 20 years. In particular, science educators have been interested in teaching strategies based on constructivist concepts that attempt to improve students' conceptual understanding in science subjects. In many cases, these concepts have been used as basic frameworks for reforming traditional methods of education.

Bada, S. (2015) suggests the six following benefits of constructivist teaching which are summarized in table 4.

Table 4. Benefits of constructivist teaching

Benefits of constructivist teaching		
1	Creating active learners	Children learn more, and enjoy learning more when they are actively involved, rather than passive listeners.
2	Enhancing critical thinkers	Education works best when it concentrates on thinking and understanding, rather than on rote memorization. Constructivism concentrates on learning how to think and understand.
3	Developing flexible decision-making	Constructivist learning is transferable. In constructivist classrooms, students create organizing principles that they can take with them to other learning settings.
4	Providing student empowerment	Constructivism gives students ownership of what they learn, since learning is based on students' questions and explorations, and often the students have a hand in designing the assessments as well.
5	Promoting knowledge building	By grounding learning activities in an authentic, real-world context, constructivism stimulates and engages students. Students in constructivist classrooms learn to question things and to apply their natural curiosity to the world.
6	Fostering collaboration skills	Constructivism promotes social and communication skills by creating a classroom environment that emphasizes collaboration and exchange of ideas. Students must therefore exchange ideas and so must learn to "negotiate" with others and to

	evaluate their contributions in a socially acceptable manner.
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Implications of constructivism for teaching and learning

With the development of constructivist philosophy, a teacher of any subject can create a pleasant classroom environment in which learners can become constructive learners. Constructivist teachers develop skills and abilities to empower learners and make them feel competent and important. It encourages active and meaningful learning and promotes accountability and autonomy. This learning is beneficial in achieving desired educational goals and objectives, and it is important for teachers to develop expertise in a way that constructs practice.

Undoubtedly, constructivist learning has evolved as an important approach to teaching. Over the past decades, many researchers and scholars have built historical precedents for constructivist learning theory. In this view, constructivism represents a transition from behaviorism-based education to cognitive theory-based education. The main message of constructivism is that active learning allows students to construct their own knowledge and make their own sense of what is being thought.

Table 5 below suggests some constructivist activities for language teaching:

Table 5. Constructivist activities for language teaching

Constructivist activities for language teaching		
No	Kinds of activities	Examples
1	Designing and pursuing research and projects	Eg. Cultural project, Magazine project,
2	Role playing	Eg. Drama or Dialogue activities
3	Necessitate multiple learning environments	Eg. Inside and outside classroom activities
4	Situational and Contextual	Eg. Problem solving activities
5	Theme and Content based	Eg. Topic analysis activities
6	Oral presentations	Eg. Collaboration activities
7	Critical thinking	Eg. Debate activities

III. CONCLUSION

Like other teaching theories, constructivism cannot be “the key to all doors”. However, constructivism plays an important role in interpreting learning outcomes and designing environments that support learning. According to the constructivist view of learning, individuals must have a background of knowledge, experiences, and interests so that they can create unique relationships in the construction of their knowledge.

Students and teachers play the role of facilitating and creating knowledge. Students are encouraged to expand their understanding and explain their own perspectives so that they are accountable for what they do.

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An Optimized Security and Threat prevention mechanism for multi cloud network Application

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ABSTRACT: Security is the primary factor to select cloud as the platform. Security threat like man in the middle attack, SQL injection, IP Spoofing increases threats in the system. The existing systems focus on performance than the security of the system. The proposed system with multi cloud application increases the security of the application with Threat Prevent Routing mechanism. Security Check Cloud for security check and Secure App cloud for the secure application. There is Pass Code named Application id is generated in the SC Cloud based on the application run in the client environment to the SA cloud using incident App. The Pass code is the authentication to enter in to the SA cloud and run the Secure App.

KETWORDS: Security, Multi Cloud, Routing, Network Security

I. INTRODUCTION

Information Security is the process of implementing measures and systems designed to securely protect all kind of information and prevent unauthorized access, misuse, malfunction, modification, destruction, or improper disclosure and preserve security services include confidentiality, authentication, integrity, availability and perform the decide functionality. Cloud security includes examining how the data attain the security services which mentioned above in the context. The cloud platform provides Infrastructure as a service, Platform as a service and provide resources.

Different Types of clouds are:

PaaS: Platform as a Service is to provide the platform to run the application.

SaaS: Software as a Service is to provide software to run the application.

IaaS: Infrastructure as a service is to provide environment to the application other than PaaS and SaaS

II. REQUIREMENTS IN CLOUD SECURITY

Most of the applications which are moved to cloud as a platform for security. The requirements of cloud security includes avoid data breaches, Secure Cloud Account Management without negligence, API Security, Denial of service and sufficient Due Diligence.

A. Avoid of data breaches:

Usage of data for other applications to do fraud is what's called data breaches. The security service availability to authorized user which avoid data breaches.

B. Secure Cloud Account Management:

The cloud access is given to users with role to access to avoid the negligence in Secure Cloud Account Management.

C. API Security:

API services to authorized user which prevent the insecurity in API. Verify the user with postman helps to authorize the user.

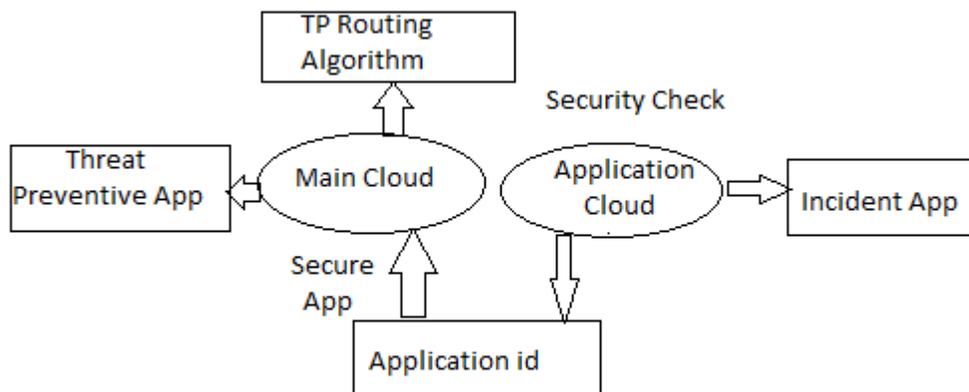
D. Denial of service:

Denial of services to hackers prevent the attack in the cloud and provide information and network security.

E. sufficient Due Diligence:

The requirement of application added to which the security of the cloud is biased.

III. ARCHITECTURE DIAGRAM

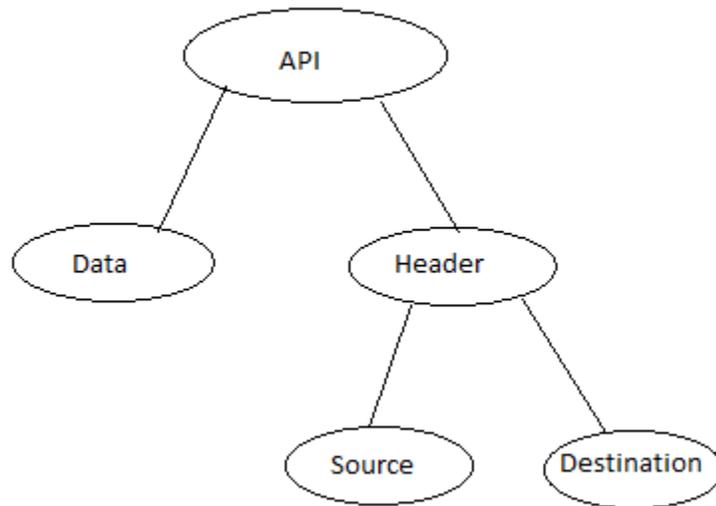


A. TP Routing Algorithm:

Threat Preventive Routing algorithm designed to provide high security services to all the application. In TP Routing have API which contain data and header. The data contain the encrypted data and header contain the destination and source address of the user and the application respectively. It each time check the header to reach the authorized user of the application.

Source->Nearest of Source->Nearest of Destination->Destination

Find the nearest of Source and Nearest of destination by using equation or ABL tree.



B. Security Check (SC) Cloud:

Security Check Cloud otherwise called Application cloud connect with incident App to provide security of the decide application. This cloud contain Blank Database which prevent SQL injection. Compute Engine service agent in the SC Cloud is to navigate from SC Cloud to SA Cloud.

C. Incident App:

Incident App runs all the applications which run the cloud to access the decide application. There is pass code for each user and it is generated based on the application status. If hackers access the system with some application which check in the incident app and respond with status fail and display the denial of service. All other users return an application id to access the decide application.

D. Application ID:

It's an encrypted ID passed from SC Cloud to SA Cloud to access the application.

E. Threat Preventive App:

Threat Preventive app uses the TP Routing mechanism to deliver the application. Threat Preventive App runs in the Secure App Cloud.

F. Secure App (SA) Cloud:

Secure App otherwise called main cloud in the threat preventive App runs. Content Delivery Network (CDN) provide the service by checking the application ID.

The Role of ICT-Based Monitoring and Evaluation Systems in Infrastructural Development in County Governments: Empirical Evidence from Machakos County, Kenya

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Abstract

There exists knowledge gap in analysis of the influence of the general ICT-based M&E systems in county governments with a focus on data analysis and timely presentation to stakeholder, there an empirical gap in physical health infrastructural, road infrastructural development, market infrastructural development and sports infrastructural development ICT-based M&E. This study tried to fill the gap in knowledge by answering a question on what the role of ICT-based monitoring and evaluation systems in infrastructural development in county governments? The study used the Realist Evaluation Theory coupled with a descriptive design. The study was conducted in Machakos County, one of the 47 counties in the republic of Kenya with a target of both internal and external M&E contractors of the Machakos County Government since 2013 to 2022. The study used purposive sampling technique and census to select the study participants. Two forms of questionnaires were used to collect quantitative data; one for ICT departments and the other for M&E department of the County Government of Machakos. Interviews were used to collect qualitative data from the Heads of ICT and Project and Delivery M&E departments. The instruments were piloted at the county government of Kitui. Content validity of the instruments were assessed by experts while reliability was determined using Cronbach's Alpha to ascertain items' internal consistency (yielding r of at least 0.75). Descriptive and inferential statistics were used to analyzed quantitative data while the qualitative data was analyzed thematically. The study found that information and communication technology improvements had often led to new ideas. Because of technological progress, there were new methods, tools, and ways of doing things, as well as new opportunities and problems in infrastructural development in Machakos county government. In the construction industry, amenities like roads, bridges, and buildings were equipped with electronic sensors that could be accessed from afar and give information about access. Monitoring and evaluation (M&E) systems should be used by all sectors in the county to keep track of project progress, measure and evaluate project results.

Key words: *ICT-Based, Monitoring and Evaluation, M&E Systems, Infrastructural Development, County Governments*

Introduction

Many new instruments and approaches for monitoring and evaluation have been available over the last two decades. Advances in information and communication technologies have frequently fueled innovation. New procedures, tools, and approaches spurred by technological advancements have created new opportunities as well as new obstacles. Infrastructure such as roads, bridges, and buildings can be equipped with remotely accessible electronic sensors to offer information on access in the construction industry. The information can be utilized to figure out when and how infrastructure or services are utilized. Intelligent infrastructure, for example, can be used to track how many people are visiting hospitals or resource centers. Intelligent infrastructure can help with automatic monitoring and decision-making in specific circumstances. It is feasible to construct wells that self-report when they are broken, for example (Intrac, 2017).

Organizations and governments utilize monitoring and evaluation (M&E) systems all around the world to track progress, measure, and assess project outcomes. By increasing their monitoring and evaluation processes, organizations can increase their performance, effectiveness, and project success. Furthermore, various studies show that information and communication technology systems are required for monitoring and evaluation activities because the majority of government organizations do not use computerized

monitoring and evaluation systems, and those that do lack a systematic early warning mechanism of project progress (Mleke & Dida, 2020).

According to UNDP Global Pulse (2016), big data can frequently give real-time and continuous data, which is useful for tracking the progress of a program. Observing behavioral change also necessitates gathering data on processes (rather than just comparing two points in time). A number of big data and ICT resources are available to help. Mobile devices can record video and audio of meetings, work groups, and other elements of community life, which can be beneficial. Social media is also a thriving, abundant source of information. Another useful tool is social network analysis. Data of high quality is typically difficult to obtain, and the recording and interpretation process frequently involves a level of subjectivity that is difficult to manage.

Smart phones can now collect high-quality audio and video data, and analysis and interpretation software are fast improving. This can aid in the removal of reporting bias and subjective interpretation. Both big data and ICTs provide a variety of options for integrating data from various sources and formats. While big data can handle very huge data sets, ICTs can handle smaller data sets as well (UN Global Pulse, 2016).

According to Institute of Development Studies (2012), many systems now use a GPS tracking device to generate sanitation facility location coordinates, which are then analyzed using an Excel-based model and the findings shown as a color-coded map. Distinct countries have different innovations. An innovation does not have to be perfect, but it must match the country's environment; for example, smart phones may be useful for data collection in India, but they may not be in Angola. These ICTs can be useful instruments for informing intervention planning and design, as well as gathering data for successful advocacy and program planning in the sector. For example, near-real-time progress tracking can help with programming and course correction.

In a study conducted by Bernardi & Chiara (2011), it was found that HIV/AIDS surveillance situation in Kenya has changed dramatically during the last ten years. The creation of new integrated governance and monitoring mechanisms, such as the NACC and the national HIV/AIDS monitoring and evaluation framework, as well as the integration of data gathering tools at the National HIV/AIDS Programme, are among them. One would be tempted to think of these shifts as the emergence of new accepted practices guided by the reforms' new logic of integration. Nonetheless, the institutionalist viewpoint used in the case study research allowed us to go deeper. As a result, the continuation of old institutionalized behaviors marked by fragmented and centralized information systems has been revealed.

To overcome challenges in monitoring and evaluation, internal and external practitioners are co-opting and slowly integrating user-friendly technologies in the systems they use to monitor and evaluate. While Machakos County Government has made progress in terms of implementing optimum monitoring and evaluation (M&E) methods, the sector is still grappling with how to best overcome important conceptual and practical hurdles. The ideal way to monitor and evaluate concepts and developments that are fundamentally abstract, complicated, and can only be observed over lengthy periods of time remains a question. The department is unable to collect data in a systematic and timely manner, process it in real time, and communicate it to all stakeholders in a user-friendly format (Corlazzoli, 2014).

Current research documented in the literature shows limited studies on the influence of M&E on infrastructural development... Most studies focus on general M&E and not on specific aspects such as ICT. M&E has also not been investigated for the county government of Machakos.

Through a keen presentation of currently available and potential technologies of ICT in M&E systems, this study sought to analyze the influence of ICT-based M&E systems in Infrastructural Development shedding light into technology solutions for practitioners to overcome long-standing M&E challenges. A number of studies have been conducted globally on the use of ICT-based M&E systems in different sectors, however most these studies targeted a specific ICT-based M&E solutions such as Geographical Information Systems (GIS) with a focus on data collection for M&E. However, there exists a knowledge gap in analysis of the influence of the general ICT-based M&E systems locally with a focus on data analysis and timely presentation to stakeholder, there an empirical gap in physical health infrastructural, road infrastructural development, market infrastructural development and sports infrastructural development ICT-based M&E. This study tried to fill the gap in knowledge in local studies in the same subject, through analyzing Machakos County Government Infrastructural Projects.

Literature Review

Gorgens & Kusek (2010) governments and organizations around the world are under continual and increasing pressure to be more responsive to demands for good governance, accountability and transparency, improved development effectiveness, and the delivery of tangible results from internal and external stakeholders. Stakeholders interested in greater performance include governments, parliaments, individuals, the private sector, non-governmental organizations (NGOs), civil society, international organizations, and donors. As the need for increased accountability and results has grown, so has the need for practical and usable results-based monitoring and evaluation systems to support policy, program, and project management. As part of their management toolkits,

governments and other organizations have a variety of tracking systems, including good human resource systems, financial systems, and accountability systems.

The World Bank (2013) found that M&E are clearly distinct, but they are also complementary. Monitoring provides information on where a policy, program, or project stands in relation to its aims and outcomes goals at any given time (and over time). It is illustrative. Evaluation provides data as to why aims and outcomes are being met or not. It investigates the relationship between cause and effect. Governments are not unfamiliar with monitoring and assessment systems. More than 5,000 years ago, the ancient Egyptians kept a close eye on grain and livestock production. Today's governments all do some form of monitoring and evaluation. Most companies keep track of their costs, revenues, employee levels, resources, program and project activities, goods and services produced, and so on.

Nirmala et al. (2017), opines that though monitoring and evaluation are complementary activities, they are separate due to the fundamental approach differences. Monitoring is carried out in accordance with the management model, with an emphasis on daily operations. To determine whether project objectives have been fulfilled or exceeded, evaluation use a research methodology. Interwoven activities, on the other hand, are the most effective. They can provide information that will assist decision-makers in determining the best course of action for the project's future or the direction of future projects when used together. Monitoring and evaluation findings should assist decision makers in deciding whether to continue the project as is or with some modifications, expand the project by increasing coverage, reproduce the initiative in a new context, or curtail the project and reallocate resources elsewhere. Decision-making requires both monitoring and evaluation systems, thus they should be included in project planning (Kumar et.al, 2017).

Governments and other organizations have a variety of tracking systems in their management toolkits, including good human resource management systems, financial management systems, and accountability management systems. They also require effective feedback systems. A results-based M&E system is simply a feedback system; it's a management tool for measuring and evaluating outcomes, as well as giving data for governance and decision-making. Many management systems lack a feedback component that allows them to track the effects of their actions. By giving feedback on performance as a foundation for future improvement, an M&E system provides decision-makers with an extra management tool (World Bank, 2013).

According to Azevedo, Ferreira & Leito (2007), with the rapid advancement of technology in the twenty-first century, economic society and life have changed dramatically. In this continuously changing and uncertain economic climate, promoting competitive advantages has become the most critical issue for businesses. Many studies have shown that technology adoption is the most critical instrument for businesses to sustain their competitive advantages. In a knowledge-based economy, a company's ability to increase its technological capability is critical to its existence.

Firms should establish appropriate approaches in this regard in order to successfully adapt new technologies in the logistics area, as well as to integrate logistics into corporate strategy in order to become even more competitive. Partners are pressuring a rising number of businesses to change their old management styles, both operationally and organizationally, and replace them with integrated systems that help boost the speed and fluidity of physical and information flows. They are investing in new ICT to achieve this level of integration (Azevedo, Ferreira & Leito, 2007).

Mleke & Dida (2020) have observed that, M&E technologies have been increasingly crucial in tracking and analyzing project progress in recent years. M&E track the progress of initiatives and determine if they are fulfilling their goals or heading in the right direction. According to recent studies, there has been an increase in the establishment of M&E awareness in both public and private organizations, as well as an increase in the number of institutions that provide M&E courses.

A study was conducted by The World Bank (2013), to aid development practitioners in evaluating and selecting ICT applications for monitoring and evaluation in rural projects, specifically in agriculture and forestry, with a focus on mobile technology for data collecting. It was found that data gathering can be difficult, especially in highly decentralized projects, and picking technology might be difficult due to the enormous number of possibilities and individual project needs. The study was written in response to a requirement for development practitioners to be able to keep up with evolving technology and find relevant routes for assessing and selecting technology to support monitoring and evaluation (M&E) and project outcomes.

Through the lens of agriculture and forestry initiatives, the report gave recommendations in selecting and applying technology for data collecting, monitoring, and assessment. It was a practical, in-depth look at how governments and development practitioners might use ICT to improve data collecting and monitoring and evaluation efforts in rural development initiatives and programs (World Bank, 2013). However, this study mainly focused on agricultural sector and though the findings can be applied to other sectors, this study greatly looked at assessment and selection of ICT solutions for M&E in rural projects with a keen interest on mobile technology for data collection.

Methods

The study used the Realist Evaluation Theory. Ray Pawson and Nick Tilley invented the phrase "realist evaluation" in their book of the same name (1997). The importance of CMO (Context, Mechanism, Outcomes) configurations in policies and programs is

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emphasized in this methodological approach. The study adopted a descriptive design. The design was used to collect information that demonstrated and described the influence of influence of ICT-based Monitoring and Evaluation Systems on Infrastructural Development by the County Government of Machakos (Gakuu, Kidombo & Keiyoro, 2018).

The study was conducted in Machakos County, one of the 47 counties in the republic of Kenya. Machakos county is located between the latitudes of 0° 45' South and 1° 31' South, and the longitudes of 36° 45' East and 37° 45' East. The altitude of the county ranges from 1000 to 1600 meters above sea level. Machakos County, often known as 'Macha,' was Kenya's first capital city and is now an administrative county. Machakos Town, Mavoko, Masinga, Yatta, Kangundo, Kathiani, Matungulu, and Mwala are among the eight (8) constituencies that make up Machakos. Machakos Town is the county's administrative center.

This study targeted both internal and external M&E contractors of the Machakos County Government since 2013 to 2022 who had worked on various infrastructure projects specifically those in sports facilities, road construction, market facilities, health facilities. The study also targeted employees of the Project Delivery M&E department in the County Government office.

The study used purposive sampling technique. This research involved studying the whole Project & Delivery M&E and ICT departments of the Machakos County Government (Gakuu, Kidombo & Keiyoro, 2018).

Since the two departments combined have less than a 100 hundred employees, the researcher used census of the two departments in order to analyze the influence of ICT-based Monitoring and Evaluation Systems on Infrastructural Development by the County Government of Machakos in Kenya.

The main data collection instrument was questionnaire. Bhandari (2022) defines a questionnaire as a set of questions or items intended to collect information about respondents' attitudes, experiences, or opinions. Questionnaires are useful for gathering quantitative and qualitative data. The questionnaire contained both open-ended and close-ended questions (Bhandari, 2022). There were two forms of questionnaires; one for ICT departments and the other for M&E department of the County Government of Machakos. Interviews were used to collect qualitative data. According to George (2022), an interview is a qualitative research approach in which data is collected by asking questions. The Key Informant Interview was specifically targeting the Heads of ICT and Project and Delivery M&E departments which were done by the researcher.

A pilot study was conducted two days before the actual study at the county government of Kitui. This allowed the researcher to familiarize with the research plan and protocols within the County Government offices. To ensure content validity of the instruments, the researcher facilitated the data collection instruments review by the supervisor as well as used the feedback from the pilot study (Kothari, 2004) to edit the instruments accordingly. The researcher tested for reliability of the instruments by checking the consistency of results across parts of the test items.

Descriptive and inferential statistics were used to analyzed quantitative data. The data was tabulated for analysis with the help of Statistic Packages for Social Science Version 26. The data was outlined and summarized using percentages and frequencies. The qualitative data was analyzed thematically based on guiding research objectives and presented using verbatims.

Results

The principal goal of this research study is establishing the implication of ICT-based in monitoring and evaluation on infrastructure development in Machakos county. Respondents were given three choices depending on the nature of monitoring and evaluation conducted in their respective departments. According to Figure 4.6, over 69% of the respondents said that they used ICT based Monitoring and evaluation as well as both ICT based, and non-ICT based monitoring and evaluation technique. Just about 30% belonged to departments that stilled relied on non-ICT based monitoring and evaluation. From this outcome, the research observed that in as much as the culture of integrating ICT in monitoring and evaluation processes was popular, most departments opted to retain non-ICT methods or deploy both.

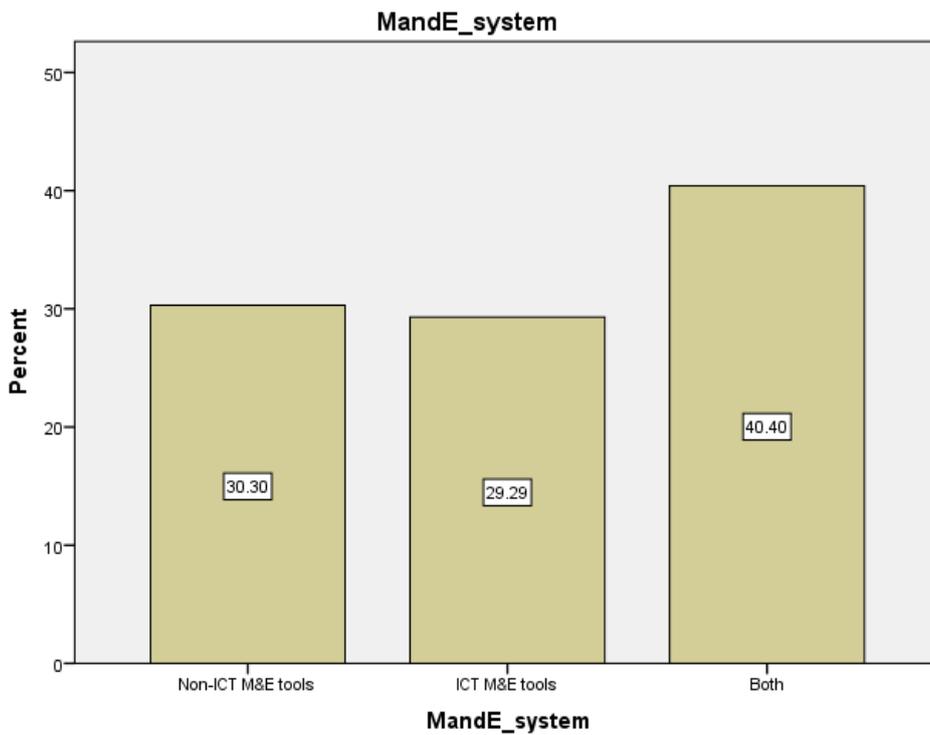


Figure 1 Distribution of M&E systems used

Scale of ICT integration

The responses collected on the scale of ICT integration in the respective department supported the hypothesis that many departments are embracing information technology in the execution of administrative and business functions. Over 70% of the respondents reported that the scale of ICT integration in their departments was either high or very high. Only around 8% and 2% said the level of ICT integration in their departments was low and very low respectively as presented on the bar chart below (See Figure 2). This distribution speaks to the crucial role technology plays in the daily function of any organization and the administrative wings of governance.

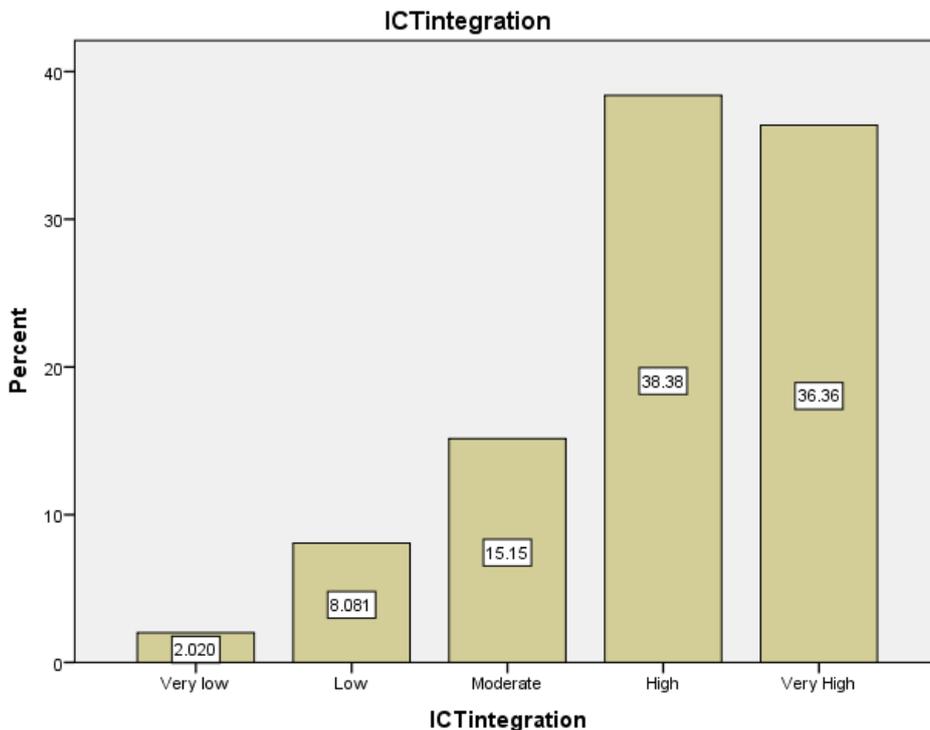


Figure 2 : Scale of ICT integration in departments

Data collection promptness

When asked to gauge the role of ICT-based monitoring and evaluation on market infrastructural development, 38.4% of the respondents strongly agreed that ICT based M&E led to systematic and timely data collection. A significant proportion (52%) agreed with these sentiments while just about 9% disagreed with those assertions according to the information displayed on Figure 4.8 below. From this outcome, it can be deduced that ICT based M&E plays a critical role in data collection processes. This is as presented in Figure 3.

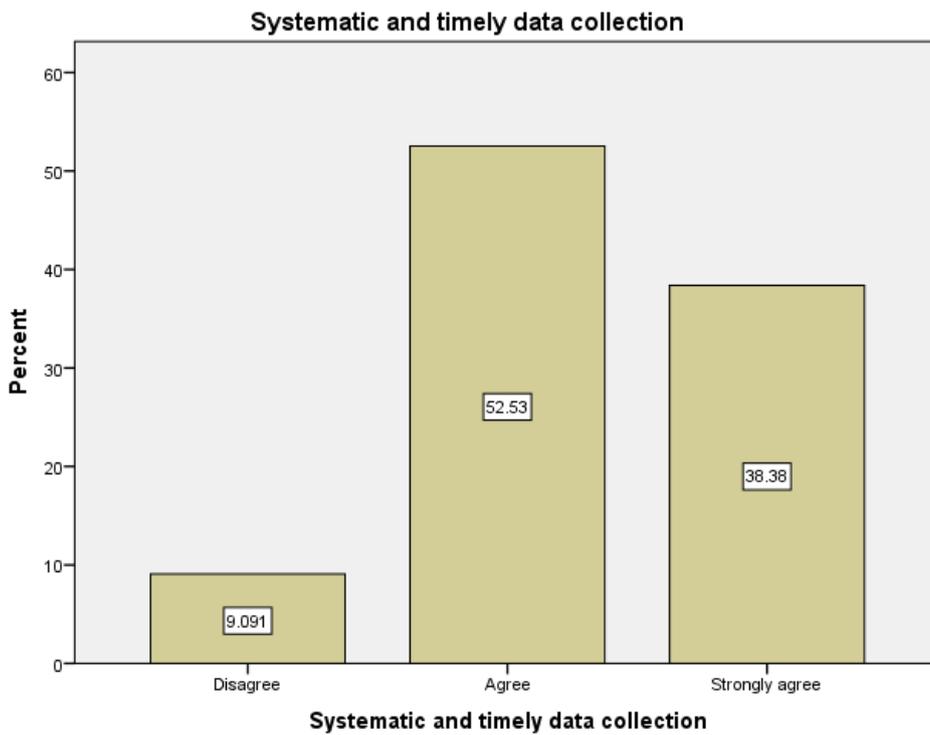


Figure 3 Role of ICT-based M&E on systematic and timely data collection

Realtime data processing

On the question of real time data processing, over 90% of the respondents said that they agreed or strongly agreed with the statement that ICT-based M&E promoted real time data processing. Those that disputed this were just about 8% as seen on Figure 4.9 below. This goes to show that ICT-based M&E place an extensive role in data processing across many different departments in Machakos County. This is presented in Figure 4.

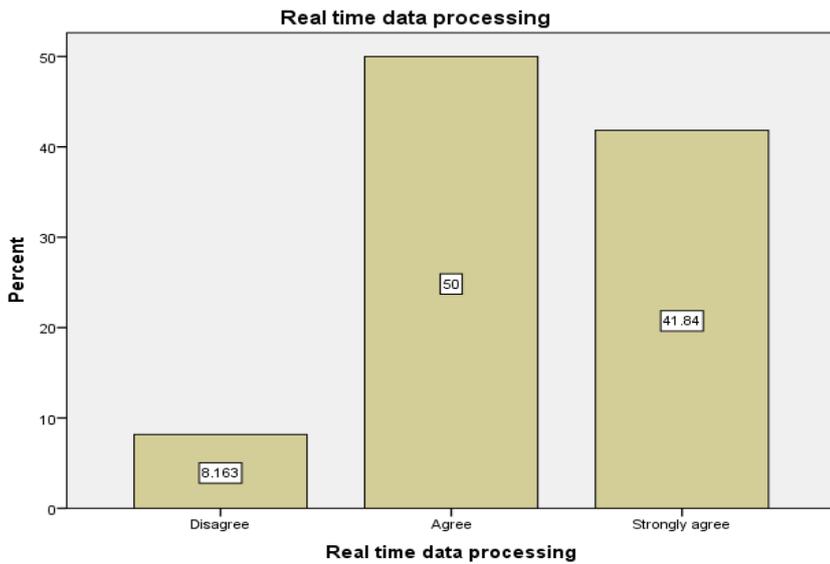


Figure 4 Role of ICT-based M&E on Real Time Data Processing

Efficiency of communication

ICT plays a very crucial role in enhancing efficient communication between parties, stakeholders and even different departments. On the question whether this was actually so in Machakos County, over 94% either agreed or strongly agreed that indeed this was so as illustrated on Figure 4.10. Of this massive chunk of the sampled respondents, 38% strongly agreed with the sentiments on the role of ICT-based M&E on enhancing communication efficiency. Only about 5% reported that they did not agree with the thoughts on impact of ICT based M&E on communication. Consequently, it can be asserted that many departments in Machakos County are reaping the benefits of ICT-based M&E on communication. This is as presented in Figure 5.

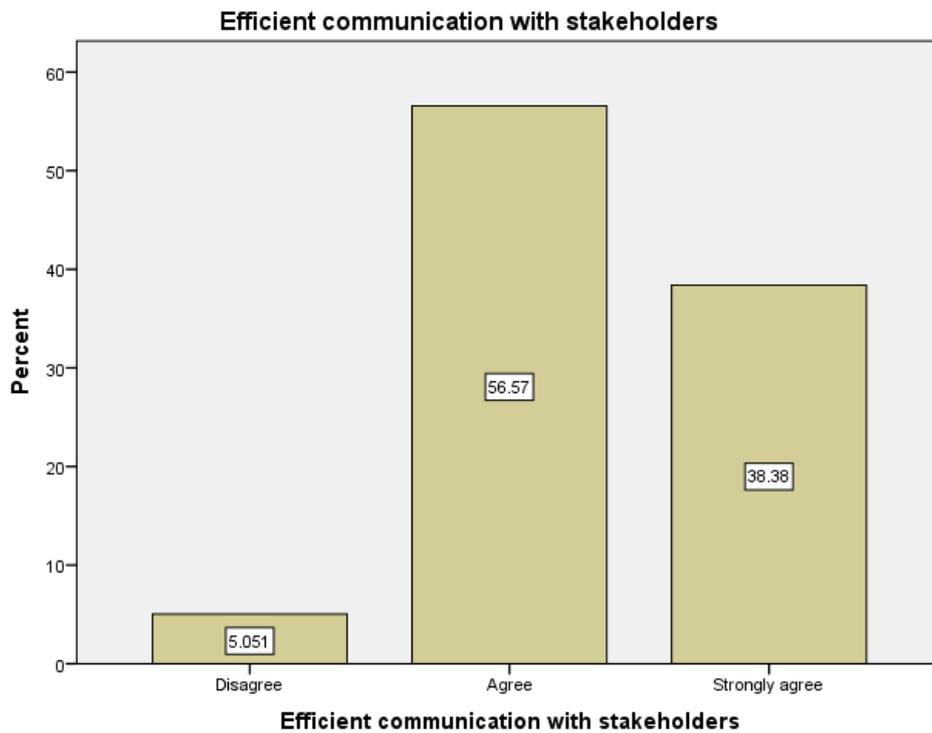


Figure 5 Role of ICT-based M&E on Efficient communication

Regression Model

The collected quantitative data was analyzed through regression modelling. The model summary of the regression is presented in Table 1.

Table 1: Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.766	.587	.511	1.31789

The outcome of the linear regression analysis is as displayed in Table 1. The R squared statistics and the adjusted R squared statistics for the above model is 0.587 and 0.511 respectively. These statistics explain the magnitude of influence of the predictor variables on the explanatory variable. Approximately 58.7% of the changes in the infrastructure development ratings stated by the respondents can be attributed to the variations in the independent variable scores. The regression coefficients for each of the predictor variables are shown on Table 2.

Table 2 Regression Coefficients

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval		Partial Eta Squared
					Lower Bound	Upper Bound	
Intercept	1.289	1.164	-7.120	.000	-10.603	-5.974	.371
Systematic timely data collection	.527	.104	5.043	.000	.319	.734	.228
Real time data processing	.464	.104	4.485	.000	.258	.670	.190
Efficient communication	1.211	.117	1.802	.005	-.022	.445	.036
Safe data storage and ease of access	1.424	.078	5.471	.000	.270	.578	.258
Cost of technology	.433	.094	4.593	.000	.245	.620	.197
Technological simplicity	.403	.081	5.004	.000	.243	.564	.225
[M&E_system=1.00]	2.037	1.204	-1.343	.000	-.678	.131	.021
[M&E_system=2.00]	-1.273	2.207	-.177	.000	-.447	.374	.000
[M&E_system=3.00]	0 ^a

a. This parameter is set to zero because it is redundant.

The regression coefficients for each of the predictor variables are shown on Table 4.3 above. The relations;

$$Y_1 = 1.29 + 0.53Sys + 0.46DataP + 1.21Comm + 1.42Stor + 0.43Tech + 0.38Cost + 0.4Simp + 2.04M\&E + e ;$$

$$Y_2 = 1.29 + 0.53Sys + 0.46DataP + 1.21Comm + 1.42Stor + 0.43Tech + 0.38Cost + 0.4Simp - 1.27M\&E + e \text{ and}$$

hold. All factors held constant, the average rating score on a scale of one to ten, assigned by an employee to the level of infrastructure development in the county was 1.29 as shown by the intercept coefficient. However, a unit increase in the scores for Systematic timely data collection, Systematic timely data collection, Real time data processing, Efficient communication, Safe data storage and ease of access, Cost of technology and Technological simplicity increased the infrastructure rating a respondent awarded the county by .527, .464, 1.211, 1.424, .433 and .403 respectively as expressed in Equation Y₁. These coefficients are statistically significant at both 95% and 99% level of confidence as indicated by the corresponding P value (P<0.05; P<0.01).

Equations Y_1 , Y_2 and Y_3 have been expressed in order to bring out the effect size of the interactive variable which is the M&E system used in a particular department. The M&E system selected was either ICT-based (1), non-ICT-based (2) or Both (3). According to Equation Y_1 , using the ICT-based M&E system increased the infrastructure rating by 2.04. In contrast, relying solely on non-ICT-based M&E system diminished the infrastructure development by 1.27. The outcome of the regression analysis is effectively illustrated on Figure 4.17 below. The average infrastructure development ratings awarded to the county was highest for respondents whose departments used the ICT-based M&E system, and lowest where the department relied exclusively on non-ICT-based M&E. The significant difference in the infrastructure ratings between the two system underscores the significance of the former in enhancing infrastructure development in the county.

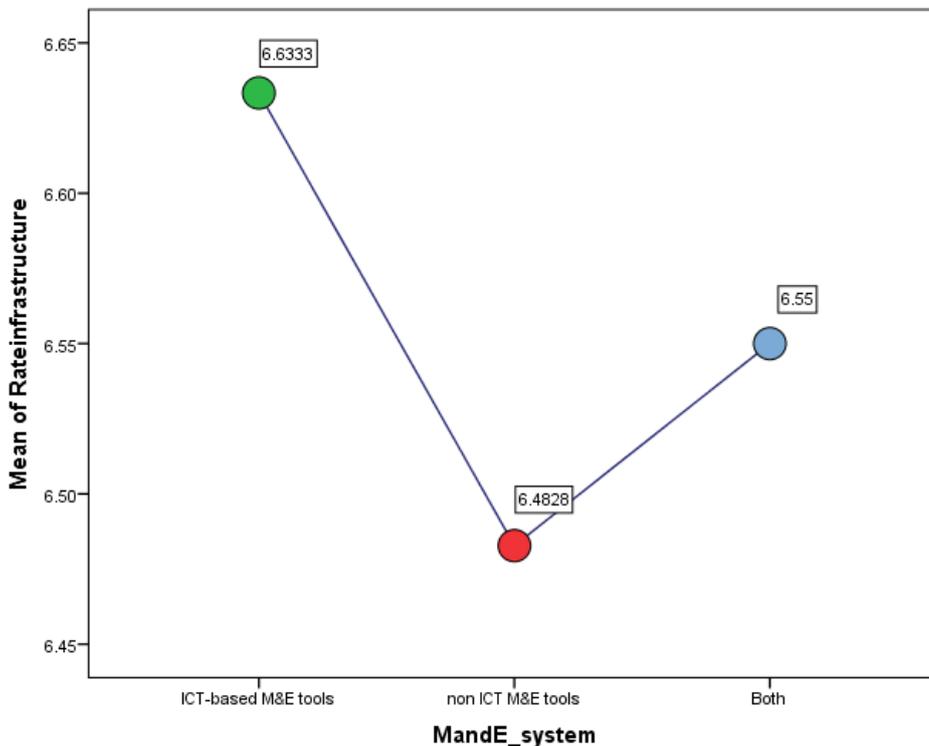


Figure 6 Mean plot for M&E systems

Discussions

The investigation into the influence of ICT-based Monitoring and Evaluation Systems on Infrastructural Development of Machakos county, Kenya, offers one of the most comprehensive insights relative to the work done by other researchers. Despite the disparity in the research done on the topic in the county, the feedback from the respondents indicated that ICT-based Monitoring and evaluation was not a new concept in the region. In fact, according to Figure 4.6, over 69% of the respondents said that they used ICT-based Monitoring and evaluation as well as both ICT-based and non-ICT-based monitoring and evaluation technique. Similarly, more than 70 % of the respondents concurred with the questions that suggested that the scale of ICT integration in their departments was either high or very high. Based on this feedback, the research is in a good position to speculate that ICT-based Monitoring has played a great role in the growth and development of infrastructure in Machakos county. Azevedo and Ferreira make similar speculation, and Leito (2007), according whom, the rapid technological advancements of the 21st century have forced governments and organizations to re-evaluate their archaic outlook on the world and adapt to the changes. Technology has been adopted in most organizations to keep up with the competition. Similarly, Mleke and Dida (2020) observe that M&E technologies have been increasingly crucial in tracking and analyzing project progress in recent years. Adopting this technology can be a significant game changer for Machakos' infrastructural development and the county's ability to compete with the other influential counties in the country, such as Nairobi and Mombasa counties.

The research found that incorporating ICT-based Monitoring and Evaluation Systems on Infrastructural Development of Machakos county had notable advantages. Figure 4.10 indicates that at least 90 % of the respondents found ICT essential in enhancing efficient communication between parties, stakeholders, and even departments. On a similar note, previous research found ICT integration into various organizations to be instrumental in improving aspects such as the quality of work and life of the stakeholders. According to the European Commission (2013), appropriate communication tools are a key strategy for improving healthcare communication and the health and well-being of older persons. The authors note that ICT can be one of the communication tools that plays that part.

Data collection promptness and real-time data processing were other advantages brought forth by the integration of ICT-based Monitoring and evaluation in the structural development of the county. According to figure 4.8, most respondents agreed that its

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inclusion positively impacted the speed of the data collection process and the quality of the data obtained. Similarly, figure 4.9 showed that the questionnaires conjured up a 90 % response in favor of the ICT-based Monitoring and evaluation system. Their response suggested that the integration had a significant positive impact on data processing speed. According to Xuesong et al. (2008), data collection accuracy has increased immensely. For instance, the authors outline that resources used in the process can work with increased situation awareness applications that could aid construction site operations, thus, allowing for productivity assessment, waste reduction, and accident prevention.

Common infrastructural development in Machakos county that could benefit from ICT-based monitoring and evaluation systems include sports, health, road, and market infrastructure. Table 4.6 shows a strong positive relationship between ICT-based monitoring and evaluation systems and the infrastructure development rating. The positive relationship suggests that an increase in the rate of the incorporation of the ICT-based systems into the development of Machakos County will trigger a proportional increase in the infrastructural development of the county. Additionally, Table 4.6 shows that 58.7 % of the various infrastructural development in the country is subject to the incorporation of ICT-based monitoring and evaluation systems. As such, the research is inclined to speculate that the inclusion of an ICT-based system is advantageous to the infrastructural development of Machakos county. Recent studies by various authors show how ICT-based systems have positively affected the various infrastructure investigated in this research. For instance, Peyroteo et al. (2021) point out the important role ICT has played in improving the quality of healthcare delivery. The improvement was shown in droves during the COVID-19 outbreak as patients with chronic conditions, the elderly, and those recovering from SARS-CoV-2 benefited immensely.

Similarly, a study on the impact of ICT on market infrastructure by Lin et al. (2017) shares the sentiments of this research as it details the important role that ICT has played in agriculture by introducing e-agricultural systems with blockchain architecture. The new platform has given farmers access to knowledge on banks and other digital resources which is essential for the efficiency of sustainable agricultural development.

Conclusion and Recommendations

The study found that information and communication technology improvements had often led to new ideas. Because of technological progress, there were new methods, tools, and ways of doing things, as well as new opportunities and problems in unfractured. In the construction industry, amenities like roads, bridges, and buildings were equipped with electronic sensors that could be accessed from afar and give information about access.

Monitoring and evaluation (M&E) systems were used by the Machakos county government all to keep track of project progress, measure and evaluate project results. However, the county government can improve their performance, effectiveness, and project success by making their monitoring and evaluation processes stronger. There are several ICT and big data tools that can help. Meetings, work groups, and other parts of community life can be recorded on video and audio by mobile devices, which can be helpful.

Based on the study findings, call for the Machakos county government to deploy ICT-based M&E systems will help in keeping its resources used during road constructions safe. It will also help to track down resources owned by the government hence helping to develop infrastructure. This study, therefore, recommends that ICT-based systems development be promoted and be part of project plan.

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UNDERSERVED, YET UNDETERRED: Exploring Perspectives of Out- Of-School Boys in Northern Nigeria.

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Abstract

During the Coronavirus Pandemic, schools across the world were forced to close down spurring them to embrace innovative means of delivering lessons to students. This resulted in an increase in the already alarming number of out-of-school children in Nigeria. Although insurgency is largely reported as the primary reason for the number of out-of-school children in the Northern part of Nigeria, there are new suggestions that several other factors that are primary contributors to this educational problem. The aim of the study, therefore, is to expose some of the hidden barriers that impede the enrollment and completion of male children in schools in Northern Nigeria. It also seeks to understand the factors responsible for the receptiveness of ACE Radio School - an alternative form of education introduced in selected states in Northern Nigeria in 2020 in response to the pandemic. For this study, qualitative data was used, employing purposive sampling as a method for selecting the participants. The responses were collected using a remote data collection tool over a three month period and were subsequently analysed thematically. A total of 35 respondents were sampled and these respondents were adolescent boys in Northern Nigeria, between ages 10 and 18 who were out-of-school and were also listeners of the ACE Radio School lessons. Findings from this study revealed seven major reasons for the number of out-of-school boys in Northern Nigeria while citing other less prominent, but note-worthy reasons. Also, the experiences the boys had with ACE Radio school affirms that this remote method of teaching, using both the radio and mother tongue, made ACE Radio School a good alternative for delivering high quality educational content to out-of-school boys, and girls alike, in Northern Nigeria.

Keywords: Alternative Education, Out-of-school Boys, School Enrollment, Northern Nigeria, School.

1.0. INTRODUCTION

All around the world, every child has a right to education; quality, safe and accessible education. As a matter of fact, the SDG Goal 4 is one of the most crucial for any child. It is therefore not a surprise that a lot of possibilities hinge on the attainment of that goal; breaking free from the chains of poverty, decent work in future, access to opportunities, etc. However, the possibilities of attaining good, safe and quality education has continuously been a mirage; a wild, unattainable dream, for many children around the world. Despite the tremendous effort being put in place, there is still a lot of work to be done (UNSD, 2019)¹.

A report from the Nigerian Tribune (Nigerian Tribune, 2022)² showed that according to the UN data, out of all 10-year-olds in low- and middle-income countries, 53% cannot read and understand a simple sentence or perform basic numeracy tasks. The numbers are worse in Sub-Saharan Africa, as 87% of children do not have basic literacy by age 10. In Nigeria, the record is terrifyingly disturbing with results being one of the lowest globally – with 70 percent of children not achieving basic foundational skills (Nigerian Tribune, 2022). The stark realities evident in the Nigerian education sector leave a sour taste in the mouth. These realities differ across geopolitical zones, states and gender. Furthermore, the paltry allocations in the federal and state education budgets also aggravate the

existing challenge as it buttresses the fact that education is grossly underfunded; an indication that the level of priority given to education in Nigeria is low (Ojeleye, 2020)³.

In Northern Nigeria, there is a notion that girls are less likely to be enrolled in schools than the boys (Nmadu et al., 2010)⁴. One of the primary reasons is because girls are married off at an early age and thus, are seen as not continuing the family legacy instead; they would be members of their husband's family legacy. This therefore presupposes that the boys are largely being enrolled in formal schools to attain basic primary and secondary education (Nmadu et al., 2010). However, there are suggestions that unlike what we are made to believe, even the boys are set up for an educational disadvantage - a reality that is not often addressed in popular media. Though insurgency in the northern part of Nigeria, particularly in the North-East, is reported as one of the key reasons why children are not getting educated (Hassan et al, 2018)⁵, there seems to be other underlying factors that are responsible for the number of out-of-school boys.

Over the years, the increasing number of out-of-school children in Northern Nigeria has been a cause of concern for both individuals and institutions. This widening educational divide (Amorighoye, 2020)⁶ poses a huge challenge considering that the inability of children to access quality education puts them at a disadvantage when compared to their peers in other regions in the country and across the world (Furuholt and Kristiansen, 2007⁷; United Nations, 2020⁸; Obiageri et al, 2021⁹). Considering that tons of evidence suggest that oftentimes, girls were the first to be left behind, the perspectives of out-of-school girls were surveyed in a previous research. It was pertinent, therefore, that the perspectives of out-of-school boys; a demographic that is often less represented, were equally surveyed to understand their own realities as well as compare if they shared similar perspectives with their female counterparts. Also, considering the evidence of high receptiveness of the ACE Radio School (an alternative form of education introduced in selected states in Northern States in 2020) (Shaibu, 2020)¹⁰, it was important to ascertain the factors responsible for its wide acceptance by out-of-school boys in the region.

This research, therefore, seeks to achieve three key objectives; To determine the factors responsible for the non-enrolment of out-of-school boys into schools in Northern Nigeria; To verify whether or not insecurity was the principal cause of poor enrolment of boys in schools in Northern Nigeria; and, To ascertain the factors responsible for the acceptance and effectiveness of radio as an alternative form of education for out-of-school boys in Northern Nigeria.

2.0. METHODOLOGY

A qualitative approach was used to answer the objectives for this study. Semi- structured interviews were conducted to gain an in-depth understanding as well as explore other possible issues. Given the pandemic, the interviews were conducted remotely via a qualitative data collection tool named Fatima. This tool was used to schedule interviews, call participants and record responses; interviews were subsequently stored on a secure server. Participants were selected to participate in this study; purposive sampling was employed. Inclusion criteria were 35 boys who were out of school before or while the ACE Radio school was implemented, and listened at home or in the listening groups to the radio broadcast.

Data was collected between February 2022 and May 2022. The length of the interviews varied among participants based on individual differences. All the interviews were transcribed verbatim by research assistants. Thematic analysis was then used to code for and analyse the transcribed content. The codes represented keywords which captured the content in the text; codes were organised and categorised to form themes. Data was interpreted based on the themes that emerged from the applied codes and recurring themes were highlighted as well as similarities and differences in the data. Prior to collecting data, informed consent was obtained from parents of each participant, and since many of the children were younger than 18, assent was also obtained. Participation in the interviews was completely voluntary and participants were informed to withdraw participation at any time they needed to do so.

3.0. RESULTS

3.1a. Demographics of Respondents.

All the respondents were between the ages of 10 and 18 years across three different states in Northern Nigeria; Sokoto (North West), Adamawa and Borno (North East). 27 (77%) of the respondents were boys who had dropped out of school while 8 (23%) had never attended formal school.

Age Group	Number of Respondents
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10 - 12	6
13 - 15	23
16 - 18	6

State	Number of Respondents
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Adamawa	13
Borno	6
Sokoto	16

3.1b. Reasons for Dropping Out of School

The respondents shared reasons they, alongside other boys either dropped out of school or never attended school. They revealed seven major reasons responsible for their dropping out of school or never attending school. These include; Lack of Funds, Hidden Fees, Death of Parents, Work, Distance, Insecurity, and School closure.

1. Lack of funds: Finance plays a vital role in children's access to quality education. Once children and their families have little or no access to funds, the chances of a child enrolling in or completing school significantly reduces. 78% of the respondents who had dropped out of school stated that lack of funds forced them to leave school, thus making it the single most recurring reason for being out-of-school. Lack of funds can be evident in the inability of the parents to purchase school uniforms, socks, sandals, school bags, stationery (textbooks, notebooks, pen, pencils, erasers, etc.), fees for tuition, extra classes, exam fees (like WAEC, NECO, GCE fees), etc for their children. This causes the children to be sent out of school leading them to eventually drop out if they are still unable to pay their fees over time.

2. Hidden Fees: Even though Basic Education ought to be free, schools still insert some hidden fees, which in turn, deter parents from enrolling their children or letting them complete school. These fees are more often than not, PTA (Parents-Teachers Association) fees, which are to be paid yearly else children would not be allowed into the school. These fees gradually become overwhelming for the parents or guardians who oversee the education of these boys. Consequently, the boys drop out of school since the financial strength of their families cannot match the monetary demands attending school incurs.

3. Death of Parents: For some of the respondents, losing either (especially the breadwinner) or of both of their parents automatically brings their education to a halt. This is because whichever relative is left may not have the funds or be gainfully employed to bear the financial costs of such education. More so, some of the children were required to fill the shoes of their deceased parents, particularly in ensuring the continuity of their trade. In addition to this, the relatives who now take up custody of these children may not value education as much as the parents did. In all of this, when the breadwinner of a home dies, it further exacerbates the poor financial situation of the family and subsequently forces the children to drop out of school.

4. Work: For some children, the opportunity cost of attending school is being able to support their parents or guardians in their trade. For such families, it is more profitable to enlist the help of their male children in their work as opposed to sending them to school since funding their education is a challenge. In fact, to them, sending their children to school reduces their disposable income while sending them to work adds to the family income. These boys are sent off to work in the farms, markets, swamps, countryside or businesses of their parents as a means to generate income. Hence, it becomes impossible for them to continue with their education.

5. Distance: For some respondents, distance was a barrier. The problem posed by distance is two fold. On one hand, it will be more expensive for parents to transport the child to and from school considering that poor funds were already a problem. On the other hand, it was more risky letting a child walk a long distance to school, indicating that some had no schools in their immediate communities.

6. Insecurity: 7% of the respondents attributed their dropping out of school to insecurity. Northern Nigeria has been battling insurgency – Kidnapping, Boko Haram, Bandits, Unknown Gunmen, Herdsmen, etc. which has claimed the lives of innocent people over the years. Some families fear that since their communities are unsafe, the schools in question are also not safe. As such, they rather their children drop out of school so they (the parents) can keep an eye on the safety of their children and any development within their community.

7. School Closure: 4% of the respondents stated that the closure of schools (possibly due to the coronavirus pandemic) forced them to drop out of school. Because the pandemic stretched the closure of schools, when schools eventually resumed, they could not re-integrate into the school system.

Some other reasons that were equally mentioned for dropping out or never attending school include; lack of parental consent to attend school, cultural beliefs, Islamic school, boys' lack of interest in school, duration of classes, uncondusive nature of schools in their locality, hunger, stubbornness, distraction, playfulness, and illiteracy of parents.

3.2. EXPERIENCE OF BOYS WITH ACE RADIO SCHOOL.

3.2a Experience with ACE Radio School

The respondents generally had positive experiences with the ACE Radio School. The feedback received shows three key experiences; that they enjoyed the lessons, they found it very interesting and they learnt new things.

3.2b. Expectations of Boys Before Starting ACE Radio School

80% (28) of the respondents expected that the ACE Radio School would help them in three predominant ways: gain new knowledge; be sent to formal schools to further their education or be helped to transition into formal schools; and, get support for themselves or their parents, especially financially. Also, some expected that they would progress via their interaction with ACE Radio School. In addition to the help they anticipated, some of the boys expected that it would be 'tales by moonlight' or that a party would be organised as an incentive. Furthermore, few of the respondents hoped it would reduce idleness and farm work or other types of work they were engaged in. However, 6% of the respondents said they had no expectations before the commencement of the ACE Radio School. Regarding whether the ACE Radio School met their expectations, 50% of the respondents answered in the affirmative. These were primarily those who expected to gain knowledge and be educated. However, 50% of respondents said their expectations of ACE Radio School were not met, mostly because they were not sent to school or given financial support.

3.2c. Motivation For Listening to ACE Radio School Lessons

The respondents recounted a variety of reasons that served as their motivation to continue listening to the ACE Radio School episodes. The majority (63%) said that gaining knowledge which would help them grow and furthering their education motivated them to continue listening. For some, listening to the ACE Radio School lessons was a more profitable use of time than sitting at home. Additionally, the improvements observed by some (9%) of the listeners inspired them to diligently listen to the program. On top of that, some of the respondents (9%) said they enjoyed the ACE Radio Radio School lessons and that in turn, prompted them to continue listening. About 6% of the respondents said the support and encouragement of their parents motivated them to continue listening to the radio episodes. However, some others were motivated by the lack of help or of parents/guardians to cater for them and their educational needs. More so, the need to help their younger ones galvanised some of the respondents into continuously listening to the episodes while some others were motivated by incentives like candy and biscuits.

3.2d. Benefits of ACE Radio School

Most of the respondents said that they benefited from ACE Radio School. For the majority, they enjoyed the school, gained knowledge and learned new things, particularly in literacy, numeracy and science. Some said some of the beneficial things they learnt included: alphabets, capitalization, sounds, parts of speech, punctuations, time, singular and plural, anatomy of the human body, arithmetic, calculations, pollution. Some learnt how to read to an extent and how to greet. Some said they also learnt how to read and how to greet. For some others, they learnt things they would have learnt if they otherwise continued in formal schools. Additionally, the respondents said the teachings aided better understanding and that every time they listened, it was a refresher. It equally improved their English and helped them write things they could not write prior. Furthermore, it was beneficial because the teaching style differs from formal school. Lastly, the respondents saw the program as beneficial because they got writing materials and are now able to teach their siblings. It also helped them make good use of their time and get rid of idleness. Notwithstanding these benefits, few respondents had no idea what they benefitted while another said he would have learned something if he attended the lessons consistently.

3.2e. Differences Between ACE Radio School and Formal Schools

Most of the respondents admitted that there were differences between the ACE Radio School and conventional formal schools. Largely, the respondents explained that, in contrast to formal schools, ACE Radio School afforded them free and easy access to good quality education. This was evident in the virtual mode of content delivery (radio) which was cost-free and easily accessible, language of instruction (their mother tongue, Hausa), quality of teachers used, quality of learning resources aired, conducive atmosphere for receiving lessons, absence of corporal punishments, and adequate focus on ensuring students' comprehension. Some respondents also cited the absence of school uniforms in the ACE Radio School as a key difference in the two schools. However, for some students, the differences highlighted were the number of subjects taught, lack of textbooks for reference, lack of physical interaction with the teachers, and the inability to catch up with missed radio lessons. These differences equally made for some challenges to the respondents as they had hoped the Radio School could teach more than the three subjects. Also, some believed having physical interactions with their teachers would bring them up to speed with parts of the lessons they had difficulty with or any other parts of the class they had missed. 6% said there was no difference between the two schools. 12% of the respondents said they had no idea what differences existed. This was understandable as some of the respondents had no prior formal education and thus may not have a basis for comparison.

3.2f. Parental Support to Listen to ACE Radio School Episodes

97% of the respondents said that they got support from their parents or guardians. Most of their parents gave them permission and encouraged them to regularly attend the classes (Listening Groups) and/or listen to the ACE Radio School lessons. They explained that their parents thought the lessons to be beneficial and thus, encouraged punctual attendance and continuous listenership. For some, their parents could not afford to pay school fees, so the ACE Radio School was an opportunity for them to get educated. Some added that their parents relieved them of any duties they were engaged in once it was time for the Radio School lessons. More so, some parents supported their children by providing them with the radios sets needed to listen to the classes. However, 3% of the respondents cited being unaware of the parental support given by parents.

3.2g. Challenges Faced with Listening to ACE Radio School Episodes

From the responses, the majority of respondents (69%) encountered no challenges listening to the ACE Radio School while 6% had no idea whether or not they encountered challenges. However, some of the boys shared some challenges they and other boys faced with listening to or attending the ACE Radio School lessons. According to them, some of the boys do not see the benefit of the lessons they receive, some were proud while others were either playful or lazy. Some other reasons cited were the lack of time and quest for money. Some of the respondents had to help their parents at home, engage in domestic chores or be engaged in some form of work to earn an income. Some other respondent said hunger was responsible for poor attendance, due to inability to feed oneself before attending the Radio School. In response to the challenges their female colleagues faced with listening, they mostly said the girls did not have the time as they were often held up at home doing domestic chores, or doing other works like hawking or farming. Therefore, when they attended, many times, they were in a haste to go back home. Also, the girls didn't want to be in the company of others.

3.3. RECOMMENDATIONS TO IMPROVE BOYS EDUCATION

The responses of the boys had shown that there was an evident need for more boys to be enrolled and retained in school. With a better understanding of what methods will work best in their immediate environments, the respondents recommended some steps that will help improve boys' education. These included six major things;

- a. **Support:** Providing financial and material support for boys has been considered as the most important step towards improving access to education for boys. The majority of the respondents have suggested that if the payment of school fees and purchase of school materials like books, bags, uniforms, etc. were sorted, more boys will attend school. Therefore, they believe that providing sponsorship, government funding, and enrolling boys in schools is a sure way to boost their access to education. Furthermore, they are confident that if their parents are supported financially, it will be instrumental in sending them to school.
- b. **Building Nearby Schools:** To mitigate the barrier caused by distance, the boys proposed that schools be built close by, preferably in their communities. That way, it mitigates the risk associated with crossing major roads and also being attacked by terrorists on their way to school.
- c. **Competition:** It was recommended that competitions be organised to spur interest in education. By so-doing, boys are eager to win prizes. Consequently, this motivates them to go to school. It equally encourages their parents to enrol them in school. Some pointed out that more boys are disposed to play football than attend school because of the competitive nature of the sport.
- d. **Incentives:** The respondents also suggested that incentives be introduced to encourage attendance at school. These incentives such as food, gifts, prizes for outstanding students, stationery and resources create a zeal for school as there was something to look forward to.
- e. **Sensitization:** Respondents believe that creating awareness on the importance of education was also an important strategy to deploy. They maintain that parents and children alike need to understand the many benefits associated with getting an education. By seeing how beneficial it is to them, they will be eager to enrol their children in school and the children will be willing to complete their education when enrolled.
- f. **Role Models:** The boys believe it is important to have other boys who serve as role models to them because this inspires them to follow the path of their role models. They are convinced that when boys see their peers who have completed school and eventually become beneficial in the society, other boys will be motivated to go to school as well.

Some other recommendations given by the boys were to ensure that teachers were doing what they were expected to do. Additionally, some believe that enforcing a more stringent approach, like whipping or flogging the boys, will make them go to school. Lastly, some respondents are of the opinion that attending/listening to the ACE Radio School lessons as well as encouraging their peers to do the same will greatly boost their interest in acquiring formal education.

4.0. DISCUSSION

The responses received from respondents made it clear that, contrary to what mainstream media portrays (Ngige et al., 2016)¹¹, the humanitarian crisis, i.e. insurgency, in the Northern part of Nigeria, was not the principal barrier to accessing education for boys. Without a doubt, insurgency plays a role in reducing the number of children who enrol and attend school (Muhammed and Mohammed, 2019)¹². However, this research has shown that other problems (Muhammed and Mohammed, 2019) like lack of funds and death of parents play even more direct roles in reducing the number of boys who enrol in school.

When families have little or no means of livelihood, education becomes a luxury they cannot afford. This is coupled with the fact that even supposedly free education incurs some additional or hidden costs like purchase of school bags, books, uniforms, examination fees, transportation, feeding, etc (Lawal, 2021)¹³. Also, when there is no one to take up the financial burden or responsibility for their education, these boys are unable to enrol in school. This is evident in the number out of school boys who are orphans or those whose families have lost their breadwinners. Furthermore, to stay remotely afloat, these boys need to undertake some form of work - farm work, market or petty trade, to provide income for their families. Some others need to help their parents or guardians with work which makes it more challenging to attend school or keep up with school work. Again, many good schools are far from the communities where these boys live. So, the distance together with the risks of commuting along major roads without adult supervision, discourages parents and their boys from enrolling or continuing with school.

ACE Radio School brought some form of respite to these children and by extension, their families, rekindling their hope about getting a good quality education that is uniquely tailored to their needs and levels of understanding. For some, it boosted their confidence among their peers who went to school. This method of learning differed from conventional formal schools as it was clear that ACE Radio School encouraged the children to take ownership of their learning. This was in contrast with the formal schools where another individual could take notes for the students. Also, with formal schools, the fact that the students had to copy notes written on the board in real time interfered with their concentration and comprehension in class. The repetitive nature of the ACE Radio School classes afforded the children a unique opportunity to learn concepts for themselves and eventually write them down. Very importantly, through ACE Radio School, boys were afforded free, quality and accessible education in a language they could easily understand, Hausa, and with a tool that was readily at their disposal, radio. High quality educational content was made available by recruiting seasoned teachers and translators who utilised the national education curriculum and broke down topics using the simplest possible form, so that the children could easily understand. Lastly, the ACE Radio School was devoid of corporal punishment often meted out by formal school teachers and thus gave the children peace of mind.

Regardless of these benefits, for some respondents, the differences highlighted equally posed challenges. These were the limited number of subjects taught in the ACE Radio School, the lack of textbooks for reference, the lack of physical interaction with the teachers, and the inability to catch up with missed radio lessons. Other challenges that were attributed to interfere with boys listening to or attending ACE Radio School lessons include the need to work due to lack of funds, quest for money, lack of time, domestic chores, playfulness, non-realization of the benefits of the ACE Radio School, laziness, pride, and hunger.

In response to the challenges their female counterparts faced with listening to the radio lessons, they mostly said the girls were often held up at home doing domestic chores, hawking or farming. Therefore, when the girls attended the Listening Group sessions, many times, they were in a haste to go back home.

Considering the number of benefits recounted by respondents, it is therefore not surprising that most of them enjoyed the support of their parents or guardians to listen to the radio episodes or attend the Listening Group sessions. Their parents provided them with the needed permission and encouragement while also relieving them of their chores. Therefore, the recommendations provided by the boys to improve boy/male education are very practical ways to cut down the number of out-of-school boys to the barest minimum.

6.0. CONCLUSION

While the rate of out of school children remains a cause of concern, it is now clear that, irrespective of the genders, the experiences of out of school children in Northern Nigeria are largely similar. Since the key factors responsible for the high number of out-of-school

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boys (and girls) have been clearly identified, it is pertinent that the aforementioned recommendations should be put in place by the government, well meaning institutions and individuals who are determined to see that no child is left behind in the achievement of universal basic education for every Nigerian child. This is equally important because an educated populace contributes to national development.

From this study, ACE Radio School has demonstrated that alternative and remote forms of education have the capacity to influence society, equip out-of-school boys and girls, and most importantly, bridge the knowledge gap between the educated and uneducated children in Northern Nigeria. Therefore, greater sensitization should be carried out so that this alternative method of education can be adopted on a wider scale as a primary way to give out-of-school children some leverage and ease their reintegration into formal school systems.

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The Fusion of GeoBioCulture In Tourism Branding of Bromo Tengger, East Java, Indonesia

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Abstract- The purpose of this study is to examine the tourism objects of the Tengger Semeru National Park (TNBTS) in the perspective of product bundling through rebranding. The research was conducted in the TNBTS area using qualitative research methods with narrative analysis. The subject of the study was the management of TNBTS, the local community, and tourist actors in the Bromo Tengger tourist area. Bromo tourist attraction is a combination of geological charm (Bromo mountains), biological diversity as a conservation area, and culture with local community rituals, namely Kasodo which is very famous. The fusion reflects the harmony between the three elements of the tourism asset. The results showed the importance of a product bundling strategy packaged in one branding concept so that it is more efficient and improves the experience and satisfaction of tourists. This strategy is in line with the national park's mission to preserve nature and the environment by utilizing and prioritizing the uniqueness of Bromo Tengger Semeru tourism.

Index Terms- National Park, Sustainable Tourism Development, Geotourism, Special Interest Tourism, Branding

I. INTRODUCTION

The Bromo tourism area is administratively located in the Bromo Tengger Semeru National Park (TNBTS) area so that the preservation aspect is the main domain of the national park. Bromo Tengger tourism is geographically and geologically located in the Bromo Tengger Mountains area. It has a mountainous landscape with the presence of Mount Bromo which is still active (eruption), especially puffs of smoke which are characteristic and at the same time become a tourist attraction. The peak of Mount Bromo becomes a spectacular charm, towering in the middle of a stretch of sand sea that was the ancient giant caldera of the Bromo Semeru mountains in the past.

The Mount Bromo area as a mountainous area is characterized by the fertile slopes of the mountains and is used by local people to grow various types of planting in accordance with their flora habitat, especially vegetables, flowers, and the like. The landscape of the slopes of the mountains with tetanaman applying the siring terrace farming system stretches on the left and right of the road to the top of the Bromo mountains and becomes its own charm that really spoils the eyes of tourists, as a very distinctive and unique tourist charm. The characteristics of the road in the winding mountainous region, of course, are a touch for visitors, providing an attractive experience and an adventuresome, unique and memorable feel.

Bromo Tengger Tourism has its own uniqueness which is marked by a combination of pegunungan (geology) natural attractions. The use of natural resources and ecosystems includes the use of mountain slopes as food agricultural

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land, as well as local community culture in the form of the annual Kasodo ritual which is carried out in the extinction of Mount Bromo which is still active. The essence of the Kasodo ritual is as a form of respect for the Tengger people to God and his ancestors, especially Roro Anteng, a daughter of King Majapahit and Joko Seger, a Brahmin son, as the forerunner of the Tengger tribe.

The combination of Tengger people's belief that the mountain is a stana (place) of worship to God and the ancestors. Creating a harmonization of people's philosophies that is reflected in cultural attitudes and behaviors in maintaining the harmonization of human life, with the creator (God), and the harmonization of the harmony of human life with the natural environment and its ecosystem. The philosophy of life of the Tengger tribal community which is geographically located within the Bromo Tengger Semeru National Park (TNBTS) area shows the harmony of national park management as a conservation area for biological natural resources and their ecosystems (SDAHE). This uniqueness then gave birth to a tourist area that is famous throughout the world, with a characteristic combination of geological, biological, and cultural charms like no other.

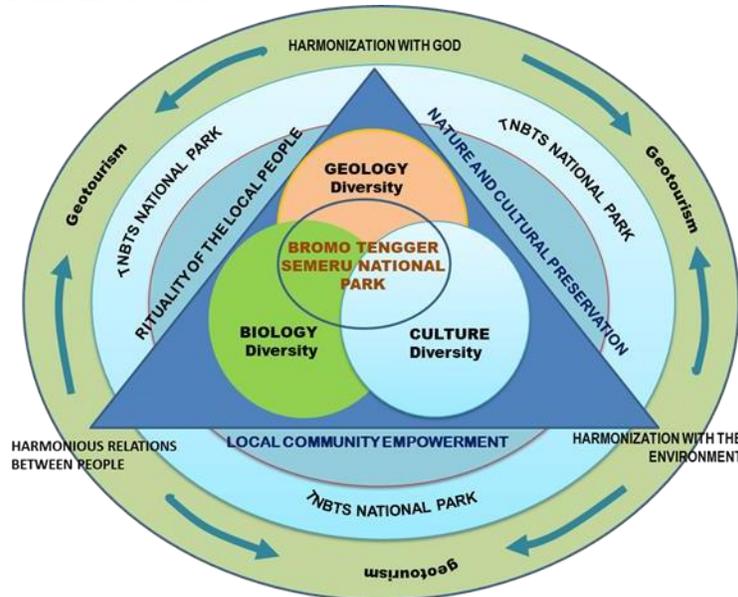


Figure 1: TNBTS Tourist Attraction Fusion Model
Source: Modifications

II. LITERATURE REVIEW

The Concept of Sustainable Development and Sustainable Tourism

Sustainable development is a human effort to improve the quality of life while still trying not to go beyond its life support ecosystem. Nowadays, the issue of sustainable development has been used as an important issue that needs to continue to be socialized in the community. The pillars of sustainable development are economically sustainable, socially sustainable and environmentally sustainable, all three of which must develop in a balanced manner; otherwise development will be stuck on conventional development models that emphasize economic growth only and abandon social and environmental development. Conventional development is hampered or constrained by social conditions (health, education, and poverty) as well as shrinking reserves of natural resources (fossil fuel energy and non-renewable coal). Deteriorating environmental quality due to pollution of air, water, rivers and lakes, as well as water shortages in the dry season and floods in the rainy season in many places in Indonesia as well as in other developing countries and also in developed countries (Emil Sallim, dalam Suparmoko, 2020).

Sustainable tourism is the development of the concept of travel that can have a long-term impact. Whether it is environmental, social, cultural, and economic for the present and future for all local people and tourists who visit. Sustainable Tourism is a pariwisata concept that is growing very rapidly, including the increasing flow of accommodation capacity, local population and environment. The development of tourism and new investments in the tourism sector must not have a bad impact and can be integrated with the environment, as well as maximize positive impacts and minimize negative impacts. So several initiatives are taken by the public sector to regulate tourism growth for the better and put

the problem of sustainable tourism as a priority because a good business or business can protect the sources or assets that are important for tourism not only for now but in the future (Sunarta dan Arida, 2017).

Understanding Geotourism

The term geotourism or geotourism is probably still less popular than ecotourism, or with the term agrotourism. The term geotourism appeared in the mid-1990s. According to some sources, a Geologist from Buckinghamshire Chilterns University in the UK named Tom Hose was the first to actively introduce the term. He even wrote in 1996 in the Geological Society a paper entitled "Geotourism, or can tourists become casual rock hounds: Geology on your doorstep" (Dirgantara dalam Hermawan dan Ghani, 2018).

Geotourism (geotourism) is a special interest tourism that utilizes the full potential of natural resources in a place, and needs to increase the enrichment of knowledge and processes of physical phenomena from nature (Nainggolan, 2016). So in simple terms, it can be concluded that geotourism is a form of special interest tourism activity whose main focus is on geological appearance. The surface of the earth and those contained therein in order to encourage understanding of the environment, nature and culture, further as a form of appreciation, and conservation activities, as well as having concern for the preservation of local wisdom.

A person's desire to visit tourist areas that have different landscapes from where they usually live, becomes an impetus in the development of geology-based tourism or geotourism. The development of geotourism is also supported by the increasing demand for tourism by tourists who have special interests. Special interest tourists are usually those who like unusual tourist destinations, and like challenging or unusual tourist activities (Hermawan, 2017), Special interest tourists in their scientific language are often called drifter tourists (Pitana & Putu, 2009). This type of tourist will not be satisfied with visiting natural tourist destinations just to see the natural panorama, or just take pictures, as is the pattern of the majority of tourist visits when traveling. The tourist destinations they choose are destinations that are able to satisfy their desire for adventure, as well as destinations that are able to add self-enrichment in the form of new experiences and insights.

Geotourism Attraction Criteria

According to Darsoprajitno (2002), the differences in natural elements, community culture, and fostered elements in each hemisphere that stimulate a person or group of people to visit them, then developed for the benefit of tourism, are called tourist attractions. It is further stated that tourist attractions consist of natural systems, communities, and fostered products. Of the three, there are several elements that can be specially developed, so it is called a special interest tourist attraction.

More clearly, tourist attractions are said to be everything that has a high attraction, uniqueness, and value, which is the destination for tourists to come to a certain area (Suryadana dalam Hermawan and Brahmanto, 2018). Meanwhile, the attraction of natural tourism, according to the Law of the Republic of Indonesia Number 10 of 2009 is explained as everything that has uniqueness, beauty, authenticity, and value in the form of diversity of natural wealth that is the target or destination of tourist visits. The definition of natural tourist attraction in the law has also described the criteria in the development of natural tourist attractions, namely the existence of uniqueness, beauty, authenticity, and value. Uniqueness, beauty, authenticity, and value, at the same time are indicators that must be measured in the research and assessment of natural tourist attractions. Crouch and Ritchie in Stevianus (2014) said that attractiveness is one of the key factors that determine a traveler's motivation to travel and is a fundamental reason to consider why someone chooses one destination and leaves another. Suryadana in Hermawan and Brahmanto (2018) said that tourist attraction is a factor that has its own strengths as a component of tourism products. Because tourist attractions are able to generate motivation for tourists and attract tourists to take tourist trips.

In developing geological tourism attractions, you can also adapt the proposed tourist attraction quality criteria Damanik and Weber (2006) as follows: (1) There must be uniqueness, uniqueness is defined as a combination of scarcity and attraction that is uniquely attached to a tourist attraction; (2) Originality or authenticity reflects authenticity or purity, i.e. how far a product is not contaminated by or does not adopt a model or value that is different from its original value; (3) Authenticity, referring to authenticity. The difference is that otenticity is more often associated with the degree of antiquity or cultural exoticism as a tourist attraction; and (4) Product diversity or diversity, meaning the diversity of products and services offered. Tourists should be given a large selection of products and services that vary in quality.

Based on the time of use, the attraction of natural tourism in geotourism activities is divided into two, namely: First, in the form of natural attractions that do not move, where tourists can directly use them without having to wait, for example: beaches, mountains, hills, natural caves and so on. Second, moving natural attractions, where tourists have to wait or not immediately take advantage, for example, is the phenomenon of incandescent lava (Sammeng in Hermawan and Brahmanto, 2018).

Development of Special Interest Tourism

According to Fandeli in Siswanto, (2010) There are several criteria that can be used as guidelines in determining a form of special interest tourism with the term REAL Travel, namely travel that contains the following elements: a) Rewarding. Appreciation for an object and tourist attraction visited, which is manifested in the desire of tourists to be able to learn to understand or even take part in activities related to the object. b) Enriching. Contains aspects of enrichment or addition of knowledge and abilities to some type or form of activity that tourists participate in. c) Adventure. Contains aspects of tourist involvement, activities that have a physical risk in the form of adventure activities. d) Learning. Contains educational aspects through the learning process that tourists participate in certain educational activities that tourists participate in. A form of special interest tourism is also considered as a form of serious travel, followed by certain activities related to the interest or interest of tourists in something or object that can be observed or done in that location. Douglas in Supandi (2019) noted, everyone has their own special interests. Special interest tourism is a type of tourism aimed at a group of people with a certain interest. Douglas in Supandi (2019) Again added that tourists from the special interest tourism group have a desire to try authentic things and get quality experiences that allow them to interact directly with the local community.

Novelli in Shamsiah, et al., (2021) dividing special interest tourism into several macro- subs before being broken down back into several micro-subs such as: Cultural, such as Heritage, Tribal, Religious, Educational, Genealogy; Environmental, such as Nature and wildlife, Ecotourism, Adventure, Alpine, Geotourism, Coastal; Rural, seperti Farm/barns, Camping, Wine/Gastronomy, Sport, Festivals and events, Arts and crafts; Urban, seperti Business, Conference, Exhibition, Sport, Gallery, Art; Others, seperti: Photographic, Small Cruise, Valounteer, Dark, Youth, Transport.

Concept of Tourist Products

Burkat and Medlik (1987) stated that tourism products can be an integrated product arrangement, consisting of tourist objects and attractions, transportation, accommodation and entertainment, where each element of tourism products is prepared by each company and offered separately to consumers (tourists). The decision to travel is essentially the same as the purchase decision, the decision to visit in choosing and evaluating two or more alternatives (Mardiyani & Murwatiningsih, in Safitri, *et.al.*, 2020). It is worth paying attention to how tourists make the attraction of tourism and brands a strong consideration. Can influence decisions seen from a strategic location and the existence of complete facilities and comfort in the services provided must be able to cause satisfaction so that it will result in how often tourists visit at different times (Dewi, 2018).

The realization of tourist visits will be determined by the existence of tourist attractions, facilities and amenities, as well as accessibility as a means of measuring how much interest tourists have in visiting (Muljadi, 2012; Dani & Thamrin, 2019). The dimensions of tourist products that can be seen from: (1) Tourist attractions, are potentials that can attract tourists to visit; (2) Facilities and amenities, namely various facilities that can support each other that can provide comfort and satisfaction for tourists during tourist trips; (3) Accessibility, namely the ease of a tourist to reach the tourist destination area through transportation media. The factor that is the basis for making visiting decisions is tourist products, therefore one of the functions of tourist products is as a reference for tourists in every visit to a tourist attraction (Huda, *et al.*, 2019). Ramadhan & Susanta (2016) states that there is a positive and significant relationship between tourist products to visiting decisions. That is, the higher the tourist product, the higher the decision to visit a tourist in visiting a tourist attraction.

Brand, Branding and Rebranding

A brand is the face or identity of the company, which will serve to gain empathy and trust. In brand marketing communications or what is known as a brand not just a name and logo, a brand is the promise of an organization (work unit) to customers to provide what is the principle of the brand. There are not only functional benefits but also emotional, self-expression and social benefits. But brands are also not just about fulfilling promises. Brand is a long journey that develops based on perception and experience as well as customer satisfaction with the services associated with the brand (Nastain, 2017). Around the end of the 1980s, a powerful idea emerged, namely the idea that brands are assets, have equity and drive business strategy and performance. The conception of the brand as an asset creates a dramatic and huge flow of change, changing the perception of marketing and brand management, how the brand should be managed and measured, and the role of marketing executives (Aaker, 2015). Rebranding is an effort made by the company to completely change or renew an existing brand for the better by not neglecting the company's original goals. Rebranding is the process of changing the brand, name, and logo of an existing brand. One of the stages of rebranding is repositioning to change the position of the brand in the minds of consumers (Ariano, 2017).

Destination Branding Strategy

Destination Branding is also defined as, name, symbol, logo, word mark or other image that can identify and distinguish a destination; for the rest, it promises a tourist experience that can be remembered for the uniqueness of a destination; which also serves to strengthen memories, memorable memories of a destination experience. Definition of destination branding, which also means an outline in developing a strategy as well as an evaluation framework to assess the effectiveness of branding a tourist destination (Blain, et al., 2005). These elements are:

1) Image; 2) Recognition; 3) Differentiation; 4) Brand Messages, after the image is created; 5) Consistency; 6) Emotional Response; 7) Creating expectation.

Schultz and Barnes (1999) Defining a branding strategy as a management of a brand in which there are activities that regulate all the elements that aim to form a brand (Galder, 2005). In carrying out the strategy, it is divided into: 1) Brand positioning, revealing positioning is not about what a product does, but about what it does to the minds of Ries and Trout prospects (2001); 2) Brand identity, a collection of aspects aimed at conveying the brand: brand background, brand principles, goals and ambitions of the brand itself (Gelder, 2005); 3) Brand personality, a way that aims to increase brand appeal from outside in the eyes of consumers (Gelder, 2005); 4) Brand communication, a way to communicate the brand to consumers using internal and external communication, namely with sales promotion, events, public relations, direct marketing, corporate sponsorship, and advertising (Schultz and Barnes, 1999).

Based on the rebranding concept presented by Goi (2011) Therefore, from the idea of rebranding, a brand appears as a reference, personality, icon, company, and policy that with rebranding will change the image of the company and the image of the company to consumers. With this improvement, it is hoped that consumers will again take into account and pay attention to the products offered by the company because this concept itself changes a lot of image and management in the company for the better and professional.

III. RESEARCH METHODOLOGY

This research uses the paradigm of constructivism to understand perspectives and focuses as well as research problems by looking at social phenomena; conducting observations and direct interviews with actors in the framework of the scientific process; collecting documentation materials and others as a tourist activity developed by local managers (Bungin, 2017). The research was conducted in the Darungan Sector of TNBTS, and the subjects of the study included TNBTS Managers and the Tengger tribal community. Based on the paradigm of constructivism, the paradigmatic views used are: (1) social phenomena are analyzed based on their meaning; (2) using observation in understanding social phenomena; (3) conduct an understanding of all social phenomena that have a relationship with all research data through in-depth interviews (Denzin and Lincoln; 2009), research using qualitative methods (Creswell, 2016). The analysis technique used is qualitative descriptive analysis to analyze and describe the branding and rebranding model of special interest tourism in the Darungan TNBTS sector.

IV. RESULTS AND DISCUSSION

Bromo tourist area is located in the Bromo Tengger Semeru National Park (TNBTS) area. TNBTS was determined based on the Decree of the Minister of Forestry Number: 278 / Kpts-II / 1997 dated May 23, 1997. The area of TNBTS reaches 50,276.20 hectares consisting of 50,265.95 hectares of land and 10.25 hectares (lakes). Geographically the TNBTS area is located between 70° 51' 39" – 80° 19' 35" LS and 112° 04' 44" – 113° 07' 45" BT. Based on the administrative area of the TNBTS government, it is located in East Java Province and is included in 4 (four) regency areas, namely Malang, Pasuruan, Probolinggo, and Lumajang Regencies.

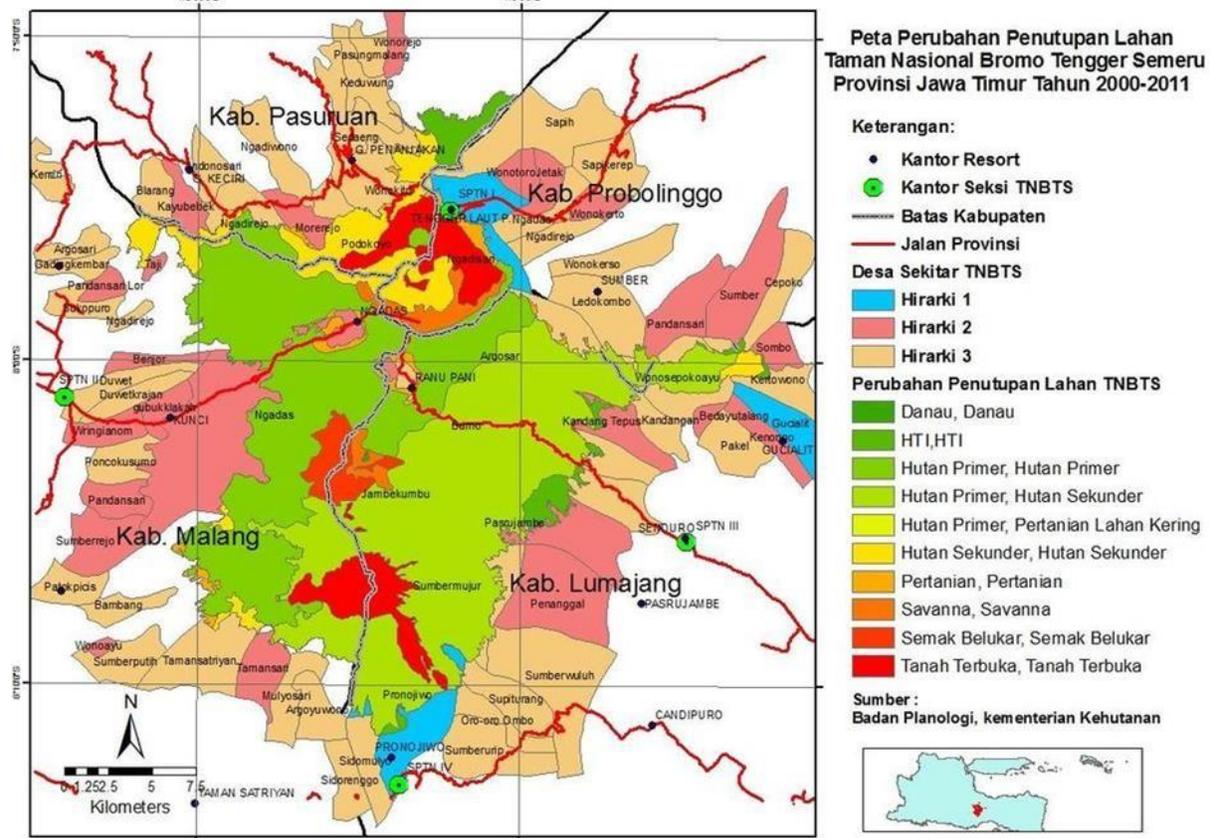


Figure 2: TNBTS Area Map
 Source: Google

TNBTS in the management of the national park area is designated twelve resort management areas, which include:
 The National Park Management Unit for region I (SPTN I) consists of:

1. Resort Penanjakan
2. Sand Sea Tengger Resort
3. Resort Jabung

The National Park Management Unit for region II (SPTN II) consists of:

4. Resort Patok Picis
5. Resort Taman Satriyan
6. Resort Coban Trisula

The National Park Management Unit for region III (SPTN III) consists of:

7. Resort Guci Alit
8. Resort Senduro
9. Resort Ranu Pani

The National Park Management Unit for Region IV (SPTN IV) consists of:

10. Resort Candipuro
11. Resort Ranu Darungan
12. Resort pasrujambe

National Park is a nature conservation area that has an original ecosystem, managed with a zoning system that is used for research, science, education, supporting cultivation, tourism and recreation (Law No. 5, 1990). A national park is a nature conservation area managed by a zoning system consisting of core zones and or other zones that are used for scientific, tourism and recreational purposes (Decree of the Minister of Forestry of the Republic of Indonesia No. 687 / KPTS / -II / 1989). The National Park System has advantages compared to other systems, including (1) National Parks are formed for the benefit of the community because they must be beneficial to the community and supported by the community, (2) The conception of preservation is based on the protection of ecosystems so as to be able to guarantee the existence of its forming elements, (3) National Parks can be entered by visitors so that education on love of nature, recreational activities and other functions can be developed effective (Bratamihardja, 1991)

TNBTS as a nature conservation area that has an original ecosystem, as well as the use of national parks for the purpose of nature love education, recreational activities and tourism, known as a world tourism icon, namely the caldera area of ancient Mount Bromo. With a stretch of sand sea and the children of Mount Bromo which is still with a combination of Kasodo rituals of the Tengger tribesmen. The charm of this very famous natural and cultural tourism is at SPTN I Sand Sea Tengger Resort. Objects based on volcanology are very famous in TNBTS, in addition to Mount Bromo, also climbing objects of Mount Semeru which are very challenging because of the conditions of the climbing terrain and are very active volcanoes. The richness of the original ecosystem that is very interesting is spread in each resort with charm and tourist attractions that are also no less interesting and become a unit of TNBTS tourism wealth. The challenges of tourism development for each of these natural tourism assets will be closely related to the development of branding, both internal branding and branding in marketing communications. These two things are important because the purpose of tourism in national parks is to introduce the richness of the original ecosystem while maintaining its sustainability, so that suitable tourism is ecological tourism or special interest tourism and geotourism.

The Charm of Mount Bromo TNBTS Tourism Area

Mount Bromo is an active mountain that is used as a tourist attraction by the TNBTS authority together with the local government in its area. Because of the beauty of the Bromo mountain area and the richness of its tourist attractions, Mount Bromo tourism is very famous and deiminati by domestic and foreign tourists. In the Gununhg Bromo area there are some very spectacular tourist attractions, here are some tourist attractions in the Mount Bromo area.

Gambar 3: Attractions in Mount Bromo TNBTS Area

Sumber: Google

Activity	Object	Description	View
Adventures outbond	Bukit Teletubbies	Enjoy the stunning sunrise	
Recreation	Bukit Mentigen	can enjoy the sunrise	
Adventures outbond	Air Terjun Madakaripura	The appearance of the Patih Gajah Mada that is in the middle of a rhythm	
Astronomical scenery	Bromo Milky Way	Star view	
Looking at the rising sun,	Penanjakan 1	The birth of a beautiful woman named Roro Anteng	
Reflexion	Padang Savana	Cozy and safe atmosphere	
Places of Worship	Pura Luhur Poten	Tangger tribe to worship God	

The Charm of Tengger Tribe Kasodo Ritual Tourism

The Yadnya Kasada ritual is a traditional Hindu ceremony of the Tengger tribe held annually on the fourteenth day of the month of Kasada. The ceremony, which always takes place during the full moon, has been held since the 14th century. Through the Yadnya Kasada ceremony, local residents are busy with traditional activities to prepare ceremonial equipment. Yadnya Kasada for the Tengger tribe community on Mount Bromo is a traditional ritual that must be held every year without any compromise. So even if Mount Bromo is in a row, or the rain is falling heavily, and the stormy wind hits, the ceremony still has to be done. There is no reason for the residents of Tengger not to hold the Yadnya Kasada ritual in the crater of Mount Bromo. The origin of the Yadnya Kasada Ritual.

The Kasodo procession begins with the recitation of the spell by the shaman, and when the recitation of the prayers has been completed, the residents of the Tengger tribe then carry the ongkek containing offerings up to the top of Mount Bromo to sail offerings containing their produce, money, and livestock into the crater. The procession of offering offerings by the residents of Tengger at the lip of the crater became the culmination procession of the Yadnya Kasada ritual after the previous day prayers were held inside the temple and the procession of taking holy water from droplets that seeped on the stones in a cave on Mount Widodaren.

Gambar 4: Attractions in Mount Bromo TNBTS Area

Sumber: Google

Activity	Object	Description	View
Kasodo Ritual Process	Widodaren Cave	The people of the Tengger tribe pray before taking holy water	
	Mount Bromo Crater	The atmosphere during the offering on the slopes of the extinction	
	Widodaren Cave	The Tengger tribe brings a gift of produce	
	Widodaren Cave	Preparations for the Tengger community in the Kasodo ritual	
	Poten Bromo Temple	Praying led by a shaman	

The Charm of TNBTS Special Interest Tourism

In the Bromo Tengger Semeru National Park area, there are around 183 species of birds, 22 species of mammals and 4 types of reptiles. Of the 22 types of mammals, only a few species can be found, including wild pigs (*Sus scrofa*), antelopes (*Muntianus muntjak*), leopards (*Panthera pardus*), anteaters (*Manis javanica*), hedgehogs (*Hystrix brachyura*), budeng (*Presbytis cristata*), and several other types of small mammals. In addition, there are also animals whose existence is almost extinct and protected that can be found in Bromo Tengger Semeru National Park, including, Deer (*Cervus timorensis*), Antelope (*Muntianus muntjak*), and various species of birds Red partridge (*Gallus gallus*), Hornbill (*Buceros rhinoceros silvestris*), Black Sriguntig (*Dicrurus macrocercus*) and Bondol eagle (*Halisastur indus*), Bido Snake Eagle (*Spilornis cheela bido*) inhabiting the Ranu Pane, Ranu Regulo and Ranu Kumbolo areas (BBTNBTS, 2015). Birds are a fauna that is often found in Bromo Tengger Semeru National Park. The distribution of bird habitats in Bromo Tengger Semeru National Park is spread throughout the national park area. Prasetya and Siswoyo (2017) mentioned that there are 183 species of birds that have been recorded in Bromo Tengger Semeru National Park and have a spatial distribution pattern of birds with an aggregation pattern. Of the bird species found in TNBTS, there are also migratory and settler bird species and some species of birds are protected by law because they are endangered (Prasetya and Siswoyo, 2017).

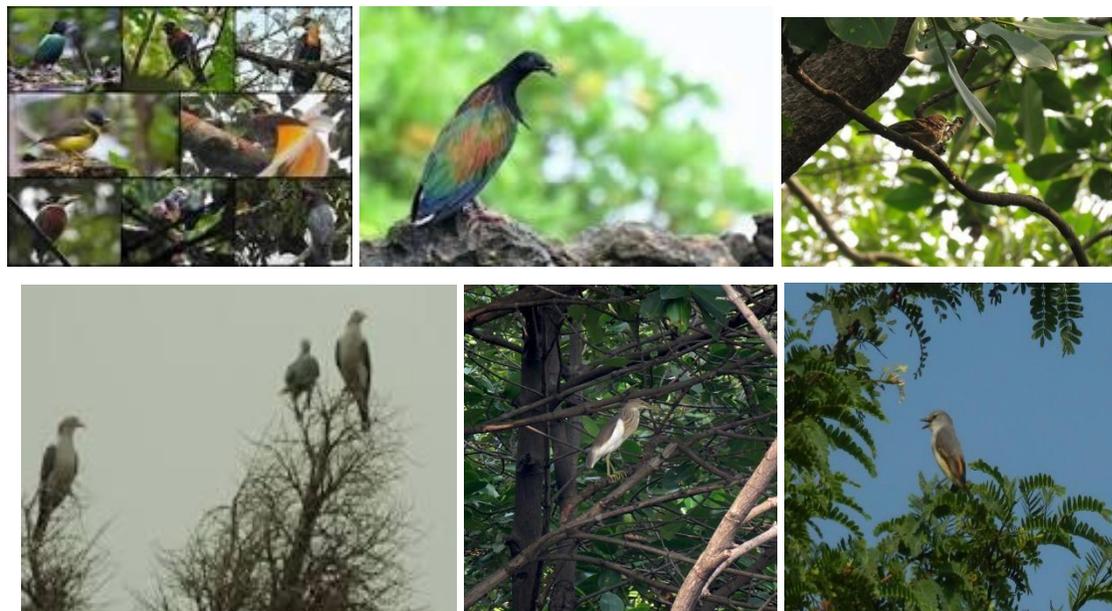


Figure 5: Some Bird Species in TNBTS Source: Google

V. CONCLUSIONS

The combination of tourist charms in TNBTS can be managed with the concept of combining several products that can increase tourist loyalty to the image of the destination. As a product bundling where several tourist attraction images are grouped together as destination product images will encourage tourists to buy more tourist products that they can enjoy. Incorporation of the image of tourist charm through branding can be a very popular marketing and cross-selling strategy during the holidays or for the one-time promotion of packaged products, but providing several different images and travel experiences, will certainly provide a satisfying experiential image of the product and increase loyalty.

This type of bundling is similar to incorporation in that the same product package incentivizes customers to buy in bulk in advance, rather than paying to ship a new order every time. This promotion strategy is an opportunity to increase the average order value of travelers. By grouping items together, it can make consumers buy more than one product during a single purchase. By packing different items simultaneously, it can display them as one efficient package for marketing costs. At the same time, it can introduce variants of tourist products owned by combining vulcological or geological charm, biological diversity, and culture that are very unique and become a unified philosophy of life of the Tengger tribe which occupies the slopes of the Bromo mountains. They have a fascinating history as well as legends packed in unique and authentic annual traditions and rituals, known as Yadnya Kasodo.

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Exchange Transfusion in Sever Falciparum Malaria with Acute Kidney Injury

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Abstract- In East Africa, where malaria is endemic, *P. falciparum* incidence has been steadily rising over the past ten years. Additionally, Africa has the greatest rate of malaria infections among tourists. As a result, severe malaria is an acute illness brought on by *P. falciparum*, but increasingly also by *P. vivax*. It is characterised by considerable organ failure and/or high parasitemia levels (>10%) in blood smears. Even if it is still debatable and ambiguous, exchange transfusion with antimalarial medication therapy is used as an additional therapeutic option in severe falciparum malaria with multiorgan failure. In light of this, we provide a case of severe malaria complicated by acute kidney damage (AKI), encephalopathy, and acute respiratory distress syndrome (ARDS). As a result, the patient tolerated conventional artesunate-based chemotherapy well and reacted well to hemodiafiltration and manual exchange transfusion.

Index Terms- Exchange Blood Transfusion, Malaria, Plasmodium Falciparum, Acute Kidney Injury.

I. CASE REPORT

A 41-year-old Chinese man from Uganda who had been to Dubai was hospitalised with a five-day high-grade fever, chills, stomach discomfort, frequent vomiting, obtundation, and yellowish staining of the urine. He had a fever (38 C) when he was admitted, as well as tachycardia, hypoxia, and a blood pressure of 106/60 mm Hg. He also experienced fine bilateral respiratory crackles, icterus, and a diminished degree of awareness. He was then moved from the emergency room to the ICU. A tentative diagnosis of sepsis, symptomatic IV fluid therapy, and blood testing were given. Initial laboratory results for the patient showed mild anaemia, an average leukocyte count, no thrombocytopenia, a creatinine level of 1.99, a blood urea nitrogen level of 24 (BUN), a sodium level of 129 (Na), and a potassium level of 5.4 (K). Additionally, microscopical hematuria and proteinuria with few granular casts were detected in the urine sample. Additionally, even with high SGOT and SGPT values, urine volume was acceptable. Additionally, there was a little rise in serum bilirubin. Similar to the peripheral blood smear, the *P. falciparum* parasite was detected there with a parasite burden >35%. Aside from splenomegaly, the US abdomen was described as normal. The chest x-ray showed no abnormalities. The brain's CT scan was also clear. As a result, the patient's parenteral Artesunate-based therapy for severe malaria was initiated.

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14	Day 15	Day 16	Day 17	Day 18	Day 19	Day 20	Day 21
Hb	11	10.2	10.8	10	9.5	9	8.9	9.5	9	9.1	10	10.3	9.5	10.5	10.1	9.9	9.9	10	9	9.5	10
TLC	5	6.2	6.5	9.5	13	16.1	14	17	16	18	20	17.7	12	5.97	5.27	5.57	13.3	7.58	8.8	8.6	7.1
Platelet count	150	130	115	116	70	40	33	37	32	39	40	30	39	50	60	139	153	194	186	219	228
Parasite	>35%	33%	<1%					<1%	<1%	not seen											
PT	15.5	13.4	13	12.2	13.3																
INR	1.34	1.15	1.12	1.09	1.14																
BUN	47	68	87	108	106	116	87	80	67	70	76	77	59	50		40		35			50
Sr. Creatinine	1.99	2.9	3	3.5	3.7	3.99	5.4	5.2	4.3	4.8	5	3.8		4.5		3.2		2.1			1.5
Na+	138	130	136	135			137	140		141		139		138							138
K+	5.6	6.5	6	6.5	6.3		5	4.5		5		4.8		4							4.9
SGOT	97	178	43	77				40				38		35				30			29
SGPT	72	56	48	50				97				40		44				28			36
Alkphos ALP	162	209	150				135	150				98		100				140			147
Sr. Bilirubin-Total	4.6	7.6	5.9			3.2	2											1.7			
D. bill	1.68	6.4	4.57	1																	
pCT	693	416	758									0.960						0.410			

Figure 1 shows the lab report of the patient status for 21 days

The patient developed tachypnea, oliguric, and metabolic acidosis on the second day. He experienced two hypoglycemic episodes for which he was treated with 50% dextrose. Creatinine levels were 3.98, blood urea nitrogen (BUN) was 58, and potassium levels were K 5.6, according to the laboratory findings. Hemodiafiltration was subsequently initiated for acute renal damage.

His peripheral blood smear revealed *P. falciparum* >1% as previously on the sixth day. He then received an infusion of Artesunate at its maximum dosage. Additionally, a manual exchange transfusion was performed to replace 2000ml of the original amount with new frozen plasma and packed RBCs. The patient did indeed take the surgery nicely. The patient was placed on a mechanical ventilator with inotropic support early on the seventh day because of a reduced level of awareness, ARDS, severe hypoxia, and septic shock. It is significant to note that inflammatory indicators have risen. Then, a chest x-ray revealed antibiotic-coated pneumonic consolidation. The patient underwent daily hemodiafiltration for 10 days and got manual exchange blood transfusions five times. The patient was extubated on day 16, was hemodynamically stable, and had nearly fully regained renal function. His score on the Glasgow Coma Scale was 15 out of 15. The patient moved out of the ICU 20 days after being admitted, and on the 21st day, he was finally allowed to go home.

II. DISCUSSION

Beginning with exchange transfusion, the parasite burden is reduced by the removal of contaminated RBCs. In fact, exchange transfusion is a method that is employed in addition to others to lower the fatality rate from severe *falciparum* malaria. It is significant to note that the blood viscosity of infected RBCs has increased with decreased deformability, decreasing sludging in microcirculation. The blood's ability to transport oxygen is also improved. Exchange transfusions help to enhance blood viscosity and flow properties as well as reduce parasite load by removing inflammatory reaction byproducts. Earlier, in 1974, exchange transfusion was first made available. Exchange transfusions are associated with a number of health risks, including fluid overload, non-cardiogenic pulmonary edema, hypotension, cerebral hemorrhage, febrile allergic reactions, metabolic disturbances, rapid effusion, and transmissible infections.

Unfortunately, there isn't a consistent treatment regimen accessible in terms of indications, exchange amount, and technique. In patients with a parasite load more than 30% or a parasite index greater than 10% and additional serious problems such as multiorgan involvement and hyperparasitaemia, exchange transfusion is typically necessary.

Automated erythrocytapheresis has the advantages of more accurate hemodynamic stability, preservation of plasma and cellular components, efficiency, and speed, but it is only offered in specialist facilities. Manual exchange transfusion, on the other hand, doesn't need for specialised equipment, thus it may be used right away at all facilities on patients with severe *Falciparum* malaria.

It must be understood that blood exchange only eliminates circulating parasite antigens. Although manual exchange transfusion does not exchange RBCs that are encapsulated in the microvasculature of important organs, it does help to reduce the load of toxins and byproducts of the host immunological response. Antimalarial medications, in particular Artesunate, are also responsible for the rapid clearance in addition to exchange transfusion. The postulated positive processes of exchange transfusion in eliminating parasite toxins, enhancing hemorheology, and treating anaemia cannot be concluded in our case, focused solely on parasite clearance.

The function of exchange transfusion is still unknown because randomised control trials have not been carried out. Riddle MS et al. compared patients with severe malaria who received exchange transfusions to those who only received antimalarial chemotherapy in a meta-analysis. They discovered no variations in survival rates. Unfortunately, exchange transfusion recipients had significantly higher parasitemia levels and were more seriously ill.

In retroactive reviews, the majority of research were unable to identify any benefits of exchange transfusion. The small sample size, the absence of a consistent transfusion technique, and observer bias tainting the data restrict the importance of the findings. In fact, there are very few circumstances in clinical practise where it is necessary to make treatment decisions without having enough information from prospective clinical trials. We contend that the theoretical benefits of exchange transfusions support their use in critically sick *falciparum* malaria patients. Before, the Centers for Disease Control and Prevention in Atlanta said that exchange transfusions were safe for some critically sick patients. The Centers for Disease Control and Prevention examined patients of severe *Plasmodium falciparum* malaria treated with exchange transfusion in 2013 and found no survival advantages. As a result, the CDC does not suggest transfusion exchange as an additional technique for treating severe malaria.

Exchange transfusion does not increase the survival rate, according to a meta-analysis. Since there was no standardised evaluation mechanism in place for the treatment groups, it was challenging to compare various studies. Additionally, there are no evidence-based recommendations for transfusion exchange in patients with severe malaria.

The elimination of toxins and inflammatory mediators is thought to provide benefits. Researchers have proposed hemodialysis, plasmapheresis, and plasma exchange as potential substitutes for exchange transfusion.

Electrolyte imbalance and hemodynamic difficulties brought on by manual exchange transfusion can be avoided with automated exchange transfusion. Extreme age groups, such as smaller children and the elderly population, benefit more since older patients are more likely to have negative results and just a little amount of blood is needed in youngsters, who may readily receive it from parents

and relatives. Due to changes in the healthcare systems' structures and operations, patients in Asia benefit from adjunct exchange transfusions more significantly. Variations in the virulence and antimalarial sensitivity of *P. falciparum* strains in various geographical locations or variations in the host's resistance to illness as a result of common genetic variables.

III. CONCLUSION

The majority of meta-analyses show that adding exchange transfusions to the therapy for severe malaria does not improve survival. However, one case study suggests that it has a better prognosis. Until well-designed randomized clinical research is completed, all critically ill patients may be cautiously assessed for adjunct exchange transfusion.

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Classification of coffee beans roast maturity levels based on digital image processing color using the KNN and PCA method

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Abstract- Indonesia is an agricultural country known as a producer of various plantation commodities, including coffee. There are several types of coffee grown in Indonesia, the majority of which are arabica coffee and robusta coffee. Coffee that has good quality can be seen from several factors, or the quality of the coffee beans, the appropriate length and temperature when roasted or roasted. There are 3 levels of roasting coffee beans, namely light roast, medium roast, and dark roast. The above problems are related to roasting coffee beans with many color standards for the level of maturity of beans based on the knowledge of experts, then an innovation emerged to determine the level of maturity of roasted coffee beans by utilizing the RGB and HSV color features using the K-Nearest Neighbor and Principal Component Analysis algorithm. Classification using image processing using MATLAB software. To create a classification system with 3 classes, namely light, medium, and dark. In this study, researchers used a dataset that had been taken using a camera in the form of images of roasting coffee beans as many as 300 datasets divided into 270 training data and 30 test data. The data is classified using the KNN method by measuring the distance to the nearest neighbor with a value of $K = 3$. From this study, the results obtained accuracy of 93.33% with the results of the classification of the test data sample as many as 28 data received accurate classification results and 2 data received inaccurate classification results.

Index Terms- K-Nearest Neighbor, Principal Component Analysis, classification, roasting coffee beans, Matlab.

I. INTRODUCTION

Technological advances have penetrated all sectors. One of them is the agricultural sector, where computer technology plays an important role in agriculture in terms of crop quality through digital image processing. Indonesia is an agricultural country known as a producer of various plantation commodities, including coffee. The number of coffee plantations makes Indonesia the fourth largest coffee supplying country in the world [1]. Coffee is a commodity in the plantation sector with various high economic values when compared to other plantation products and has an important role in the country's foreign exchange source [2]. Coffee farmers have an important contribution to coffee production in Indonesia by 96%, State Large Plantations (PBN) produce 2%, and Private Large Plantations (PBS) produce as much as 2% [3].

There are several types of coffee grown in Indonesia, the majority of which are arabica coffee and robusta coffee. Good coffee has a delicious taste when consumed. The most important thing is maintaining coffee quality, which is achieved through seed selection, planting, harvesting, and post-harvest processing. Coffee that has good quality can be seen from several factors, or the quality of the coffee beans, the appropriate length and temperature when roasted or roasted (the process of roasting coffee beans), the grinding process, and the technique for brewing it [4].

Of the many stages to make the dish, the roasting process is the main process that will determine the taste and aroma of the coffee that is the hallmark of the coffee bean. There are 3 levels of roasting coffee beans, namely light roast, medium roast, and dark roast. At the light roast level, the color produced is yellow-brown, for the medium roast level the color produced is brown, and for the dark roast the color produced is black [5]. There are many factors that determine the taste of coffee during roasting, including fire, engine temperature, drum temperature, timer, and the expertise of the roaster itself [6]. From some of these techniques, if done correctly, it will produce a good level of color maturity and taste in an Arabica coffee bean.

The solution to the problem above is related to roasting coffee beans with many color standards for the level of maturity of the

beans based on the knowledge of experts, then there is an innovation to determine the maturity level of roasted coffee beans by utilizing information technology. In some of the descriptions above, the author will conduct research using the K-Nearest Neighbor algorithm to extract and classify the types of coffee beans roasting levels and then visualize using the Principal Component Analysis algorithm to make it easier to find out the distribution of the data.

II. LITERATURE REVIEW

The first research referred to is research conducted by Widyaningsih et al (2020) entitled "Comparison of Classification of Coffee Maturity Levels Using the Fuzzy Logic and K-Nearest Neighbor Methods with Gray Level Co-Occurrence Matrix Feature Extraction". In this study, comparing the classification of coffee cherries using the fuzzy logic and k-nearest neighbor methods provides accurate information that obtains 100% accuracy with a computation time of 108.03 s at the maturity level with KNN classification and GLCM extraction while using the fuzzy logic method to obtain accuracy. 70.8% with a computing time of 10.5.17 s, this test uses a total of 240 training data and 60 testing. The second study was conducted by Cinantya et al (2019) with the title "Classification of Lime on Fruit Maturity Levels Based on Color Features Using K-Nearest Neighbor". In this study, the K values used were 9, 7, 5, 3 and 1 for testing. search for the Euclidean distance and cityblock distance in images with pixel sizes of 512x512, 256x256 and 128x128. In the preprocessing stage, the feature extraction process uses the mean RGB. Research has been conducted to prove that with Euclidean distances $k=7$ and $k=3$ have a percentage value of 92% and the cityblock distance $k=1$ and $k=3$ has a percentage value of 88%. Based on the level of accuracy it has, the color feature $k=3$ shows the best k value in the classification of lime ripeness.

The third research used as a reference by Yusuf and Nur (2021) entitled "Classification of Banana Types Based on Color, Texture, Image Shape Features Using SVM and KNN" in this study used 399 banana images which were classified into 7 types of bananas, namely Ambon banana, kepok, milk, king, mas, king jackfruit, and cavendis. From the Banana image, the color features are taken from the average RGB value, RGB standard deviation, RGB skewness, RGB entropy. Texture features are the average grayscale image value, grayscale standard deviation, and gray level co-occurrence matrix (contrast, energy, correlation, homogeneity). As well as the shape features of the binary image value area, perimeter, metric, major axis, minor axis, eccentricity. The test results show that the accuracy of the SVM algorithm for classifying banana types from color, texture, shape features is 41.67%, 33.3%, 8.3%, respectively. And the results of the banana type classification using the KNN algorithm, the best K value is 2 at 55.95% color features, 58.33% texture features, and 45.24% shape features. The fourth research that became the reference was carried out by Indra Harry et al (2019) entitled "Application of the K-Nearest Neighbor Algorithm for Polishing Arabica and Robusta Coffee Bean Types". The research uses the Canny edge detection approach assisted by the K-Nearest Lightweight Classification (K-NN) and the MATLAB programming language. Image processing used on coffee beans is 200 image data which is divided into 80% training data and 20% test data, so this study uses 160 image training data and 40 image test data. The results of the study produced the best accuracy, namely 75% at $K=1$ and $K=7$, with a shooting distance of 15 cm.

The fifth study was conducted by Anggi and Anwar (2019) entitled "Identification of Arabica Coffee Plant Diseases with the K-Nearest Neighbor Method". This research is to address the problem of identifying a disease that is measured qualitatively and quantitatively. The test was carried out by testing the effect of the k value on accuracy with variations of 1-5 with a distribution of 10, 15, and 20 training data and 10 test data which resulted in a K test of 1-5 with an average accuracy value of 65.99%. While the highest accuracy is at $k=1$ with a total of 15 training data, $K=4$ and $K=5$ on 10 training data with an accuracy of 80%. The sixth research conducted by Ahmad and Rizal (2020) entitled "Introduction to Leaf Patterns to Distinguish between Rice and Weeds Using Principal Components Analysis (PCA) and Extreme Learning Machine (ELM) Methods." By using the Principal Component Analysis feature extraction method and the Extreme Learning classification method, this research can distinguish between rice plants and weeds. The implementation of PCA and ELM was able to distinguish weeds from rice (*Oryza sativa* L). In this case, the weeds used were jawan (*Echinochloa crus-galli*) and crema (*Alternanthera sessilis*). Based on the results of tests carried out 8 times by changing the number of hidden neurons, the highest accuracy value was 91.67% using 10, 15, 30, 35, 40 hidden neurons, while the lowest accuracy value was 58% with the number of hidden neurons. 5. The time needed by ELM to conduct training and testing is very short, 0.374 seconds and 0.500 seconds, measurements are carried out starting from the running program to the process.

III. METHODOLOGY

The steps that the author does to carry out the classification process with coffee using the KNN algorithm, the first is the pre-process stage is carried out to obtain feature extraction from the image of coffee beans. This stage can also facilitate the process of testing the system that will later be made. Next is the distribution of data in this study, the number of data images is 300 coffee bean data images. of the 300 coffee bean image data, it is divided into 90% training data and 10% testing data, so the author has 270 training data images and 30 testing data images. Then the next step is feature extraction. At this stage, the image data that has been grouped into training data and testing data will go through a feature extraction stage which will remove 3 features from the image, Light, Medium and Dark Roast. Furthermore, there will be a testing process with KNN, at this stage the images that have been grouped and have extracted their characteristics will perform a classification test using the KNN method. The level of accuracy of the KNN method can be known by comparing the output results. Furthermore, the results are visualized using the Principal Component Analysis algorithm to make it easier

to find out the distribution of data from each image using software in the form of MATLAB.

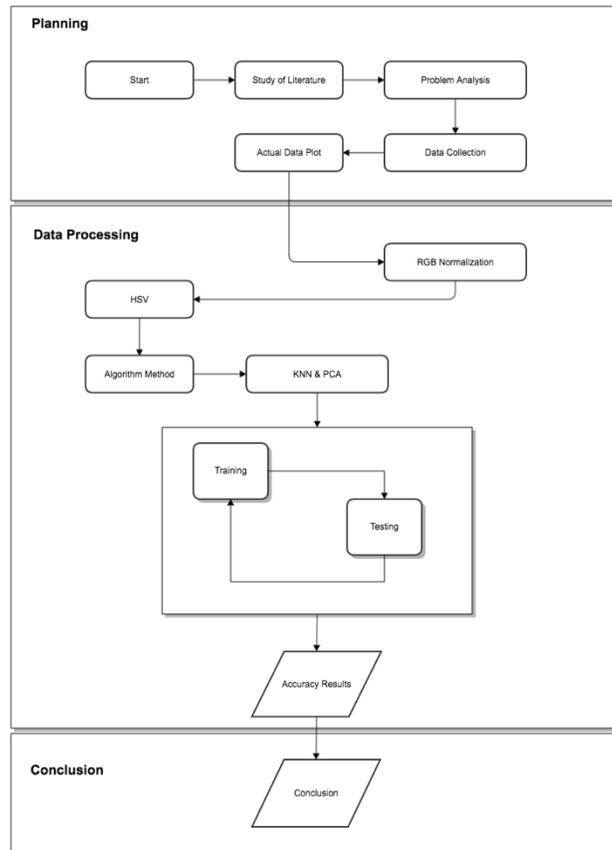


Figure 1. Research Design

A. *K-Nearest Neighbor*

K-Nearest Neighbor (K-NN) belongs to the instance-based learning group. This algorithm is also a lazy learning technique. K-NN is done by looking for groups of k objects in the training data that are closest (similar) to the objects in the new data or testing data [7]. We need a classification system as a system that is able to find information. Near or far a location (distance) is usually calculated based on the Euclidean distance. With the following formula [8].

$$d(xy) = \sqrt{\sum_{i=1}^n (x_i - y_i)^2}$$

Description:

d : proximity

x : data training

y : data testing

n : number of intermediate attributes 1 to n

i : individual attributes between 1 to n

B. Normalization RBB

Normalization is an extension of RGB color where each pixel color is proportional to the total number of RGB colors in each pixel [9]. This method uses the percentage value of the RGB color in an image that has been calculated, so that objects that have certain colors can be detected and avoid the influence of changes in the intensity of light from outside [10]. The formula used is in Equation 2.

$$r = \frac{R}{R+G+B} \quad g = \frac{G}{R+G+B} \quad b = \frac{B}{R+G+B}$$

Description :

1. The values of R, G, and B are values that have not been normalized.
2. The values of r, g, and b are values that have been normalized.

C. HSV Color Features

Hue, saturation, and value are one of the color features that have a perspective on color, where the color is close to the color that can be seen by the human eye [11]. HSV color features can also be interpreted as hue values representing colors that vary from red to green, saturation representing colors varying from red to pink, and value (light intensity) representing colors from black to white [12]. To find the results of the color space, there are several formulas for determining the value of the HSV color space, which are found in Equation 3 to Equation 6 [13].

1. Finding RGB values

$$R = \frac{R}{255} \quad G = \frac{G}{255} \quad B = \frac{B}{255}$$

2. Finding the value

$$V \text{ (value)} = \text{nilai max}$$

3. Finding saturation values

$$s, \left\{ \begin{array}{l} 0, \text{jika} = \min \\ \frac{\max - \min}{v}, \text{jika} \max > 0 \text{ mm} \end{array} \right\}$$

4. Finding hue value

$$H \left\{ \begin{array}{l} 0, \text{jika} \max = \min \\ 60^\circ \left(\frac{G - B}{\max - \min} \text{ mod } 6 \right), \text{jika} \max = R \\ 60^\circ \left(\frac{B - R}{\max - \min} + 2 \right), \text{jika} \max = G \\ 60^\circ \left(\frac{R - G}{\max - \min} + 4 \right), \text{jika} \max = B \end{array} \right\}$$

IV. RESULTS AND DISCUSSIONS

In this study, researchers created a system for classifying the level of maturity of coffee beans. As for in this study using the K-Nearest Neighbor algorithm to classify the data and using the Principal Component Analysis algorithm to visualize the distribution of the dataset. The researcher used MATLAB R2017b software to create a coffee fruit maturity classification system. The maturity level of roasting coffee beans used is Light, Medium, Dark. The following is the maturity level of the coffee beans used in this study:

Table 1. Coffee fruit class table

Class	Define	Picture
Light	Image of roasting brownish yellow coffee beans	
Medium	Image of brown coffee bean roasting	
Dark	Black coffee bean roasting images	

A. Training Stage

At the training stage using the MATLAB R2017b software, it was carried out using 270 coffee bean training image data and divided into 3 classes, namely, light, medium and dark. The 270 images were extracted with RGB, HSV, and Area features.

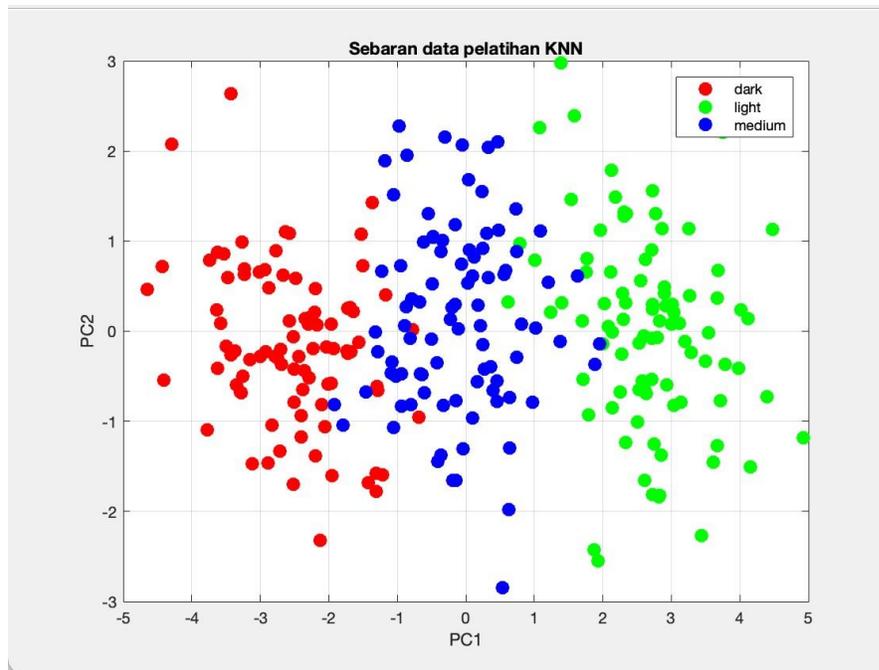


Figure 2. Training data distribution graph

Based on Figure 2 above, the distribution of roasting maturity levels of light, medium, and dark coffee beans shows the distribution of training data as many as 270 datasets grouped according to the distance of neighbors and each class.

B. Testing Stage

The next step is testing using 30 images of roasting coffee beans with different maturity levels. At the testing stage, the steps taken are the same as in the training stage. The difference is in the testing phase, the test data is tested using the KNN method based on the number of nearest neighbors obtained from the training phase. From the testing phase, the distribution of 30 test data was visualized using the PCA algorithm.

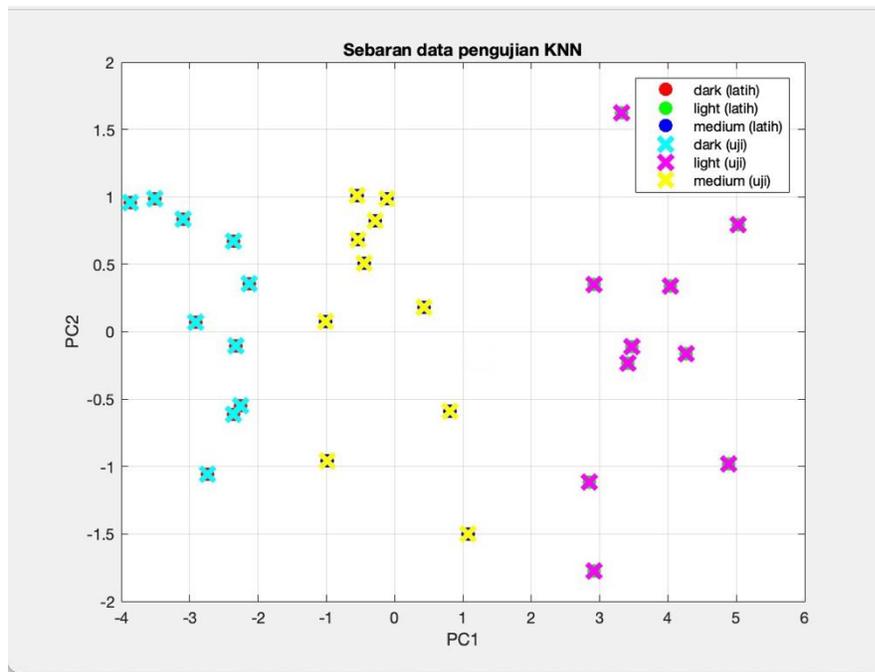


Figure 3. Test data distribution graph

The distribution of test data on the training data can be seen in Figure 3. There is a description, the cross (x) has 3 colors for 3 classes, namely, pink for test data with light class, yellow for test data with medium class, and blue color young for test data with dark class.

C. GUI Creation

The coffee fruit maturity classification system was created using the MATLAB R2017b software. The system made this time has several functions, namely image load/image input, segmentation, feature extraction, classification, and reset. Image load/image input serves to select the image to be displayed on the system. Segmentation serves to display the segmentation results from the selected image, to improve the segmentation results, morphological operations are also carried out on this system. Feature extraction serves to display the results of feature extraction (RGB, HSV, and Area) from the segmented image. Classification serves to display the results of the classification using the KNN method. Reset functions to reset the system. The results are shown in Figure 4 below:

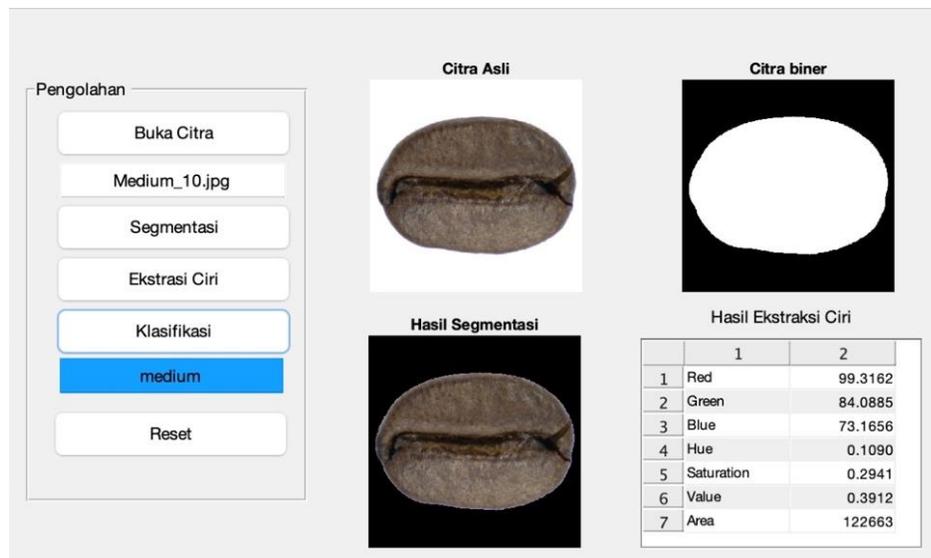


Figure 4. GUI system

D. Implementation

This study implements the K-Nearest Neighbor method in classifying data. As for implementing the KNN method by measuring the shortest distance between test data and training data. In this study there are labels and attributes, labels are taken from the level of

fruit maturity and attributes obtained from the extraction of image features. The attributes are R(red), G(green), B(blue), H(hue),S(saturation), V(value), and Area [14]. At this stage, the calculation of the feature extraction value of the training data is carried out, in table 2 shown as many as 30 data samples from the total data of 270 training image data.

Table 2. Extraction table of training data features

No	R	G	B	H	S	V	Area	Label
1	137,5904	108,4125	80,4496	0,0999	0,4294	0,5397	137,5904	Light
2	123,7513	96,1922	74,3480	0,0990	0,4141	0,4858	123,7513	Light
3	129,3103	103,5379	77,3197	0,1025	0,4123	0,5075	129,3103	Light
4	146,2964	116,9673	86,5773	0,1086	0,4156	0,5745	146,2964	Light
5	124,1115	96,6155	75,4161	0,1017	0,3953	0,4873	124,1115	Light
6	128,8759	100,6961	75,0219	0,1030	0,4294	0,5059	128,8759	Light
7	121,0803	97,0278	77,1957	0,0977	0,3763	0,4752	121,0803	Light
8	125,5899	99,7357	75,9839	0,1024	0,4106	0,4930	125,5899	Light
9	129,5067	97,5951	72,2028	0,0964	0,4596	0,5087	129,5067	Light
10	117,8637	92,2791	70,2198	0,1042	0,4148	0,4627	117,8637	Light
11	102,5131	86,6145	74,8113	0,0019	0,2908	0,4034	114436	Medium
12	97,9477	81,2350	69,8981	0,1007	0,3120	0,3855	139428	Medium
13	92,6141	80,4565	73,3579	0,1245	0,2359	0,3658	122467	Medium
14	85,7378	71,7116	63,4252	0,1186	0,2778	0,3384	139827	Medium
15	92,4953	79,2115	69,4827	0,1079	0,2725	0,3642	106629	Medium
16	95,9925	80,3835	68,7649	0,1122	0,3114	0,3784	128222	Medium
17	97,6911	83,5103	73,9543	0,1188	0,2668	0,3860	131749	Medium
18	100,0552	83,6168	70,8366	0,1087	0,3138	0,3939	116396	Medium
19	86,7849	71,4742	62,1413	0,1062	0,3049	0,3418	112584	Medium
20	104,8507	86,5742	72,1218	0,1081	0,3325	0,4129	121406	Medium
21	85,4347	77,7418	73,2555	0,2475	0,1965	0,3421	107073	Dark
22	80,0428	70,9411	66,4359	0,1808	0,2186	0,3207	121594	Dark
23	75,0832	67,3286	62,8049	0,1686	0,2178	0,3005	104969	Dark
24	74,3238	70,8670	70,1226	0,3316	0,1502	0,3058	127615	Dark
25	84,3437	76,7009	71,4822	0,2008	0,1974	0,3377	104220	Dark
26	76,6569	69,1639	64,2152	0,1738	0,2089	0,3065	113190	Dark
27	74,1681	67,2686	64,2100	0,2273	0,2055	0,2986	112929	Dark
28	75,7993	69,2469	65,5115	0,2707	0,2277	0,3081	117938	Dark
29	73,0420	67,3512	64,3154	0,2203	0,1684	0,2927	118746	Dark
30	71,9720	67,2142	65,1105	0,2667	0,1802	0,2917	106985	Dark

Next, the closest distance from the test data will be calculated to 270 training data from which 30 training data samples are taken. For example, the researcher took 1 test data for calculation using the Euclidean Distance formula. Which is the extraction of test data as follows.

Table 3. Extraction of test data features 1

No	R	G	B	H	S	V	AREA	LABEL
1	0,464	0,480	0,189	0,180	0,300	0,520	68765	?

From the calculations that have been carried out, the results of testing the test data on the training data are obtained, in table 2 it is shown as many as 35 data samples from a total of 270 data as shown in Table 4 below.

Table 4. Euclidean distance test data 1 against 35 training data

No	Description	Euclidean Distance
1	test data 1 against training data 1	0,000
2	test data 1 against training data 2	0,910
3	test data 1 against training data 3	0,935
4	test data 1 against training data 4	0,429
5	test data 1 against training data 5	0,345
6	test data 1 against training data 35	1,410
7	test data 1 against training data 36	1,480
8	test data 1 against training data 37	1,450
9	test data 1 against training data 38	1,789
10	test data 1 against training data 39	1,814
11	test data 1 against training data 80	2,150
12	test data 1 against training data 81	2,395
13	test data 1 against training data 82	1,604
14	test data 1 against training data 83	1,708
15	test data 1 against training data 84	1,339
16	test data 1 against training data 115	2,088
17	test data 1 against training data 116	1,991
18	test data 1 against training data 117	1,774
19	test data 1 against training data 118	1,890
20	test data 1 against training data 119	1,406
21	test data 1 against training data 215	1,321
22	test data 1 against training data 216	1,076
23	test data 1 against training data 217	1,780
24	test data 1 against training data 218	0,678
25	test data 1 against training data 219	0,980
26	test data 1 against training data 225	2,024
27	test data 1 against training data 226	1,869
28	test data 1 against training data 227	1,835
29	test data 1 against training data 228	1,809
30	test data 1 against training data 229	0,878

From these calculations, a classification is carried out with a value of $K = 3$, the results of the classification of the roasting maturity level of coffee beans from test data 1, namely Dark. The above process is repeated as much as the number of test data, namely 30 test data so that the following results are obtained:

Table 5. Test results test data

Test Data	Class	KNN results	Description
1	Light	Light	Accurate
2	Light	Light	Accurate
3	Light	Light	Accurate
4	Light	Light	Accurate
5	Light	Light	Accurate
6	Light	Light	Accurate
7	Light	Light	Accurate
8	Light	Light	Accurate
9	Light	Light	Accurate
10	Light	Light	Accurate
11	Medium	Medium	Accurate

12	Medium	Medium	Accurate
13	Medium	Medium	Accurate
14	Medium	Medium	Accurate
15	Medium	Light	Not Accurate
16	Medium	Medium	Accurate
17	Medium	Medium	Accurate
18	Medium	Medium	Accurate
19	Medium	Medium	Accurate
20	Medium	Medium	Accurate
21	Dark	Dark	Accurate
22	Dark	Medium	Not Accurate
23	Dark	Dark	Accurate
24	Dark	Dark	Accurate
25	Dark	Dark	Accurate
26	Dark	Dark	Accurate
27	Dark	Dark	Accurate
28	Dark	Dark	Accurate
29	Dark	Dark	Accurate
30	Dark	Dark	Accurate

Of the 30 test data calculated using the KNN method, 28 images with accurate classification results were obtained and 2 images with inaccurate classification results and can be seen from the test results, which are formulated as follows [15]:

$$Accuracy = \frac{\text{The sum of all data is correct}}{\text{Sum of all data}} \times 100\%$$

Then obtained the level of accuracy:

$$Accuracy = \frac{28}{30} \times 100\% = 93,33\%$$

The level of accuracy obtained from the calculation of the KNN classification on roasting coffee beans is 93.33% of 30 test data with a value of K = 3, with a visual diagram as follows:

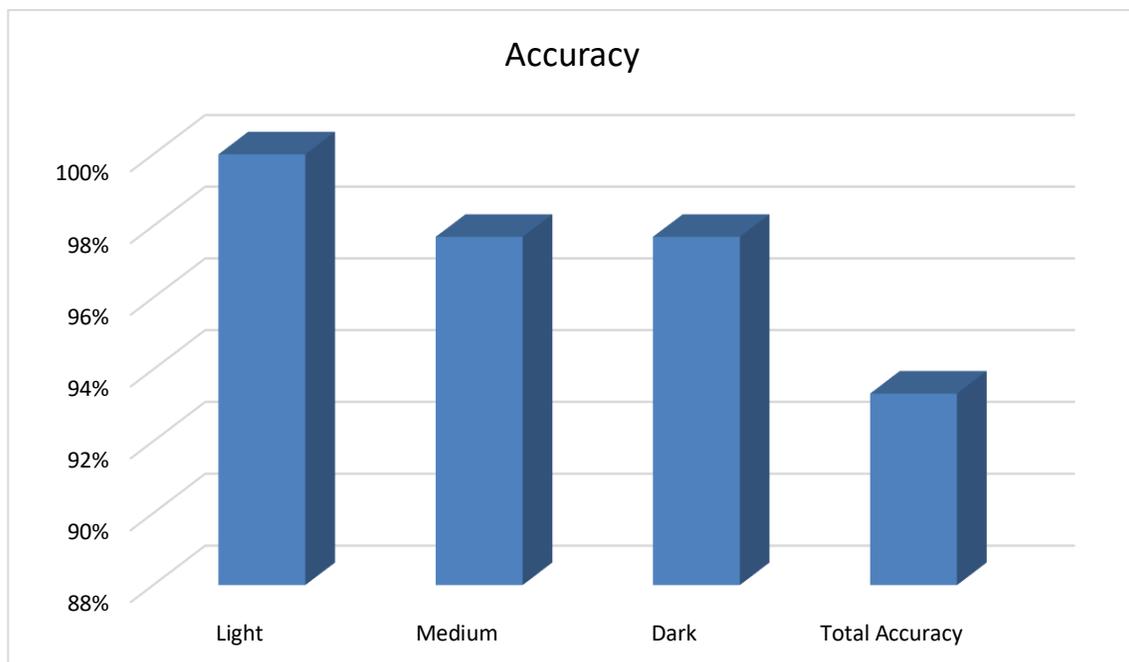


Figure 5. Coffee ripe accuracy chart

V. CONCLUSION

From the research that has been researched, it has resulted in a classification system for the level of roasting of coffee beans made using MATLAB R2017b software, where the system can classify the level of maturity of roasting coffee beans by utilizing the image of the coffee bean by inputting an image of coffee fruit that has been preprocessed by changing the background is white for easy segmentation. The coffee fruit maturity level classification system uses the K-Nearest Neighbor method to classify the coffee fruit maturity level by utilizing the RGB, HSV and Area color features using 35 samples of training data from a total of 270 coffee bean image datasets and 30 test data. Image of coffee beans with 3 classes light, medium, and dark. From this system, the accuracy results from the classification of the maturity level of coffee cherries using the KNN method is 93.33% with a $K = 3$ value obtained from 28 test data with accurate classifications, and 6.7% from 2 test data with inaccurate classifications. The results of this study are expected to help coffee roasters as a reference in determining the roasting of Arabica coffee beans and for further researchers as a reference for making desktop or mobile-based applications.

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Influence Of Contractor's Firm Structure On Completion Of Building Construction Projects In Nairobi City County, Kenya

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Abstract- The subject of project completion is of global concern to parties that are involved in construction of projects. Poor performance of completion of construction projects is usually characterized by production of low-quality projects, time and cost overruns. Success of a construction projects directly affects how a contractor is perceived since it's a contractor's responsibility to ensure that a construction projects is completed as that is how their performance is measured. Thus, the study research was on contractor's firm structure and its influence on completion of building construction projects. The study was anchored on agency theory and targeted registered contractors working on the on-going building projects in Nairobi City County. The descriptive, correlation and regression was conducted. Findings showed completion of construction projects was influenced by contractor's firm structure based on high score of ($M=3.92$ and $SD=.89$) from the descriptive analysis. Correlation analysis revealed strong and positive significance between the two variances since $r=.622$ and 71.2% of changes in completion of construction projects was due to firm structure. Regression coefficient was $\beta=.208$ for link between firm structure and completion of construction projects. The study concludes that firm structure helped in completing and delivering construction projects on time, as per the cost and budget estimate and meeting government standards. The study recommends that industry players to push for policies and regulations that can improve on quality of the completed building construction projects..

Index Terms- Communication, Defined work plans, Decision making process, Coordination amongst parties, Number of personnel, Completion of projects

I. INTRODUCTION

The construction industry, it accounts for millions of jobs worldwide, economic growth and development through linking economic entities and productivity of different sector player. The role of construction sector cannot be overemphasized, as noted by Sulieman and Adlan (2016) who noted that it plays a key in socio-economic development of people by providing

shelters, social amenity systems and facilities and employment opportunities. Momanyi and Kamau (2020) add that the construction industry activities affect all other sectors and industries in any economy.

The construction industry is multi-faceted as it has many players including clientele (private and public consumers), contractors, consultants, stakeholders and regulators. The sector faces challenges in terms of sourcing for adequate capital since it is a capital intensive industry, poor workmanship, incompetency of engineers, insufficient organization and unstable business environment (Asiedu & Adaku, 2019). It also suffers from unpredictable demand cycles, uncertain circumstances like change of weather and project-specific demands. But Cheng, Chang and Korir (2019) share that the role played by contractors is central for the success of projects due to their function of translating the plan into a completed structure.

The performance of contractors is an important measure in the construction industry as it determines, quality and delivery timelines of the projects, cost of completed of projects bearing in mind the construction projects are capital intensive. Komen and Juma (2018) measure the performance of contractors in terms of level and quality of projects delivered to clients. While Sulieman and Adlan (2016) talk of timelines in completion and delivery of construction to avoid many delays at each construction phase, as this will have a direct effect on the overall cost of the project. In general, contractor performance in the construction industry is based on three aspects, quality of the completed project, costs incurred in the construction project and delivery timeliness of the completed construction project (Cheng, *et al.*, 2019).

The structure of the firm is another aspect that plays a key role for measuring the contractor's performance. The structure can create an enabling environment for ease of delivery of the project objectives (Fernandez, Le Roy & Chiambaretto, 2018). The contractor's firm structure is based on the communication channels and systems that convey information and ensure synergy among the functional areas of the project, it is also about defining work plans and decision making processes that ensure all systems are coordinated and all teams work together to achieve the project goals. The structure of the contractor's firm also looks at number

of personnel, their skill-set and experience and which departments and work areas to assign them for complete utilization of their skills for the benefit of the project.

Kenya's building and construction sector has grown immensely over the last few years. A growth of 14.2% was reported over the period of 2006-2011 (G.O.K, 2014). Within that same period, the GDP had declined to 4.3% in 2011 and it was high of 6.33% in 2006 (G.O.K, 2014). The statistics from the central bureau show that the Kenyan construction industry contributes to the nation's GDP by 7%. But the industry suffers similar issues and problems that other developing nations face and in some instances the problems are severe. The fact that this industry is important to this country and most other developing countries, their poor level of performance should be looked into and a solution found. Since, contractors are at the major contributors of the construction industry; thus any changes should be centered on them as a means to improve the industry outcomes and delivery of contractors.

The construction sector has been strategic in creating job opportunities and it has worked to reduce unemployment especially amongst the youths. In Nairobi like in other cities around the world have many projects that are usually not completed on time leading to abandonment due to exceeding the estimated project costs. Some of the projects remain unfinished while few are eventually completed but very much later than the date agreed on the schedule and with a very highly inflated budget. Other reasons affecting majority of construction project performance in Nairobi Metropolitan area are dynamic economic conditions, cultural differences, political instability, inadequate infrastructure, lack of control and motivation for staff, inexperienced stakeholders and poor leadership structures in the industry.

In every 10 building construction projects, only 2 are completed in time and within the budget, the other 8 suffer from delays in accessing drawing designs, non-availability of building materials, political interference and finances to cover costs for the entire project (Mwangi, 2016). The Nairobi City County has seen an increase in building construction projects especially with the growing population hence demand for residential and commercial premises and other social amenities. But the issue still remains in completion of projects in the stipulated timelines and within the set budgets. Since the success and completion of projects is the responsibility of the contractor, then it is thought that the solution to the challenges in completing projects will be found by looking at the performance of the project contractor.

Thus, this study investigated on the influence of contractor firm structure on completion of construction projects in building construction projects in Nairobi City County, Kenya.

The research question is:

- i. What is the influence of contractor's firm structure on completion of building construction projects within Nairobi City County?

II. LITERATURE REVIEW

Theoretical Literature

The Agency Theory

The theory was advanced by Alchian and Demsetz (1972) and later elaborated and expanded by Jensen and Meckling (1976)

and its key principal is on the correlation between the principal and agent. The theory works to ensure there is a proper working relationship between the principal and agent and interests of both parties are taken care of. Its focus is how to draft the contract between the principal –owners and shareholders of the firm and the agent –executioner of all activities in the firm, in light of differing views for realization of high performance. When the firm managers make decisions that align with their interests the principals feel outpaced and might resolve to sack the managers. Another issue is when the principal cannot authenticate the work and output of the agent due to lack of transparency.

The theory is based on these assumptions that conflicts of goals and interests between principals and agents may arise during the duration a contract is supposed to exist; this may be because one party might have more information about the contract than the other. Usually, most of the agents can take more risks as compared to the principals (Otundo, 2015). The theory exposes how firm structure and the inter-relation between the construction company and its client; and between the contractor and project manager. It shows how these stakeholders can create a good working relationship and coordinate activities through efficient communication systems. The structure will enhance completion rates of construction projects.

Empirical Literature

Sartipi (2020) investigated on organizational structure for construction entities that is based on cooperative. The construction entities just like other industry players must make changes to remain competitive and cooperate with other players in the marketplace. The study adopted the use of game theory that uses mathematical principles to evaluate decisions made by managers and improve chances of good outcomes. The contractors and project managers are market players that can improve performance through coordination and cooperation and positively influence the outcome of the construction entities. The cooperative game theory is based on coordination, cooperation and integration of different construction sector players based on the structure of the firm. The structure that enables resource sharing and equitable treatment of all players will benefit the entire construction sector.

Kuria and Kimutai (2018) conducted a study on the internal environment in firms and its effect on performance of projects for these constructing firms that are based in Nairobi City County, Kenya. The internal organizational environment was looked at through elements like communication system, training and development, reward and recognition system and shared values and practices and how they influence of project performance for the construction firms. The study collected data using semi-structured questionnaires from the 49 registered construction firms. The findings showed there association between the two elements were good and led to project performance in the construction firms that are based in Nairobi.

Omer, Adeleke and Moshood (2021) study was organizational structure and risk management based on mediating effect of the coercive pressures in the construction industry in Malaysia. The aim of the study was seeking risk management strategies to resolve the risks that have be-deviled the Malaysian construction industry. The researchers noted that an effective organization structure can mitigate some of the risks and lead to highly performing construction industry. Data was obtained from

G7 construction companies in the peninsular where findings showed that aspects of organization structure including specialization of assignments, centralization of authority and power and deployment of formal management structure led to reduced risks and highly performing construction firms.

Chepcheng and Siringi (2019) study looked at performance of donor-funded health projects as influenced by leadership styles, the structure of the firm and engagement of stakeholders. The focus of the study was a case study of health solutions in Kenya due to declining donor funding, wastage, un-satisfaction by project

stakeholders and economic loss from failing health projects. The study collected data from employees of health solutions center in Kenya and found that study elements worked to improve performance outcomes in the health projects in Kenya’s Center for Health Solutions. The transformational and transactional leadership styles and organizational structure based on formal relationships, hierarchy of authority, control held by managers and effective communication channels and systems; led to higher performing projects.

Conceptual Framework

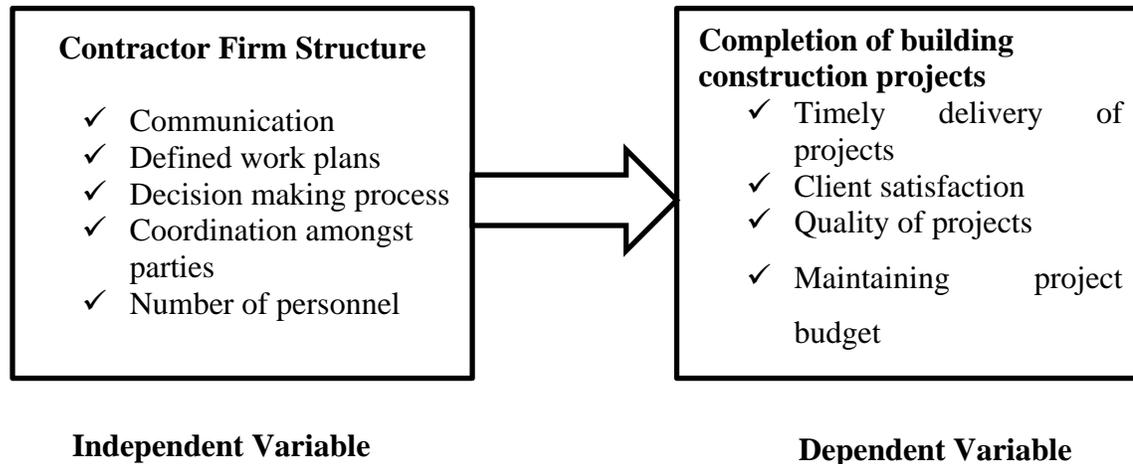


Figure 1: Conceptual Framework

III. RESEARCH METHODOLOGY

The study design is the blueprint that guides researchers in all activities they undertake to answer the research questions (Bryman, 2016). The study employed a descriptive and explanatory design and the choice was based on giving information without any manipulation and explaining the focus of the study. This study targeted registered contractors with the National Construction Authority that are working in the 764 ongoing building projects in Nairobi City County. Through the adoption of the Kothari (2004) formula a sample size of 255 contractors formed the sample size of the study.

Primary data was collected using questionnaire and copies were made and distributed to the respondents. The questionnaire

used a five point Likert Scale and it was arranged in sections and the scale showed the weight and degree in intensity to agreements that were made on each statement. The 12 contractors were those registered by the NCA as building works contractors within the Nairobi City County. The pilot testing was done to check if the instrument is valid and reliable. The Cronbach alpha results at an average score of .840 indicated that the instrument was reliable and confirmed its fitness for use in the study. The quantitative data was coded and entered into SPSS where descriptive; correlation and regression analysis was conducted.

IV. FINDINGS

Descriptive Analysis

Table 1: Contractor’s Firm Structure

Statement	Mean	SD %	D %	UD %	A %	SA %	STD. DEV.
There is smooth flow of communication in the contractor firm.	3.97	0	26.7	14.7	45.3	12	1.116
Throughout the firm, there are defined work plans which are duly followed by everyone.	3.81	11.4	24	20.2	30	14.2	.945

The decision-making process involved in the firm is done properly.	4	8.7	18.6	13.6	38.2	20.7	.872
There is coordination amongst all the parties in the contractor firm.	3.72	15.3	19.1	10.9	37.7	16.0	.904
The contractor has enough personnel to work with during the construction process.	3.96	3.8	6	5.4	39.3	45.3	.872
The structure allows staff to learn from each other leading to successful project	4.04	0	5.4	13.6	34.4	46.4	.636
Total	3.92	9.8	16.63	13.06	37.48	25.76	.89

In general, contractors' firm structure and effect on completion of construction projects had an overall mean score of 3.92 and standard deviation of .89. Aggregate scores were such that 9.8% of respondents strongly disagreed, 16.63% disagreed and 13.06% wavered between both sides; while 37.48% and 25.76% agreed and strongly agreed respectively. The findings are also echoed by Chepchieng and Siringi (2019) who concluded that adopted leadership style, control measures, hierarchy of authority and effective communication led to higher project performance. In addition, Kuria and Kimutai (2018) noted internal environment of the firm such as communication system influenced performance of projects and Sartipi (2020) shared that success of projects relied on cooperation, coordination and integration of all construction sector players.

Table 2: Completion of Construction Projects

Statement	Mean	SD %	D %	UD %	A %	SA %	STD. DEV.
The client needs were met (socially, economically and environmentally)	3.77	2.1	13.1	10.3	43.1	31.1	1.161
The project was completed on time.	3.64	15.8	8.7	22.4	28.4	24.5	1.024
Project was completed within the scope.	4	0	10.9	0	37.7	51.3	.793
The completed project was of high standards.	3.85	6	18.5	15.8	30	29.5	.731
Project was completed within the budget.	3.89	10.3	21.8	6	33.8	27.8	.86
Project met the required government standards.	4.18	13.1	20.2	14.2	22.9	29.5	.594
Total	3.88	9.46	15.53	13.74	32.65	32.28	.86

Table 2 indicates that in general, completion of projects as affected by contractor performance management had high mean scores of 3.88 and standard deviation of .86. The results indicate that 9.46% strongly disagreed with the statement, 15.53% disagreed and 13.74% had undecided on which side to lie with. There were 32.65% who agreed and another 32.65% strongly agreed with the statement. Cheng, *et al.* (2019) stated that in general construction projects are said to be successful based on quality of the completed project, cost and timeliness. It is also about high satisfaction rates for owners, investors and consumers of the completed construction project. As echoed by Komen and Juma (2018) who noted that successfully completed projects are those whose quality of work is high and Beste (2020) added that project designs help in saving time and increases delivery as per the work plan and schedule. Sulieman and Adlan (2016) mention that timelines of completed projects is another indicator of its success similar to the opinion of Oyieyo (2020) arguing that timeliness is a performance measure for projects.

Table 3: Correlation Analysis

		Completion of Construction Firm Structure Projects	
Completion of Construction Projects	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	183	
Firm structure	Pearson Correlation	.622*	1
	Sig. (2-tailed)	.000	
	N	183	183

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

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

Contractors' firm structure had positive and strong significance to completion of the construction projects in Nairobi City County. The correlation analysis results found $r = .622$ and $p < 0.05$ an indication that elements of firm structure such as staffs learning from each other, proper decision making procedures, smooth communication flow and having sufficient number of personnel influenced the completion of construction projects in Nairobi City County, Kenya.

Regression Analysis

Table 4: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.874 ^a	.717	.712	.51056

a. Predictors: (Constant), Contractors' Firm Structure

Results showed that the correlation coefficient of R is .874 implying that contractor firm structure had strong and positive effect to completion of construction projects in Nairobi City County, Kenya. The overall regression model is fit based on obtained coefficient of determination based on R square of .717. The adjusted R square at .712 shows that 71.2% changes in completion of construction projects is based on contractor firm structure.

Table 5: ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	326.239	1	326.239	110.477	.000 ^b
	Residual	534.430	181	2.953		
	Total	860.669	182			

a. Dependent Variable: Completion of Construction Projects

b. Predictors: (Constant), Contractors' Firm Structure

The ANOVA test findings indicate that model is fit for use and there is correlation between predictor variable of contractors' firm structure and the response variable of completion of construction projects. The F ratio calculated is at 110.477 showing variance between the groups and it is higher than F critical calculated at 3.893. The F calculated ratio is what is the error term and the test findings show fitness of the model and p-value is less than the standards set at 0.05, thus showing significant effects between the contractor firm structure elements and completion of construction projects.

Table 6: Regression Coefficient

	Unstandardized Coefficients		Standardized Coefficients		t	Sig.
	B	Std. Error	Beta			
(Constant)	1.619	1.048			1.544	.001
Contractor's Firm Structure	.251	.130	.208		1.922	.045

a. Dependent Variable: Completion of Construction Projects

The resultant regression equation took this form:

$$Y = 1.619 + .208X_1$$

Y = Completion of Construction Projects

X₁ = Contractors' firm structure

The results showed positive and significant effect between contractors' firm structure and completion of construction projects in Nairobi City County based on beta results where $\beta = .208$; $p = .045 < 0.05$.

V. CONCLUSION AND RECOMMENDATIONS

The study found that contractors' firm structure strongly influenced completion of building construction projects. Therefore, conclusions were made that firm structure with elements including allowing staff to learn from each other, having sufficient number of project personnel, coordination and integration of activities and communication that eases decision making improve completion of projects. The study concludes that firm structure helped in completing and delivering construction projects on time, as per the cost and budget estimate and meeting government standards.

The study recommends to the Nairobi City County and the building construction industry to commit sufficient resources in the training and development of contractors. Focusing on the contractors who include project managers, engineers, architects and designers will result in completing projects as per the scope, design, standards of quality, time and cost. The industry players are also advised to push for policies and regulations that can improve on quality of the completed building construction projects.

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A Study To Evaluate The Effectiveness Of Self-Instructional Module On Knowledge Regarding Prevention Of Cervical Cancer Among Women.

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Abstract- Background- The incidence of cervical cancer has declined in developed countries, cervical cancer remains a significant problem in people who are developing. Past studies suggest that Indian women, who account for a minimum of one-fourth of the worldwide disease burden, aren't routinely screened. Thus the investigator intended to conduct the study with to a study to evaluate the effectiveness of self-instructional module on knowledge regarding prevention of cervical cancer among women visiting in selected hospital, at Maharashtra. **Material & Method** – Pre experimental research design, one group pre test post test research design with A Quantitative evaluative research approach was used in women visited in selected hospital at BKL Walawalkar hospital, Dervan, Sawarde. A total of 60 women's were selected with help of Non-Probability Purposive Sampling technique, to evaluate the effectiveness of self-instructional module on knowledge regarding prevention of cervical cancer among women. **Results** - Finding revealed that the overall post test mean score was (15.55 ± 3.416) which is 51.83% of total score. It interprets that the self-instructional module was effective in increasing knowledge regarding prevention of cervical cancer among women's. There was no significant association between post test knowledge score and demographic variables like age, education, occupation, age at marriage, number of children, per capita monthly income, family history of cancer, diet and use of oral contraceptive pills. However, significant association was found between post test knowledge score and demographic variable like age at menarche. Paired "t" test between the pre test and post test mean score level of knowledge shows that the significant positive relationship $t = 8.53$ $p \leq 0.0001$ found between the pre test and post test level of knowledge mean score of women's. **Conclusion-** The result of the study will enable the health professionals to utilize the self-Instructional module on prevention of cervical cancer in the hospital setting. Hence researcher concluded that the self-instructional module was an effective teaching strategy where by the women could be helped to enhance the knowledge regarding prevention of cervical cancer.

Index Terms- Evaluate, Effectiveness, Self- Instructional Module, Knowledge, Prevention, Cervical Cancer, Women, Hospital

I. INTRODUCTION

“Early DETECTION for your PROTECTION”

Cancer is a disease in which some of the body's cells grow uncontrollably and spread to other parts of the body. Cancer can start almost anywhere within the physical structure, which is created of trillion of cells. As cancerous cells grow and multiply, they continuously invade nearby tissues. It migrates to distant parts of the body and promotes the growth of new blood vessels from which the cells derive nutrients. Cancerous (malignant) cells can develop from any tissue within the body.¹

Cancer is that the second leading reason behind death and is chargeable for an estimated 9.6 million deaths. Globally, about 1 in 6 death is because of cancer. Approximately 70% of deaths from cancer occur in low- and middle-income countries. In 2018, there have been an estimated 18 million cancer cases round the world, of these 9.5 million cases were in men and 8.5 million in women.² In 2020, an estimated 604,237 women were diagnosed with cervical cancer globally, representing 6.5% of all female cancers. Cervical cancer is the most common cancer among women in 36 low-and-middle-income countries, mainly in sub-Saharan Africa. A women diagnosed with cervical cancer is almost twice as likely to die than a woman diagnosed with breast cancer.³

About 96,922 new cervical cancer cases are diagnosed annually in India estimates for 2018. Cervical cancer ranks as the second leading cause of female cancer in India. Annually about 60,078 cervical cancer death occurs. If detected at an early stage, cervical cancer is often curable.⁴

According to study, cervical cancer is the second leading cause of cancer death for women in the state of Maharashtra, approximately 10 deaths happen due to cervical cancer per 100000. In 2019 about 5,700 deaths were reported due to cervical cancer. The burden is growing in Maharashtra; thus, the programme is aimed in providing knowledge and awareness

regarding prevention of cervical cancer among the women is most important.⁵

Tata Memorial Hospital (TMH), Mumbai, India, premier cancer institute is a tertiary cancer centre in India. Annually, out of 45,000 new cancers cases, approximately 800-1000 new cervical cancer cases are diagnosed, among them 75% undergo complete treatment at TMH.⁶

A study to assess the level of knowledge regarding cervical cancer among women (n=50), estimated that the women had 35 (70%) inadequate knowledge and 15 (30%) had moderate knowledge regarding cervical cancer. Some of the demographic variables like educational status, religion and source of information are significantly associated at (p<0.05) with knowledge score of women. The knowledge level and understanding of cancer as well as its preventable nature should be improved consisting nurse education may strengthen cervical cancer screening programme. Health care professional has to create awareness of disease can educate masses and increase health seeking behaviour women.⁷

A study to assess effect of planned teaching programme on knowledge regarding cervical cancer among women (n=100), showed that, there was significant difference between pre-test and post-test knowledge score, women with poor knowledge about cervical cancer had got increased awareness regarding the topic after planned teaching programme.⁸

A study on effectiveness of self-instructional Module (SIM) on knowledge regarding cancer of cervix and its prevention among married women, study revealed that sample size was 60 married women and purposive sampling technique was used. Self-instructional module was accustomed evaluate its effectiveness by using pre-experimental one group pre test and post test design, knowledge level of married women was less before administration of self-instructional module and increased after the programme.⁹ A study to assess the effectiveness of Self-Instructional Module on knowledge regarding prevention of cervical cancer among women at selected village, revealed that the paired pre-test value was 27.3 which was highly significant and it indicated that the SIM improved the level of knowledge regarding cervical cancer among the women.¹⁰

A study on effectiveness of Self-Instructional Module (SIM) on cervical cancer on learning outcomes among married women study (n=50), estimated that, after implementation of SIM the post-test knowledge score was high than the pre-test and significant association between the knowledge and age of married women was also high. Hence it revealed that the SIM was an effective method for improving learning outcomes.¹¹

A study to assess the knowledge of staff nurses regarding cervical cancer and its prevention in view of information booklet at primary care hospital (n=30), revealed that the 27% nurses had moderate knowledge, 73% nurses had adequate knowledge. Socio-demographic variables were found to be non-significant with the knowledge of staff nurses at $p > 0.05$.¹²

II. MATERIAL AND METHOD:-

The Pre experimental research design, one group pre test post test research design with A Quantitative evaluative research approach was conducted among 60 women's visiting in BKL Walawalkar hospital & Diagnostic center, Dervan, Sawarde.

Before commencement of the study, ethical approval was obtained from the Institutional Ethical Committee, and official permission was received from the authority. The women's who were Visiting the OPD in the selected hospital, Age group above 35 years, Willing to participate in the study, Able to read, write and understand Marathi, Hindi, English, Available during data collection period were included in the study by using the non – probability; purposive sampling method. The Women's who are, Unable to read, write and understand English, Hindi or Marathi. and Participated in same or similar cancer awareness programme were excluded from the study. The purpose of study was explained to women's with self-introduction and consent was obtained to participate in the study. The data was collected from 01.12.2021 to 31.12.2021. During the period, the investigator collected data from women visiting in selected hospital. Women's were made to feel comfortable. An instruction related to tool was given to facilitate co-operation and participation. Printed 30 structured questionnaire was issued to the women visited in selected hospital. Before giving Self - Instructional Module pre test on knowledge regarding prevention of cervical cancer was taken. The Self – Instructional Module was given to the women's who fulfill the inclusion criteria and present during the data collection period. Post test data was collected after 7 days.

Tab No. 1
Scoring procedure of the tool for assessment of level of knowledge adapted by awareness on cervical cancer

Area	Area of Score	Percentage	Level of Knowledge
Effectiveness of SIM on awareness regarding cervical cancer	1-10	1-33%	Inadequate knowledge
	11-20	34-67%	Moderately Adequate knowledge
	21-30	68-100%	Adequate knowledge
Total	30	100%	

The collected data was tabulated and analyzed using appropriate statistical methods like descriptive statistics (mean, SD and mean percentage) and inferential statistics (chi – square test) and Paired ‘t’ test.

Results:

Findings related to demographic variables of women visiting in selected hospital:- Majority (33.34%) were seen in age group 46-50 years, Highest percentage (63.34%) of women had primary education., Majority (46.66%) of women were home maker, Nearly half (53.33%) women's were in the age of menarche 13-15 years, Highest percentage (63.33%) of women's were married in the age group of 19-21 yrs, Majority percentage (40%) of women's had 1 child, Majority percentage (45%) of women's had Rs.3,793-Rs.5,693 per capita monthly income,

Majority (100%) women's had no family history of cancer, Majority (83.34%) were had mixed type of diet, Majority 60 (100%) of women were not using oral contraceptive pills.

Table No.2
Demographic Variable frequency and Percentage

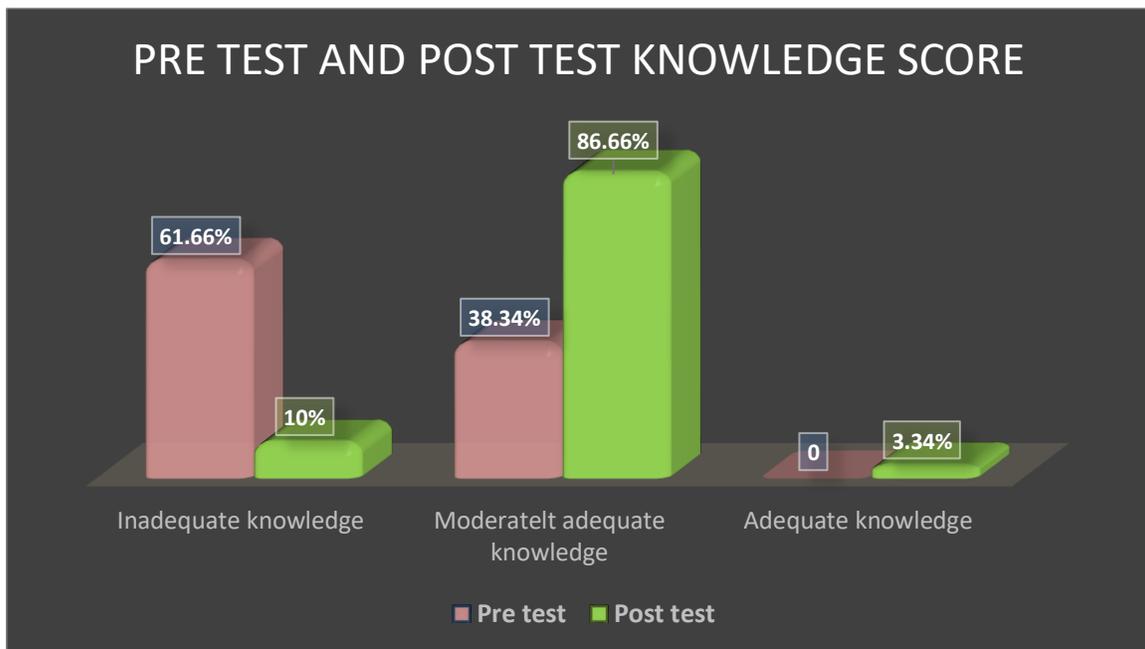
SN	Variables	Items	Frequency	Percentage
1	Age in Year	35 – 40	12	20%
		41 – 45	13	21.66%
		46 – 50	20	33.34%
		51 – 55	5	8.34%
		56 and above	10	16.66%
		Total	60	100%
2	Education qualification	Primary education	38	63.34%
		Secondary education	21	35%
		Higher education	1	1.66%
		Graduate and above	0	0%
		Total	60	100%
3	Occupation	Home maker	28	46.66%
		Daily wages	4	6.67%
		Private Employee	0	0%
		Govt. Employee	0	0%
		Business	6	10%
		Agriculturist	22	36.67%
		Total	60	100%
4	age at menarche	10yrs-12yrs	26	43.34%
		13yrs-15yrs	32	53.33%
		Above 15yrs	2	3.33%
		Total	60	100%
5	Age at Marriage	13yrs-15yrs	0	0%
		16yrs-18yrs	22	36.67%
		19yrs-21yrs	38	63.33%
		Above 21yrs	0	0%
		Total	60	100%
6	Number of Children	No children	4	6.66%
		1 child	24	40%
		2 children	23	38.34%
		3 children and above	9	15%
		Total	60	100%
7	Per Capita monthly Income	Rs.15197 and above	2	3.34%
		Rs.7,595 - Rs.15196	2	3.33%
		Rs.5,694 – Rs.7,594	15	25%
		Rs.3,793 – Rs.5,693	27	45%
		Rs.2,273 – Rs.3,792	14	23.33%
		Rs.762 – Rs.2,272	0	0%
		Total	60	100%
8	Family History of cancer	No	60	100%
		Yes	0	0%
		Total	60	100%
9	Diet	Vegetarian diet	7	11.66%
		Non vegetarian diet	3	5%
		Mixed diet	50	83.34%
		Total	60	100%
10	Are you using oral contraceptive pills?	No	60	100%
		Yes	0	0%
		Total	60	100%

Findings related to Assessment of pre test and post test level of knowledge.: Percentage wise distribution of level of knowledge score of women’s according to their pre test score shows that highest percentage (61.66%) of women’s had “inadequate knowledge (1-10)” and (38.34%) of women’s had “moderately adequate knowledge (11-20)”. It depicts that in pre test level of knowledge score shows majority of women’s had ‘inadequate knowledge’ regarding prevention of cervical cancer. Percentage wise distribution of level of knowledge score of women’s according to their post test score shows that the majority

(86.66%) of women had “moderately adequate knowledge (11-20)”, (10%) of women’s had “inadequate knowledge (1-10)” whereas the lowest percentage (3.34%) of women’s had “adequate knowledge (21-30)”. It depicts that in post test level of knowledge score shows majority of women’s had ‘moderately adequate knowledge’ regarding prevention of cervical cancer. Hence it interprets that the self-instructional module was effective in increasing the level of knowledge regarding prevention of cervical cancer among women.

Table No. 3
Assessment of pre test and posttest level of knowledge regarding prevention of cervical cancer among women

Level of knowledge	Pre test		Post test	
	Frequency	%	Frequency	%
Inadequate knowledge (1-10)	37	61.66%	6	10%
Moderately adequate knowledge (11-20)	23	38.34%	52	86.66%
Adequate knowledge (21-30)	0	0%	2	3.34%



Graph No. 01

Bar diagram showing percentage distribution of women’s according to their pre test and post test level of knowledge

Findings related to Effectiveness of self-instructional module on knowledge regarding prevention of cervical cancer

among women. The percentage wise distribution of mean, mean percentage and SD of pre test and post test level of knowledge

score of women’s shows that the highest score (15.55 ± 3.416) which is 51.83% of total score was obtained during post test which indicates women’s had “Moderately adequate knowledge”. The lowest mean score (10.36 ± 3.700) which is 34.53% of the total score was obtained during pre test which indicates women’s had “Inadequate knowledge”.

However, the overall post test mean score was (15.55 ± 3.416) which is 51.83% of total score. It interprets that the self-instructional module was effective in increasing knowledge regarding prevention of cervical cancer among women’s.

Table No.4
Comparison of pre test and post test knowledge score based on mean, mean percentage and standard deviation

Standard measures	Pre test Level of knowledge score	Post test level of knowledge score
Mean	10.36	15.55
Mean %	34.53%	51.83%
Standard deviation	3.700	3.416

Finding related to effectiveness of Self - Instructional Module on knowledge regarding prevention of cervical cancer among women based on paired “t” test:- Paired “t” test between the pre test and post test mean score level of knowledge shows that the significant positive relationship $t = 8.53$ $p \leq 0.0001$ found between the pre test and post test level of knowledge mean score

of women’s. it indicates that the obtained ‘p’ value is less than 0.005, the self-instructional module was effective in improving the knowledge regarding prevention of cervical cancer among women. Hence, null hypothesis H_0 is rejected and research hypothesis H_1 is accepted.

Table No. 5
Effectiveness of Self - Instructional Module on knowledge regarding prevention of cervical cancer among women based on paired “t” test

Outcomes	Level of knowledge score			Paired “t” Test
	Mean	SD	Mean %	
Pre test	10.36	3.700	34.53%	t = 8.53 p ≤ 0.0001 Significant
Post test	15.55	3.416	51.83%	

Findings related to Association between the post test level of knowledge regarding prevention of cervical cancer among women with their selected demographic variables. Chi square values were calculated to find out association between post test knowledge score with their selected demographic data. Findings reveled that there was no significant association between post test knowledge score and demographic variables like age, education, occupation, age at marriage, number of children, per capita monthly income, family history of cancer and diet. However, significant association was found between post test knowledge score and demographic variable like age at menarche. Hence, the stated null hypothesis (H_0) was rejected as there was significant association was found between the level of knowledge and their demographic variables.

III. DISCUSSION:

Description to assess pre test and post test level of knowledge regarding prevention of cervical cancer among women. In the present study, percentage wise distribution of level of knowledge score of women’s according to their pre test score shows that highest percentage (61.66%) of women’s had “inadequate knowledge (1-10)” and (38.34%) of women’s had “moderately adequate knowledge (11-20)”. It depicts that in pre test level of knowledge score shows majority of women’s had ‘inadequate knowledge’ regarding prevention of cervical cancer. Percentage wise distribution of level of knowledge score of women’s according to their post test score shows that the majority

(86.66%) of women had “moderately adequate knowledge (11-20)”, (10%) of women’s had “inadequate knowledge (1-10)” whereas the lowest percentage (3.34%) of women’s had “adequate knowledge (21-30)”. It depicts that in post test level of knowledge score shows majority of women’s had ‘moderately adequate knowledge’ regarding prevention of cervical cancer. Hence it interprets that the self-instructional module was effective in improving the level of knowledge regarding prevention of cervical cancer among women. A similar study supported to evaluate effectiveness of self-structured module on knowledge regarding cancer of cervix and its prevention among married women (n=60), revealed that the pre-test and post-test mean score was 8.37 and 24.85; standard deviation 3.08 and 2.27 respectively. The paired t-test value was 39.419. Significant difference was seen in pre-test and post-test knowledge level of married women. All women should be aware about cancer of cervix and its prevention and encourage them for screening for prevention.¹³

Description to evaluate the effectiveness of self-instructional module on knowledge regarding prevention of cervical cancer among women by comparing the mean pre test and post test level of knowledge scores. In the present study, mean, mean percentage and SD of pre test and post test level of knowledge score of women’s shows that the highest score (15.55 ± 3.416) which is 51.83% of total score was obtained during posttest which indicates women’s had “Moderately adequate knowledge”. The lowest mean score (10.36 ± 3.700) which is 34.53% of the total score was obtained during pre test which indicates women’s had “Inadequate knowledge”. However, the overall post test mean score was (15.55 ± 3.416) which is 51.83% of total score. It interprets that the self-instructional module was effective in increasing knowledge regarding prevention of cervical cancer among women’s. The similar study was conducted to assess the effectiveness of self-instructional module on knowledge regarding prevention of cervical cancer among women at selected village, Tamil Nadu (n=50) samples were selected by using non probability convenient sampling technique. A study revealed that in pre test 35(70%) had Inadequate level of knowledge, 15(30%) had Moderate level of knowledge and 0 (0%) had Adequate level of knowledge. In post test 0(0%) had Inadequate level of knowledge, 19(38%) had Moderate level of knowledge and 31(62%) had Adequate level of knowledge.¹⁴

Description to find out the association between post test level of knowledge score regarding prevention of cervical cancer among women with their selected demographic variables.

In the present study, association between post test knowledge score with their selected demographic data. Findings revealed that there was no significant association between post test knowledge score and demographic variables like age, education, occupation, age at marriage, number of children, per capita monthly income, family history of cancer, diet and are you using of oral contraceptive pills? However, significant association was found between post test knowledge score and demographic variable like age at menarche. A similar study revealed to assess the effectiveness of self-instructional module on knowledge and attitude regarding prevention of cervical cancer among middle aged women between (30-55yrs) in selected areas at Namakkal. (n=60), revealed that, in the pre test the mean score of knowledge was 10.116 with SD 4.47 whereas in the post test the mean score

of knowledge was 30.70 with SD 4.52. The calculated paired ‘t’ value of $t = 20.671$ was found to statistically significant at $p < 0.001$ level. None of the demographic variable other than the residential area had shown statistically significant association with post test level of knowledge regarding prevention of cervical cancer among middle aged women between (30-55yrs) at $p < 0.05$ level. The association between post test level of attitude showed that demographic variables had shown statistically not significant association with post test level of attitude regarding prevention of cervical cancer among middle aged women between (30-55yrs) at $p < 0.01$ level.¹⁵

IV. CONCLUSION

The study finding shows that the overall mean score of post test level of knowledge was (15.55±3.416) which is 51.83% of total score. It interprets that the self-instructional module was effective in improving the knowledge regarding prevention of cervical cancer among women’s mean score of post test level of knowledge indicates “Moderately adequate knowledge (11-20)”. Significant association was found between post test knowledge score and demographic variable like age at menarche. Hence researcher concluded that the self-instructional module was an effective teaching strategy where by the women could be helped to enhance the knowledge regarding prevention of cervical cancer.

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Conflict of Interest

None to declare.

Informed Consent

The informed consents have been obtained from the parents.

Author Contributions

DG: Literature exploration, research data collection, statistical analysis and first draft. LVR: Guide, concept, research design, literature exploration and final draft. VB: Research guidance, clinical support, co-ordination.

Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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Philosophy Of Fair Regional Regulations In The Implementation Of Special Autonomic Orders In The Regions

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Abstract : This research is supposed to 1) To find out and find and analyze Fair Regional Regulations in the Implementation of Special Autonomy Orders in the Regions. This research used a normative legal research method. This research was conducted by examining the existing concepts, doctrines, theories and statutory provisions using the Philosophy Approach, the Statute Approach and the Conceptual Approach. The results of the study show that the fundamental basis of just regional regulations in the administration of special autonomy government in the regions includes three basics or foundations, namely the philosophical basis, namely the legislation is produced, has a philosophical basis and if the formulation or norms get justification and are studied philosophically then the law has justifiable reasons, Sociological Foundation; a law is said to have a sociological basis if its provisions are in accordance with the general belief or legal awareness of the community, and the juridical basis; or also called the legal basis is the basis contained in the legal provisions of a higher degree. Legal regulation in the framework of establishing good and fair regional regulations in special autonomous regions is a necessity in the era of regional autonomy based on broad, real, and responsible decentralization in the context of realizing the objectives of special autonomy. The establishment of responsive and participatory regional regulations can have a fair value in the implementation of special autonomy orders in the regions, so special institutions in the regions are needed.

Keywords: regional, regulations, philosophical, sociological, juridical

1. INTRODUCTION

Since the collapse of the New Order, a wave of reforms has changed the format of politics and the system of government in the country. The government's authority which was previously very centralized is now increasingly distributed to regional governments based on the principle of decentralization. According to Hari Sabarno (Sabarno, 2007) the implementation of decentralization that results in autonomy is carried out and developed in 2 (two) basic values, namely: unitary values and territorial decentralization values. The basic unitary value is realized in the view that the Unitary State of the Republic of Indonesia will not have other government units in it that are state in nature, meaning that the sovereignty inherent in the people, nation and state will not be divided between government units. Meanwhile, the basic value of territorial decentralization is manifested in the administration of local government in the form of autonomy. Article 1 paragraph (3) of the 1945 Constitution of the Republic of Indonesia (UUD 1945) affirms that the State of Indonesia is a state of law. As a state of law, all aspects of life in the fields of society, nationality, and the state, including government, must be based on laws that are in accordance with the national legal system.

The national legal system is the law that applies in Indonesia with all its elements that support each other in order to anticipate and overcome problems that arise in the life of society, nation and state. As a state of law, Indonesia embodies the applicable law through written law, namely statutory regulations. The normative juridical study in the process of forming legislation is a procedural concept (included in the normative aspect of democracy) and has not been *hermeneutic* in carefully examining the context and text of the Articles in the Legislation which is the substance of the content. The provisions governing the formation of laws and regulations are the implementation of the mandate of Article 22A of the 1945 Constitution of the Republic of Indonesia which states that "Further provisions regarding the procedure for establishing laws are further regulated by law. However, the scope of the material content of this law is expanded not only by law but also to other laws and regulations, in addition to the 1945 Constitution of the Republic of Indonesia and the Decree of the People's Consultative Assembly. Article 18 paragraph (6) of the 1945 Constitution of the Republic of Indonesia affirms "Local governments have the right to stipulate regional regulations ("Perda") and other regulations to carry out autonomy and assistance tasks". From this provision, every local government, whether at the provincial, district/city levels, in carrying out their duties, is given the freedom to form local

regulations. Basically, local regulations are local government legal instruments in implementing central government policies and local government policies themselves. Perda functions to carry out regional autonomy, assistance tasks, accommodate special conditions of the region and further elaboration of the laws and regulations on it. (I Gde Pantja Astawa and Suprin Na'a, 2008)

Regional regulations are one of the instruments in carrying out social and democratic transformation. In addition, local regulations are expected to be the main driver for the fundamental changes needed by the regions. Judging from its function, local regulations have an important function to realize prosperity in the region. If all regions prosper, it is certain that the ideals and goals of the Indonesian state as a whole will be achieved automatically as well. The stages of the formation of laws and regulations as regulated in Article 1 number 1 of Law Number 12 of 2011 concerning the Formation of Legislations are through the stages of planning, drafting, discussing, ratifying and determining, as well as enacting the steps through the study of academic texts which basically must be taken in the formation of laws and regulations, including the formation of regional regulations. In the formation of laws and regulations, including regional regulations, it begins with planning, in this case it begins with the preparation of academic texts. Before compiling an academic text of a Regional Regulation, it is very necessary to conduct a legal study or research in order to obtain comprehensive and relevant data and information with the material to be regulated. This is also confirmed in Law Number .12 of 2011 concerning the Establishment of Legislation, related to solutions to problems and community needs, scientifically setting problems in a draft law, draft Provincial regulation or draft Regency/Regency regional regulation. The city is very important so that the problems and legal needs of the community can be resolved. Furthermore, Law Number 12 of 2011 concerning the Establishment of Legislations, followed up with Regulation of the Minister of Home Affairs of the Republic of Indonesia Number 80 of 2015 concerning the Establishment of Regional Legal Products and related to regional legal products in this case Perda, Article 33 of Law No. 12 of 2011 concerning the Establishment of Legislations confirms the following:

- (1) The Prolegda as referred to in Article 32 contains a program for the formation of Provincial Regulations with the title Draft Provincial Regulations, the materials to be regulated, and their relation to other Legislations.
- (2) The regulated material and its relation to other Legislative Regulations as referred to in paragraph (1) is a description of the conception of the Draft Provincial Regulation which includes:
 - a. Background and purpose of preparation;
 - b. Goals to be realized;
 - c. The main idea, scope, or object to be managed; and
 - d. Setting range and direction.
- (3) The regulated material as referred to in paragraph (2) which has gone through the assessment and alignment is set forth in the Academic Manuscript.

The complexity of legislation is shown that even though there are legal rules as guidelines for carrying out legislation, especially with the enactment of Law Number 12 of 2011 concerning the Establishment of Legislations, it cannot be avoided that the process is full of interests and political interactions in it. Law No. 12 of 2011 concerning the Establishment of Legislation and Law no. 23 of 2014 concerning Regional Government has paved the way for democratic political interaction in the legislation of Regional Regulations. The formulation of the Elucidation of Law Number 23 of 2014 concerning Regional Government essentially states that the legislation of regional regulations is in the context of improving people's welfare by always paying attention to the interests and aspirations that grow in the community. The two laws have also determined the principle of openness, the right of the community to participate in the formation of regional regulations, and the existence of orders for organs authorized to form regional regulations and publish draft regional regulations. Democratic political interaction in the legislation of regional regulations is intended to build *good governance*, which demands a democratic climate with governance management based on the principles of participation, accountability and transparency to produce responsive regional regulations. In other words *Good Governance* is very dependent on the participation of the wider community. This is commensurate with what A. Pangerang Moenta stated that:

“Laws or laws (including regional regulations) that are effective are those that actually embody the behavior desired by the law itself. And good laws (including local regulations) are really effective in making government decisions that are not arbitrary. In other words, a good law is a law that is made by involving as much community participation as possible. In this way, a *sense of belonging* and a *sense of responsibility* will emerge among the people who are involved in the formation of the regional regulations”. (A. Prince Moenta. 2003.)

In this regard, Jimly As-shiddiqie also stated that the legal norms to be included in the draft laws and regulations had actually been prepared based on careful thought and deep reflection, solely for the *public interest* .), not personal or group interests. (Jimly As-shiddiqie, 2006) By referring to the principles of the formation of legislation including the formation of Regional Regulations as stated above, a good Regional Regulation of course must also follow the principles of good legislation, so that the formed Regional Regulation is useful in the long term and lasts in accordance with the conditions of community development and is sustainable. As for the steps that can be taken to obtain good and fair laws and regulations, including Regional Regulations in this case there are several steps as follows: “First, the need for planning the formation of laws through the preparation of academic texts; Second, there is public participation in the formation of laws; Third, there is a need for conformity between the content material and the requirements for the formation of the law”. (Yuliandri, 2009)

In addition, with research and assessment prior to the formation of Regional Regulations, it can also avoid overlapping with other Regional Regulations (*Existing Local Law*). The formation of Regional Regulations is still felt to be lacking or has not gone through good planning for the formation of legislation. It is marked by:

- a. There are still many problematic local regulations because their substance is still considered controversial, ambiguous, overlapping and inconsistent both vertically and horizontally;

- b. Has not shown commitment and responsive character to the development of human rights, weak and marginalized communities, the value of gender justice; and
- c. The formation process is less aspirational and participatory. (Wicipto Setiadi, 2011)

With regard to the number of problematic Regional Regulations found because their substance is still considered controversial, ambiguous and overlapping and inconsistent vertically and horizontally, it is generally triggered by the high spirit of regional autonomy, resulting in an increase in the formation of Provincial and Regency/City Regional Regulations. However, the Regional Regulation that was formed still caused many problems, so it was canceled. The results of the research by the Monitoring Committee for the Implementation of Regional Autonomy (KPPOD) showed that of the 709 regional regulations studied, 85.2% were problematic regional regulations and only 14.8% were not problematic. In addition, from the results of the 2015-2019 Ministry of Home Affairs (Kemendagri) study, it was found that 369 problematic Tax and Retribution regional regulations had to be suspended, revised, or revoked. (Ministry of Home Affairs, 2019) Many regional regulations are problematic or canceled because in the process of forming regional regulations they did not go through a good study of academic texts or it is suspected that the study of academic texts was inadequate, so that the substance of regional regulations was unable to solve the problems and needs of the community. In addition, the cancellation of regional regulations occurs because they are contrary to higher laws and regulations and are contrary to the public interest. Starting from these problems, it will greatly affect the attitude of people's non-compliance with regional regulations. As a form of community disobedience, there is a rejection of a draft regional regulation as well as the attitude of the community not to comply with regional regulations in their implementation. This has an impact on the number of regional regulations that have been set by the DPRD together with the Regional Head, but in its implementation it does not go well.

These problems are overcome by conducting scientific studies and research, so that the results of the study show whether the formation of regional regulations is needed and how ideally it is regulated in the regional regulations themselves. through the Regional Regulation Formation Program ("*Propemperda*"). Based on Article 16, Article 32 and Article 39 of Law Number 12 of 2011 concerning the Establishment of Legislation, the legislation program consists of the National Legislation Program ("*Prolegnas*") and the Provincial Legislation Program ("*Prolegda*") as well as the Regency/City Regional Legislation Program (Prolegda). In Article 1 points 9 and 10 of Law Number 12 of 2011 it is stated that the National Legislation Program, hereinafter referred to as "*Prolegnas*", is an instrument for planning programs for the formation of laws that are prepared in a planned, integrated and systematic manner. While the Regional Legislation Program is the Regional Legislation Program, hereinafter referred to as "*Prolegda*", is a planning instrument for the formation of Provincial Regulations or Regency/City Regional Regulations which are prepared in a planned, integrated, and systematic manner.

Based on this explanation, there are at least four reasons why the formation of laws and regulations needs to be based on the Regional Regulation Formation Program ("*Propemperda*"), namely:

- a. So that the formation of regional regulations is based on a priority scale in accordance with the development of the legal needs of the community;
- b. So that regional regulations are vertically and horizontally synchronized with other laws and regulations;
- c. For the formation of coordinated, directed, and integrated regional regulations that are jointly prepared by the DPRD and the Regional Government.
- d. So that the products of regional laws and regulations remain in the unity of the national legal system.

In addition, according to Mahendra (Mahendra, AA. Oka, 2006), there are several reasons why "*Prolegda*" is needed in planning the formation of laws and regulations including regional regulations, namely:

- a. To provide an objective picture of the general conditions regarding the issue of the formation of regional regulations;
- b. To determine the priority scale for the preparation of draft regional regulations for the long, medium or short term as a joint guideline for the DPRD and the Regional Government in the formation of regional regulations;
- c. To carry out synergies between institutions authorized to form regional regulations;
- d. To speed up the process of forming regional regulations by focusing on activities to formulate regional regulations according to a set priority scale;
- e. Become a means of controlling activities for the formation of regional regulations.

The preparation of regional regulations also needs to pay attention to conformity with regional development planning. These adjustments need to be made to ensure that the regional regulations that are drawn up are able to support regional development and do not otherwise hinder development. For example, the provisions of regional regulations that impose a burden on regional or community finances on a large scale and are not in accordance with development planning can become obstacles that hinder development. Article 18B of the 1945 Constitution of the Republic of Indonesia states that "The state recognizes and respects special or special regional government units that are regulated by law." The provisions of Article 18B of the 1945 Constitution indicate that the Republic of Indonesia provides opportunities for regions to carry out special autonomy, special regions and special regions such as Papua, Nanggroe Aceh Darussalam (NAD), DKI Jakarta and DI Yogyakarta. Regions in Indonesia that get special treatment in autonomy, both special autonomy, special capital areas and special regions include : (duniapolitikmu ,2008)

1. Province of Irian Jaya which was granted Special Autonomy within the framework of the Unitary State of the Republic of Indonesia. This autonomy was granted by the Republic of Indonesia through Law Number 21 of 2001 concerning Special Autonomy for the Province of Papua (LN 2001 No. 135 TLN No 4151);
2. State Recognition of the Privileges and Specialties of the Aceh Region given through Law Number 11 of 2006 concerning the Government of Aceh (LN 2006 No 62, TLN 4633) and Law Number 18 of 2001 concerning Special Autonomy for the Special Region of Aceh as the Province of Nanggroe Aceh Darussalam .

3. The specificity of DKI Jakarta Province as the State Capital is given through Law Number 29 of 2007 concerning Provincial Government of the Special Capital City Region of Jakarta as the Capital of the Unitary State of the Republic of Indonesia (LN 2007 No. 93; TLN 4744).
4. The Special Region of Yogyakarta within the Unitary State of the Republic of Indonesia is given special privileges. This is regulated in the Law of the Republic of Indonesia Number 13 of 2012 concerning the Privileges of the Special Region of Yogyakarta. (LN 2013 TLN No. 5339).

During the reign of the New Order through Law Number 5 of 1974 concerning the Implementation of Regional Government, it was clearly seen that the government was carried out based on the principle of centralization. The government at this time thought that if the regions were given the freedom to organize their own government, there would be a potential loss of a sense of nationalism and the potential for national disintegration. In practice, the government enforces diversity in the implementation of local government in Indonesia. This is proven by neglecting and not acknowledging local institutions in Indonesia that have long lived and developed and are respected and obeyed by the local community. Another form of centralization that we can see in the implementation of government during the New Order era is the existence of very tight supervision and domination by the central government over the regions.

Papua and West Papua are provinces that have received awards from the Central Government in the form of the passage of Law Number 21 of 2001 concerning Special Autonomy for the Provinces of Papua and West Papua. These two provinces are known regionally as Indonesian Papua apart from Papua New Guinea (PNG). Philosophically, in recognition of the local communities, these two provinces are collectively referred to as Tanah Papua through pledges and commitments such as; "two for one and one for two". Two for one - one for two, meaning one Papuan Special Autonomy Law for two provinces, namely Papua and West Papua, two provinces for one development, namely Tanah Papua. The similarity of past experiences is why the implementation of Special Autonomy (*OTSUS*) is given by the central government and applies absolutely to the two provinces, both Papua and West Papua. the issuance of Law Number 21 of 2001 which has been replaced by Law Number 35 of 2008 concerning Special Autonomy for the Province of Papua, which in one of its articles also stipulates the ulayat rights, namely Article 43 which affirms that the Government of the Province of Papua is obliged to recognize respect, protect, empower and develop the rights of indigenous peoples by referring to the provisions of the applicable legal regulations. The rights of the customary law community include the customary rights and individual rights of the indigenous peoples concerned.

Perdatus No. 23 of 2008 concerning ulayat rights (customary rights of indigenous Papuans to land) clearly places the position of indigenous peoples in maintaining the existence of indigenous peoples in Papua. "*Perdatus*" No. 23 of 2008 appears as if the identity of the community and its customary rights to land can only be recognized if there is an acknowledgment from the Governor (regional head/government) of the Papua Region. Legislators actually place local governments as if they were the real owners of the Land of Papua, so that the local indigenous community (indigenous Papuans) that existed long before the birth of the 1945 Constitution, 1960 Agrarian Law and 2008 Special Autonomy Law were as if they were newcomers. requiring recognition and placement in a region. This Regional Regulation is a product of regional law that does not have the value of justice in protecting the rights and existence of the Customary Law community in Papua and cannot be implemented properly in communities in special autonomous regions such as Papua and West Papua.

Research purposes

1. To find out and find and analyze Fair Regional Regulations in the Implementation of Special Autonomy Orders in the Regions?

Benefits of research

The results of this study are expected to provide the following benefits:

1. Theoretically for the development of science, it is hoped that it can describe the extent to which the making and implementation of just regional regulations in the administration of special autonomous regions is expected.
2. Practically, it is a contribution of thought for the Indonesian government and regional governments, especially the special autonomy system in Indonesia.

2. RESEARCH METHODS

Types of research

This study uses a normative legal research method, which is a research that mainly examines positive legal provisions, legal principles, legal principles and legal doctrines in order to answer the legal issues faced. (Peter Mahmud Marzuki, 2005). This research is related to just regional regulations in the administration of special autonomy government so that philosophical problems and the preparation of responsive and participatory local regulations must receive full attention in achieving values and a sense of justice in the community in special autonomous regions. The main approach in this research is the statutory *approach* and the *conceptual approach*, this is considering the statutory *approach* as the legal basis for analyzing the problems in this research which is strengthened by the conceptual approach. (*conceptual approach*) to obtain legal arguments in answering the problem.

Types and Sources of Legal Materials

Secondary legal materials include materials that support primary legal materials such as text books, articles in various scientific magazines or research journals in the field of law, papers submitted in various forms of meetings such as discussions,

seminars, workshops, and others. other. Primary legal materials in the form of statutory regulations are collected by conducting inventory and categorization codes. Secondary legal materials are collected using a *card system*, either with an overview card (containing a summary of the writing according to the original, in outline and the main essay containing the author's original opinion); citation cards are used to contain notes on the subject matter, as well as review cards (contains analysis and special author notes).

Legal Material Analysis Techniques

Primary legal materials and secondary legal materials that have been collected (inventory), are then grouped. This is then studied with a statutory approach to obtain an overview of the level of synchronization of all legal materials. The legal materials that have been classified and systematized are studied, studied and compared with legal theories and principles put forward by experts, to be analyzed normatively. In the processing and analysis of legal materials, the use of normative legal research types is used to try to answer the problems of Philosophy, Analysis of legal materials using normative legal research types is intended to obtain a more optimal picture related to equitable regional regulations in the administration of special autonomy government.

3. RESULTS AND DISCUSSION

1. National Regulation Perspective;

National regulations which are part of the national legal political agenda, in order to carry out the national legal political agenda related to the formation of national legal regulations (legislation process), there are three important things that must be considered as guidelines, namely **the philosophical basis, the sociological basis and the juridical basis**. **The philosophical basis** is a consideration or reason that illustrates that the regulations formed take into account the views of life, awareness, and legal ideals which include the spiritual atmosphere and the philosophy of the Indonesian nation which originates from Pancasila and the Preamble to the 1945 Constitution of the Republic of Indonesia.

The sociological basis is a consideration or reason that illustrates that regulations are formed to meet the needs of the community in various aspects. The sociological basis actually concerns empirical facts regarding the development of problems and needs of society and the state. While the juridical basis is a consideration or reason that illustrates that regulations are formed to overcome legal problems or fill legal voids by considering existing rules, which will be changed, or which will be revoked in order to ensure legal certainty and a sense of justice for the community. **The juridical basis** concerns legal issues related to the substance or material that is regulated so that it is necessary to form new laws and regulations. Some of these legal issues, among others, are outdated regulations, inharmonious or overlapping regulations, types of regulations that are lower than the law so that their enforcement power is weak, the regulations already exist but are inadequate, or the regulations do not exist at all. According to Kreems, (Kreems in Maria Farida Indrati, 2007) the substance of the science of legislation (*Gesetzgebungslehre*) can be grouped into 3 (three) parts, namely:

- a. Legislative process (*Gesetzgebungs-verfahren*);
- b. (*Gesetzgebungs-method*);
- c. Legislative engineering (*Gesetzgebungs-technik*).

Legislative process (*Gesetzgebungs-verfahren*), namely discussing and analyzing the process or mechanism for making laws and regulations, to monitoring and testing them. The Legislative Method (*Gesetzgebungs-methode*), which discusses and analyzes the substance or content material (het onderwerp) of laws and regulations, including ways to find the content material. Legislation technique (*Gesetzgebungs-technik*), namely discussing and analyzing the external form (*kenvorm*) of statutory regulations. Thus, statutory theory is oriented towards explaining understanding and is cognitive, while statutory science (in a narrow sense) is oriented to carrying out implementing actions and is normative.

In relation to national legal politics, Padmo Wahjono (Padmo Wahjono, in Mahfud MD, 2010) said that legal politics is a basic policy that determines the direction, form, and content of the law to be formed. In another article, Padmo Wahjono clarified this definition by saying that legal politics is the policy of state administrators regarding what criteria are used to punish something which includes the formation, application and enforcement of the law. Padmo Wahjono is of the view that legal politics is a basic policy that determines the direction, form, and content of the law to be formed. In addition, Satjipto Rahardjo (Satjipto Rahardjo in Mahfud 2009) also said that legal politics is an activity of choosing and the method to be used to achieve a social goal with certain laws in society whose scope includes answers to several basic questions, namely; what goals are to be achieved through the existing legal system, what methods and which are considered the best to be used in achieving these goals, when and through how the law needs to be changed, can a standard and established pattern be formulated to help in deciding the process of selecting goals and how to best achieve those goals. According to Satjipto Rahardjo, legal politics is a voting activity and a mechanism used to achieve certain social and legal goals in society.

Same context, Soedarto (Soedarto in Mahfud MD, 2010) also said that legal politics is a state policy through state agencies authorized to establish the desired regulations which are expected to be used to express what is contained in society and to achieve what is aspired to. - aspire. In another article, Soedarto reiterated that legal politics is an effort to realize good regulations according to the circumstances and situations at a time. Soedarto explained that legal politics is a state policy through state agencies that are authorized to establish the desired regulations that are expected and used to express what is contained in society and to achieve the goals that are ideals. at the same time, that legal politics is a legal policy regarding laws that will be enforced or not enforced to achieve the goals of the state. Law as a tool to achieve the goals of the State. Practically legal politics is also a tool

or means and steps that can be used by the government to create a national legal system in order to achieve the ideals of the nation and the goals of the state.

The basis of these various thoughts is born from the fact that our country has goals that must be achieved and efforts to achieve these goals are carried out by using the law as a tool through the enforcement or enforcement of laws in accordance with the stages of development faced by our society and country. Some legal politics are permanent or long term and some are periodic. For example, the permanent implementation of the principle of judicial review, the balance between legal certainty, justice and expediency, the replacement of colonial laws with national laws, the independence of judicial power, it is seen that several principles contained in the Constitution also apply as legal politics. Periodic is legal politics that is made in accordance with the development of the situation faced in a certain period, whether it will be enacted or will be repealed, for example codification and unification in certain legal fields, national legislation programs.

The various thoughts put forward lead to our understanding that the study of legal politics includes *legal policy* as the official policy of the State regarding laws that will be enacted or not enforced and matters related to it. There are differences in the scope of legal politics and the study of legal politics; Legal politics is more formal in terms of official policy, while the study of legal politics covers official policy and other matters related to it. The study of legal politics covers at least three things; First, state policy, the official line of law that will be enforced or not enforced in the context of achieving the goals of the state; Second, the political, economic, social, cultural background for the birth of legal products; Third, law enforcement in the field reality. (Moh Mahfud MD,2009)

The factors that determine legal politics are not only determined by what one aspires to or depends on the will of lawmakers, theorists and legal practitioners, but also depends on the reality and developments of international law. As a legal discipline, legal politics provides an academic basis for the process of forming and finding laws that are more in line with the historical context, situations and conditions, culture , values that develop in society, and by taking into account the community's needs for the law itself. Through a process like this, it is hoped that legal products that will be implemented in the midst of society can be accepted, implemented and obeyed. In the view of Moh. Mahfud, the implementation of legal politics can be in the form of (i) making laws and updating legal materials that are considered foreign or not in accordance with needs by creating the necessary laws; (ii) Implementation of existing legal provisions, including affirmation of institutional functions and training of members of law enforcement. (Moh Mahfud MD,2009)

In relation to Pancasila as the basis of the State, Mahfudz MD (Moh Mahfud MD,2009) introduced four rules to guide the making of legal politics or other state policies so that Pancasila is not just a mere jargon, namely **First** , general policies and legal politics must maintain integration or integrity . nation both ideologically and territorially. Any laws or policies in Indonesia must not threaten our integrity as a nation, both ideologically and in terms of its territory. Political law and public policy must be shared and accepted without being damaged by sectarian values. Every policy or effort that has the potential to tear the integrity of our ideology and territory must be resisted and dealt with firmly. **Second**, public policy and legal politics must be based on efforts to build democracy (people's sovereignty) and nomocracy (state of law) at the same time. Indonesia is a democratic country which means handing over the government and determining the direction of state policies to the people through healthy political contestation, but Indonesia is also a legal state (nomocracy) so that every state policy made on behalf of the people must be in accordance with legal principles and legal philosophy that underlying it. **Third** , public policy and legal politics must be based on efforts to build social justice for all Indonesian people. Indonesia is not a follower of liberalism, but ideologically adheres to the prism of individualism and collectivism with an emphasis on general and social welfare.

The function of regulation or legislation is the first branch of power that reflects the sovereignty of the people. The first activity of the state is to organize common life. Therefore, the authority to stipulate the regulations must first be given to the people's representative institutions or the parliament or the legislature. One that is regulated is an arrangement that can reduce the rights and freedoms of citizens. The first function of the people's representative institution is the function of legislation or regulation. This regulatory function (*regelende functie*) relates to the authority to determine regulations that bind citizens with binding and limiting legal norms. Therefore, this authority can only be exercised as long as the people themselves agree to be bound by such legal norms .

In the legal world, it is known that there are three forms of pouring legal norm decisions, namely (i) regulatory decisions (*regeling*) resulting in regulatory products (*regels*), (ii) decisions that are administratively decisive or stipulating something that results in state administrative decisions (*beschikking*s) and (iii) judgmental decisions as a result of the judicial process (*adjudication*) resulting in a decision (vonnis). Besides that, there are also what are called beleidsregel or policy rules which are often referred to as quasi-regulations, such as implementation instructions, circulars, instructions, and so on which cannot be categorized as regulations, but their contents are regulatory as well. (Jimly Asshiddiqie , 2007). The formation of law in Indonesia has been regulated by type and hierarchy by the Law of the Republic of Indonesia Number 12 of 2011 concerning the Establishment of Legislation.

In the formation of law there are at least three theories, namely: *Materiele theorie* , *Formile theorie* , and *Filosofische theori* . (Muhammad Khambali , 2014) The Materiele theory, put forward by Leopold Pospisil, is in three frameworks of thought, namely: **First**, the law in a country can essentially only be divided into two: (1) *Authoritarian law* , the law that comes from the *author* (ruler), and (2) *Common law*, the law that lives in society. **Second** , in the dimensions of advantages and disadvantages. The advantages of *authoritarian law* are in two respects: (1) high legal certainty, and (2) high coercive power. The weakness of *authoritarian law* is that it is static and the objectivity of justice is difficult to realize because it is made by the author (ruler) not by the people. Meanwhile, the advantages of common law are: (1) it is dynamic, and (2) the objectivity of justice is easy to realize. The weakness of common law is that its legal certainty is low, and its enforcement power is also low. **Third**, good law is law whose material (content) is as much as possible taken from common law but given a place in the form of *authoritarian law* (written law). *Formile theory*, put forward by Rick Dickerson in *Legal Drafting Theory*. A good law must fulfill three conditions:

(1) thoroughly regulate the problem, (2) there are no provisions regarding the delegation of legislation (delegatie van wetgeving), and (3) there should not be any provisions (articles) that are elastic. Philosophische theorie, put forward by Jeremy Bentham in Legal Theory. A good law must meet the following elements : (1) apply philosophically. In the Indonesian context, legal products must apply according to the Pancasila philosophy. That is, if the legal product is filtered with Pancasila, it can pass, (2) applies sociologically. This means that the legal product formed must be in accordance with the legal awareness of the community where the law will be applied. If it is not appropriate, then the legal product formed will be redundant, and (3) juridically applicable. These three applicable properties must be owned by a legal product that is formed.

2. Regional Regulation Perspective

Simultaneously with the enactment of Law Number 32 of 2004, then followed by the issuance of Law Number 33 of 2004 concerning Financial Balance between the Center and the regions or precisely on October 15, 2004, the State Gazette of the Republic of Indonesia of 2004 Number 126 and the Supplement to the State Gazette of the Republic of Indonesia Number 4438.

The background that led to the birth of Law Number 32 of 2004 is as follows: (BN. Marbun,2003)

- a. There is a shift in the atmosphere and a shift in political power in Indonesia which is reflected in the considerations considering Law Number 32 of 2004, namely:
 - 1) Whereas in the context of administering regional government in accordance with the mandate of the 1945 Constitution, regional governments that regulate and manage government affairs themselves according to the principles of autonomy and assistance tasks are directed to accelerate the realization of community welfare through improvement, service, empowerment, and community participation, as well as increasing competitiveness. regions by taking into account the principles of democracy, equity, justice, privileges, and the specificity of a region within the system of the Unitary State of the Republic of Indonesia;
 - 2) That the efficiency and effectiveness of regional government administration needs to be improved by paying more attention to aspects of the relationship between government structures and between regional governments, regional potentials and diversity, opportunities and challenges of global competition by giving the widest possible authority to regions accompanied by the granting of rights and obligations to implement autonomy regions within the unity of the state administration system; and
 - 3) Whereas Law Number 22 of 1999 concerning Regional Government is not in accordance with the development of conditions, state administration, and demands for the implementation of regional autonomy so that it needs to be replaced.
- b. The atmosphere of reform has been misinterpreted;
- c. The issue of special autonomy for Aceh and Papua and the principle of the Unitary State;
- d. DPRD and local government are "drunk" of reforming and making regulations that overlap with other laws and regulations;
- e. The rise of corruption in DPRD throughout Indonesia;
- f. DPRD acts " *overacting* " against the Regional Head, especially regarding the Accountability Report (LPJ) at the end of each year and at the end of the Regional Head's term of office; and
- g. Amendment of the 1945 Constitution by the MPR.

As stated above, that the state as a system, local government is a subsystem in the administration of government at the basic level of the state structure. Regional People's Representative Council (DPRD). Each agency or institution carries out its role in accordance with its position, main tasks, and functions in the Indonesian state government system. The Regional Government and DPRD are an integral unit that provides public services in accordance with the legal provisions mandated by the Constitution. (BN. Marbun,2003)

Meanwhile, the principles used in the administration of regional government as regulated in Law Number 32 of 2004 concerning Regional Government include : (BN. Marbun,2003) (1) The principle of autonomy and assistance tasks; (2) DPRD is an element of regional administration; and (3) Regional Heads and Deputy Regional Heads are elected directly, publicly, freely, confidentially, honestly and fairly by the people in the area concerned. Furthermore, in accordance with the provisions of Law Number 32 of 2004, the relationship between the regional government and the DPRD is a working relationship of equal position and is a partnership. This is reflected in making regional policies in the form of regional regulations. The partnership relationship means that between the local government and the DPRD are both partners in making regional policies to implement regional autonomy in accordance with their respective functions so that between the two institutions build a working relationship that is mutually supportive and not an opponent or competitor to each other in implementing each function.

Taking into account the description above, it can be concluded that: (Hanif Nurcholis, 2007) (1) In Indonesia, a regional government is formed; (2) Regional Government consists of large and small regions; (3) Regional government must be based on democracy, namely the existence of deliberation in the DPRD; and (4) Autonomous regions and indigenous legal community units that have original structures must be considered to become special regional governments after reforms are carried out, namely by adopting a democratic system in their government system. This is the most authentic understanding of Article 18 of the 1945 Constitution.

Thus, it is clear that in accordance with the original meaning, regional government when viewed from its structure consists of large regions and small regions. Meanwhile, if viewed from the form, the regional government is in the form of an autonomous region, not an administrative area. This is very clearly shown by the clause, by looking at and remembering the basis of deliberation in the state government system. The basis for deliberation is a democratic system whose essence is deliberation in the Regional People's Representative Council. Regional government that adheres to a democratic system is an autonomous regional government, not an administrative regional government. (Hanif Nurcholis, 2007) Based on the description above, regional

autonomy is the basis for expanding the implementation of democracy and an instrument for realizing public welfare. Therefore, the basic principle in the implementation of regional autonomy is that the implementation of autonomy is carried out by giving broad, real, and responsible authority.

If viewed from the aspect of constitutional law (HTN), autonomy is related to the basics of the state and the organizational structure of the state which leads to 2 (two) basic directions of state administration in the Indonesian government, namely democracy and state administration based on law. Therefore, the provisions of Article 18 of the 1945 Constitution as a juridical framework for the implementation of regional government in Indonesia must be interpreted as: (1) Regional government is the composition of government within the Unitary State of the Republic of Indonesia; (2) The desired regional government is a government that has the right to regulate and manage its own household (autonomous region); (3) The regional government is composed of a maximum of two levels, and the village is an integral unit in the regional government structure; (4) Regional government is structured by taking into account rights, origins in special regions, and (5) Regional administration is carried out on the basis of the widest possible autonomy.

The consequence of the implementation of regional government based on the widest possible autonomy is that the regions are given the authority to administer and regulate all government affairs outside those that are government affairs regulated by law. In this case, the regions have the authority to make regional policies in order to provide services, increase participation, initiatives, and community empowerment aimed at improving people's welfare. In line with this principle, the principle of real and responsible autonomy is also implemented, which means that the principle of real autonomy is a principle in terms of government affairs that are carried out based on tasks, authorities and obligations that actually already exist and have the potential to grow, live and develop in accordance with with the potential and uniqueness of the region. Through this principle, it can be concluded that the content and type of autonomy for each region is not always the same as for other regions. Meanwhile, responsible autonomy is autonomy which in its implementation must be in line with the aims and purposes of granting autonomy, which in essence is to empower the regions, including improving the welfare of the people, which is the main part of national goals.

In addition, the implementation of regional autonomy must also ensure harmonious relations between regions and other regions. In another sense, regional autonomy must be able to build cooperation between regions to improve mutual welfare and prevent inequality between regions, and must be able to maintain and maintain the territorial integrity of the country for the sake of the establishment of the Unitary State of the Republic of Indonesia. Thus, several things that are considered important in relation to the implementation of regional autonomy in Indonesia are: (1) The distribution of power and authority of government from the Central Government to the regions; (2) democratize, or carry out democratization; (3) Fostering initiative and creativity in the region in developing the local area; (4) Equity and justice in the utilization of regional natural resources; (5) Fishing and providing opportunities for community participation in development; (6) Paying attention to and appreciating regional potential and regional diversity (not necessarily uniform); and (7) Improving public services and welfare.

Some of the things mentioned above are the main essence of the implementation of autonomy which is seen as very urgent in the framework of the life of the nation and state in one unit of the Unitary State of the Republic of Indonesia. Therefore, the existence of regional government is a logical consequence of the existence of a vertical division of power in a country, namely between the central government and regional governments. The vertical division of power with the establishment of local government aims solely at achieving efficient governance, because local governments are considered to be more important in dealing with various matters relating to the problems of the local community which cover all aspects of life and values that live in a full local community. with its diversity.

With a decentralized system that is closely related to empowerment, local governments are given the flexibility and authority to take the initiative and make decisions. In taking the initiative, local governments have broad opportunities to develop creativity, find the best and flexible solutions based on the context of people's lives in solving the problems they face. This means that in acting, local governments do not need to first ask for instructions or wait for instructions from the central government, but are required to be able to respond and serve the various demands of the community. In addition, the urgency of the formation of regional governments is also intended to answer and overcome various issues that are specific and characteristic of localities in accordance with geographical conditions, population conditions, economic activities, cultural characteristics and historical backgrounds. In this case, local governments are seen as more capable of quickly understanding regional specific values or local community sentiments and aspirations, so that on the one hand local communities feel more secure and at peace with local government institutions.

Local government, in fact if viewed from the administrative aspect is part or branch of the government above. The relationship between the regional government and the central government is the relationship between carrying out orders or the relationship between superiors and subordinates, especially for financing the administration of regional government, everything is financed from the finances of the central government and its authorities. However, in an autonomous regional government, the status is not part or a branch of the superior government or the central government. Regional governments that are given the right to manage certain affairs as their own household affairs have their own responsibilities regarding what actions will and must be taken and their implementation in order to bring the maximum benefit for the benefit of their own household. In this case, the relationship between the regional government and the central government or its superior government is a supervisory relationship, not in a superior-subordinate relationship or in carrying out orders.

In other words, the implementation of the authority, duties and responsibilities of the state government is not only carried out by the central government, but besides the central government there are also lower government units that also carry out the authority, duties and responsibilities in order to carry out some of the government affairs that are submitted or assigned to the government. recognized as regional affairs concerned. On this basis, regional autonomy which is applied to regional government through decentralization policies must be understood that regional autonomy is a regional obligation in the context of the success of national development. Therefore, the nature of regional autonomy is more of an obligation than a right, namely the obligation

to participate in launching the course of development as a means to achieve people's welfare which must be accepted and carried out with full responsibility.

4. CONCLUSION

The fundamental basis of just regional regulations in the administration of special autonomy governance in the regions includes three basics or foundations, namely the philosophical basis, namely that legislation is produced, has a philosophical basis (*filisofische grondslag*) and if its formulation or norms are justified (*rechtvaardiging*) and studied philosophically. then the law has a justifiable reason, Sociological Basis; a piece of legislation is said to have a sociological basis (*sociologische grondslag*) if its provisions are in accordance with the general belief or legal awareness of the community, and the juridical basis; (*rechtgrond*) or also called the legal basis is the basis contained in the legal provisions of a higher degree.

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Examining the Nursing Impact of Diabetes Patients' Health Education and the Endocrinology Department's Diabetes Nursing Practice of Maternity and Children Hospital of King Khaled

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Abstract- The purpose of this research was to examine the diabetes education effects and nursing strategies used by the endocrinology department on the outcomes of care provided to patients with diabetes. A total of 90 newly diagnosed diabetes patients hospitalized to our hospital's Endocrinology Department between October 2018 – 2019 were included in the research. All of the patients' medical records were retrospectively reviewed. 45 patients served as the control group and got standard medical care, while the same number of patients were given the experimental diabetic health education care model. Randomly dividing patients into two groups. We monitored routine care patients' blood sugar, meals, and medicines. The experimental group received diabetes education. The nursing influence, blood sugar level, degree of illness awareness, incidence of problems, and compliance were evaluated for the two patient groups. Patients in the experimental group in this research got diabetic health instruction. When comparing the overall data from the two patient groups, there was no statistically significant difference in gender, age, or length of illness ($P > 0.05$). When the nursing effects of the two patient groups were compared, it became clear that the experimental group's nursing effects were higher and that its overall rate of effectiveness was greater. A statistical study showed that the two groups were different ($P 0.05$). In the experimental group, 90.1% of treatment compliance assessments were effective, compared to 75.5% in the control group. Conclusion: Even though these patients were cared for utilizing standard nursing practices, they performed significantly better than the control group. As a result, implementing diabetic health education is extremely beneficial. The remission of the illness has good outcomes.

Index Terms- Diabetes mellitus, Health education, Nursing

I. INTRODUCTION

In the entire clinic, diabetes is a metabolic disease. It is an endocrine system disorder. In addition to doing a lot of damage, it also severely damages the patient's organs and systems, and in some cases, it may even be the cause. Patients' quality of life continuously declines as a direct result of diseases like chloasma of the fundus and peripheral auditory damage, as well as diabetic feet and diabetic kidneys. (Guo, 2015) There is currently no effective treatment for diabetes in clinical medicine; instead, focus is being placed on the patient's comprehensive life intervention, which has been shown to significantly improve prognosis and prevent diabetes complications. Since treating diabetes requires a lengthy process, it is crucial to provide effective health education while undergoing treatment. Diabetes has a very high clinical incidence and is the most prevalent chronic disease. Long-term high blood sugar levels may cause the patient to develop blood vessel and organ disorders, cause a variety of difficulties, and in severe instances, endanger their life. Patients with diabetes must take long-term blood sugar-controlling drugs, but bad feelings will also impact how the condition is treated, which will decrease the patient's adherence to the regimen. Poor disease knowledge will also result in less treatment compliance from the patient. (Weaver, 2018) (Balaji et al., 2019) The purpose of this study was to examine how diabetes education and nursing techniques used on diabetic patients in the endocrinology department of the Maternity and Children Hospital of King Khaled affected the nursing care of those patients.

II. METHODOLOGY

90 diabetic patients were the study participants, and all of the patients' medical records were retrospectively evaluated. These patients were hospitalized at our hospital's Endocrinology department between October 2018 and October 2019. The patients were divided randomly into 2 groups: 45 patients were in the control group, receiving standard treatment, and 45 patients were in the experimental

group, receiving diabetes health education and nursing care. General characteristics between the two groups, such as gender and age, were compared. No statistical difference existed.

Patients in the routine group received routine care, meaning that we monitored their blood sugar levels, nutrition, and medication regimens. Patients in the treatment group were also given health education about diabetes, however the following were the most common approaches used. A team for nursing research and diabetes education is first established. The hospital has a research team focused on diabetes care, which includes the head of the endocrinology department, diabetes specialists who serve as attending physicians, the hospital's chief nurse, the department's head nurse, and several other key nurses, a psychologist, and a dietician. When a new patient comes in for treatment, the nurses should greet them with a cheerful and engage in conversation with them and their loved ones to learn all they can about the patient's history with diabetes, lifestyle, diet, and any other health issues. Only then should the nursing staff enter the patient's condition into an electronic database. They must to file and keep getting well during their subsequent medical care. The attending physician in the undergraduate room must also educate the patients on blood sugar management so that they are aware of its significance and can afterwards effectively stop the progression of their own illness and consequences. Third, while the patient is in the hospital, the nursing staff should deliver diabetes booklets or brochures and explain the pathophysiology, types, related consequences, and effective blood sugar management measures. In order for patients to completely understand the right approaches to personal care, nutrition, exercise, and medicine following sickness the head of department should routinely arrange for patients to offer lectures on the stage of "diabetes." Additionally, in order to properly regulate blood sugar and increase patients' ability for self-management, the director should urge patients receiving future therapy to eat healthily, exercise sensibly, and utilize scientific drugs. The nursing staff should also provide the patients' families with the proper information and publicity so that they may support the patients as much as possible in their efforts to control the condition and watch over them while they practice excellent self-management. Finally, nursing staff should gently explain to patients what to do once they are released from the hospital, while also creating appropriate care plans and telling patients to visit the hospital frequently for review, depending on the situations of various patients. Following hospital discharge, nursing staff should call patients on a frequent basis to check in on how they are doing so they can alter their care plan in time for their recovery and receive better care. In order to make it convenient for patients to consult with them after discharge, the department should also set up a consultation. The two patient groups' nursing impact, blood sugar level, level of disease knowledge, occurrence of problems, and compliance were assessed. T and the chi-square test were utilized. A value of P 0.05 was regarded as significant, & SPSS 22 was utilized in order to carry out statistical analysis on the data from the text.

III. RESULTS

Comparison of the Two Patient Groups' General Information

The gender, age, and duration of illness of the two patient groups were not significantly different ($P > 0.05$). Table 1 compares two groups' general statistics.

Table 1

	Control	Test group	T value	p-value
Gender	21	23	1.56	0.08
Age	48	46	1.29	0.28
Year	5.6	5.8	0.65	0.58

Comparison of Nursing Impacts on the Two Patient Groups

The experimental group's nursing effects were better and its overall effective rate was greater. A statistical test showed two groups were different ($P 0.05$). Table 2 compares nursing effects on two patient groups.

Table 2

Groups	Markedly effective	Effective	Invalid	Total effective rate
Control group	16	17	12	73.2%
Test group	22	18	5	88.7%
X ²				8.95
p-value				0.02

Disease Awareness and Blood Glucose Levels Differ Between the Two Groups

Blood glucose levels were statistically lower in the experimental group both before and after eating. Sickness awareness in the experimental group was much greater than in the control group ($P 0.05$).

Table 3

Groups	FBG	2H blood glucose after meal	Awareness disease level
Control group	9.56	10.2	85.3
Test group	6.5	8.1	95.5

t-value	5.4	5.6	12.5
P-value	≤ 0.01	0.01	≤ 0.01

Complications Comparison

One case of hypoglycemia and two cases of heart failure were among the 6.7% of after-effects experienced by the test group. There were 2 cases of hypoglycemia (11%) in the control group. Two had heart failure and three had angina. Two groups differed statistically (P 0.05).

Compliance Evaluation of the Two Patient Groups

The experimental group's treatment compliance rate was 90.1%, far higher than the control group's 75.5% (P 0.05). Table 4 compares patient groups' compliance.

Table 4

Groups	High compliance	Moderate compliance	Poor compliance	Efficacy
Control group	26	8	11	75.5%
Test group	30	11	4	90.1%
T-value				6.5
p-value				0.01

IV. DISCUSSION

People who have diabetes typically have high blood sugar levels, which can be brought on by a variety of reasons including obesity, autoimmune diseases, the environment, heredity, and even other lifestyle choices. Numerous factors may contribute to the development of diabetes. All of the research participants had type 2 diabetes, which may be controlled with medication. According to the research mentioned, using simply pharmaceuticals to treat diabetes makes it difficult to get a bigger curative impact, but health education may improve the effectiveness of diabetes therapy. Health education for diabetes patients should be given by medical professionals, since it may greatly improve patients' adherence to treatment (Cramer, 2004, García-Pérez et al., 2013).

Health education may be given by nursing staff in a number of different methods. Depending on the patient's requirements, nursing staff may do a complete assessment of the patient's condition and create a customized education programme. Demonstrations, classes, and talks may all help to raise awareness about diabetes. In the context of health education, subjects like "blood glucose testing processes," "the necessity of controlling blood glucose," and "the normal blood glucose range" are discussed, among other related matters. Health education also covers the causes, symptoms, and classifications of diabetes; the means, ends, and definitions of dietary management; the necessary amount of exercise and the best times to exercise; the effects of negative emotions on health and how to control them; and the dangers, indications, dosages, and administration schedules of medications. When patients actively collaborate with the nursing staff and objectively monitor both their own behavior and nutrition, the effectiveness of the treatment is incrementally improved. We found that giving endocrine patients with diabetes health education can have a positive impact on their treatment outcomes by influencing their nutrition, behaviour, and mental health (Coppola et al., 2016, Frich, 2003).

Diabetes causes endocrine abnormalities. Untreated, it can cause metabolic abnormalities, vascular illness, and death. Relevant research indicate that lifestyle, employment, and dietary habits are mostly responsible for endocrine problems in diabetes individuals. Patients get inadequate therapy and have poor prognoses because they have a poor understanding of their own diseases and lack self-control in everyday life. Therefore, it is crucial to provide health education top priority in clinical practice in order to increase the treatment impact for diabetic patients. Through effective and scientific health education, we should assist patients in changing their harmful eating and lifestyle patterns. Additionally, we must educate patients on the importance of taking their medications as prescribed. Doing so will increase patient compliance and treatment success. As a consequence, it's essential to provide individuals with diabetes adequate health information about endocrine therapy (Zheng et al., 2019).

The delivery of health education by nursing practitioners may take many different forms. After conducting a detailed assessment of the patient's condition, the nursing team may devise a specialized educational plan for the patient. It's possible that patient education via lectures, workshops, and seminars can help them understand diabetes better. Health education includes knowledge on the mechanism, signs, prognosis, or forms of diabetes, as well as food management approaches, aims, and meanings, exercise quantity, and exercise duration. The processes for checking blood glucose, the need of maintaining blood glucose management, and the normal range of blood glucose are all discussed in this article. The negative effects, indications, doses, and timing of hypoglycemic medications; The use, storage, injection processes, and dosages of insulin; The relationship between negative emotions and illnesses and how to manage them; The usage, storage, and dosages of insulin; Patients have the opportunity to collaborate actively with nursing staff to scientifically manage their own behavior and diet via the use of health education, which has the effect of gradually enhancing the therapeutic impact. This research has shown that giving endocrine patients with diabetic health education may progressively improve medication adherence and nutritional, behavioral, and psychological well-being, all of which have a positive influence on treatment success. (Cameron, 1996) In this study, gender, age, and length of illness were not statistically different between the 2wpatient populations ($P > 0.05$). This was determined by comparing the general characteristics of the two patient groups. The experimental group's nursing effects were better,

and its overall effective rate was greater, according to a comparison of the nursing effects of the two patient groups. (Alinier et al., 2006) Two groups differed statistically ($P < 0.05$) The experimental group's fasting and two-hour post-meal blood glucose levels were lower than the control groups. The experimental group's sickness cognition was significantly higher than the control group's ($P < 0.05$). (Miller et al., 2002) When the incidence of the two patient groups was compared, it was found that the experimental group had a complication rate of 6.7%, which included 1 instance of hypoglycemia and 2 cases of heart failure. This was observed when the two patient groups were compared. Complications occurred at a rate of 11% among those in the control group. These complications included 2 instances of hypoglycemia. There was a total of three cases of angina pectoris and two instances of people experiencing heart failure. An examination of the available statistical information revealed the existence of a considerable disparity between the two groups ($P < 0.05$). In the group that was subjected to the experiment, the effective rate of treatment compliance was found to be 90.1%, which was a considerable increase from the 75.5% that was reported in the control group ($P < 0.05$).

V. CONCLUSIONS

The last component of this investigation was the provision of diabetes health education to the patients who participated in the experimental group. This group of patients' conditions improved considerably after the implementation of conventional nursing practices, which allowed for a comparison with the basic group of patients' circumstances. Therefore, it can be said that the implementation of diabetic health education is fairly effective. In addition to this, it offers potential benefits for the treatment and rehabilitation of the ailment.

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An Optimized Adhoc Network for Real Time Applications

Binu C T

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Abstract- Adhoc Network for real time application require highly secure infrastructure. The real time application require data in its derivative forms. Security mechanism increases adhoc network in its actual form. The connection of smart devices such as mobile phones, iPad etc. to the internet result in the improvement of computation everywhere. The computational capability of devices are very important while using computation to solve problems. The existing systems have problems with scheduling of tasks while doing high speed adhoc network with security. The proposed system have unique registration number of which 6 digit given by the user and 4 digit by the system and scheduling is based on this unique number. There is a Registration layer in each devices. The last 4 digit in the registration number defines the capacity of the device to do computation. A new Sorted Encoding Encryption and Decryption is to provide information security to the devices

Index Terms- data structure, information security, adhoc network, real time system

I. INTRODUCTION

Stock Quote Update require more amount of RAM to run the application. The fetch and decode the data is happening in a fraction of seconds. Another important stage is execute the application. There is the important of RAM. The changes in data is happening in a fraction of second. High computation operations are happening in RAM.

Flight information system is a real time system which updates information about flights. This is also a high speed application and faster RAM is required to execute the application. Real time system require less response time compared to general systems. So faster RAM is required to run the application.

II. DIFFERENT TYPES OF NUMBER SYSTEMS

Binary is a type of representation of data in which the computer can understand. The data stored in the RAM in the form of binary.

Decimal	Binary
0	0
1	1
2	10
3	11
4	100
5	101
6	110
7	111
8	1000
9	1001
10	1010
11	1011
12	1100
13	1101
14	1110
15	1111
16	10000
17	10001
18	10010
19	10011
20	10100

Fig 1: Binary values with Decimal

ASCII is a type of representation of data. We can convert these ASCII value to binary. The data is stored in RAM in the form of binary.

I. TYPES OF RAM

1. *DIMM(Dual Inline Memory Module)*
Compatible only with desktop computers.
2. *SO-DIMM(Small Outline Dual Inline Memory Module)*
Compatible only with laptops and other portable devices.
3. *SRAM (Static RAM)*
In an SRAM chip, each memory cell stores a binary digit

(i.e., 0 or 1) for as long as power is supplied. It is also larger in size.

4. **DRAM** (Dynamic RAM)
 In a DRAM chip, the charge on individual memory cells must be refreshed periodically to retain data.

RAM can also vary depending on its age. DDR5 (Double Data Rate 5) is the most current. Generally, the processors and motherboards that are manufactured today are only compatible with the RAM of this generation. On the other hand, there are those of the generation DDR4 or DDR3. They are used by computers of a certain age. Although their presence is decreasing, they still circulate. This allows users of old computers or devices to expand their memory. With this, you can extend its lifespan without needing to make big payments.

III. OBJECTIVES

The objectives of the system to provide high speed adhoc network with security for real time application.

IV. DATA STORED IN RAM USING HASH TABLE

The main three operations in RAM are

- Search
- Insert
- Delete

Hash table is a data structure mainly used to store data in RAM. There is a key for the table to store data in RAM. The key is used to Search (key) data in RAM using probability of presence of data. Generate key to Insert () data into the RAM and the key may be a random number. Initially allocate a slot in RAM before going to insert data. The key is generated based on the custom of usage. More used data have a Rank and data is stored based on that Rank. More used data have highest rank. The Delete (key) operation is related to search operation .Initially find out the data and free the memory. In C++ new is the keyword to allocate memory and delete is the keyword to free the memory.

V. OPTIMIZED DATA TRANSFER ALGORITHM IN ADHOC NETWORK

The proposed algorithm uses an equation to store data in RAM. The mathematical equation is connected with the data structure to map data in RAM. The mathematical equation is $x^{c+1}+y^{c+1}\pm c=d$, where x and y are the data to represent actual data and C is a constant value ranges from 0 to n and finally d is the actual data. If the binary data are of 2 bits then c value is 0. So the equation must be $x+y+0=d$. Find the value of x and y and stored in RAM. For example, if the data is 4(0100) c value must be 1.

C	Data Ranges	Equation
0	0 to 4	$x+y\pm c=d$
1	0 to 15	$x^2+y^2\pm c=d$
2	0 to 32	$x^3+y^3\pm c=d$

Find in Network(Key k1,k2) where k1 and k2 are keys
for (i=0 to k1)
 A[k1,i]

for (j=0 to k2)
 A[k2,j]
 Substitute the value of A[k1,i] and A[k2,j] in the corresponding equation to represent data and get the actual data.

Insert in Network(data d)

Allocate two slot in RAM for x and y and two for the two keys
 Compute the value of x and y using the equation $x^{c+1}+y^{c+1}\pm c=d$
 Call Random () for data d
 The function random returns two key values to map x and y

Delete from Network(key k1, K2)

Search for x and y using Find (key k1, K2) function
 If x and y are not null
 Free x and y

KEYWORDS: Information security, Scheduling, Computation

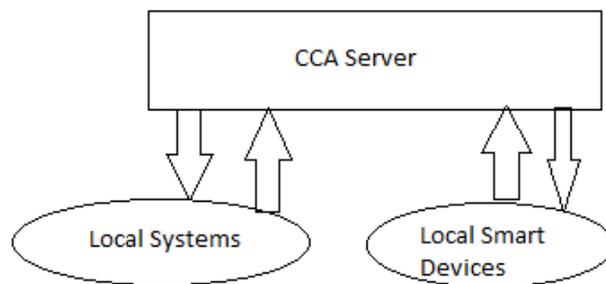


Fig 1: Optimized Adhoc Network in fight control area

VI. OPTIMIZED ADHOC NETWORK ARCHITECTURE

The proposed architecture provide high security and high speed computation. The figure shows the block diagram of Capacity Computing Architecture (CCA).

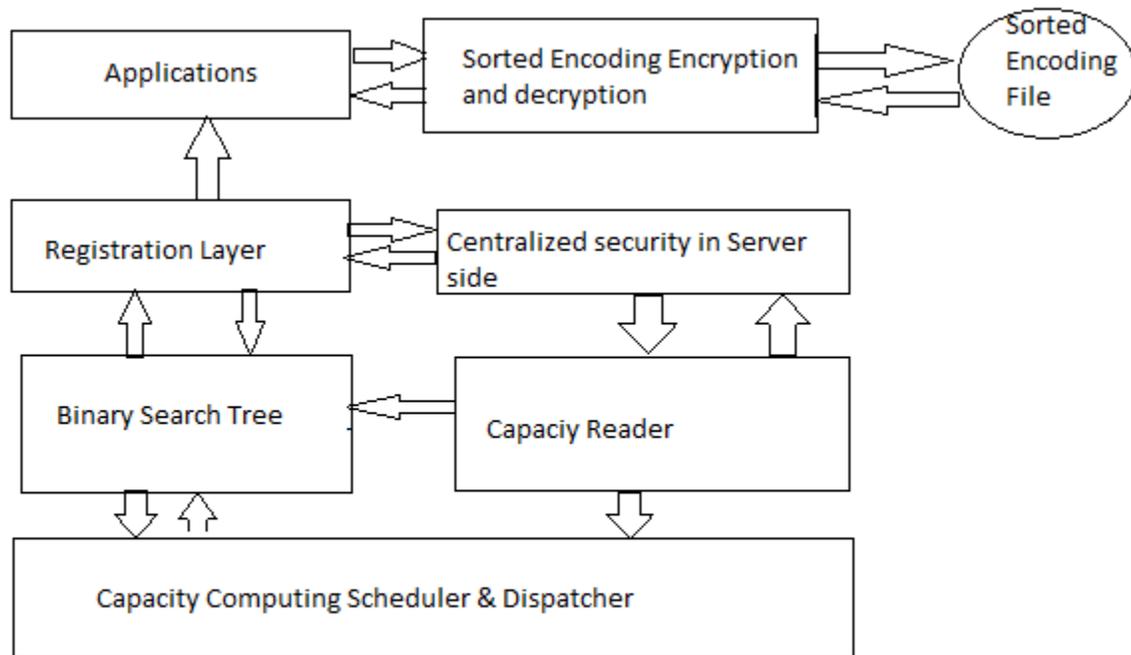


Fig 2: Architecture of Optimized Adhoc Network

The architecture diagram of the CCA devices connected to the system consist of Registration layer at the devices, Sorted encoding encryption and decryption method, Sorted Encoding file and the other applications. The server consist of centralized security in server side, capacity reader and capacity computing scheduler and dispatcher.

VII. REGISTRATION LAYER

Each device connected to the system have a registration number and it's a ten digit number. The six digit of registration number is given by the user. The last four digit of the registration number shows the capacity of computation in each devices which is set by the application. The registration layer is present in each devices manages the computation. The registration layer send the registration number to the server when the device is idle. The registration layer connects with centralized security system in server to provide security. The registration layer provides information security to the other application in the device. Computation is done through the Registration layer.

VIII. .SORTED ENCODING ENCRYPTION AND DECRYPTION

The CCA provides security to the system connected with the system by using Sorted Encoding Encryption and Decryption method. Each file in the device is protected by the above method. The files in the device is encoded using Sorted Encoding file. The Sorted encoding file is updated each time when the user add new

file in the device. The all files are decoded when the user click on the file. The Centralized Security in Server side blocks the intrusion and penetration in the file system.

IX. .SORTED ENCODING FILE

There is a sorted Encoding file present in the device which protects the files in the device. There is a 32 bit key is used to encrypt the sorted encoding file. The registration number is used as the 32 bit key for encryption. A random number is generated by the Encoding Encryption and Decryption and added to the Sorted Encoding file and make it as sorted. The random number is added after 128 bits of data. Sorted Encoding file is encoded with all the files in the device. The sorted Encoding file is sorted all the time and decoded when authorized user open the file. The Sorted Encoding file consists of unique password for each file. The file is automatically verifies the password when authorized user open the file.

X. .CENTRALIZED SECURITY IN SERVER SIDE

Centralized Security in Server side connects with Registration layer of each device. Centralized Security in server side have all the registration number of each device. It updates when new user is added with the system. Centralized Security in server side is connected with Capacity Reader. The Centralized Security in Server side blocks the intrusion and penetration in the file system

XI. CAPACITY READER

The capacity reader reads the registration number of devices which are free in current time. The last four digit of registration number is assigned to capacity. Capacity Reader is connected with the scheduler and dispatcher. It also updates each time when new message is reached in the Capacity Reader with a binary search tree in server.

XII. BINARY SEARCH TREE

Most of the system uses queue or priority queue for scheduling. The proposed system uses Binary search tree. The capacity Reader reads the capacity value of each devices and update in binary search tree. The scheduler reads the highest value each time when new message reaches the Capacity Reader. There is another type of tree called equation tree which can use if more security is needed. Each node have the capacity value. Equation tree uses linear equation or binomial equation to map the data into a tree.

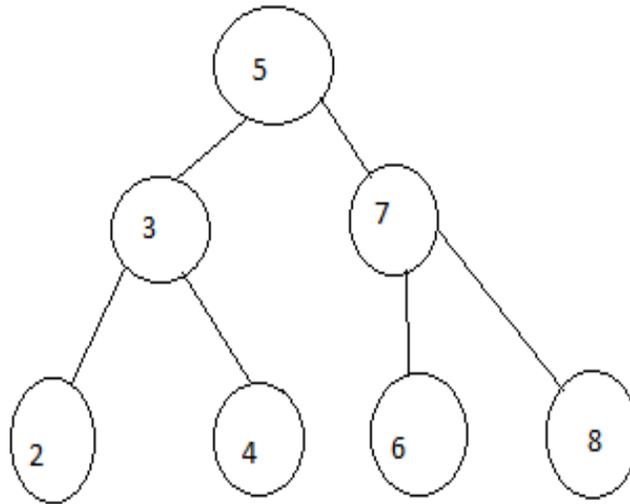


Fig 3: Binary Search Tree with capacity value

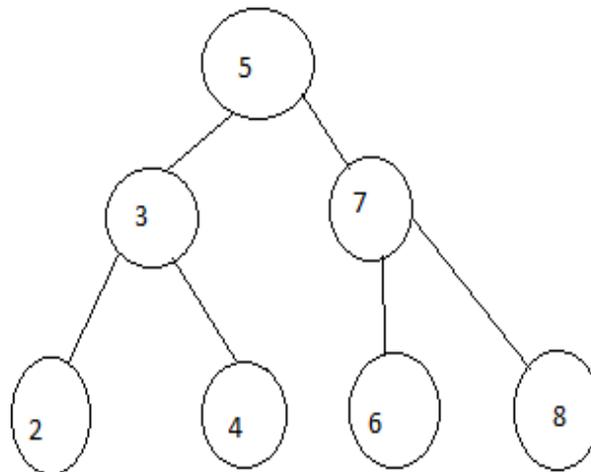


Fig 4: Equation Tree with adhoc network

XIII. SCHEDULER AND DISPATCH

The proposed algorithm reads the capacity value from the binary search tree or from the equation tree and schedule the task for the computation to the device with highest capacity. The Earliest Finish Time is computed before doing the monitoring for each task. The task is represented in DAG (Directed Acyclic Graph).

1. for each Task T_i
2. Get Capacity(C_k) from Binary Search tree
3. Compute EFT
4. Initialize $Time_free = EFT(T_j)$
5. For $time_free \neq 0$
6. Select D_j with C_k high
7. Assign task to D_j
8. End if
9. Decrement $Time_free$

10. Compute $EFT(T_i, D_j)$
11. End
12. Update $free_time$
13. End

CCA Algorithm

XIV. EXPECTED OUTCOME

The proposed Optimized Adhoc network touches the information security services and high performance is given to the System

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The influence of social media on tourist' planning and destination selection decisions

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Abstract- Social networks are becoming increasingly popular. According to researchers, more than half of the world's population now uses social networks. Social media represents a revolution in terms of advertising opportunities for businesses. Thus, the mechanisms of social networks have changed not only the means, but also the communication. Social media is becoming an important marketing tool for destination management organizations and thus has a major impact on tourism markets. The advent of new technologies such as social media has changed the way consumers seek information related to their purchasing decisions. Through the advice or knowledge, they receive from the community, they create an image of the destination and are used by consumers to make decisions. The purpose of this paper is to highlight the use of social media and the impact of social media on consumer travel decision making.

Index Terms- tourist destination, information in social networks, communication in social networks, decision-making process

I. INTRODUCTION

Promote Mongolia-specific tourism and enhance competitiveness in the international tourism market as the third priority economic area in Chapter 4 "Economy" in Development Guidelines 2021-2025." The tourism is mentioned as above. In addition, tourism is mentioned second after infrastructure development in Chapter 8 "Regional and Rural Development." The followings have been specified as specific targets and are described in the Investment Program (PIP), an attached document: project name, project budget, financial plan, financial resources, and supervision, and others that are scheduled to be implemented.

1. Improvement of tourism products, services, quality, and planning to enhance competitiveness and increase the number of tourists to 1 million

2. Establishment of the Chinggis Khaan Complex to promote historical tourism by protecting historical sites that appear in the secret history of Mongolia, and by implementing international promotion and infrastructure development in stages

3. Sustainable tourism development projects will be implemented in Khuvsgul aimag, Khentii aimag, Arkhangai aimag, Bayan-Ulgii aimag, Uvs aimag, Khovd aimag, and

Zavkhan aimag, contributing to the increase in revenues from local residents and businesses.

The number of tourists visiting Mongolia grew steadily from 2015 to 2019, but in 2020 it fell to one tenth of that of 2019 due to COVID-19. According to the COVID-19 RESPONSE of the UNCTAD (United Nations Conference on Trade and Development), Mongolia was a country that experienced the largest decrease in the number of tourists in 2020, an 89% decrease from that of 2019 (source: UNTWO Tourism Dashboard). According to the OECD's forecast, the number of tourists around the world will return to its 2019 level in 2024 at the earliest. The table below shows the results of estimating the number of tourists from 2025 based on the average rate of increase from 2015 to 2019 [2].

The annual average growth rate of the number of foreign tourists from 2015 to 2019 before the COVID-19 situation became more serious was a 10.5% increase. UNWTO assume that the Post-COVID tourism industry will take at least four years to return to 2019 levels. Considering the heightened sense of anxiety about health among people, Mongolia, a country adjacent to the origin of the COVID-19 outbreak without a high level of medical care, may require more time for recovery. The impact of the COVID-19 infectious disease is essentially different from and far more serious than the economic crisis caused by the Lehman crisis. However, it is not an exaggeration to say that the future of tourism in Mongolia depends on how to prepare for the Post-COVID situation and making it an attractive country for tourists during this period when the world's tourism industry is stagnant.

In Mongolia, the number of domestic tourists has increased sharply in recent years. Under the COVID-19 crisis, as pointed out by many people, the tendency to shift to domestic tourism will appear, but Mongolia has another background. Since the statistics are not fully developed, all we can do is to guess based on the number of visitors to specific areas of major sightseeing areas or tourist spots, but we can see that the number has increased sharply in recent years as indicated below. As soon as COVID-19 in Mongolia settled down, the number of domestic tourists is expected to further increase in the future.

Tax revenues in the tourism sector in 2019 amounted to approximately 7.3 billion MNT (approximately 2.65 million USD) from approximately 570 thousand foreign tourists. Although the tax revenue decreased to 5.2 billion MNT in 2020, despite a

decrease of the number of foreign tourists to one tenth, tourism revenues have not decreased much. The cause of this is considered to be attributed to a significant increase in the number of domestic tourists.

Many researchers have studied social media in tourism from different perspectives, such as the benefits and risks of using social media, and whether traveler social media engagement is positively associated with motivation and empowerment. A variety of information is collected before the trip and shared after the trip, especially for unfamiliar destinations. The connection between social media and purchasing decisions is highlighted by the fact that almost 78% of travelers use social media for travel. Social networks were analyzed as they play an important role in the communication process. However, quantitative measurement tools for social media are quite limited, since the decision-making process influenced by social media is analyzed mainly through qualitative research [1].

Social media influences all stages of travel as it facilitates information gathering, communication and travel decisions. Satisfaction or dissatisfaction of customers with any segment of the offer can spread very easily, since social networks can quickly spread this information across the digital environment. Although many active users use the Internet and social networks to get information about destinations, some tourists find it takes too much time to find certain information.

The purpose of the study is to determine the extent to which communication through social networks can influence the process of choosing a destination and the importance of communication for potential tourists. To achieve the objectives of the study, an empirical study was conducted using a self-completion questionnaire. The research instrument was a structured online questionnaire that was developed from previous literature and the questions were adapted to meet the needs of the study. The questionnaire is divided into two parts. The first part deals with the importance of using social media, social media communication, social media information and decision making. The purpose of this is to find out whether respondents believe that social networks facilitate communication and help to simplify the process of collecting information when choosing a destination, and whether they find the information collected useful and important when choosing a destination. Education. This section also includes questions about the importance of timely information and updated address profiles. The second part of the questionnaire examines the socio-demographic characteristics of the respondents, such as age, gender, education and employment, and the use of social networks [3].

According to the results of the survey, Facebook is the most frequently used social network by users, along with Instagram and YouTube (Figure 1).

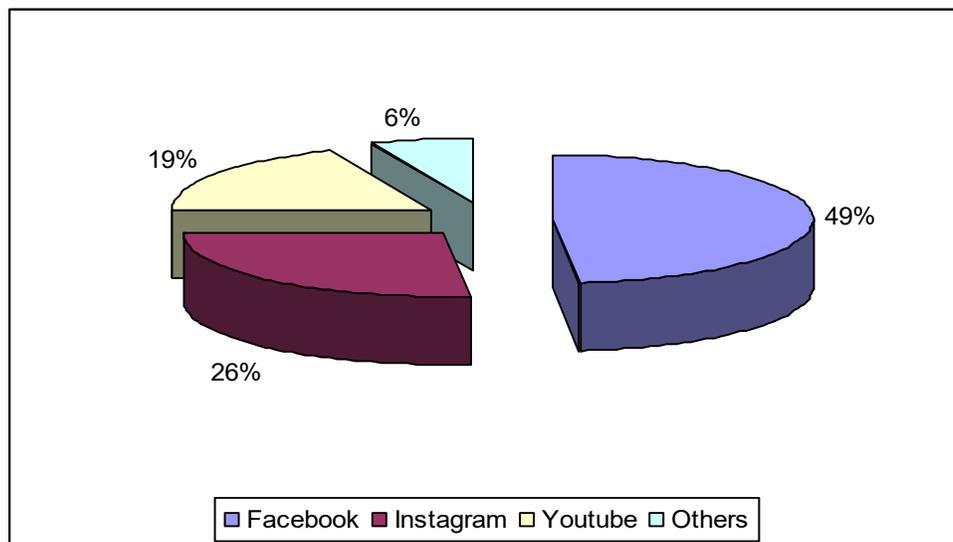


Figure 1 – The most popular social networks among respondents [4].

H1: Reviews posted and shared by consumer stakeholders on social media have a positive impact on travel decisions.

One of the questions in the study was asked as follows: "Do you use information from social networks when planning a trip"?

Figure 2 presents the results of respondents' answers to the question of whether tourists use data obtained from social networks in the process of preparing for travel.

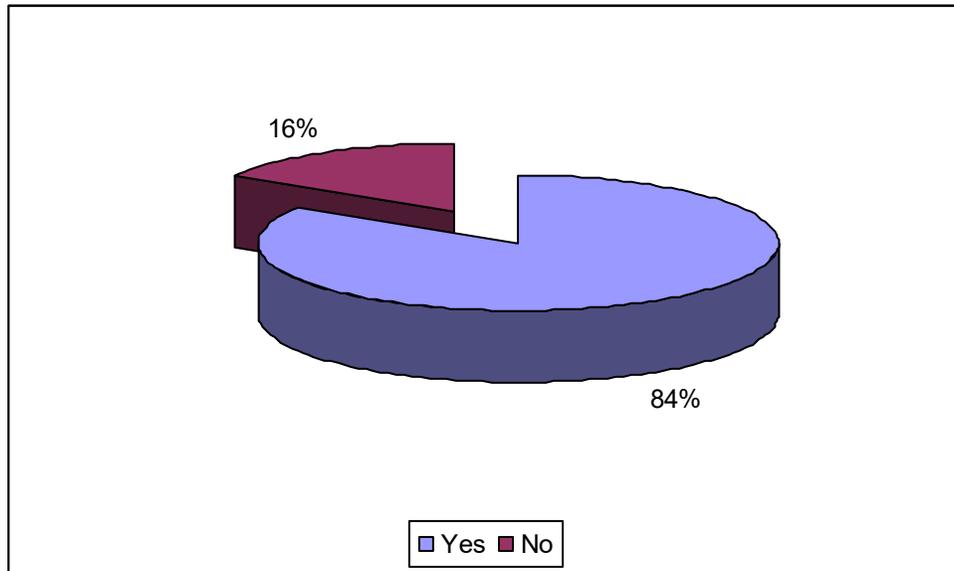


Figure 2 - Use of information from social networks in the process of preparing for the trip

Thus, the data presented in Figure 2 convincingly shows that the vast majority of respondents use information from social networks in the process of planning travel.

The next question that needed to be answered in the course of the study was the following: “To what extent do you trust reviews and comments on social networks”?

Figure 3 shows data on the degree of user trust in reviews and comments on social networks.

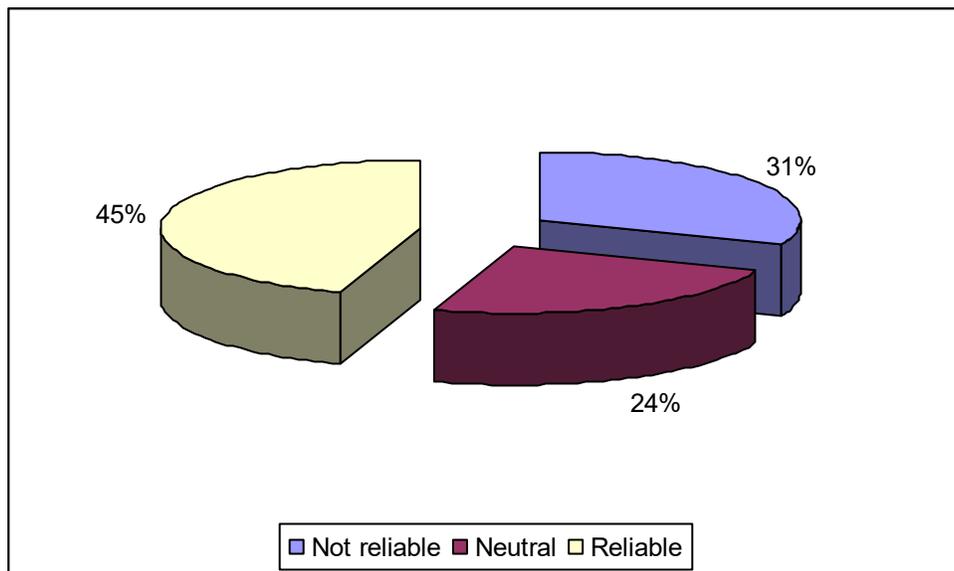


Figure 3 - Reliability of social media posts and comments as a source of information

Thus, as the results of the survey show, almost half of the respondents consider posts and comments on social networks a reliable source of information.

Therefore, the hypothesis that reviews posted and shared by consumer stakeholders on social media have a positive impact on travel decisions can be considered proven.

H2: social media has a direct impact on tourists' decision-making as they find it easier to use social media when choosing a travel destination.

When studying the level of influence on decision-making by tourists of various sources of information, the respondents were asked the question: “Which sources do you prefer to use when making a decision about choosing a place to travel”?

Figure 4 presents data on the results of the survey.

As the data shown in Figure 4 show, a significant part of the respondents, when making a decision on choosing a travel destination, are guided by reviews and comments on social networks.

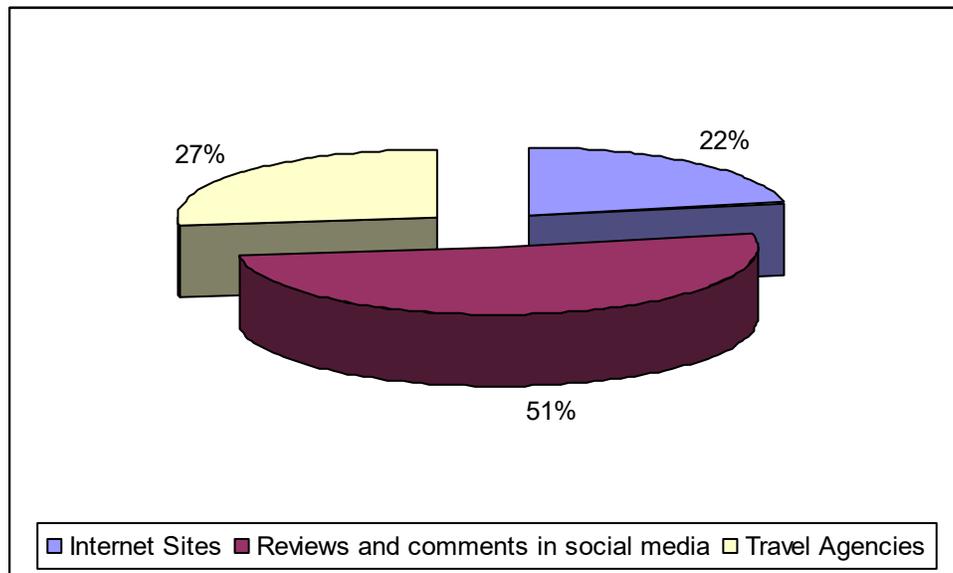


Figure 4 - Preferred sources of information when choosing a travel destination

The discriminant validity of the measurement model, assessed using the Fornell-Larker test, shows that social media use has a statistically significant positive effect on decision making, social media communication, and social media information. Construction Decision making in the aggregate is explained by 69.4%, which is considered important. The f^2 effect size of using social media in explaining the concept of decision making is large (0.436), while social media communication (0.059) and social media information (0.074) have small effect sizes.

Social media offers a number of advertising benefits and this social media offers a combination of different elements such as text, video, audio and photos. This combination creates great advantages in integrated marketing communications. Social media is a new trend, but it is developing rapidly and therefore needs to be managed well [5].

Social networks like Facebook, Youtube and Webpage have gained popularity and trends show that consumers are more educated and young people connect with them every day and become a part of their daily life.

Facebook is good tool for promotion because they have high usage, are reliable, have interest in the information they provide, and have a high monetary value.

In a sense, Facebook brings customers back, e.g. social media users, in advertising and promotional channels. Customers can form a positive or negative impression of a company, its products and services, depending on how the company is

presented to them. Thus, consumers' perceived image or quality affects the opinion or message they convey to others on social media.

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Iron Deficiency Anemia, Anemia of Chronic Disease, Iron Overload: Use of Hepcidin as a Laboratory Marker in the Diagnosis Along With its Therapeutic Implications and Management of Iron Homeostasis

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Abstract- Purpose: Iron deficiency is mostly affecting nutritional deficiency in low and middle-income countries. Infants, young children, adolescent females, young females with heavy bleeding during menstrual periods, women of childbearing age, and old people are at a significant risk of iron deficiency. Doctors usually prescribe iron therapy in treating iron deficiency. Along with iron deficiency, iron overload is a serious complication when there is an excess of iron storage in the human body. Hemochromatosis, a hereditary genetic defect where an excess of iron absorption happens, caused primary iron overload. Iron overload also develops secondary to multiple transfusions in transfusion-dependent anemic patients (thalassemia, Myelodysplastic syndromes, etc.). Iron overload can damage organs, including the heart and liver, leading to serious complications if it is inadequate or lacks iron chelation therapy. Cytokines and acute phase proteins play a significant role in the etiology of anemia of chronic disease, which is also known as anaemia of inflammation. Hepcidin a peptide hormone regulates iron efflux from plasma-absorbing enterocytes, iron-recycling macrophages, and iron-storing hepatocytes. Hepcidin binds to its receptor ferroportin, a cellular iron exporter, and regulates the membrane content of ferroportin and ferroportin-mediated iron transfer to blood plasma. In iron deficiency, hepcidin reduces iron efflux into the plasma and promotes iron-dependent erythropoiesis. Inflammatory stimuli promote the production of hepcidin, which reduces iron intake in inflammatory anaemia. Hepcidin deficiency results in iron overload in hereditary hemochromatosis, whereas excess hepcidin is associated with inflammatory anaemia, chronic renal disease and iron-refractory anaemia, leading to iron deficiency anemia. The mechanism of hemochromatosis is because of impaired synthesis of hepcidin or impaired hepcidin binding to ferroportin. Hematology parameters and iron studies have limits in diagnosing iron deficiency anaemia, anaemia caused by chronic disorders, according to several studies, as both conditions can produce similar laboratory results. This paper reviews the importance of hepcidin in making a thorough diagnosis of anemia, before starting the treatment, along with serum hepcidin as a prognostic tool for the early detection of early response to oral iron therapy and iron overload (hemochromatosis). Current therapeutic options are limited to control iron levels by regulating the hepcidin/ferroportin axis. This literature review includes reviewing a summary of some of the research in advanced clinical studies on various aspects of hepcidin tuning, understanding the mechanism of hepcidin and its pathological components which may lead to advanced therapies, and alternative therapies, along with the importance of new treatment options, including modulation and inhibition of hepcidin activity and its future use in clinical trials and implementing the latest treatment options.

Methodology: The information was collected from secondary sources published in various scholarly journals selected from google scholar. The research articles systematically reviewed and identified hepcidin's role in iron homeostasis, therapeutic and diagnostic advances, and research gaps in the research field.

Results/Findings: Based on a systematic review, the current status of the management of iron homeostasis and its limitations are identified. Hepcidin's role in the diagnostic and therapeutic field is explained. Future advances and research gaps in the management of iron homeostasis are explained in the literature review.

Index Terms- Hepcidin, Iron deficiency, Iron overload, Anemia, Ferroportin

I. INTRODUCTION

Around two billion individuals worldwide, especially in developing and under-developed nations, suffer from iron deficiency anemia. IDA is more common in babies after six months of age, young women with heavy menstrual bleeding, women of childbearing age, and older people. Iron therapy is the primary treatment for iron deficiency. [1]. Common iron deficiency anemia

symptoms include tachycardia, tachypnea, headache, palpitations, rash, glossitis, restless leg syndrome, irritability, and fatigue. According to Sonia Bouri et al. 2018 [2], determining the cause of anemia is important because patients with iron deficiency deserve prompt investigation, as eight to fifteen percentage of these patients diagnosed with gastrointestinal cancer. If there is no iron deficiency, the research may be directed elsewhere. If iron deficiency is suspected, the following laboratory tests are performed.

Laboratory features of iron deficiency include:

<p>Hematology: Hemoglobin, RBC count Low red cell indices, including MCV, MCH, and MCHC. High RDW Low reticulocyte hemoglobin content (CHr)</p> <p>Biochemistry: Low serum iron Low ferritin Increased serum ferritin Low transferrin saturation Increased iron zinc protoporphyrin Increased soluble transferrin receptors Low serum hepcidin</p> <p>*MCV: Mean cell volume *MCH: Mean cell hemoglobin *MCHC: Mean cell hemoglobin concentration *RDW: Red cell distribution width</p>

In iron-refractory anemia bone marrow does not respond to oral iron therapy and the hemoglobin level rises ≥ 1 g/dl after 4-6 weeks. Persistent anemia is usually associated with gastrointestinal diseases. In pathological conditions, where the content of hepcidin increases, the absorption of iron weakens, reducing the content of plasma iron in blood circulation. Margherita et al. [2021] summarized underlying conditions, gastrointestinal diseases, hepcidin dysfunction, and therapeutic and diagnostic approaches in refractory anemia. Refractory anemia shows a genetic disease caused by a mutation in TMPRSS6. The gene that encodes the serine 6 transmembrane protease, also known as matriptase-2. To prevent the progression of iron deficiency anaemia, the responsiveness to iron therapy in refractory anaemia needs particular care and treatment. [3].

Anemia of inflammation (AI), also known as anaemia of chronic disease, includes chronic lung disease, kidney failure, congestive heart failure, etc. AI is the most prevalent anaemia in hospitalised and chronically ill individuals. owing to inflammation, cytokines (e.g., interleukin-6) increase hepcidin synthesis causes reticuloendothelial cells to retain iron, inhibit iron absorption in the intestine and results in shortened red blood cells' half-life [4]. Proinflammatory cytokines, including interleukin-1, interleukin-6, interleukin-10, and gamma interferon or alpha tumour necrosis factor, produced during anemia of chronic disease (anemia of inflammation), increase the expression of hepcidin, which inhibits absorbing iron and releases iron into the blood, causing iron-depleted erythropoiesis. Anemia of chronic disease also leads to a decrease in erythropoietin as chronic kidney disease progresses, especially because of the coexistence of other diseases such as diabetes, which causes nephropathy and reduces erythropoietin production in the kidneys, which also causes anemia [5]. Patients suffering from chronic diseases may have a poor appetite and insufficient dietary iron, as well as increased cytokines and interleukins, which cause an increase in hepcidin, which reduces iron absorption. Iron absorption, transport, and storage are tightly regulated in the body, and ferritin plays a crucial role [6].

Iron overload disorders represent a range of medical conditions that cause an increase in the body's iron stores and subsequent organ damage [7] β -Thalassemia's are inherited disease of hemoglobin production characterized by deficient hemoglobin synthesis leading to shortened erythrocyte (RBC) survival because of hemolysis and ineffective erythropoiesis in the bone marrow. In order to prevent heart failure and other iron related problems, iron chelation therapy is essential. Despite the availability of potentially affordable oral iron chelation therapy, many patients experience the adverse outcome of iron overload and eventually die each year as a result of inadequate or inadequate iron chelation therapy [12].

Hepcidin binds to ferroportin and regulates iron homeostasis. Hepcidin is produced in response to increased body iron stores to prevent iron absorption and prevent iron overload. BMP/SMAD signaling pathway, which triggers hepcidin induction of transcription. Inactivating mutations in components of this pathway lead to hepcidin deficiency and increased absorption into the bloodstream, leading to a genetically heterogeneous autosomal recessive disease of iron metabolism, known as hereditary hemochromatosis (HH). The dominant form of HH is associated with mutations in the HFE gene and represents the most common genetic disease among Caucasians. Other variants caused by inactivating mutations in hemojuvelin (HJV), HAMP (hepcidin), or TFR2 (transferrin receptor 2). SLC0A1 (ferroportin) mutations that confer HH's metabolic phenotype is recapitulated by hepcidin resistance. However, ferroportin-associated

hemochromatosis happens in an autosomal dominant manner. Loss-of-function ferroportin mutations cause ferroportin disease, characterized by macrophage iron overload and low transferrin desaturation. Aceruloplasminemia and atransferrinemia are also inherited iron overload disorders resulting from the absence of ceruloplasmin or transferrin, plasma iron oxidase, and iron carrier, respectively [8].

Table 1: Hemochromatosis (iron overload)

DISEASE CONDITION	GENE	LOCUS	TRANSMISSION	PATHOLOGY HAPPENING	LABORATORY FEATURES	MAIN CLINICAL MANIFESTATION
HFE hereditary hemochromatosis	HFE	6p21.3	Recessive	Hepatocyte iron loading	↑ serum ferritin & transferrin saturation	Hepatic
HJV juvenile hemochromatosis	HJV	1q21	Recessive	Hepatocyte iron loading	↑↑ serum ferritin & transferrin saturation	Cardiac and endocrine
HAMP juvenile hemochromatosis	HAMP	19q13	Recessive	Hepatocyte iron loading	↑↑ serum ferritin & transferrin saturation	Cardiac and endocrine
TfR2 hereditary hemochromatosis	TFR2	7q22	Recessive	Hepatocyte iron loading	↑ serum ferritin & transferrin saturation	Hepatic
Ferroportin hemochromatosis	SLC40A1	2q32	Dominant	Hepatocyte iron loading	↑↑ serum ferritin & transferrin saturation	Hepatic
Ferroportin disease	SLC40A1	2q32	Dominant	Mainly Kupffer cell iron loading	↑↑ serum ferritin, normal/low transferrin saturation	Hepatic
Congenital aceruloplasminemia	CP	3q23-q24	Recessive	Mainly Kupffer cell iron loading, CNS iron loading	↑ serum ferritin & normal to low transferrin saturation	Neurologic
Congenital atransferrinemia	TF	3q22.1	Recessive	iron hepatocyte loading	↑ serum ferritin & transferrin saturation	Hepatic and hematologic

Hepcidin binding to its receptor ferroportin (a cellular iron exporter) and regulates the membrane content of ferroportin and ferroportin mediated iron transfer into the blood plasma. Ferroportin is a part of the solute carrier family. Through a conformational flip-flop mechanism that alters iron access from the intracellular and extracellular surfaces of the transformer, ferroportin promotes iron transport. Hepcidin regulates the activity of ferroportin by:

1. Ferroportin endocytosis and proteolysis induced by hepcidin
2. Hepcidin binds to the ferroportin's central cavity to seal it during iron transport to achieve high ferroportin occupancy.

Besides hormonal modulation of hepcidin-hepcidin-ferroportin, other systems, like hypoxia-inducible factors (HIFs) prolyl hydroxylases, are involved in the controlling systemic iron sensitive to iron concentration and hypoxia [9].

Alteration of hepcidin is a compensatory mechanism to regulate iron homeostasis under physiological conditions, including pregnancy. In pathophysiological conditions such as beta-thalassemia, myelodysplastic syndrome, inflammatory anemia, and hereditary hemochromatosis, the role of hepcidin is significant [10]. Understanding the underlying pathophysiology of iron metabolism can help improve the evaluation of iron deficiency and overload. Future therapy options could include targeted pharmacological manipulation of the hepcidin regulatory system besides iron supplementation and iron chelation. [11]. Understanding the role of hepcidin in iron

overload, iron deficiency and, a systematic review of current therapy in the management of iron homeostasis, advanced therapeutic options to control iron homeostasis by upregulating or downregulating hepcidin and the use of hepcidin as a diagnostic and prognostic tool in the early identification of iron excess and deficiency along with research gaps included in this paper.

II. OBJECTIVES :

A few targeted questions were and research objectives developed to understand hepcidin's role in iron deficiency anemia, iron overload, anemia of inflammation

1. Current diagnostic methods, and their limitations in early diagnosis of iron overload and iron deficiency
2. Role of hepcidin in making a thorough diagnosis of anemia
3. Role of hepcidin as a prognostic tool for the early detection of early response to oral iron therapy and iron overload.
4. Current therapeutic options for controlling iron homeostasis and its limitations
5. Understanding the role of hepcidin in new therapies, alternative therapies, the importance of hepcidin tuning and its implication in iron therapy, and its future use in clinical trials and implementing the latest therapeutic options.
6. To find out the research gap and research agenda which supports the physicians to change the treatment of physiological and pathophysiological conditions based on hepcidin treatment.

III. METHODOLOGY :

The literature review was based on a reviewing latest information collected from various secondary sources, including published literature from various scholarly journals. Relevant articles were selected using a computerized search using google scholar. In order to understand the current status of hepcidin in the laboratory diagnosis and its therapeutic implications, recent secondary sources were only used for literature evaluation.

IV. IRON HOMEOSTASIS.

4.1 Understanding Hepcidin's role in iron homeostasis.

Hepcidin is a small (25 amino acid) peptide hormone that is mainly responsible for regulating iron homeostasis in the body. Hepcidin is mainly produced by hepatocytes and, after entering the circulation, hepcidin can interact with the membrane-active cellular iron exporter ferroportin, causing its endocytosis, preventing iron efflux and promoting cellular iron retention. Together, hepcidin and ferroportin are currently the only known regulators of cellular iron export. Ferroportin is mainly expressed in cells involved in dietary iron assimilation and homeostasis in duodenal enterocytes, macrophages, and hepatocytes. Hepcidin expression is controlled by plasma iron levels and storage; this transcriptional control is made possible by the SMAD signalling pathway connected to the bone morphogenetic protein receptor. Hepcidin production is also increased by infection and inflammation, and this is associated with IL-6-induced JAK/STAT pathway activation. [13][14][15].

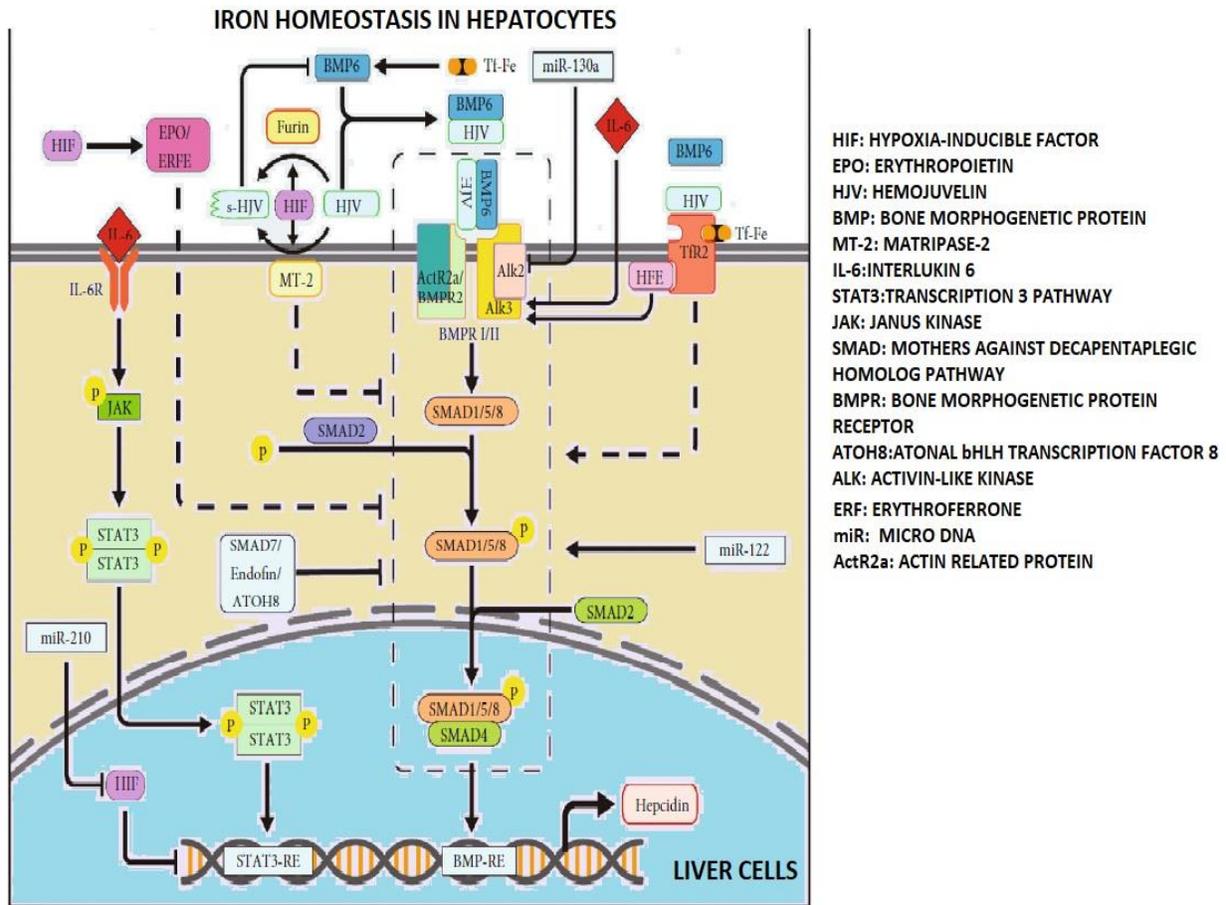


Fig. 1: Mechanism of iron homeostasis

4.2 Role of Hypoxia Inducible factors (HIFs)

Hypoxia-inducible factors (HIFs) are transcription factors that regulate how the body reacts to hypoxia. HIFs bind hypoxia response elements to control erythropoiesis-related genes (e.g., Epo), angiogenesis, and metabolism. Normally, a hypoxic environment and increased HIF2α in the small intestine caused iron absorption on the apical side of enterocytes and iron absorption on the basolateral side, and iron limitation increases sensitivity to hypoxia [16].

4.3 Iron homeostasis in polycythemia vera

The most frequent JAK2 driver mutation is JAK2 V617F, which causes constitutive Epo-independent JAK-STAT activation and the overexpression of genes involved in the JAK-STAT pathway in polycythemia vera. Even before starting therapeutic phlebotomy, the cornerstone of therapy and subsequent phlebotomies, which frequently worsen iron shortage, most patients with polycythemia are anemic at diagnosis. [16].

4.4 Acquired and genetic disorders in Iron homeostasis

Acquired and genetic disorders in iron homeostasis led to iron deficiency and iron overload [17]

Table 2: Acquired and genetic disorders in iron homeostasis led to iron deficiency and iron overload

DISORDER	INHERITANCE	GENE	PHENOTYPE
GENETIC IRON OVERLOAD WITHOUT ANEMIA			
HH type 1	AR	HFE	Inappropriate low hepcidin
HH type 2	AR	HJV	Low hepcidin
HH type 3	AR	TFR2	Low hepcidin
HH type 4	AD	SCL40A1	Hepcidin resistance

DISORDER	INHERITANCE	GENE	PHENOTYPE
GENETIC IRON OVERLOAD WITHOUT ANEMIA			
Ferroportin disease loss-of-function FPN mutations	AD	SCL40A1	Macrophage iron overload

DISORDER	INHERITANCE	GENE	PHENOTYPE
IRON LOADING GENETIC ANEMIAS			
ALPHA THALASSEMIA	AR	HBA	Iron overload, Microcytic anemia
BETA THALASSEMIA	AR	HBB	Iron overload, Microcytic anemia
CONGENITAL IRON SIDEROBLASTIC ANEMIA	X linked AR	TFR2	Iron overload, Microcytic anemia, Ring sideroblasts
SA and ataxia	X-linked	ABCB7	SA and ataxia
SIFD	AR	TRNT1	SA, immunodeficiency, and development delay
Type 1	AR	CDAN1	Anemia, splenomegaly, jaundice, erythroblasts
Type 2, HEMPAS	AR	SEC23B	
Type 3	AR	KIF23	
Hypotransferrinemia	AR	TF	Microcytic anemia, iron overload
DMT1 mutations	AR	SLC11A1	Microcytic anemia, iron overload
IRIDA	AR	TMPRSS6	Iron-deficiency anemia
Hyperferritinemia-cataract syndrome	AD	FTL promoter (IRE)	High serum ferritin in the absence of iron excess
Ferritinopathy	AD	FTL	Accumulation of iron in the Brain

DISORDER	INHERITANCE	GENE	PHENOTYPE
GENETIC IRON DEFICIENCY			
IRIDA	AR	TMPRSS6	Iron refractory anemia, Iron deficiency anemia

DISORDER	INHERITANCE	GENE	PHENOTYPE
GENETIC REGIONAL IRON FERRITIN ACCUMULATION			
Hyperferritinemia-cataract syndrome	AD	FTL promoter (IRE)	Increased ferritin in absence of iron overload, congenital cataract because of ferritin deposition in the eye
Ferritinopathy	AD AR	FTL FRDA	Iron accumulation in the brain, cardiac brain overload, neurodegenerative changes

DISORDER	INHERITANCE	GENE	PHENOTYPE
ACQUIRED IRON OVERLOAD			
Chronic blood Transfusion			Iron overload

DISORDER	INHERITANCE	GENE	PHENOTYPE
ACQUIRED IRON OVERLOAD			
Chronic blood Transfusion			Iron overload

DISORDER	INHERITANCE	GENE	PHENOTYPE
ACQUIRED IRON-LOADING ANEMIA			
RS MDS	Clonal disorder with somatic mutations	SF3B1	Iron overload, Macrocytic anemia, Ring sideroblasts

DISORDER	INHERITANCE	GENE	PHENOTYPE
ACQUIRED ABSOLUTE IRON DEFICIENCY			
Iron deficiency			Microcytic anemia with low iron

DISORDER	INHERITANCE	GENE	PHENOTYPE
ACQUIRED FUNCTIONAL IRON DEFICIENCY			
Anemia of Inflammation			Microcytic anemia with low iron

* AR= Autosomal recessive, AD= Autosomal disease, IRIDA= Iron refractory anemia, RS MDS =Myelodysplastic syndrome with ring sideroblasts

4.4 Published research work on the current and future advances in the treatment and diagnostics of iron disorders

De Amicis et al. [3] presented the current therapy used for iron deficiency anemia. Intravenous iron therapy is preferred for patients who don't respond to oral iron therapy, which is the most popular treatment technique used by clinicians worldwide.

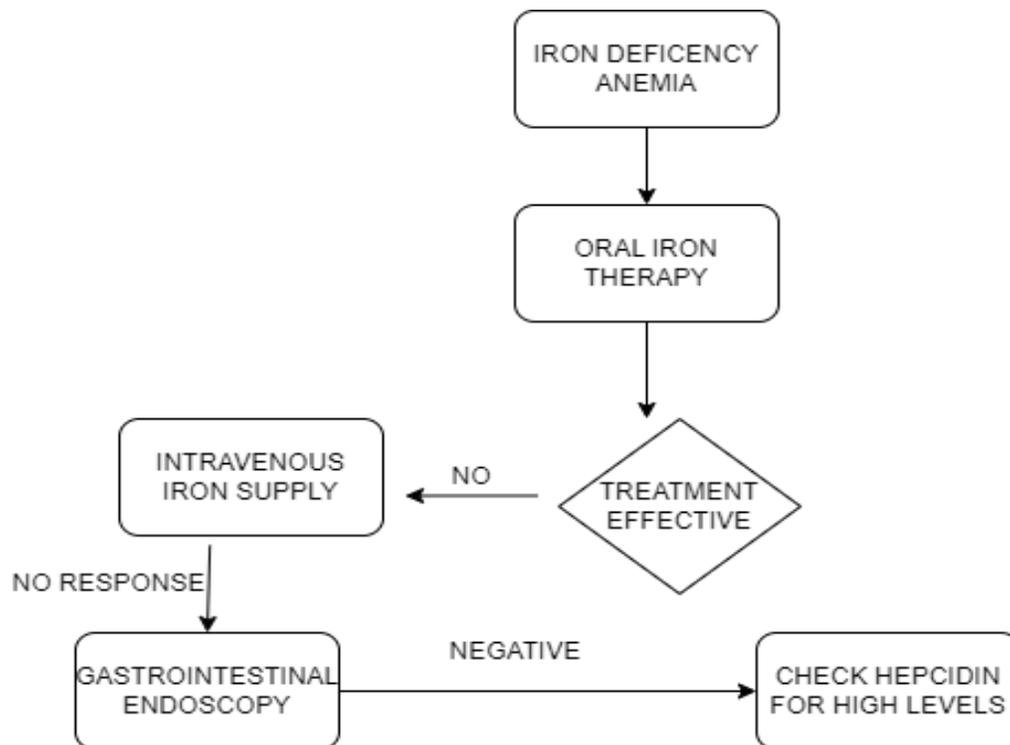


Fig. 2: Current Iron therapy

4.5 Related scholarly work in therapeutic advances, current trials of hepcidin in treated disorders in iron homeostasis

Table 3: Therapeutic advances in clinical trials in iron homeostasis disorders

SL.NO	Research Area	Outcomes and Findings	References
1	Inflammation impact on ferritin, hepcidin, in the management of iron deficiency anaemia in chronic renal failure.	Iron absorption in macrophages, a shortening in erythrocyte half-life, and cytokine-mediated malfunction of erythropoietin and erythroid progenitor cell development are all results of altered iron metabolism in macrophages in inflammatory anaemia. A reduction in iron content and a rise in the acute phase reactants ferritin and hepcidin are characteristics of inflammatory anemia. Effective treatments for inflammatory anaemia include managing the underlying condition, iron therapy, erythropoietin-stimulating agents, and blood transfusion in severe anemia cases. The paper highlights the significance of new therapy alternatives, such as hepcidin activity modulators or prolyl hydroxylase (hypoxia-inducible factor) inhibitors, and their usage in further clinical studies and the application of the latest treatment options.	L.Lanser et al. [2021] [18]
2	The latest drugs that can counterattack hepcidin's impact on iron homeostasis and treat the underlying disease that causes inflammatory anemia with iron therapy and erythropoiesis-stimulating agents	Anemia of inflammation (AI), commonly referred to as anaemia of chronic disease, is the most prevalent anaemia in hospitalised and chronically ill patients. Inflammation causes cytokines (like interleukin-6) to enhance the production of hepcidin, which therefore inhibits intestinal iron absorption and causes iron to be retained in reticuloendothelial cells and reduced red cell half-life. In addition to treating the underlying condition that causes inflammatory anaemia with iron therapy and erythropoiesis-stimulating medications, the study emphasises the importance of developing new drugs that can block hepcidin's effects, which include the redistribution of intestinal iron absorption and iron retention in reticuloendothelial cells. It was challenging to diagnose concurrent iron deficiency in the trial due to the fact that usual low iron deficiency and high ferritin also supported AI.	Weiss et al. [2019] [4]
3	Hepcidin's role in inflammation and neuronal iron overload	Recently, the role of hepcidin in neuronal iron overload and inflammation has been explained. Iron overload and inflammation often lead to neurodegeneration. Hepcidin crosses the blood-brain barrier, and when neurons are stimulated by a high dose of an inflammatory cytokine, the result is an increase in hepcidin levels, which causes the efflux of iron from the plasma to the brain, causing nerve cell damage. In addition, the manipulative function of hepcidin to restore neuronal degeneration and damage has been used in recent studies in animal models and cell cultures. Understanding hepcidin's dual role in iron overload and inflammation in brain cells will help open a new door to the treatment of neuronal damage in neurodegenerative diseases. Driton Vela [2018] found in his observational studies that the suppression of hepcidin occurs in inflammation, which leads to the flow of iron into the	Driton Vela et al. [2018] [19]

		brain, causing damage to neurons. Pre-treatment with hepcidin prevents brain neuronal iron overload in and protects cells against oxidative stress and inflammation-induced biochemical changes in neurons. However, the therapeutic significance of hepcidin pre-treatment in neurodegenerative diseases has not been thoroughly studied. Based on the importance of hepcidin in brain physiology, future studies of hepcidin in Alzheimer's and Parkinson's disease are warranted.	
4	Role of hepcidin and erythroferrone in the Pathogenesis of Beta Thalassemia and its key development of new strategies in its treatment	Iron overload (hemochromatosis) is common in patients with transfusion-dependent thalassemia major because of ineffective erythropoiesis and multiple transfusions. Tsz Yuen Au et al. [2022] summarized current clinical trials and research on the clinical implications of HAMP gene single nucleotide polymorphisms and new treatments for thalassemia and the role of hepcidin and erythroferrone. The review suggested the importance of including serum hepcidin and erythroferrone as prognostic tools for the early detection of hemochromatosis in beta-thalassemia because low hepcidin and high erythroferrone are important in the early diagnosis of iron overload. Mini hepcidins (hepcidin-like compounds) can restore iron in thalassemia, e.g.: LJPC-401, PTG-300, etc., it prevents the expression of Tmprss6, or erythroferrone, which is effective in restoring in preliminary. studies iron homeostasis. In addition, research shows that the use of astragalus polysaccharide and icariin has recently been recognized as an inducer of hepcidin expression. The article sheds light on studying iron metabolism regulators and gene polymorphisms affecting iron homeostasis in the treatment of iron overload and beta-thalassemia.	T Y Au et al. [2022] [20]
5	Hepcidin's role in advanced treatment of thalassemia	Gene therapy and erythropoiesis regulation are two important advancements in thalassemia treatment that are currently in rapid development. Hepcidin levels are markedly decreased in thalassemia, and hepcidin therapeutic correction has a positive effect on erythropoiesis and iron metabolism. Synthetic hepcidin and hepcidin mimetic created for the clinical trial phase did not have an acceptable efficacy/safety profile, according to Filomena Long et al. [2022]. According to the paper, the best course of action is to specifically target erythroferrone, the major factor preventing hepcidin expression. Altering Tmprss6, Tfr1, Tfr2, or ferroportin, a hepcidin target, are other strategies to enhance hepcidin function.	Filomena Long et al. [2022] [21]
6	Managing iron overload in Beta thalassemia patients	In this clinical case review, they focused on their experience treating such patients and addressed certain issues related to the management of iron overload in patients with beta-thalassemia syndrome. In a case series study, the pathophysiology of hemochromatosis and several techniques to assess, measure, and monitor it were looked at.. They also discussed chelation techniques that can be used with	V.M Pinto et al. [2020] [22]

		currently available chelating agents. They balanced the need to maintain minimal (zero) non-transferrin-bound iron levels 24 hours/7 days a week with the risk of over-chelation. The onset of endocrinopathy, osteoporosis, cirrhosis, renal failure, and malignant changes is linked to long-term exposure to iron toxicity. The study highlights that chelation therapy's main objective is to prevent 24 hour exposure to toxic iron and to keep the body's iron levels within normal ranges, preventing any chelation-related damage. The article states that secondary hepcidin suppression and increased intestinal absorption result in the primary portal and subsequent hepatocyte iron load and relatively lower serum ferritin levels compared to transfused patients. However, the study emphasized the importance of chelation therapy rather than therapeutic hepcidin reconstitution in the managing iron overload. In relation to chelation therapy in thalassemia patients, studies on regulating iron homeostasis by hepcidin rearrangement are necessary.	
7	Auranofin may increase hepcidin expression, reduces systemic iron overload and induce ferroptosis.	Lei Yang et al. [2020] identified iron modulators by functionally screening hepcidin agonists using a library of 60 FDA-approved drugs in human liver Huh7 cells. They also confirmed the results in C57BL/6J mice and a mouse model of hemochromatosis (Hfe ^{-/-} mice). The results of research recommended that the rheumatoid arthritis medication auranofin (AUR) may increase hepcidin expression. AUR at high doses (25mg/kg) produces ferroptosis and causes lipid peroxidation by decreasing the activity of thioredoxin reductase (TXNRD). The study provides evidence that thioredoxin reductase is a significant regulator of ferroptosis and that the drug auranofin is a novel hepcidin activator, suggesting a promising strategy to the treatment of hemochromatosis and hepcidin-deficient diseases.	Lei Yang et al [2020] [23]
8	Potential of dapagliflozin (a drug used to treat type 2 diabetes) in suppressing hepcidin and increased erythropoiesis	Husam Ghanim et al. [2022] investigated the potential of dapagliflozin (a drug used to treat type II diabetes) in a prospective, randomized, placebo-controlled trial. Type II diabetes is a pro-inflammatory condition in which hepcidin levels are increased because of inflammation, which inhibits erythropoiesis. They included 52 obese patients with type 2 diabetes who were randomized (1:1) to receive dapagliflozin (10 mg/day) or a placebo for 12 weeks. After dapagliflozin treatment, HbA1c significantly decreased, and concentration of hemoglobin and hematocrit significantly increased. Dapagliflozin treatment significantly decreased circulating hepcidin and ferritin concentrations, while the hepcidin inhibitor erythroferrone significantly increased plasma transferrin level and transient erythropoietin concentration. Transferrin receptors 1 and 2 in mononuclear cells were increased by a hypoxia-induced reduction in factor-1 α expression in mononuclear cells (MNC), while it increased the expression of its inhibitor, prolyl hydroxylase-2.	Husham Ghanim et al. [2022] [24]

		<p>MNCs harvested from lymphocyte media, and the expression of iron regulatory mediators was measured in MNCs by RT-PCR. HbA1c, and iron studies complete blood count, were calculated by established clinical tests and determination of hepcidin, erythroferrone, and ferritin by ELISA. They were not important. Changes in these indices in the placebo group. In summary, the study found a small but significant increase in hematocrit after treatment with dapagliflozin. Plasma hepcidin concentration was significantly decreased, and plasma transferrin concentration and transferrin receptor expression were increased. The significant reduction of hepcidin causes increased uptake of iron, resulting in increased erythropoiesis followed by increased hematocrit.</p>	
9	Hepcidin, Iron and death in patients with acute renal failure	<p>The study looked at the results of the Acute Renal Failure Research Network trial, which assessed the association of plasma catalytic iron, transferrin, ferritin, hepcidin, free hemoglobin, and total iron with 60-day mortality. Patients who are critically ill with acute kidney disease were included in the study. Of the 807 patients enrolled in the study, 51% (409) died before the 60th day. Both lower levels of hepcidin and higher levels of plasma catalytic iron were substantially related with an increased risk of mortality. The risk of death was 4.06 times higher for patients with catalytic iron levels in the highest quartile compared to the lowest quintile, and 3.87 times higher for patients with hepcidin levels in the lowest quintile compared to the highest quintile. The study's findings were consistent, and while other iron markers were also connected to mortality, catalytic iron and hepcidin had the strongest links. Patients requiring renal replacement therapy because of kidney illness are independently related to higher plasma levels of catalytic iron and lower levels of hepcidin. The study results suggest that hepcidin and catalytic iron can serve as effective prognostic indicators for patients with acute kidney injury and suggest that further studies needed to determine hepcidin and catalytic iron administration strategies that possibly useful in patients with renal failure.</p>	DE Leaf et al. [2019] [25]
10	Hepcidin a key regulator of iron homeostasis	<p>Recent evidence has shown that mutations in the human hemochromatosis gene (HFE) cause hepcidin deficiency, which leads to iron overload and contributes to hemochromatosis. Figuring out the mechanism of hepcidin and its pathological components in blood and iron disorders may lead to new therapeutic advances. Hepatic bactericidal protein (Hepcidin) is an iron-regulating hormone designed primarily for iron homeostasis. It is a cysteine-rich small cationic peptide produced by liver cells. Hepcidin has recently been extracted from human urine and plasma by ultrafiltration. The hepcidin antimicrobial peptide (HAMP) gene, also known as HFE, for high iron Fe, human hepcidin is</p>	Saneela s et al. [2019] [26]

		located on chromosome 19q13,2637 base pairs long, consisting of two introns and three exons. The HAMP 19q13 gene is expressed in several locations, including the brain, liver, spinal cord, lung, heart, skeletal muscle, intestine, stomach, pancreas, testes, adipocytes, and macrophages. The post-translational process of hepcidin is mediated by the liver prohormone-converted furin. Hepcidin is initially produced as a larger precursor protein that undergoes two cleavages and is quickly secreted from the cell. Using the chemical inhibitor decanoyl-Arg-Val-Lys-Arg-chloromethyl ketone (dec-RVKR-cmk) to block furin protein convertase or block furin synthesis with small interfering ribonucleic acid (siRNA) results in the inhibition of the second cleavage of hepcidin precursor. However, its release from the cell is not blocked, which means that furin is the main enzyme involved in the maturation of hepcidin.	
11	Effect of treating iron deficiency diagnosed by hepcidin quantification on outcomes after a longer period of intensive care compared with conventional care	A controlled, single-blind, multicenter trial were conducted in seriously ill patients discharged from the ICU who were admitted for over 5 days awaiting intervention with either a hepcidin treatment protocol or a control. Hepcidin levels were evaluated to determine whether hepcidin levels provide an accurate guide to the management of iron deficiency in critically anemic patients after prolonged intensive care. Out Of the 399 analyzed patients, 220 (55%) had iron deficiency at discharge, with a hepcidin level of <41 µg/l. The prolonged stay was not reduced but significantly reduced 90-day mortality and improved 1-year survival in critically ill patients discharged home after a long stay. Patients were treated with intravenous iron (1 g ferric carboxymaltose) when hepcidin was < 20 µg/l and with intravenous iron and erythropoietin when hepcidin ≤20 and <41 µg/l.	Lasocki S et al. [2021] [27]
12	The renal hepcidin/ferroportin axis controls iron absorption and determines the extent of renal and systemic iron overload.	A new mice model with an inducible renal tubule-specific fpnC326Y knock-in encoding a hepcidin-resistant ferroportin called FPNC326Y. Under conditions of normal iron availability, female mice carrying this allele had a persistent decrease in renal iron content, but a transient increase in the systemic iron index. Under circumstances of excess iron availability, male and female mice carrying this allele had milder renal iron overload but greater systemic iron overload compared with controls. Despite comparable systemic iron overload, renal iron overload developed in wild-type mice fed an iron-rich diet, but not in hemochromatosis mice with a systemic fpnC326Y knock-out. The research demonstrates that, under physiological circumstances, endogenous hepcidin regulates ferroportin-mediated tubular iron absorption. It also demonstrates how crucial such regulation is for maintaining renal and systemic iron homeostasis in cases of iron overload.	Mohamad, G et al. [2021] [28]
13	Hepatic heparan sulfate is a master regulator of hepcidin expression	Hepcidin expression is regulated by the bone morphogenetic protein (BMP6)/SMAD1/5/8 pathway and the pro-inflammatory cytokine	M Pauli et al. [2019] [29]

		interleukin 6 (IL6). Heparin found to suppress hepcidin expression and BMP6 activity in the liver, and modulation of endogenous heparan sulfates alters hepcidin and thus iron homeostasis. Enzymatic removal of the heparan sulfate-protein interaction with sodium chlorate or surfen reduces hepcidin expression. The study also shows that inactivation of the biosynthetic genes N-deacetylase and N-sulfotransferase 1 in mouse hepatocytes reduces the expression of hepatic hepcidin, leading to iron accumulation in the liver and serum of mice. Heparan sulfate manipulation inhibits IL-6 and IL-6-dependent iron redistribution and stimulates iron redistribution. Therefore, the study showed that inactivation or manipulation of heparan sulfate results in hepcidin-dependent iron homeostasis regulation.	
14	Polychlorinated biphenylquinone induces hepatocyte iron overload by upregulating hepcidin expression	polychlorinated biphenyls (PCBs), an industrial by-product, have adverse impact on human health, especially the liver. A surrogate for PCB-induced lipid peroxidation and iron overload (PCB29-Qp) studied in vivo and in vitro and found that iron overload resulting from reactive oxygen species (ROS)-hepcidin disruption in hepatocytes and hepcidin elevation is regulated by nuclear factor erythroid. 2-related factor 2 (Nrf2), which binds directly to the hepcidin promoter to promote hepcidin transcription.	J Liu et al. [2020] [30]
15	Better treatment of anemia of chronic disorders (anemia of inflammation)	Before starting the treatment of anemia, it is important to make a thorough diagnosis of the root cause of anemia and prescribe a specific treatment, along with the old practice of treating anemia using iron, folate, and vitamin B12 supplements. According to Michali et al. [2020] concluded that besides traditional anemia treatment, including dietary supplements, the administration of drugs targeting specific proteins, including hepcidin, should be considered in the treatment of anemia of chronic disease. The article highlights the prophylactic administration of heparin to cancer patients significantly reduces hepcidin levels in the blood because bone morphogenetic protein 6 (BMP6) binds to heparin. The study also found a reduction in hepcidin levels in rheumatoid arthritis patients who received anti- α tumour necrosis factor antibodies and in lung cancer patients who received anti-interleukin-6 antibodies. The article found that recent therapies such as HIF-2 α stabilizers and prolyl hydroxylase (PHD) enzyme inhibitors such as roxadustat, molidustat, vadadustat, and desidustat, which stabilize hypoxia-inducible factor (HIF), resulting in positive erythropoiesis are in the late phase of clinical trials.	Michali et al. [2020] [5]
16	Hepcidin, ferritin, and the treatment of iron deficiency anaemia in chronic kidney disease are all impacted by inflammation.	Iron deficiency is common in chronic kidney disease. Inflammation in CKD increases the acute phase reactants ferritin and hepcidin independently of iron status, leading to iron deficiency. Intravenous iron therapy is more effective than oral iron therapy in CKD patients compared to non-CKD patients.	N Ueda et al. [2018] [31]

		<p>However, inflammation lowers the predictive value of ferritin and hepcidin for iron content and response to iron therapy. The review article suggests that treatment of iron deficiency should be different in patients with CKD compared to patients without inflammation because ferritin levels are low in iron deficiency anemia without inflammation compared to iron deficiency in CKD. Thus, they suggest that further studies needed to assess the effect of inflammation on ferritin and hepcidin and the therapeutic strategy of IDA in CKD.</p>	
17	<p>Hepatic hepcidin regulates intestinal HIF-2α in iron deficiency, anemia, and iron overload</p>	<p>The most frequent diseases worldwide are iron related diseases. Systemic iron homeostasis depends on hepcidin, a hormone produced by the liver that regulates iron mobilisation through its molecular target ferroportin (FPN), the sole known mammalian iron exporter. Diseases that result in iron excess disrupt this pathway. Intestine HIF-2α (hypoxia-inducible factor) plays a crucial role in local absorption in both systemic iron deficit and iron overload. According to data, intestinal HIF-2α is controlled by hepatic hepcidin under conditions of iron overload, anaemia, and deficiency. The results of the study showed that FPN controls the activity of intestinal prolyl hydroxylase domain enzymes that depend on iron to control cell-independent iron efflux to stabilise and activate HIF-2α (in phase II clinical trials for clear-cell renal cell carcinoma) In a mouse model, HIF-2α successfully eased iron overload. These findings show a molecular link between hepatic hepcidin and intestinal HIF-2α, which regulates physiological iron absorption and causes iron overabsorption during iron overload, and the study results show that inducible deletion of hepatic hepcidin leads to intestinal HIF-2α activation and rapid iron accumulation.</p>	<p>Andrew J. Schwartz et al. [2019] [32]</p>
18	<p>Hepcidin ferroportin in health and disease</p>	<p>Transcription factors known as hypoxia-inducible factors (HIFs) regulate physiological responses to hypoxia. HIFs bind hypoxia response elements to regulate genes central to erythropoiesis (e.g., Epo), angiogenesis, and metabolism. HIFs are degraded in the proteasome because of HIF hydroxylation by prolyl hydroxylases under normoxic conditions. Prolyl hydroxylase activity requires iron, and inactivating mutations of prolyl hydroxylases increase HIF and stimulate erythrocytosis, bypassing inflammation-related increases in hepcidin and resulting in suppression of hepcidin. Normally, a hypoxic environment and increased HIF2α in the small intestine caused iron absorption on the apical side of enterocytes and iron absorption on the basolateral side, and iron limitation increases sensitivity to hypoxia. Polycythemia vera: the most common JAK2 driver mutation is JAK2 V617F, leading to constitutive Epo-independent JAK-STAT signaling and upregulation of genes downstream of the JAK-STAT pathway. Most patients with polycythemia vera shows iron deficiency at</p>	<p>Y Z Ginzburg. et al. [2019] [33]</p>

		diagnosis, even before starting therapeutic phlebotomy, the mainstay of therapy, and repeated phlebotomies, often worse iron deficiency.	
19	New insights into the relationship between hypoxia and iron homeostasis	Recently, the importance of the hepcidin-ferroportin axis in the modulation of intestinal HIF-2 in regulating iron absorption are emphasized. Recent advances also show that erythroiderone directly titrates bone morphogenetic proteins, contributing to hepatic hepcidin suppression and increasing iron availability. Hypoxia signaling links erythropoiesis to iron homeostasis. Using drugs that stabilize or inhibit HIF is a promising therapy for iron-related diseases.	Renassia, C et al. [2019] [34]
20	Treatment options for patients with secondary iron overload	Iron overload disorders represent a range of medical conditions that cause an increase in the body's iron stores and subsequent organ damage. Increased ferritin and transferrin iron saturation can usually be seen when evaluating for elevated liver enzymes. Confirmatory homeostatic iron regulator (HFE) genetic testing for C282Y and H63D, the most common mutations in hereditary hemochromatosis, should be pursued in the evaluation of hyperferritinemia. If necessary, magnetic resonance imaging should be used with a quantitative evaluation of iron content or liver biopsy (especially if the cause of the iron overload is liver disease). If the HFE gene test is negative for homozygous C282Y or C282Y/H63D heterozygous mutations, a secondary cause of iron overload should be considered. Hematologic disease, iatrogenic reasons, or chronic liver disease are among the differential diagnoses for secondary iron overload. Thalassemia syndromes, myelodysplastic syndrome, myelofibrosis, sideroblastic anemias, sickle cell anaemia, or pyruvate kinase deficiency are examples of common hematologic illnesses. Evaluation of the causes of hyperferritinemia should begin once iron overload has been ruled out. Chronic liver illness, cancer, infections, renal failure, and rheumatic diseases such as adult-onset Still's disease or hemophagocytic lymphohistiocytosis are among the factors that can lead to hyperferritinemia. In this review, they discussed the diagnostic procedures for people who may have hereditary hemochromatosis, the assessment of patients whose serum ferritin levels are elevated, the characteristics of secondary overload, and the therapy choices for people who have secondary iron overload.. In patients with elevated iron tests but negative for HFE genes C282Y or H63D, evaluation for CLD is warranted, and hematologic disorders such as thalassemia or MDS should be considered for anemia.	Christine C. Hsu et al. [2022] [7]

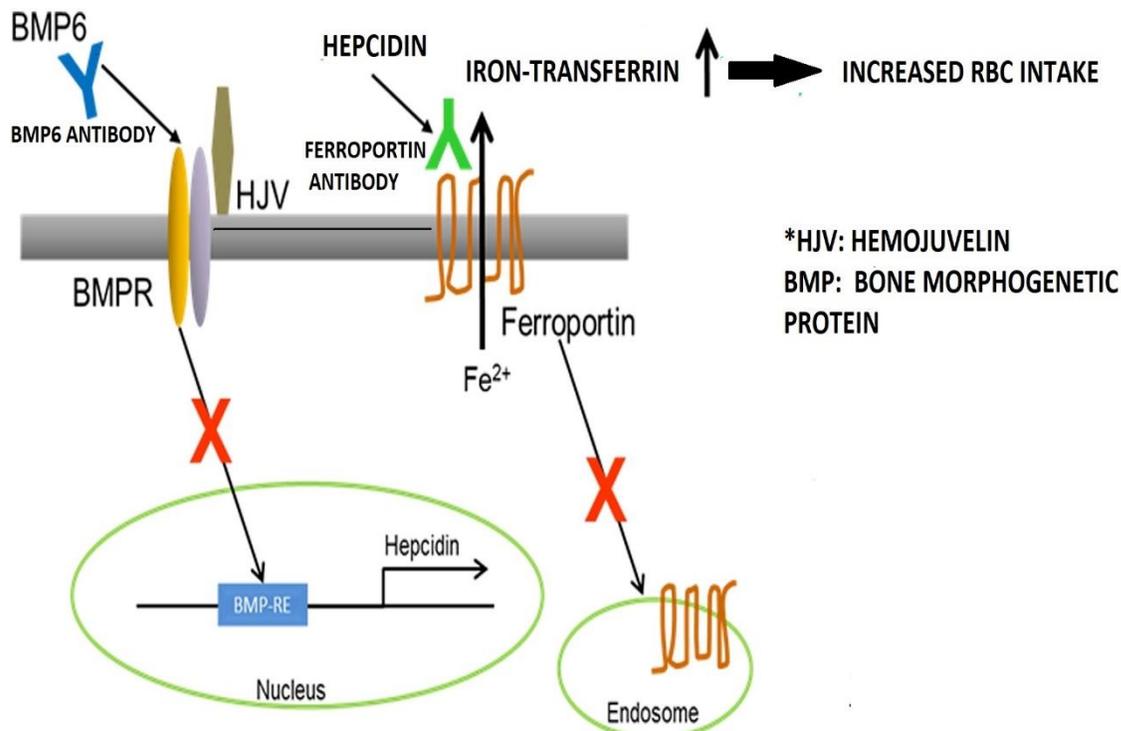


Fig 3: Monoclonal antibody therapy in the regulation of hepcidin ferroportin axis

Sheetz M et al. [2019] study shed light on the use of monoclonal antibodies as a new therapy for CKD anemia. The ferroportin antibody prevents the interaction of hepcidin with its receptor, thus reducing the internalization of ferroportin. BMP antibody prevents binding of the BMP6 to its receptor, reducing hepcidin mRNA transcription and hepcidin expression. Monoclonal antibodies LY3113593 and LY2928057 directed against BMP6 and ferroportin tested to investigate alternative therapies for erythropoietic-stimulants for individuals with chronic kidney dysfunction. Results include LY2928057 bound ferroportin and blocked interactions with hepcidin, allowing iron efflux, which increases serum iron, transferrin saturation levels and increases hepcidin levels in monkeys and humans. Whereas LY3113593 specifically blocked BMP6 binding to its receptor and increased iron and transferrin saturation and hepcidin pre-clinically and clinically. LY3113593 increased hemoglobin and decreased ferritin in CKD patients [35].

A review by Hawula et al [2019] explores the role of hepcidin and ferroportin agonists and antagonists in the induction and promotion of these proteins that regulate iron homeostasis. The hepcidin/ferroportin axis controls the regulation of systemic iron homeostasis, and multiple stimuli affect the axis. Factors such as plasma iron, inflammation, and erythropoietic demand. Long-term cytokine-dependent inflammation and genetic defects lead to dysregulation of the hepcidin/iron axis, leading to hemochromatosis and anemia. Currently, there are limited therapeutic options to control iron levels by regulating the hepcidin/ferroportin axis. The study examines the therapeutic use of hepcidin/ferroportin inducers and inhibitors in the regulation of the hepcidin/ferroportin axis and the treatment of hemochromatosis and iron deficiency anemia. [36].

Current Therapeutic Treatments for Hepcidin Deficiency

- Weekly phlebotomy
- Iron chelators, including deferoxamine, deferi-prone

Current Therapeutic Treatments for Lowering Hepcidin

Direct Hepcidin inhibitors

- Anti-Hepcidin antibodies
- Short Interfering and Short Hairpin RNA
- Hepcidin-Binding molecules
- Hepcidin binding L RNA aptamers

Inhibitors of hepcidin production and synthesis

- Heparin-based targeting of the BMP/SMAD pathway
- Bone morphogenetic protein receptor (BMPR) inhibitors
- Hemojuvelin (HJV) and transferrin receptor 2 (TRF2) inhibitors
- Interleukin 6 targeting antibody

- AMP-activated protein kinase (AMPK)
- Hypoxia-Inducible Factors (HIF) Stabilisers

Current Therapy for increasing Heparidin

- Mini hepcidins
- Heparidin Analogues
- Small molecule hepcidin analogues

Current therapeutics targeting ferroportin

- Ferroportin agonists (Fursultiamine-a thiamine derivative)
- Some drugs are in clinical trials and the emergence of these drugs may overcome the current limitations in the treatment of iron homeostasis.

Alessia Pagani et al. [2019] described hepcidin manipulations may be useful in all iron deficiency anemia, inflammatory anemia, and iron overload disorders. Compounds that antagonize hepcidin or its effects may be useful in inflammation and refractory iron deficiency anemia, while hepcidin agonists may improve ineffective erythropoiesis. In animal studies, restoring inefficient erythropoiesis decreases hepcidin inhibition, which improves iron homeostasis and anaemia. There are now certain focused strategies under clinical trials, which may result in new anaemia treatments. [37].

Table 4: Compounds that upregulate and downregulate hepcidin and ferroportin

Compounds that lowers hepcidin or enhance ferroportin function		
Class I	Reduction of the signaling pathway stimulating hepcidin	Anti IL6-R, anti-IL-6 monoclonal antibody, BMPR inhibitors, Anti-HJV monoclonal antibody
Class II	Heparidin binders	Non-anticoagulant heparins Anti-HAMP monoclonal antibody
Class III	Interfering with hepcidin-FPN interaction	Oligonucleotides aptamers Anti-FPN Moab, GDP
Compounds that increase hepcidin or decrease ferroportin function		
Class I	Heparidin mimics	Heparidin analogues
Class II	Activating hepcidin Blocking the hepcidin inhibitor Blocking the hepcidin receptor	Mini hepcidin, BMPs Anti-TMPRSS6, FPN Inhibitors
Class III	Others	Human transferrin infusions, Protoporphyrin IX (inhibition of heme oxygenase) Bone marrow TFR2 inactivation

4.6 Related scholarly work in the diagnostic and prognostic role of hepcidin in iron homeostasis disorders

Table 5: Diagnostic and prognostic role of hepcidin

SL.NO	Research Area	Outcomes and Findings	References
1	Oxidative stress and hepcidin expression in sickle cell anemia in children with iron overload	Patients with sickle cell disease who receive regular blood transfusions develop oxidative stress and iron hemochromatosis (iron overload). Eman A Elbostany et al. [2021] at the Egyptian National Research Centre investigates the relationship between oxidative stress, iron profile, hepcidin mRNA gene expression, iron overload and gene expression in sickle cell disease patients. 90 children, were divided into two groups (45 each). groups 1 (serum ferritin<938 ng/ml) and group 2 Serum	Eman A Elbostany et al. [2021] [38]

		ferritin ≥ 938 ng/ml). 55 children took part as a control group. Malondialdehyde (MDA) and nitrite (to measure oxidative stress), s. iron, s. total iron-binding capacity (sTIBC), transferrin saturation percentage, ferritin, hepcidin, and hepcidin mRNA gene expression. The gene expression of hepcidin and s. hepcidin was significantly lower in the two patient groups than in the controls. TIBC, iron, ferritin, percent transferrin saturation, ferritin/hepcidin ratio, and MDA levels were higher in SCD patients than in controls. The study also showed that group 1 had a higher mean ratio of ferritin/hepcidin and MDA than group 2. Based on the research relationship of hepcidin, hepcidin gene expression and MDA can be used as biomarkers of oxidative stress and iron overload in patients with SCD.	
2	Role of serum hepcidin and reticulocyte hemoglobin concentration in predicting anemia in patients with ulcerative colitis.	A study by Amr Mohamed et al at Tanta University. [2022] had to evaluate the role of serum hepcidin and reticulocyte hemoglobin (CHr) concentration in anemia in patients with ulcerative colitis (UC). The study conducted on 80 UC patients and 30 healthy controls. 80 patients were divided into group I: 50 UC anemic patients and group II:30 non-anemic patients. CHr demonstrated a statistically highly significant reduction in anemic UC patients than in the other two groups. They observed a substantial negative correlation between CHr, serum hepcidin, and serum ferritin, and a positive correlation of hepcidin between CHr, hemoglobin level, MCV, ferritin, and transferrin. The study concluded that serum hepcidin had an excellent performance in predicting anemia of chronic disease and CHr for iron deficiency anemia of CHR and anemia of chronic disease.	Amr Mohamed et al. [2022] [39]
3	Urinary hepcidin concentration in the assessment of iron homeostasis in children	They conducted the study with 75 children with iron deficiency and 25 healthy control children. Receiver operating curve analysis assessed the diagnostic performance of urinary hepcidin. A diagnostic cut point with a high predictive value for iron deficiency was selected. Hepcidin levels were considerably lower compared to the control group at all stages of iron insufficiency. They confirmed significant positive correlations between urinary hepcidin levels and hemoglobin, mean tissue volume, serum iron, ferritin, and transferrin saturation. The study revealed that hepcidin levels were significantly lower in all phases of iron deficiency than in the control group. Urine hepcidin analysis offers a reliable non-invasive screening method for the diagnosis of iron deficiency in children.	Sonia G et al. [2019] [40]
4	Evaluation of serum hepcidin levels and iron content in anemic patients admitted to the intensive care unit	A prospective study was conducted on 80 patients admitted to the intensive care unit of Zagazig University Hospital to improve the prognosis of anemia in critically ill patients by evaluating serum hepcidin and iron levels in critically ill anemic patients to determine the association between hepcidin levels and outcomes in critically anemic patients. Significantly elevated serum hepcidin and	MM Yousif et al. [2022] [41]

		ferritin levels seen in critically ill anemic patients in the MICU. Serum hepcidin and ferritin levels are markedly elevated in critically anemic patients characterized by disease-induced inflammatory stress. The study showed that serum hepcidin levels, measured at the time of admission to the medical intensive care unit, did not affect the short-term outcome of the intensive care unit in terms of mortality or length of hospital stay.	
5	Hepcidin as a biomarker in the differentiation between iron deficiency anaemia and anaemia of chronic disease	Serum iron, total iron-binding capacity, transferrin saturation, serum ferritin, haemoglobin, and erythrocyte indices such as cellular haemoglobin (MCH), mean cellular haemoglobin concentration (MCHC), mean cell volume (MCV), and erythrocyte distribution width are typically assessed in the laboratory in diagnosing iron deficiency anaemia (IDA) and anaemia of chronic disease (ACD) (RDW). These measures have some limitations in differentiating iron deficiency anaemia from anaemia caused by chronic diseases, according to several studies. RBC indices, which play minimal role in distinguishing IDA from ACD because these illnesses occasionally exhibit identical alterations in the RBC indices, are the mainstay of anaemia diagnosis. Here, it is necessary to consider the significance of hepcidin in the distinction between anaemia caused by chronic illness and iron deficiency anaemia.	Ephraim Chikwanda [2018] [42]
6	Threshold levels of ferritin and hepcidin show an early iron deficiency in young women due to increased iron absorption	The study aimed to determine the concentration of ferritin at which the body regulates the absorption of iron from food, and they interpreted that the physiological increase in iron absorption, the threshold of ferritin, is 50mg/L, which corresponds to the threshold hepcidin <3 nmol/l shows an incipient iron deficiency in young women. In addition, the study results include a linear increase in hepcidin, as ferritin increases throughout almost the entire range of ferritin values in healthy women without inflammation.	Valeria Galetti [2021] [43]
7	Hepcidin and iron deficiency in women one year after sleeve gastrectomy	The aim of the study was to investigate the effect of weight loss on the rescue of iron balance in patients who underwent sleeve gastrectomy (SG), which preserves the duodenum, the primary site of iron absorption. The cohort included 88 obese women; blood samples and duodenal biopsies collected from 35 patients before and one year after SG. Analysis of 35 patients included assessment of iron homeostasis, including hepcidin, expression of markers of erythroid iron deficiency (soluble transferrin receptor (sTfR) and erythrocyte protoporphyrin (PPIX)), duodenal iron transporters (DMT1 and ferroportin), and inflammatory markers. After surgery, sTfR and PPIX decreased. Serum hepcidin levels increased despite a significant reduction in inflammation (levels of the inflammatory markers AGP and IL-6 significantly decreased after surgery). DMT1 abundance is negatively correlated with higher serum hepcidin levels. Ferroportin numbers have not changed. This study provided fresh insight	Thibaud Lefebvre [2021] [44]

		into the ineffective iron recovery routes following SG, which include hepcidin's beneficial regulation of iron homeostasis, inflammatory inhibition, improved iron absorption, iron supply and erythropoiesis efficiency. In order to evaluate iron status, these new characteristics should be taken into account when making recommendations for iron supplements in patients after SG.	
8	Relation between obesity and iron deficiency anemia and the role of hepcidin	Iron deficiency is common in obese children, although the underlying mechanism is unclear. The study investigated the relationships between iron parameters, leptin, adiponectin, and hepcidin levels in obese children. Complete blood count, serum iron content, iron-binding capacity, ferritin level, leptin, hepcidin, and adiponectin concentrations studied in 237 children aged 5-18 years, of which 180 were with primary obesity and 57 healthy children and adolescents. White blood cells, platelets, binding of iron, high-sensitivity C-reactive protein, leptin, and hepcidin levels were all higher in the obese group than they were in the control group. However, the study concluded that hepcidin levels do not cause iron deficiency anemia in obese children. In addition, they recommended larger studies to clarify the relationship between iron and hepcidin in obese children compared with non-obese children.	E Sal [2018] [45]
9	Acute inflammation and iron deficiency anaemia have opposing effects on serum hepcidin and iron absorption in young women.	Their study involved a 45-day prospective follow-up of young women aged 18-49 years with and without iron deficiency anemia and compared iron and inflammatory markers, serum hepcidin, and erythrocyte iron incorporation from a ⁵⁷ Fe-labeled test meal, before and after 8, 2, and 36 hours after influenza. After DPT vaccination as an acute inflammatory stimulus. Iron studies and hemoglobin erythropoietin levels measured. C-reactive protein and alpha-1-acid glycoprotein were used to determine the degree of inflammation. In women with IDA, mild acute inflammation did not increase blood hepcidin levels, indicating that low iron levels and limited erythropoietic activity offset the inflammatory triggers that cause hepcidin expression. It is possible that iron-recycling macrophages are more sensitive than enterocytes to high serum hepcidin levels during inflammation because inflammation increased serum hepcidin levels and led to mild hypoferrremia in non-anemic women but did not affect dietary iron absorption.	Nicole U. [2019] [46]
10	Association of serum erythropoietin, hepcidin and haptoglobin levels with disease severity and other biochemical values in patients with COVID-19 infection	Studies have shown that covid infection affects iron metabolism. The study was conducted in Sisli Hamidiye Etfal Research and Training Hospital in Turkey with 59 patients with covid infection, who were divided into groups with mild, severe, and critical severity of the disease, serum iron, and hepcidin levels decreased in COVID-19 patients along with erythropoietin. and haptoglobin levels were much lower in the patient groups who were critically ill and deceased.	Sema Yağcı [2021] [47]

11	Hepcidin as an early biomarker that predicts oral iron therapy in children	Tanya Singh et al. (2021) evaluated serum hepcidin levels in children aged 2–12 years with iron deficiency anemia. A prospective study was conducted to determine serum hepcidin levels on day 0 (pre-treatment) and days 1 and 14 of oral iron therapy to determine if there was a relationship between baseline or day 1 hepcidin levels and change in hemoglobin levels on day 14. A total of 64 children were recruited, excluding children with severe IDA (Hb<7 g/dl); suffering from fever/acute infectious disease; if they have taken oral iron in the last 3 months, or had a blood transfusion, or if they have oral iron intolerance. A complete blood count performed on day 0 to assess red blood cell indices, iron profile, serum ferritin, and serum hepcidin and was repeated on day 1 and day 14 The study found that baseline hepcidin on day 0 increased on day 1 and continued to increase on the 14th day. On day 14, a negative correlation (statistically insignificant) was observed between changes in hemoglobin and hepcidin. The study concluded that hepcidin appears to be a biomarker that predicts early response to oral iron therapy in children with IDA.	Tanya Singh et al [2021] [48]
12	Threshold levels of ferritin and hepcidin indicate an early iron deficiency in young women due to increased iron absorption	The goal of the study by Valeria Galet et al. [2021] was to determine the ferritin concentration at which the body regulates iron absorption from food. In addition, the study assumed that the threshold concentration of ferritin corresponds to the threshold concentration of hepcidin, where iron absorption increases. They performed a pooled analysis on healthy women aged 18-50 between 2006 and 2019 using an iron isotope. Iron absorption was measured by mass spectrometry of ELISA-labelled test meals containing physiological amounts of iron. Hepcidin and ferritin were analyzed by immunoassay. The result of the study suggests that, based on the physiological increase in absorption of iron, the threshold value of ferritin < 50 mg/l, which corresponds to the threshold value of hepcidin and <3 nmol/l shows a developing iron deficiency in women	Valeria Galet et al. [2021] [49]
13	Hepcidin as a biomarker	The clinical use of hepcidin as a biomarker is limited because of the lack of an appropriate diagnostic test. Recently, assays have been developed for the evaluation of serum and urinary hepcidin, which are likely to facilitate the use of hepcidin in research and institutional care soon. Current research into the mechanism of action and control mechanism of hepcidin has enabled new pathological associations and the development of new diagnostic tests and therapeutic options.	Arunava Kali et al. [2015] [50]
14	Hepcidin discriminates sepsis from other illness	The study was conducted on 16 adult patients admitted to the intensive care unit (ICU) within 2 hours of hospital admission. Hepcidin, heparin-binding protein (HBP), and standard biomarkers were measured in blood samples taken daily for seven days in a row. At inclusion, blood cultures were started. Daily clinical scores were evaluated, and death was noted at 28 and 180 days. Six patients did not meet the sepsis threshold, while 100 did.	Jon Olinder et al. [2022] [51]

		Septic patients had significantly higher hepcidin levels than non-septic patients. Hepcidin levels in septic individuals significantly dropped after two hours, then followed by a continuous decline. Hepcidin levels and SAPS 3 were found to be significantly inversely correlated in patients with sepsis. Hepcidin levels were considerably greater in septic patients with projected mortality and a 180-day survival rate at inclusion. Hepcidin levels in sepsis patients admitted to the critical care unit are shown in their data to have prognostic value for mortality..	
15	Hepcidin as a prognostic marker in prostate cancer	The results showed that high hepcidin expression levels and low ferroportin expression levels in pancreatic cancer tissues were significantly associated with poor prognosis in overall survival analysis. Thus, hepcidin and ferroportin expression may be new prognostic indicators of pancreatic cancer.	Toshiyamma et al. [2018] [52]

V. RESEARCH GAP :

Despite being the first country to introduce the National Nutritional Anemia Prophylaxis Programme in 1970, treatment of iron deficiency continues to be a major problem in India. Besides present treatment options, the knowledge of physicians on the role of hepcidin in the diagnosis and treatment of iron homeostasis are limited. Many of drugs, including hepcidin modulators, are in the phase of clinical trials only. Development of these drugs may overcome current limitations in the treatment of iron homeostasis

5.1 Research Gap 1

The diagnosis of concomitant iron deficiency was difficult, as anemia of inflammation is also supported by typical low iron deficiency and elevated ferritin. Gene polymorphism affecting iron homeostasis needs to be studied. However, the technique is complex and costly. Current options for diagnosing iron deficiency and iron overload are cheaper. Advanced iron metabolism regulators, and biomarkers, including evaluation of hepcidin, are complex and expensive compared to traditional methods, which makes their implementation difficult. Under normal conditions, serum ferritin is a sensitive marker of iron status, but ferritin is an acute-phase reactant that increased as a result of inflammation, making diagnosis difficult. Hepcidin has less predictive value when iron deficiency anemia with anemia of inflammation coexists.

5.2 Research Gap 2

Iron chelation therapy increases the cost and standard of life and lowers its quality, which is considered a challenge when choosing chelation therapy. The price of chelation therapy comprises not only the cost of the treatment itself but also the costs of symptom management, treatment, follow-up, complications, quality of life, compliance, and the consequences of non-compliance. The number of research needed to determine the risks and benefits of iron supplements for others with a genetic predisposition to iron overload is limited. More research is needed. Despite the availability of potentially affordable oral iron chelation therapy, many patients experience the side effects of iron overload and pass away each year as a result of inadequate or lack of iron chelation therapy.

5.3 Research Gap 3

The lack of an adequate diagnostic test restricts the clinical application of hepcidin as a biomarker. The therapeutic significance of hepcidin, hypoxia-inducible factors, ferroportin, erythroferrone, and gene polymorphisms (refractory anemia, thalassemia) needs to be studied. Many of the therapeutic advances are still in the phase of clinical trials only. More detailed research works only will help in the implication of advanced therapeutic options in treating iron homeostasis along with current treatment options.

VI. FINDINGS BASED ON THE REVIEW :

- (1) Currently, there are limitations in the treatment and early diagnosis of iron deficiency and iron overload.
- (2) The mechanism of hemochromatosis is because of impaired synthesis of hepcidin or impaired binding of hepcidin to ferroportin.
- (3) In pathophysiological conditions such as beta-thalassemia, myelodysplastic syndrome, inflammatory anemia, and hereditary hemochromatosis, the role of hepcidin is significant.
- (4) Therapeutic hepcidin management in iron overload is important, along with iron chelation therapies.
- (5) Hepcidin can be used as a prognostic marker in patients with acute kidney injury

- (6) The use of drugs that stabilize or inhibit hypoxia-inducible factors can be promising in the treatment of iron homeostasis disorders
- (7) Targeted pharmaceutical upregulation and downregulation of hepcidin will help in maintaining iron homeostasis.
- (8) Most of the therapeutic advances are still in the phase of clinical trials, hence more detailed studies need to be carried out before implementing the new therapeutic advances.
- (9) Hepcidin has an excellent role in predicting anemia.

VII. CONCLUSION :

This study analyzed the hepcidin's role in the management of iron homeostasis. Currently, there are limitations in the diagnosis and treatment of iron deficiency and iron overload. Understanding the role of hepcidin ferroportin, and hypoxia-inducible factors in iron homeostasis sheds light on advanced therapeutic options and the use of hepcidin as a diagnostic and prognostic biomarker. In this review paper, the importance of advanced clinical studies on various aspects of hepcidin that needs to be carried out in the diagnostic and therapeutic field is explained. The study highlighted various aspects of hepcidin tuning, understanding the mechanism of hepcidin and its pathological components, which may lead to advanced therapies and alternative therapies, and the importance of new therapeutic options, including modulation and inhibition of hepcidin activity, and its future use in clinical trials and introduction of the latest therapeutic options. However, more researches on a large number of subjects and clinical trials need to be carried out. Further education is needed for physicians, health professionals, and patients to understand the role of hepcidin and its diagnostic and therapeutic value, which may lead to new advances in the management of iron homeostasis.

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Analysis of relationship between employee mental health and their job satisfaction in public and private hospital of Karachi

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Abstract- Our objective of study is to determine effect of hospital sectors on job satisfaction and mental health in tertiary care hospitals of Karachi. To achieve this we targeted two renowned hospitals of Karachi. This study is helpful in understanding that whether employees of government hospital are much satisfied and mentally healthy or private hospital employees are? This will also clarify that how these two factors affect the performance.

We selected descriptive research design to build an effect of hospital sector on employees. The population of interest was the employees from all functioning departments; for example, clinical staff (doctors, nurses, technician, etc) and clinical staff (HR staff, administration, finance, etc). This study population comprise of 150 employees from each hospital. We used convenient random sampling technique to draw 150 sample sizes from each sector. The data collection method was tailor made structured questionnaire. For data analysis we used descriptive, standard deviation, and independent t-test.

Findings obtained from the study reveal that sector has significant influence on level of job satisfaction of hospital employees and found little higher in public sector hospitals whereas mental health was same in employees of both sector.

Index Terms- hospital employee, job satisfaction, mental health, occupational health.

I. INTRODUCTION

This is known by epidemiologists that factors including social and environmental, can contribute to the incidence of many human diseases. The most important factor is work pressure and stress within the workplace, either public or private. Mental health disorders associated with anxiety, depression, sleep disturbances and related symptoms have been reported to be prevalent at the workplace.¹

According to Butterworth, "Mental health refers to a person's ability to function and undertake productive activities, to develop

and maintain meaningful relationships and to adapt to change and cope with adversity. Mental health underlies a person's ability to interact with others and their environment. It represents an individual's sense of well-being and competence, and their ability to realize their full potential."² Occupational mental health has been shown to be significantly related to productivity and other desired organizational outcomes such as commitment and satisfaction. If employee mental health is impaired, it has negative impact on job performance leading to job dissatisfaction.³

According to Locke and Latham, "Job satisfaction is a pleasurable or positive emotional state resulting from the appraisal of one's job or job experience."⁴ Job dissatisfaction affects employees both health status as well as economic one individually and society too. It can cause frustration and burnout feeling among employees.

The current trends in employment terms and conditions like long working hour practices, technology advances, high workload and conversion of permanent workforce into contractual one throughout sourcing, are directly involved in Job dissatisfaction and damaging employees mental health.⁵

The hospitals are medical workplaces and have very complex working environment. Personal, interpersonal and organizational factors have been found to be involved in employee mental health and Job satisfaction in the hospital settings.⁶ Many researches have been done which focused on physicians, nurses, pharmacists and other medical professionals. Medical error done by health professionals in hospitals is attracting increasing attention in the society.⁷ These errors occur mostly due to employees' poor attention and unprofessional behavior caused by work stress and job dissatisfaction. Job satisfaction is very important for services provided by healthcare professionals in hospital setting. Low job satisfaction can lead to increased staff turnover and levels of absenteeism, which can reduce the efficiency of health services.

The present study is conducted to determine the relationship between employees' mental health and their job satisfaction at public and private sector hospitals in Karachi. The aim is to provide recommendations for prevention and treatment of employees' mental disorders, to improve their job satisfaction through performance

METHODOLOGY: RESEARCH DESIGN:

To design our research in descriptive manner we use (cooper and schindler 2001) method and design 15 investigative questions which may determine the employee satisfaction level and their mental health. We selected two populations one from public sector hospital and other from private sector hospital and kept hospital as an independent variable and job satisfaction and mental health as a dependent variable.

POPULATION AND SAMPLE DESIGN:

Our targeted population was 150 employees from each hospital. We design our sample which incorporates employees from fundamental functioning departments of hospitals, ranging from clinical and non-clinical.

SAMPLE TECHNIQUE AND SAMPLE SIZE:

Convenient random sampling technique used in the selection of sampling element. 150 employees from each hospital so we concluded the result of total 300 employees from both hospitals.

DATA COLLECTION METHOD AND RESEARCH PROCEDURE:

Our data type was ordinal. We design a question according to cooper and schindler 2001 to collect data. We kept information confidential that encourage the respondent to think carefully before answering the question. The questions were divided into 3 section first part was to analyze demographic data for example age, gender marital status, qualification, department, working experience and sector, second part was to investigate job satisfaction level of employees and third part is designed to evaluate the mental health of employees. There was a likert method to answer each question from strongly agree, agree, not sure, disagree and strongly disagree. We opted the drop and pick method to fill the questionnaire.

DATA ANALYSIS METHOD:

When we collected data we edited, coded and transcribed and then cleaned it, keeping in mind the cooper and schindler 2001 saying; “the purpose of data analysis is to reduce accumulated data to manageable size, developing summaries, looking for pattern and applying statistical technique. First data check for missing element and made it correct as could do, we attach numeric value to each data from 1, 2, 3, 4, 5, to SA, A, NS, DA, AD respectively. Then we used statistical package for social science (SPSS) to analyze data using descriptive statistics. We found frequency of demographic data and mean standard deviation of age group. Then we designed separate column for job satisfaction and mental health in variable view for further testing. Then we applied independent t-test to find effect of sector on jib satisfaction and mental health. We kept sector in independent variable and job satisfaction and mental health dependent variable with the help of bar charts.

RESULTS

The results of the analysis on the study are below. Demographic characteristics of participants are shown in Table.

Our data is normally distributed as the results of skewness is 0.198 for public and private sector both and kurtosis is 0.394 for both

		NUMBE R	PERCENTAG E
AGE	Upto 25	119	39.7
	26-32	114	38.0
	33-49	57	19.0
	50-56	7	2.3
	57-63	2	0.7
	64 and above	1	0.3
GENDER	Male	192	64.0
	Female	108	36.0
MARITIAL STATUS	Married	166	55.3
	Unmarrie d	129	43.0
	Widow	1	0.3
	Divorced	4	1.3
QUALIFICATIO N	MBBS	68	22.7
	MDS	7	2.3
	PHARM D	17	5.7
	BSN	64	21.3
	Others	144	48.0
DEPARTMENT	Clinical	229	76.3
	Non clinical	71	23.7
WORKING EXPERIENCE	Up to 5	168	56.0
	6-10	84	28.0
	11-15	18	6.0
	16-20	14	7.7
	21-25	9	3.0
	26 and above	7	2.3
SECTOR	Public	150	50.0
	Private	150	50.0

public and private sectors which is with in +1 and -1 which shows that our result is normally distributed.

Result of shiparo-wilk test for job satisfaction in public sector is 0.953 and in private sector is 0.977 and for mental health in public sector result is 0.989 and in private sector is 0.816 which is greater than 0.05 which indicates that our data is normally distributed.

JOB SATISFACTION:

To find out the effect of hospital sector (public or private) on job satisfaction we apply t-test, the results of t-test shows that there is a significant difference in the level of job satisfaction in public and private sector hospitals as the spss results shows significance level of t-test is less than 0.05 with mean of -1.64667 and standard deviation of 0.52888 which indicates we reject null hypothesis and accept alternate hypothesis that is "There is a difference in the level of employee job satisfaction in public and private sector ($\mu_1 - \mu_2 \neq 0$)" at significance level 0.05.

MENTAL HEALTH:

In order to find out the effect of hospital sector (public private) on job satisfaction we apply t-test, the results of t-test shows that there is no significant difference in the level of employee mental health in public and private sector, as we collected data of 300 respondents 150 from each sector hospital, spss result shows significance level of t-test is greater than 0.05 with mean of 0.15333 and standard deviation of 0.65674 which indicates we accept null hypothesis and reject alternate hypothesis that is "There no difference in the level of employee mental health in public and private sector ($\mu_1 - \mu_2 = 0$)" at significance level 0.05.13

CONCLUSION:

As a result of the study it is found out that there is a significant difference in the job satisfaction levels of employees working in private sector hospital and employees of public sector hospital as there is great difference in the working environment of both hospital sectors also there is a difference in the facilities provided by private sector hospital than public sector hospitals with have an impact on the job satisfaction levels on employees of both sectors. Whereas there is no significant difference on the mental health of employee on both private sector hospitals and in public sector hospitals which shows that the working condition are not worse for employee in both sectors

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Feasibility Study Analysis of Hybrid Power Plant: Case Studies of Biomass and Solar PV at Bangka Island

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Abstract - In 2021, the Indonesia New Renewable Energy (NRE) mix achievement was 11,5% while the target for NRE mix targeted by Ministry of Energy and Mineral Resources (ESDM) in 2025, 2030, and 2050 was 23%, 25%, and 31%.

On Bangka Island, current NRE power plant installed capacity was 11,2 MW or 4,6% from total energy mix in Bangka – Belitung Islands Province, whereas Government of Bangka – Belitung Islands Province through Rencana Umum Energi Daerah (RUED) 2019 – 2050 planned to increase NRE mix at least 31,42% until 2025 with NRE power plant installed capacity at least 246,44 MW, and at least 39,31% until 2050 with NRE power plant installed capacity at least 560 MW.

This paper presents analysis to seen potential of generated electricity and Life Cycle Cost (LCC) & Levelized Cost of Energy (LCOE) of NRE power plant with types of Biomass Power Plant fueled by Empty Fruit Bunches (EFB) and Ground Mounted Solar PV on Bangka Island.

The result of this analysis indicates that potential of generated electricity from Biomass power plant fueled by EFB was 443,401 GWh/year according to availability of EFB on Bangka Island and potential energy production from Solar PV was 0,721 kW/m²/day according to solar radiation on Bangka Island and efficiency of solar panel, inverter, and other equipment efficiency. LCC for 10 MW Biomass power plant was IDR 557.386.383.703 with LCOE IDR 544,37/kWh, also LCC for 2 MW Solar PV Power Plant was IDR 48.949.012.349 with LCOE IDR 1.336,54/kWh. LCOE for hybrid biomass and solar PV power plant system is Rp. 940,459/kWh. The LCOE of hybrid system is less than PLN electricity tariff limit on Bangka Island which is Rp. 2.006,52/kWh or cent USD 13,77/kWh.

Index Terms- Biomass, Solar PV, Potential Generated Electricity Energy, LCC, LCOE

I. INTRODUCTION

The dominant climate crisis caused by the use of fossil fuels has prompted countries in the world to agree to reduce global Greenhouse Gas (GHG) emissions, as outlined in the Paris Agreement. Indonesia ratified the Paris Agreement through Undang – Undang No. 16 Year 2016 and committed to reducing national GHG emissions by 29% in 2030 with their own efforts

and 41% with international assistance. One of the efforts made to reduce GHG emissions is by increasing the New Renewable Energy (NRE) mix in the national energy mix. In 2021 the NRE mix that was successfully achieved was 11,5%, while the targets for achieving the NRE mix targeted by the Indonesia Ministry of Energy and Minerals Resources (ESDM) in 2025, 2030, and 2050 were 23%, 25%, and 31%.

Another attempt to increase the NRE mix is carried out by Perusahaan Listrik Negara (PLN) through the Rencana Usaha Penyediaan Tenaga Listrik (RUPTL) years 2021 – 2030, were the NRE mix in the RUPTL planned to reaches 51,6% of the total energy mix of 40,6 Gigawatts (GW), while in the previous RUPTL years 2019 – 2028, the NRE mix is only planned to reach 29,6% of the total energy mix of 56,4 GW.

At this time, the use of electrical energy derived from fossil fuels (coal, gas, and oil) to fulfilled the electricity demand is still very high. The availability and reserves of fossil energy sources are decreasing over time, therefore the dependence on fossil energy as a power plant fuel must be reduced. In addition, during the process of fossil fuel converting into electrical energy may releases harmful pollutant gases into the air, the impact of these pollutants causes global warming and high GHG emissions. Many parties that often to fund the power plant projects, especially banks, has begun to stop funding fossil fuel power plants, especially coal and prioritize funding for NRE power plants.

1.1 Electricity Condition in Bangka Island

The electric power system on Bangka Island is supplied from PLN's Coal Power Plant (PLTU), Gas Engine Power Plant (PLTG), and Diesel Engine Power Plant (PLTD), besides that it is also supplied from Biogas Power Plant (PLTBg) and Biomass Power Plant (PLTBm) owned by Independent Power Producer (IPP) and excess power through the 150 kV and 20 kV networks. The capacity of the operating power plant serving the electricity needs on Bangka Island can be seen in the following table:

Table 1
Operating Power Plant on Bangka Island

POWER PLANT TYPE	UNITS	TOTAL CAPACITY (MW)	NETT AVAILABLE POWER (MW)	HIGHEST DMP IN PREVIOUS 1 YEAR (MW)
PLTU (Coal)	2	60	44	44
PLTS (Solar)	2	0,2	0,2	0,2
PLTD (Diesel)	46	90	58	58
PLN TOTAL	50	150,2	102,2	102,2
IPP				
PLTG (Gas)	2	50	50	50
PLTBm (Biomass)	2	8	8	5
PLTBG (Biogas)	2	3,2	3,2	3,2
IPP TOTAL	6	61,2	61,2	58,2
RENTED				
PLTD (Diesel)	6	38	38	38
RENTED TOTAL	6	38	38	38
GRAND TOTAL	62	249,4	201,4	198,4

According RUPTL PLN 2021 – 2030 simulation result for electricity supply and demand in Bangka Belitung Islands Province, there will be an electricity deficit in 2024 because the current generating capacity is 278,8 MW while in 2024, the peak load of electricity is 289 MW.

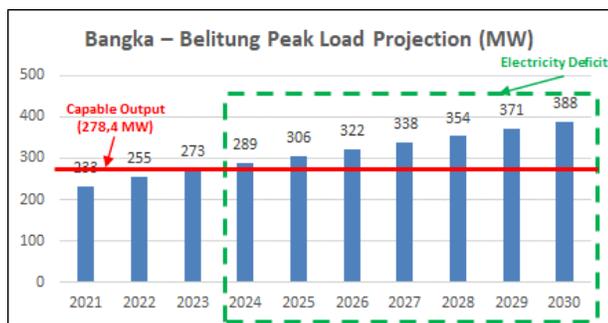


Fig. 1 Bangka – Belitung Peak Load Projection (MW)

1.2 NRE Development Plan in Bangka Belitung Island Province

Bangka Belitung Island Provincial Government through Rencana Umum Energi Daerah (RUED) year 2019 – 2050 has planned to increase NRE mix at least 31,42% until 2025 by providing NRE power generation capacity to 246,44 MW, details of NRE power plant up to 2025 according to RUED 2019 – 2050 can be seen below:

- Biomass Power Plant (PLTBm) 113,34 MW (Palm Shell fuel based)
- Wind Turbine Power Plant (PLTB) 4,15 M
- Biogass Power Plant (PLTBg) 17,4 MW (POME fuel based)
- Biodiesel Power Plant (PLTD) 10 MW

As for the target up to 2050 targeting NRE mix at least 39,31% by providing NRE power generation capacity to 560 MW, details of NRE power plant up to 2050 according to RUED 2019 – 2050 can be seen below:

- Biomass Power Plant (PLTBm) 280 MW (Palm Shell fuel based)
- Solar PV (PLTS) 220 MW
- Wind Turbine Power Plant (PLTB) 20 MW
- Biogass Power Plant (PLTBg) 20 MW (POME fuel based)
- Biodiesel Power Plant (PLTD) 20 MW

1.3 Biomass Potential in Bangka Island

Bangka Island is one of the largest CPO producing regions in Indonesia, in 2021 production (CPO) on Bangka Island reach 800,400 Tons and is the 12th (twelve) CPO producing region in Indonesia (Indonesian Central Bureau of Statistics, 2022). With this relatively large amount of CPO production, of course, the availability of solid waste from CPO processing is abundant, so there is potential to utilize this solid waste as fuel for power plants.

1.4 Solar PV Potential in Bangka Island

Indonesia as a country located on the equator has considerable potential in the provision of solar-based renewable energy power plant. The potential for solar energy in Indonesia is around 3,294 GWp (Anditya, 2021).

According to the Photovoltaic Power Potential Map published by the World Bank Group, Bangka Island has potential for solar energy of around 3,4 Kwh/kWp per day or 1.241 Kwh/Kwp per year.

1.5 Hybrid Power Plant System

In its development, NRE power plant that have an intermittency factor always developed using hybrid technology, which combines two or several types of power plant to meet the electricity demands at the same electricity load, it was developed to ensure the energy production, reliability, and availability can be maintained. In addition, a hybrid power plant was developed to be able to utilize NRE potential sources.

With availability and abundant of NRE potential sources in Bangka Island, especially EFB from CPO solid waste which can be used as biomass power plant fuel and solar radiation which can be converted into electricity energy, its very possible to develop biomass and solar PV power plant with hybrid technology to produce sustainable and reliable electricity. Beside that, the development of NRE with hybrid system can increase the power generation capacity, increase NRE mix in electricity system, reduce dependence on fossil power plant, reduce air pollution and GHG effect on Bangka Island.

1.6 Problem Identification

1. There is a deficit potential in capable power generation in Bangka Island on 2024, the current capable power generation is 278,4 MW, while PLN RUPTL 2021 – 2030 simulation result projected electricity demand in 2024 is estimated at 289 MW.
2. The NRE mix in Bangka Island on 2022 is only 4,6% with an installed capacity of NRE power plant is 11,2 MW, while the target to achieving the NRE mix in 2025 planned by the government of Bangka Belitung Island Province is 31,42% with installed capacity of NRE power plant is 246,44 MW.
3. Utilization of NRE sources in Bangka Island still not maximized yet, especially EFB from CPO solid waste and solar radiation.

1.7 Research Objectives

1. To know the potential electricity energy that can be generated by Biomass (EFB fuel based) and Solar PV on Bangka Island

- To know Life Cycle Cost (LCC) and Levelized Cost of Energy (LCOE) of Biomass and Solar PV on Bangka Island.

II. LITERATURE REVIEW

2.1 Review of Empirical Studies

There have been many previous studies and research about NRE potential electricity energy, LCC, and LCOE from various power plant type namely Biomass, Solar PV, Wind, and Thermal power plant.

In the study done by Perkins (2018) which analyzed and calculating Levelized Cost of Energy (LCOE) from 2 different system, Solar PV + Battery and Solar PV + Combustion Bio Crude & Biomass. The findings revealed that hybrid solar PV + Bio-Crude & Biogas power plant has competitive LCOE than Solar PV + Battery Storage.

According to Singh and Baredar (2016), which researching about techno – economy analysis of hybrid Solar PV + Battery + Biomass Gasifier. The result of research is the LCOE of hybrid power plant LCOE is Rs 15,064/kWh.

Solar PV + Biogas power plant has Net Present Cost (NPC) USD 67.616 and Cost of Electricity (COE) USD 0,164/kWh. Solar PV + Diesel power plant has NPC USD 115.355 and COE USD 0,280/kWh (Sanni et al., 2021).

Ara, Paul, and Rather (2021) research about techno – economic of hybrid wind + solar PV power plant with 2 different scenarios. The result of the research found that from 2 scenarios (power plant output 320 MW and 343 MW) known that 343 MW output scenario has better efficiencies and economic feasibility. LCOE

from 320 MW output is 7.975 INR/MWh and from 343 MW output is 7.316,8 INR/MWh.

According to Khaur, Gupta, and Dhingra (2021), which conducting research about analysis of hybrid solar biomass power plant for generation of electric power in Punjab, India. The result is potential electricity energy generating from biomass is 62,73 MW and from solar PV average is 5,23 kWh/m²/day. The LCOE from hybrid power plant system is 10,39 INR/kWh.

According to previous research on Biomass, solar PV, and other hybrid NRE power plant type, this research focused on hybrid power plant of biomass power plant fueled with Empty Fruit Bunches (EFB) and solar PV which located in Bangka Island, Indonesia, focused to find out potential generated electricity energy from biomass also to know the LCC and LCOE.

2.2 Research Framework

Research concept framework is a description and visualization of the relationship and links between concepts or variables that will be observed or measured through the research (Notoatmodjo, 2012).

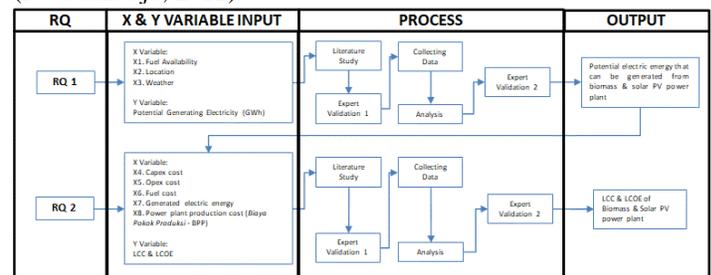


Fig. 2 Research Concept Framework

This section aims to present the methodology of research to know potential electricity energy that can be generated from biomass and solar PV in Bangka Island and to know LCC and LCOE.

3.1 CPO Waste Production

CPO waste production is the residue from CPO processing which can be utilized to produce products that have an added value. The CPO waste consist of Empty Fruit Bunches (EFB), shell, fiber, and liquid waste. In general, the composition of CPO waste production can be determined by converting CPO production using the approach from research conducted by Lappeenranta University of Technology (2009) which can be seen below:

Table 2
Composition of Waste Production from CPO Processing

Per Tonne Fresh Fruit Bunch (FFB)			
Inputs	Lowest	Average	Highest
FFB (kg)	1000	1000	1000
Electricity (MJ)	58	65	75
Steam (MJ)	1100	1400	1700
Outputs	Lowest	Average	Highest
Main Products			
CPO (kg)	190	200	210

III. METHODOLOGY

Palm Kernels (kg)	50	70	80
Palm Waste			
EFB (kg)	220	240	300
Fibre (kg)	120	140	160
Shell (kg)	50	70	80
POME (kg)	500	590	700

Source: Lappeenranta University of Technology (2009)

3.2 Biomass Fuel Needed

According to NEDO (2011), fuel needed for biomass power plant which using 100% EFB can be calculated using the following equation:

- Ratio according to calories:
 - kWh production:
Capable Capacity (kW) x Hours/Year (hour) x Capacity Factor (CF)
 - Joule needed:
kWh production x 3,59 MJ
 - Thermal efficiency according to assumption (17%):
(Energy produced x 100) / 17; per year

- Ratio according to volume needed:

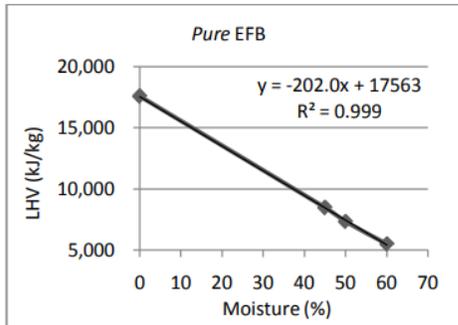


Fig. 3 EFB Calorific Value Function

$$Y = -202x + 17563$$

where:

Y = LHV (kJ/kg)

X = Moisture (EFB moisture assumption is 40%)

3.3 Solar Radiation

Solar radiation data will be obtained from Meteornorm by entering coordinates of Bangka Island location. Meteornorm records solar radiation data from 1991 – 2010 and air temperature data between 2000 and 2009. Meteornorm is a software that provides weather data from trusted sources. In addition, Meteornorm can process weather data very accurately and represent more than 30 weather parameters. The processed data is obtained from more than 8000 weather stations, 5 geostationer satellites, and aerosol climatology which calibrated globally.

3.4 Potential Generated Electric Energy

Potential generated energy from biomass power plant is dependent on EFB availability on Bangka Island which is used as a power plant fuel, EFB production data for calculation of potential generated electricity energy will taken from the last 5 years. Potential generated electricity energy can be calculated using the following equation:

$$\text{Potential Generated Energy} = \frac{\text{Avg. Annual EFB Production (ton)}}{\text{EFB Consumption per MW per years (ton)}}$$

3.5 Life Cycle Cost (LCC)

Life Cycle Cost (LCC) is all the cost incurred during the lifetime of the power plant includes initial investment cost, maintenance cost, and equipment replacement cost. In general, LCC for biomass and solar PV power plant can be calculate using the following equation:

$$LCC = C + M_{PW} + R_{PW}$$

where:

C = Initial Investment Cost

Mpw = O&M (fixed and variable) cost

Rpw = Equipment replacement cost.

O&M (fixed and variable) cost can be calculate using the following equation:

$$M_{PW} = A \left[\frac{(1 - i^n) - 1}{i(1 - i)^n} \right]$$

where:

A = O&M cost value

i = interest value

n = asset lifespan.

Equipment replacement cost can be calculate using the following equation:

$$R_{PW} = F(1 + i)^{-n}$$

where:

F = Equipment price

i = interest value

n = time period to replace the equipment

3.6 Levelized Cost of Energy (LCOE)

Levelized Cost of Energy (LCOE) can be calculated by divided LCC into annual cost (annual LCC) then divided with annual energy production from power plant. Annual LCC can be calculated using the following equation:

$$\text{Annual LCC} = LCC \frac{i(1 + i)^n}{(1 + i)^n - 1}$$

where:

LCC = Life Cycle Cost value

i = interest value

n = asset lifespan.

After knowing annual LCC and annual energy production from power plant, then LCOE can be calculated using the following equation:

$$LCOE = \frac{\text{Annual LCC}}{\text{Annual Energy Production}}$$

3.7 Technical Details

This research will assume Biomass power plant capacity is 10 MW and Solar PV capacity is 2 MW. Technical details for this research will be shown below:

Table 3
 Technical Detail of 2 MW Solar PV Power Plant

Project Location	Bangka Island, Indonesia
Power Plant Capacity (kWp)	2.000
Technology	Solar Photovoltaic
Module Efficiency (%)	20.9

Module Temp. Efficiency (%)	1.19
Inverter Efficiency (%)	98.8
Cable & Other Equipment Efficiency (%)	85
Type of Module	Mono-Crystalline
Solar Panel (wP)	545
No. of Solar Panel	2500
Capital Cost of The Plant (Rp.)	35,700,000,000

Table 4
Technical Detail of 10 MW Biomass Power Plant

Project Location	Bangka Island, Indonesia
Power Plant Capacity (kW)	10.000
Lossess & Personal Usage (kW)	1.000
Supplied Energy (kW)	9.000
Technology	CFB Boiler
Capacity Factor (%)	80
Capital Cost of The Plant (Rp.)	255,750,000,000

IV. RESULT & DISCUSSION

4.1 Biomass Potential Energy Generated

A. Fuel Needed

Biomass power plant fuel needed calculated using equation from sub-chapter 3.2 and the result can be seen below:

Table 5
Biomass Power Plant Fuel Needed

Annual kWh Production (kWh)	63.072.000
Joule Needed (MJ)	226.428480
Energy Needed (Thermal Eff.: 17%) (MJ)	1.331.932.235
Assumed EFB Moisture (%)	40
LHV (kJ/kg)	9,48
EFB Needed for Annual Op. 10 MW Biomass (Ton)	140.499

B. Potential Energy Generated

Potential energy generated from biomass power plant is depend on production of EFB on Bangka Island which will be used for main fuel, EFB production data for past 5 years shown a stable trend.

Table 6
EFB Production on Bangka Island

Year	EFB (Ton)		
	Low.	Avg.	Hi.
2017	875.484	907.320	1.080.143
2018	1.042.453	1.080.360	1.286.143
2019	944.495	978.840	1.165.286
2020	976.105	1.011.600	1.204.286
2021	926.779	960.480	1.143.429
Average	953.063	987.720	1.175.857

Calculation for potential energy generated is according to fuel needed for operated 10 MW Biomass power plant and average EFB production on Bangka Island, the result is potential energy generated from Biomass power plant is 443,401 GWh/year.

4.2 Solar PV Potential Energy Generated

Solar PV energy output is depended on solar radiation and weather condition during the day. Solar radiation and weather condition on Bangka Island presented on table below:

Table 7
Solar Radiation & Temperature on Bangka Island

Month	POA (kWh/m ²)	POA (kWh/m ² /day)
January	107,8	3,59
February	108,7	3,62
March	129,8	4,33
April	120,9	4,03
May	137,1	4,57
June	140,2	4,67
July	141,6	4,72
August	142,4	4,75
September	141,3	4,71
October	128,6	4,29
November	103,3	3,44
December	97,6	3,25
Average	124,94	4,16
Ambient temperature (°c)		28,5

According to Meteonorm, average solar radiation on Bangka Island is 4,16 kWh/m²/day.

Potential energy generated is based on average solar radiation on Bangka Island and solar PV power plant technical specification, the calculation result can be seen at table below:

Table 8
Solar PV Potential & Energy Production

Solar Radiation (kWh/m ² /day)	4,16
Module Efficiency (%)	20,9
Module Temp. Efficiency (%)	1,19
Inverter Efficiency (%)	98,8
Cable & Other Equipment Efficiency (%)	85
Potential Energy Production (kW/m ² /day)	0,721
2 MW Power Plant Annual Production (kWh)	2.527.118

According to the calculation, 2 MW Solar PV Power plant can produce electricity 2.527.118 kWh per year and has potential energy generated 0,721 kWh/m²/day.

4.3 Life Cycle Cost (LCC) & Levelized Cost of Electricity (LCOE)

A. Power Plant Cost

Power plant cost consist of Component A (Investment Cost), Component B (Fixed O&M Cost), Component C (Fuel Cost), and Component D (Variable O&M Cost). Biomass and Solar PV power plant cost, cost breakdown will be presented on table below:

Table 9
10 MW Biomass Power Plant Cost

Component A (Investment Cost; Rp.)	255.750.000.000
Component B (Annual Fixed O&M Cost; Rp.)	12.858.681.605
Component C (Annual Fuel Cost; Rp.)	2.653.873.417
Component D (Annual Variable O&M Cost; Rp.)	3.068.100.000
Annual Depreciation (Rp.)	10.230.000.000

Table 10
2 MW Solar PV Power Plant Cost

Component A (Investment Cost; Rp.)	35.700.000.000
Component B (Annual Fixed O&M Cost; Rp.)	357.000.000
Component D (per-5 yrs Variable O&M Cost; Rp.)	2.856.000.000
Annual Depreciation (Rp.)	1.428.000.000

B. Life Cycle Cost (LCC)

LCC will be defined as the total cost of the power plant during its lifetime and will be calculated using data of power plant cost. Life time of power plant is set to 25 years and assumed inflation rate is 3,64%. Calculation result show that 10 MW Biomass power plant LCC is Rp. 557.386.383.703 and 2 MW Solar PV power plant LCC is Rp. 48.949.012.349.

C. Levelized Cost of Electricity (LCOE)

LCOE will be calculated based on power plant annual LCC and power plant annual energy production, LCOE will defined as the price at which the generated electricity should be sold for system break event at the end of its lifeteme. From the calculation known that 10 MW Biomass power plant LCOE is Rp. 544,37/kWh and 2 MW Solar PV power plant LCOE is Rp. 1.336,54/kWh. According to LCOE of each power plant, the LCOE of hybrid system of Biomass and Solar PV is Rp. 940,459/kWh.

V. CONCLUSION

Total of potential generated electricity energy from Biomass power plant fueled by empty fruit brunch (EFB) on Bangka Island is 443,401 GWh/year and from solar PV according to solar radiation and efficiency solar panel, inverter, and other equipment is 0,721 kWh/m²/day.

In developing country, such as Indonesia, this research offers a new perspective on renewable technology and their potential. This research has covers energy from Biomass and solar PV. Life Cycle Cost (LCC) of 10 MW Biomass power plant is Rp. 557.386.383.703 and 2 MW Solar PV power plant is Rp. 48.949.012.349.

Levelized Cost of Electricity (LCOE) of 10 MW Biomass power plant is Rp. 544,37/kWh and 2 MW Solar PV power plant LCOE is Rp. 1.336,54/kWh, the LCOE of biomass

and solar pv hybrid system is Rp. 940,459/kWh, the LCOE of hybrid system is less than PLN electricity tariff limit on Bangka Island which is Rp. 2.006,52/kWh or cent USD 13,77/kWh. Hybrid system of biomass and solar PV development has benefits:

- Suitable for produce and distributed electricity in remote area, especially area around or near palm oil plantation
- Reduced palm oil wastes
- Employment local people
- Utilization of available renewable energy resources
- Increase NRE mix on Bangka Island and Indonesia.

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Development Of Traditional Cruise: Preservation of Traditional Shipbuilding Culture as a Marine Tourism Attraction

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Abstract- Indonesia is the world's largest archipelagic country, with the sea covering nearly three-fourths of its land and 17,508 islands scattered across it. Aside from an abundance of natural resources, the country is rich in cultural diversity, particularly in the traditions and daily life patterns of rural communities. History proved that in the past the Indonesian people have played a major role in the development of world maritime culture. On this basis, the government has launched a sea-based development program in the form of the world maritime axis and the sea highway. The goal is to make the potential wealth of the country's marine resources the primary source of income for the country's economy and its people. Generally, this article aims to provide a proposed solution through sustainable tourism development based on maritime culture, by lifting traditional people's boats made of wood developed into traditional cruise ships, and preserving the tradition of traditional shipbuilding as an effort to strengthen the roots of Indonesian maritime culture. This study used a SWOT analysis based on data and information on community maritime culture, traditional shipbuilding traditions, and the development of traditional cruises in traditional shipbuilding areas, to generate various development strategies. The findings can be used as input for problem-solving and decision-making processes needed by the government in formulating policies related to sustainable tourism in Indonesia.

Index Terms- preservation, culture, marine, tourism, traditional.

I. INTRODUCTION

Indonesia is a country with roughly three-fourths of its land covered by the sea. . The country is known as the world's largest archipelagic country, has the second longest coastline in the world that has more than 17,508 islands, with the potential for a rich diversity of natural and cultural environmental resources (Dahuri, 1998).

Based on historical data and information, the Indonesian nation in the past was known as a maritime nation with accomplished sailors. The existence of the maritime cultural strength of the archipelago kingdoms in conducting trade, especially spices, has shaped the people to be tough as master sailors who seek life at sea (Salman & Surya Yuga, 2011). According to Adhuri (2009), Nusantara has created a relationship of trade traffic flows both locally and between countries which are still carried out by fishermen from Bugis. Nusantara, a term derived from words in the Kawi language (a form of Old Javanese language that is heavily influenced by Sanskrit), was first recorded in the Negarakertagama book to describe the concept of state adopted by Majapahit as a large kingdom in Java that was founded in the 13th century. Nusantara is still immortalized as a synonym for the Indonesian archipelago. This shows that the sea area of Indonesia in the past, especially during the golden era of the Sriwijaya and Majapahit Kingdoms, was a unifier of the nation and played an important role as a busy shipping crossroads for ships from various countries (Zuhdi, 2012). Other evidence that the Indonesian archipelago was once a "crossroads" of international shipping lanes in the past is the discovery of many underwater cultural remains in the form of Indonesian and foreign shipwrecks from various periods, which are estimated to be widely spread in Indonesian waters.

During that time, the Indonesian people saw the sea as an essential component of their cultural, economic, political, social, and defence progress. This perspective is manifested in cultural elements such as customs, traditions, and patterns of marine-based daily life, which have values or norms that the community must live, maintain and obey.

Recognizing the potential diversity of Indonesia's wealth of marine resources, the government has launched a future development vision to establish Indonesia as the World Maritime Axis by shifting development priorities from land-based to sea-based development (Kadar, 2015). The goal is to elevate Indonesia as the world's largest maritime country with its main economic income derived from the development of regional cultural roots based on traditions and ways of life at sea (maritime cultural roots), managing (protecting,

developing, and utilizing) the diversity of marine potential wealth in a sustainable manner. However, the target has yet to be met due to some issues including changes in development orientation from land to sea that has not been optimally implemented, often the cultural approach in marine development programs is not used, thus causing a mismatch with needs, and widening the development gap in coastal areas.

The success of realizing Indonesia's development as the largest archipelagic country and as the world's maritime axis is determined by the existence of values and maritime cultures which are generally still maintained and carried out by coastal communities. Koentjaraningrat (2009) defined maritime culture as a set of practices shared by coastal communities and small islands that incorporate knowledge systems, values, norms, rules, institutions, arts, activities, facilities, and technology related to the marine environment.

Supporting the acceleration of maritime-based development in Indonesia as an archipelagic country can be accomplished through a sustainable tourism approach that focuses on developing accessibility which allows tourists to easily move from one tourist destination to another. Connectivity to the diversity of regional attractions located on thousands of islands and separated by the ocean is important for development, by emphasizing the need for facilities, infrastructure, and modes of sea transportation. Based on these conditions, it is necessary to develop a mode of transportation in the form of traditional tourist boats as one of the components of developing marine tourism in Indonesia.

The variety of traditional boats with characteristics of Indonesian maritime culture is one mode of sea transportation that can be used to visit tourist destinations while also becoming an attraction for marine tourism. Each region in Indonesia has its unique characteristics of traditional ships, such as the traditional Patorani, Padewakang, and Pinisi ships from Sulawesi, the traditional Golekan Lete ship from Madura, the Sope traditional ship from Jakarta, the Alut Pasa traditional ship from East Kalimantan, the Gelati traditional ship from Bali, and the traditional Kora-kora ship from Maluku (Liebner, 1996). These boats were built from special wood and designed traditionally from generation to generation, preserving the elements of tradition and local wisdom of the builders. Small traditional ships with sails and engines that functioned to catch fish and transport goods and people have the potential to be utilized and developed to meet the needs of tourist transportation into traditional tourist ships (Traditional Cruise) with a passenger capacity of about 25 people (Ardiwidjaja, 2016).

In connection with the previous explanation, this article attempts to provide alternative solutions by proposing a methodology that can be used to determine how to strengthen efforts to preserve marine cultural life. At the same time, it is also used to enhance one of the indicators of maritime culture, namely the manufacture of traditional ships to be developed as traditional tourist ships (traditional cruises). This article essentially provides an answer to the question of how a traditional cruise ship development strategy (Traditional Cruise) can become a tourism attraction based on the roots of maritime culture, which can also make Indonesia a major global marine tourism destination and support Indonesia as the World Maritime Axis.

II. MATERIALS AND METHODS

A. Study Location

The study was conducted in the provinces of Bali (Singaraja, Buleleng), South Sulawesi (Bulukumba), East Nusa Tenggara (Labuan Bajo), and East Java (Sumenep Regency) (Figure 1).



Figure1. Map of the traditional shipbuilding industry

These locations were selected based on consideration of historical and cultural information as follows:

- a. The people used to have a very strong maritime culture,
- b. The area experienced glory in the maritime sector by using traditional boats made of wood that they built themselves,
- c. The people have sailed using trade routes both on rivers and at sea,
- d. People rely on marine resources for their daily needs,
- e. Areas that still use traditional boats as a means of public transportation.

B. Methodology

This exploratory study employed a qualitative descriptive method using primary and secondary data. Primary data and information were obtained through in-depth interviews, observations, and focused group discussions (FGD) in several locations, especially those in coastal areas that still maintain traditions and have traditional shipbuilding industries made of wood. In-depth interviews through snowballing techniques and FGDs were conducted with key informants including traditional leaders, shipbuilders, as well as local communities, local governments, businessmen, and academics. While secondary data were obtained from various sources such as literature studies, books, research results, and journals.

To find out the prospects for traditional cruise ships that are feasible to develop, mapping and potential assessment of data and information from literature studies, in-depth interviews and field observations were grouped through analytical evaluation based on three predetermined criteria, namely:

1. Community maritime culture
 - a. Efforts to preserve the roots of marine culture
 - b. knowledge (local wisdom) of maritime culture from generation to generation
 - c. The pattern of daily life and livelihoods of coastal communities
 - d. institutions and kinship of coastal communities
 - e. The tradition of making and using traditional boats for coastal communities
2. Traditional shipbuilding
 - a. Tradition and the role of expert figures in traditional shipbuilding
 - b. maritime-based government program
 - c. Labor capacity
 - d. Connectivity needs and traditional ship market
 - e. Traditional shipbuilding industry policies along with local raw materials
3. Development of traditional cruise
 - a. Adaptation of traditional shipbuilding
 - b. Traditional cruise market needs
 - c. The need for facilities and connectivity of inter-island tourist attractions

- d. Incentive policy for making traditional cruise
- e. Collaboration and partnership patterns in traditional cruise governance

The collected and validated primary and secondary data were analyzed using the SWOT matrix analysis method to formulate a development strategy plan based on elements in the cultural system in each study location (Rangkuti, 2013). According to Stainback & Stainback (1988) to ensure the validity and reliability of the study data, data triangulation was carried out through several data sources, and methodological triangulation was carried out through different data collection methods.

This SWOT analysis is used to describe the level of internal and external factors that influence the development of traditional cruises, by examining the criteria of community maritime culture, the traditional shipbuilding industry, and the development of traditional cruise ships that are still run by the community at the study area. Factors to consider include:

1. internal factors include strengths and weaknesses which are analyzed in developing the attractiveness of maritime culture, traditional people's shipbuilding, and the development of traditional tourist ships (traditional cruises) covering the attractiveness of tourism destination components including attractions, accessibility, amenities as well as traditions and wisdom of local people at the study area.
2. External factors include opportunities (opportunities) and threats (threats) which are analyzed in developing the attractiveness of maritime culture, traditional people's shipbuilding, and the development of traditional tourism boats (traditional cruises) covering, among others, regional conditions, tourism industry, policies, tourism market needs, life socio-cultural community, as well as the attractiveness of attractions, accessibility, and amenities around the study area.

Data and information from the two factors were analyzed in stages starting from the Internal Strategic Factor Analysis Summary (IFAS) and External Strategic Factor Analysis Summary (EFAS) matrix approaches to determine the development strategy, SWOT matrix, and Quantitative Strategic Programming Matrix (QSPM) approach. This QSPM was used to determine the best strategy from those obtained in the previous stage.

To determine a score and weighting, all indicators of the strengths, weaknesses, opportunities, and challenges were computed. The score is calculated using the ranges 1 and 4, respectively, with a 0.75 interval. While weighting is determined by comparing the relative importance of each indicator in each criterion. Table 1 shows the criteria based on the results from the score and the weighting of indicators.

Table 1. Criteria for Strengths Weaknesses and Opportunities Threats

Interval	Strengths & Opportunities	Weaknesses & Threats
3.26 – 4	Very high	Very low
2.27 - 3.25	Tall	Low
1.76 - 2.50	Low	Tall
1 - 1.75	Very low	Very high

Source: Data processed, 2019

III. THEORY

It is necessary to strengthen knowledge and understanding from the perspective of developing marine tourism in coastal areas and small islands in Indonesia, particularly about the development of traditional cruises that can support Indonesia as the Maritime Axis and as a world marine tourism destination. Following are the theories to guide the result and discussion in the next section.

A. Maritime Culture

Indonesia is a maritime country with natural diversity and marine culture that is spread throughout the territory of Indonesia (Ardiwidjaja, 2013). As an archipelagic country, Indonesia should have a strong maritime culture, both in the way of life of the people and in its national development policies. According to historical records, Indonesian kingdoms like Sriwijaya, Samudra, Majapahit, and Malacca had sailed across the ocean to the north and west to Madagascar and from the east to Easter Island as early as the ninth century AD. As an archipelagic country located at the crossroads of the sea traffic network that connects the East and West world, Indonesia's maritime territory has long been an arena for the activities of other nations such as China, India, and Arabia, both in terms of trade and the struggle for influence or power. The oldest written evidence of the use of boats as a means of sea transportation is printed in the Kedukan Bukit Inscription (16 June 682 AD) and the reliefs of Borobudur Temple (7th-8th century AD) which described several types of ships and boats that are commonly found across the archipelago. At that time, the Indonesian people saw the maritime as a major part of cultural, economic, political, and social progress and defense. This paradigm has been manifested in the form of customs and traditions

that have values or norms to be lived and maintained, even obeyed by the community, especially rural communities in coastal areas until now. According to UNESCO (2010) culture is not only defined as performing arts such as music, dance, theater, painting, sculpture, literature, buildings, and others but also includes understanding at a broader level in identifying human identity in a community group, ethnic group, or nation.

Preservation of tradition for coastal communities is believed to be important. Traditions that grow in society become assets or social capital to realize the quality of life and welfare, as well as to deal with cultural influences from outside. The fishing communities of the Bugis and Makassar ethnic groups, for example, are described as coastal communities with fishing as their main source of livelihood.

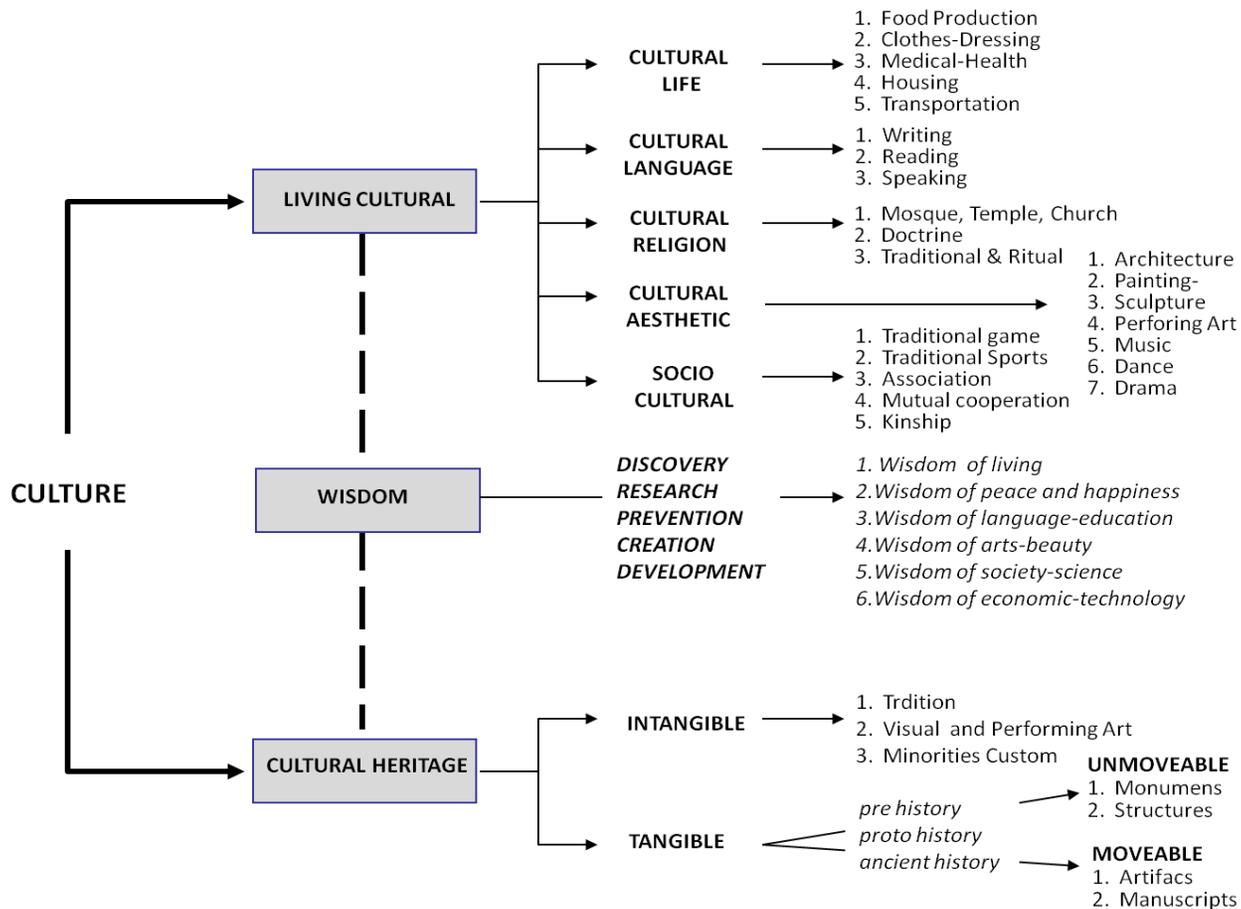


Figure 2. Elements in the Cultural system
Source:(Maithai, 2000) Modified by RA

These fishing communities have mastered the field of fishing, shipping technology, making Pinisi-type sailboats and have even been able to sail as far as Sri Lanka and the Philippines to trade. Their daily lives were shaped toward an adaptable maritime culture, particularly in the context of values, ideology, and technology, due to the presence of a trading business and commercial shipping law.

B. Sustainable Tourism Development

The vision of sustainable development is no longer centered on growth that emphasizes economic outcomes, but rather on development that prioritizes the preservation of nature and community culture (Richards, 2007). Law number 10 of 2009 about Tourism, Law number 11 of 2010 about Cultural Heritage, Law number 5 of 2017 about the Advancement of Culture, Law number 5 of 1990 about Conservation of Biological Natural Resources and Ecosystems, as well as the declaration of sustainable development, emphasized that while natural and cultural resources can be used, they should be preserved sustainably based on the principles of benefit and sustainability, democracy, welfare, justice, togetherness, openness, and integration.

In the tourism product development program, the Indonesian government prioritizes the development of environmentally sound tourism and the preservation of natural and cultural resources. With a sustainable tourism approach and the development of special interests, it

is hoped that tourism development is not only based on land (terrestrial based) but will also begin to optimize the sea-based (marine). In addition, the new tourism approach has been reinforced through the declaration of the Sustainable Tourism Charter which emphasizes the sustainability criteria that must be managed ecologically in the long term, while taking into account the economic, ethical, and social aspects of the community (Lafferty & Eckerberg, 2013). Thus Indonesia's marine potential, along with its coasts and small islands must be conserved and wisely managed.

Based on this, the management of maritime cultural heritage, especially in coastal areas that have traditions and the traditional people's shipbuilding industry, needs to be protected, developed and utilized. One of the efforts is to lift traditional people's boats as an attraction for traditional tourist boats. Hopefully, the more the economic and scientific principles underlying the historical boat-building tradition are preserved, the more prosperous society will be.

C. Maritime Based Tourism

Sustainable tourism development should be the foundation of Indonesia's tourism development. Namely, a development that can preserve (protect, develop and utilize) the environment (nature and culture) as a source of tourism attraction; able to empower and sustainably prosper the community; able to strengthen cross-cultural understanding of the nation; and able to strengthen the identity and character of the roots of maritime culture.

According to Moscardo et al. (2001), marine tourism is a special interest tourism that includes activities above sea level (marine), activities below sea level (submarine), as well as activities on the coast (coastal). According to the government's program to promote sustainable tourism, the potential number of coastal villages is 12,510 villages from 84,096 villages spread throughout Indonesia (Department of Statistics Indonesia, 2021), giving Indonesia a great opportunity to develop quality tourism based on the preservation of the existence, integrity, and authenticity of the natural environment and marine culture in an integrated and sustainable manner.

D. Coastal and Small Islands

According to Law number 6 of 1996 concerning Indonesian Waters, the number of large and small islands in Indonesia is 17,508 islands. In addition, Law number 27 of 2007 on the Management of Coastal Areas and Small Islands defined a small island as a collection of islands with an area of less than 2,000 km² or a width of less than 10 km, as well as the unity of the surrounding ecosystem that is separated from the main island. Some experts explain that a small island is ecologically separated from the main island (large island) and has definite boundaries, isolated from other habitats, so it has an insular nature (Whittaker & Fernández-Palacios, 2007; Haila, 1990). The coastal area is a land belt bordering the ocean where land processes and land uses are directly affected by ocean processes and vice versa (Cicin-Sain et al., 2000).

Therefore, the Indonesian government requires various approaches to exploring the potential of coastal areas and small islands and ecosystem units that are separated and isolated from the main island, as well as forming unique life habitats that are sensitive to changes by nature and humans. One approach that is considered feasible is a maritime-based sustainable tourism development that is socially accepted, people-centered (pro-poor), culturally appropriate, indiscriminative, and environmentally sound. The unique potential, especially those located on small islands, must be managed sustainably by strengthening conservation efforts and maximizing the potential for the unique diversity of marine resources as a tourist attraction.

E. Indonesia World Maritime Axis

History has proven that in the past, Indonesia's sea area was a busy traffic lane traversed by ships from all over the world, including Nusantara ships. The existence of the maritime power of the archipelago's kingdoms in trading, especially spices, has shaped the people to be strong to seek life at sea. One of the historical evidence of the Indonesian archipelago as a "crossroad" of past international shipping lanes was the several findings of underwater cultural remains in the form of Indonesian and foreign shipwrecks which are estimated to be widely scattered in Indonesian waters. Indonesia with its potential as the largest archipelagic country with the second longest coast in the world has the ability to rebuild its maritime power. Indonesia has met the criteria for six elements of strength as a maritime country, namely geographical location, land and coast shape, area, number and character of the population, and the nature of its government (Yuliati, 2016). According to Son Diamar (Member of the Indonesian Maritime Council), Indonesia with 4 (four) strategic points traversed by 40% of commercial ships from around the world, namely the Malacca Strait, Sunda Strait, Lombok Strait and Makassar Strait, can be positioned as a center for maritime trade and global shipping industry (Ksatrya, 2019).

F. Strategic Issues

- a. The development of marine tourism as part of nature-based sustainable tourism has not been developed with optimal attention to the potential for the diversity of attractiveness of daily life patterns and traditions from the roots of marine culture in coastal areas (coastal), as well as the diversity of sea surface landscapes (marine) and natural phenomena, flora and fauna and underwater non-living resources (submarine).
- b. Maritime tourism can be a strategic tool in preserving (protecting, developing, and utilizing) as well as elevating marine cultural heritage in the form of traditional sailing ship transportation to be developed as a traditional cruise which can be an attraction for one of the identities of maritime civilization in Indonesia.

- c. Maritime tourism is a tool or means to develop the soul and roots of marine culture with the potential to influence and encourage the realization of Indonesia as a marine tourism destination and the world's maritime axis.

G. Scope of substance:

1. Data and information on potential infrastructure, facilities, and people's shipbuilding facilities that can be used to produce traditional tourist boats (Traditional Cruise).
2. Data and information on people's sailing ships that can be utilized and modified as traditional cruises include size and space allocation (accommodation) for the comfort and safety of tourists.
3. Data and information on traditional and modern ports that can be used as a stopover or traditional cruise anchorage.
4. Data and information on potential surrounding tourist destinations that can be visited by traditional cruise tourist ships include attractions, accessibility, amenities, and people.
5. Data and information on marine culture preservation knowledge from local community human resources can support the growth of traditional cruise tourist ships as a marine tourism attraction.

Data and information related to the main problems and opportunities for sustainable tourism destination management, efforts to preserve the value and existence of maritime culture, as well as the development of the people's sailing ship industry as a traditional cruise.

IV. RESULT

Realizing Indonesia as the world's maritime axis, the government has established five main pillars including the rebuilding of Indonesia's maritime culture and a commitment to encourage the development of maritime infrastructure and connectivity by building sea highways, seaports, logistics, and shipping industries, as well as maritime tourism. Rebuilding the maritime culture of the Indonesian people is very important because most areas in Indonesia are seas and islands so maritime culture is one of the identities of the Indonesian people. Likewise, the shipping industry strongly supports inter-island connectivity and marine tourism. This national program certainly changes the policies and paradigms of development priorities, especially in the archipelagic regions of Indonesia.

One of the indicators is the traditional shipbuilding industry, which is expected to be feasible to be developed in the Indonesian archipelago as an attraction for marine tourism as a transportation mode in the form of traditional cruises. The development of traditional tourist boats is a breakthrough effort to increase the attractiveness of the diversity of traditional people's ships in Indonesia, as well as an effort to solve the problem of implementing traditional ships which has become increasingly difficult due to massive land-oriented infrastructure (transportation network) development. The decline in the operation of traditional shipping vessels is influenced by a lack of facilities and port facilities for traditional ships, the growth, and development of shipbuilding technology made of fiber and metal, as well as the limited basic materials of wood in shipbuilding. This condition is suspected to eliminate the roots of the Indonesian maritime culture as a strategic element in realizing the acceleration of achieving sea-based development and the world maritime axis program.

The result of the field data found that stakeholders (consisting of the government, academia, society/community, private/industry, and the media), agreed to increase the involvement of maritime culture and the traditional shipping industry in supporting the national maritime axis program, marine highways, and sustainable tourism in Indonesia through the development of traditional cruises.

From the evaluation analysis through mapping and potential assessment of the existing criteria, various indicators can be determined which can be grouped based on internal factors including strengths and weaknesses, as well as external factors including opportunities and threats. The results are presented in Table 2 in the following matrix. Here comes the most crucial step for your research publication. Ensure the drafted journal is critically reviewed by your peers or any subject matter experts. Always try to get maximum review comments even if you are well confident about your paper.

Table 2: Results based on the evaluation analysis

No	Criteria	Strength	Weakness
1.	Community Marine Culture	<ol style="list-style-type: none"> 1. maritime knowledge from generation to generation such as shipping and shipbuilding 2. Utilizing traditional boats as a means of transportation 3. Maritime traditions and sea rituals are still being carried out 4. have kinship institutions in the community 5. use the sea as the main livelihood 	<ol style="list-style-type: none"> 1. Not optimal transfer of knowledge of maritime cultural roots to the younger generation in coastal villages 2. the structure of coastal communities is still simple with a low level of education 3. The reduced role of traditional and religious leaders in daily life 4. The shift to a new land-based livelihood

			5. the resilience of the roots of maritime culture is still weak
2.	Traditional Ship-Building Industry	<ol style="list-style-type: none"> 1. There is a shipbuilding industry group 2. The existence of knowledge and skills of shipbuilding from generation to generation 3. Some figures are experts in shipbuilding 4. The design of the ship maintains the traditions and culture of the local community. 5. Ship craftsmen are creative in accommodating the needs of ships in the community 	<ol style="list-style-type: none"> 1. The quality and quantity of ships have not been able to optimally meet market demand 2. The number of craftsmen and their workforce is decreasing 3. Lack of working capital 4. The cost of producing and repairing traditional boats is still high 5. The unavailability of adequate shipyard facilities
3	Traditional Cruise Development	<ol style="list-style-type: none"> 1. The increasing need for eco-friendly traditional tourist boats from the tourism industry and individuals 2. adaptive capacity promotion of traditional ship design traditions 3. Supports easy access to attractions between the coast and small islands 4. The potential Diversity of shapes, types, and ornaments of traditional ships is a tourist attraction 5. Means of providing satisfaction for tourists to gain experience and knowledge of marine culture 	<ol style="list-style-type: none"> 1. The ability of human resources in making tourist ship designs is very limited 2. Requires capital-intensive and skilled manpower 3. Lack of readiness of ship craftsmen to access capital and quality labor in the manufacture of tourist boats 4. Limited quality local materials for tourist boats 5. Limited facilities and facilities for traditional tourist boat docks.

No	Criteria	Opportunity	Threat
1.	Community Marine Culture	<ol style="list-style-type: none"> 1. the diversity of traditions and marine life is a tourist attraction 2. national programs of sea-based development and the World Maritime Axis 3. sustainable tourism destination program 4. The development of rural tourism and tourism villages based on cultural roots 5. Government programs to improve creative industries, including traditional shipbuilding 	<ol style="list-style-type: none"> 1. Cultural degradation due to cross-cultural through tourism and advances in information technology 2. The growth of cultural commodification due to market demand 3. Extreme weather factors that affect the daily life of people at sea 4. Development gaps in coastal areas 5. urbanization from coast to land 6. Environmental pollution impacts the livelihoods of coastal communities

2.	Traditional Ship-Building Industry	<ol style="list-style-type: none"> 1. There is still government attention to ship industry SMEs 2. The magnitude of the potential diversity of maritime resources 3. Maritime Axis priority program and sea highway 4. There is still a need for connectivity for the transportation of people and goods at sea 5. Traditional boats and their construction are the main attraction of the tourism industry Tourism 6. Provision of traditional shipyards by the government 7. The development of advances in navigation technology 	<ol style="list-style-type: none"> 1. The main raw material for wood is increasingly difficult to obtain 2. Capital-intensive business competition with the modern shipbuilding industry 3. More and more workers are moving to modern shipbuilding 4. The development program is still land-based 5. Improved land transportation networks have an impact on the sustainability of traditional sailing vessels 6. Lack of access to markets, banks, and capital 7. There is no policy to provide facilities and incentives to the traditional shipping industry
3	Traditional Cruise Development	<ol style="list-style-type: none"> 1. The need for inter-island attraction connectivity 2. There is a global program related to environmental conservation. 3. The increasing demand for using traditional boats as tourist boats 4. Increased visits to villages including shipbuilding villages as a tourist attraction 5. The existence of a maritime axis program and sea highway 6. jetty revitalization program and traditional route (spice line) 	<ol style="list-style-type: none"> 1. The development of modern ship transportation that is cheaper and faster 2. No policy regulates traditional tourist boats 3. Tourist perceptions, safety, and comfort factors are not optimally considered 4. The demand for the use of more materials from outside 5. Growing and developing modern foreign yachts operating in Indonesian territory 6. The lack of the main raw materials for traditional tourist boats

Traditional cruise as a means of transportation used in sea and river areas (river cruise), needs to be managed in an integrated and sustainable manner. The aim is not only for the transportation of people, goods, and services but also to facilitate connectivity to inter-island attractions while supporting.

V. DISCUSSION

Traditional cruise as a means of transportation used in sea and river areas (river cruise), needs to be managed in an integrated and sustainable manner. The aim is not only for the transportation of people, goods, and services but also to facilitate connectivity to inter-island attractions while supporting government programs related to the conservation of the natural environment and marine culture, the development of sustainable tourism destinations as well as the world maritime axis program and sea highways. The sustainability of the governance of traditional cruise utilization is made possible by a qualitative and quantitative approach of the SWOT matrix, through the identification of various factors in several destinations of traditional shipbuilders (Rangkuti, 2013).

Qualitative SWOT Matrix

According to Kearns (1992), the influencing factors must be managed and handled as effectively as possible by optimally combining internal strengths and weaknesses with external opportunities and challenges in the IFAS and EFAS matrices to formulate the strategies required in the development of traditional cruises. The details of the matrix are presented in Table 3.

1. The Strengths and Opportunities (SO): To maximize the internal strengths of the community's maritime culture, the traditional shipbuilding industry, and the development of traditional cruise ships owned by the destination. Also taking advantage of external opportunities that affect the destination to have the ability to compete.
2. The Weakness and Opportunity (WO): To minimize the internal weaknesses of the community's maritime culture, the traditional shipbuilding industry, and the development of traditional cruise ships owned by the destination through the use of opportunities in the market.
3. The Strength and Threat (ST): To reduce or minimize the impact of external threats on the community's maritime culture, the traditional shipbuilding industry, and the development of traditional cruise ships by maximizing existing strengths.
4. The weakness and Threat (WT): To defend against external threats by reducing the weaknesses of the community's maritime culture,

the traditional shipbuilding industry, and the development of traditional cruise ships. A conclusion section is not required. Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions.

Table 3: Strategies required in the development of traditional cruises

Community Marine Culture	SO	WO
	<ol style="list-style-type: none"> 1. Strengthening efforts to preserve marine culture 2. Enhancement of traditional and modern Maritime Knowledge 3. Utilization of technological advances in livelihood patterns at sea 4. Maritime culture socialization as a tourist attraction 	<ol style="list-style-type: none"> 1. Form marine cultural groups in the community to facilitate activities in support of national programs 2. Increase regeneration to minimize the influence of foreign cultures 3. Increasing community competence increases the attractiveness of marine culture-based tourism 4. Strengthening the role of community leaders,
	ST	WT
	<ol style="list-style-type: none"> 1. Strengthening efforts to preserve the roots of marine culture 2. Increased knowledge of the hereditary traditions of traditional shipbuilding 3. Socialization and campaign of maritime cultural roots as national identity 	<ol style="list-style-type: none"> 1. Strengthening the role of traditional and religious leaders as well as community leaders in transferring values, traditions, and local wisdom to the younger generation 2. Optimizing the role of kinship institutions 3. Promote activities and results from the daily life of coastal communities as an attraction.
Traditional Shipping Industry	SO	WO
	<ol style="list-style-type: none"> 1. Increased innovation in traditional shipbuilding and use 2. Involvement of industrial groups as a means of receiving capital assistance, market access, and provision of local raw materials 3. Increasing the capacity of quality traditional shipbuilding craftsmen 4. The role of traditional shipbuilders in kinship institutions 5. Development of digital promotions and involvement in nautical events 	<ol style="list-style-type: none"> 1. policies on the use of coastal areas 2. Increasing BUMD in supporting traditional ship SMEs 3. Improvement of facilities and facilities of the traditional shipbuilding industry 4. Simplifying the licensing process and providing incentives for small-scale shipbuilding SMEs. 5. Improving HR competencies through education 6. Strengthening forest reforestation program
	ST	WT
	<ol style="list-style-type: none"> 1. Promoting the use of traditional boats as a means of inter-island transportation 2. Developing coastal villages as destinations for traditional shipbuilders has a tourism appeal 3. Creating a supply chain in traditional shipbuilding can be fulfilled sustainably 	<ol style="list-style-type: none"> 1. Development of traditional ship industry educational institutions 2. Development of regulations that ensure the integration of traditional ship management in a sustainable manner 3. Increasing the use of local components in the construction and maintenance of wooden vessels

Traditional Cruise Development	SO	WO
	<ol style="list-style-type: none"> 1. Development of the use of traditional ships as traditional cruises in marine tourism activities 2. Realizing an incentive policy for the people's boat industry and traditional tourist boats 3. Positioning the unique roots of maritime culture and traditional cruises to become part of the attraction of marine tourism 4. Improve community competence to increase job opportunities 	<ol style="list-style-type: none"> 1. Regulations governing traditional cruises to support government priority programs 2. The program for the construction and revitalization of the ancient wharf and route (Spice Line) 3. Development of coastal villages as an attraction for tourist destinations 4. Strengthening the management of traditional tourism boats
	ST	WT
	<ol style="list-style-type: none"> 1. Promoting the use of traditional boats as a traditional cruise characteristic of regions in Indonesia 2. Realizing regulations that regulate the operation of tourist boats that are more beneficial to the community 3. Strengthening communication and coordination between stakeholders in setting standards, community empowerment, and security in the implementation of traditional cruises 	<ol style="list-style-type: none"> 1. Collaborative development with marine tourism operators and other tourism industries 2. Improving partnership programs with investors in the maritime sector 3. Develop regulations that protect traditional tourist boats from foreign tourist boats (yachts) operating in Indonesia 4. Positioning traditional tourist vessels as environmentally friendly transportation to support tourism, maritime axis, and marine highways

Quantitative SWOT Matrix

The data was then analyzed using SWOT analysis calculations to determine the position of the three criteria in supporting the development of traditional cruises with certainty, as well as the actions required to accelerate its achievement (Pearce and Robinson, 1998). Based on the calculations carried out through SWOT analysis, the final values of strengths, weaknesses, opportunities, and threats are obtained as shown in Table 4.

Table 4. Calculation Results for Strengths, Weaknesses, Opportunities, and Threats (SWOT)

No	Criteria	Factor		Total Score	Notes	Coordinate
		S - O	W - T			
1	Community Marine Culture	Strength		3.2	Very high	-0.35,0.4
			Weakness	3.9	Very low	
		Opportunity		3.4	Very high	
			Threat	2.6	Low	
2	Traditional Ship Building	Strength		3.5	Very high	-0.35,0.45
			Weakness	2.8	Low	
		Opportunity		2.6	Tall	
			Threat	3.5	Very low	
3	Traditional Cruise Development	Strength		3.8	Very high	-0.4,0.3
			Weakness	3.0	Low	
		Opportunity		3.5	Very high	
			Threat	2.9	Low	

Source: Data processed, 2019.

The Grand Strategy Matrix in Figure 1 displayed the outcome or value of each criterion. The results showed that the Traditional Cruise Development criteria were in the aggressive strategy quadrant, which is supported by the Marine Culture Community criteria in the turnaround strategy quadrant. While the Traditional Shipbuilding Industry criteria are located in the diversification strategy quadrant.

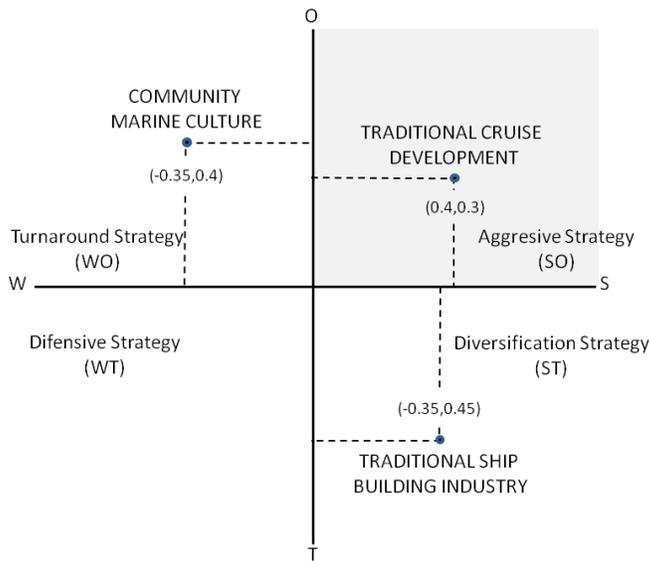


Figure 1. Grand strategy matrix

VI. CONCLUSION

Indonesia, the world's largest archipelagic country, has a wide range of traditions and local wisdom that are still maintained by rural communities, including communities in 12,510 coastal villages from 84,096 villages spread across 17 thousand coasts and small islands. Based on historical data, the Indonesian nation in the past was once known as a maritime nation with accomplished sailors (Salman & Surya Yuga, 2011). This could be because the territory of Indonesia was once a busy shipping crossroad and has already been described as an international maritime axis.

The government is trying to revive the past glory by launching a priority program to make Indonesia the world's maritime axis and sea highway. Efforts to realize the program are outlined in four development pillars that need to be considered, namely the maritime culture development pillar, the maritime resource management pillar, infrastructure development, and the maritime connectivity pillar by prioritizing the shipping industry and marine tourism. Sustainable tourism based on the diversity of natural attractions and marine culture continues to be developed, one of which is by utilizing traditional boats whose implementation was declined, becoming traditional tourist ships (traditional cruises). The aim is not only to support various government priority programs such as the maritime tourism development program, the maritime axis, and the sea highway program but also to promote traditional ships as a tourist transportation attraction that facilitates access to natural and marine cultural diversity while accommodating the need for inter-island rural area connectivity.

Referring to the facts on the ground, it shows that there are similarities in internal factors, strengths, and weaknesses as well as external factors, opportunities, and threats on the criteria of maritime culture, traditional shipbuilding, and traditional cruise development in each of the traditional shipbuilding study areas. Overall, it can be concluded from internal factors (which can be identified as strengths), that the community still views the sea as a major part of their daily life, still maintains the roots of maritime culture in their daily lives, and the tradition of traditional shipbuilding is carried out adaptively. Weakness factors highlighted include the degradation of the roots of maritime culture, the reduced role of traditional leaders and traditional ship craftsmen in their community institutions, and the less-than-optimal transfer of shipbuilding traditions from generation to generation. External factors that become opportunities include the existence of a national sea-based development program (sea highway and maritime axis), the need for inter-island connectivity, and the acceleration of the development of rural-based sustainable tourism destinations in the regions. While threats include policies that support the acceleration of marine-based development that are less than optimal, the limitations of the raw materials for traditional shipbuilding, and the increase in new types of work that are more in demand by the younger generation.

Efforts to realize Indonesia's development as the largest archipelagic country and as the world's maritime axis require a commitment from the community to strengthen the values and existence of the roots of a maritime culture that are preserved and carried out by the community in a sustainable manner. The facts found in several traditional shipbuilding destinations can be formulated into several strategies needed in developing traditional cruise as a marine tourism attraction, through a sustainable tourism approach based on the preservation of traditional shipbuilding traditions.

Based on the result of the analysis, several recommendations can be proposed as follows:

1. Traditional Cruise Development has the strength and opportunity to implement a progressive strategy by expanding the development of traditional cruises in many areas by strengthening the traditions and competencies of traditional tourism shipbuilding, as well as increasing access to marine-based special interest tourism markets.
2. In addition to the great challenge of implementing a diverse strategy, the traditional shipbuilding industry has strengths by enhancing creativity that can adapt and increase innovation in meeting market needs for traditional shipbuilding.
3. The community's marine culture demonstrates the degradation of the maritime culture's roots, but there is still time to shift the strategy that has been or is being implemented by developing a new strategy that is more adaptable to various future developments.

It is hoped that a strategy that focuses on elements of community maritime culture, traditional shipbuilding traditions, and the development of traditional cruises, can be a reference for recommendations in the problem-solving and decision-making process needed to formulate policies for developing traditional tourism boats in Indonesia.

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Study of Community Satisfaction at Kumun Debai Sub-District Office, Sungai Penuh City

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Abstract- This research will examine the issue of public (public) satisfaction with the services provided by the Kumun Debai Sub-District Office, Sungai Penuh City. Various factors that influence it will be explained in detail. The dependent variable that will be discussed is; job satisfaction while the independent variables that also influence are; quality of service, quality of work life, and motivation of public service. This research was conducted at the Office of the Kumun Debai Sub-District City of Sungai Penuh. This type of research is descriptive qualitative. The data used in this research are primary data and secondary data, the data presented consists of quantitative data and qualitative data. The research population is all service users at the Kumun Debai Sub-District Office, Sungai Penuh City. The data collection instrument used a questionnaire that had been adapted to the research objectives. Interviews and observations were conducted to describe the phenomena that occurred at the research location. Data analysis was carried out qualitatively. The results of this study are; job satisfaction caused by factors of service quality, quality of work life, and public service motivation based on the results of the total achievement of respondents (TCR) are in the pretty good category. However, the Kumun Debai sub-district office must improve the services provided to the community so that community satisfaction increases.

Keywords: Quality of service, Quality of work life, Public service motivation, Community Satisfaction

I. INTRODUCTION

Public service is a component that will always be used by the community. The demand for services that are getting better day by day must be carried out continuously by the government as the executor of the service. The government's role in carrying out daily tasks cannot be separated from excellent service to the community as service recipients. As the spearhead of public services, the government must work optimally, quickly, carefully, and efficiently. Often there are complaints about government services received by the community. Complaints in the form of long lines and convoluted procedures make people feel reluctant to deal with government offices. Good service quality will certainly be able to make the community as the object of public service feel satisfied. The community as users of the services provided by the government must get good, fast, easy, and cheap service. As revealed by Putra et al (2015) that the community will be satisfied with the service from the government as the executor if the performance in the service is of high quality. Good quality services will cause people who receive services to feel satisfied.

Quality services, fast, accurate, and responsive to the interests of the community require support from various facilities, both physical and non-physical. Adequate, sophisticated, and modern facilities and infrastructure will make the services carried out more efficient and effective. People will increase trust and feel satisfied with the services provided. The community is increasingly critical and understands the standard of service provided. If it is felt that government services are complicated and burdensome, then the community will complain and lose confidence because they are considered unprofessional.

The services provided by the government start from the lowest level to the highest level. Services at the lowest level are usually carried out by local governments. Regional governments have the authority to carry out their duties as executors in enforcing regulations that must be implemented. In addition to exercising legal authority, regional governments must also protect the interests of the community, and guarantee the implementation of order and security in general. This is important because the achievement of goals in development will not be successful if these various things are ruled out.

The sub-district as the body that carries out the authority delegated by the district in its operational area has duties in the fields of government, development, economy, social, community welfare, and various other public services. The following functions are carried out by the sub-district :

- a. Organizing administration of government in the district area;
- b. Organizing activities for fostering and developing the people's economy and carrying out regional revenue collection by following the delegated authority;

- c. Implementation of community social services and community empowerment;
- d. village development;
- e. Implementation of administrative support in the field of elementary school education;
- f. Fostering peace and order in the district area;
- g. Implementation of coordination, operational units of service/agency technical implementation; and
- h. Implementation of facilitation of development activities and development of community participation.

In carrying out the authority and tasks carried out by the sub-district, success will certainly be determined by the community as the target of the service. The public satisfaction index should always increase from time to time as a form of service improvement, especially in the fields of facilities and infrastructure, human resources, and technology used in the service process. Based on the phenomenon that occurred, from the secondary data encountered in the field, it appears that community satisfaction with the services of the Kumun Debai Sub-district Office has decreased in the last three years as can be observed in table 1, namely:

Table 1
 Performance Target Achievements of Kumun Debai District Office

No	Target Indicator	2019 (%)	2020 (%)	2021 (%)
1	Community Satisfaction Index	88	85	83

Source: Lakip 2019, 2020, 2021

Kumun Debai sub-district office in the last three years is; in 2019 it was 88%, in 2020 it was 85% and in 2021 it was 83%. From this data, it can be seen that community satisfaction has continued to decline in the last three years with the services provided by the Kumun Debai District Office. Therefore, this research is important to do to get a picture of why people's satisfaction has decreased, and what factors have contributed to this phenomenon occurring.

Before conducting the research, a preliminary survey was conducted to see how the community responded to the services of the Kumun Debai District Office Employees. The list of questions distributed to 25 respondents who were randomly selected related to satisfaction with the service received from the sub-district office staff. The following presents the findings of respondents who filled out the list of questions as follows:

Table 2
 Survey of District Office Public Services Kumun Debai

No	Information	Public Satisfaction (%)	
		Satisfied	Not satisfied
1	Service procedures	35	65
2	service time	30	70
3	Service competence	51	49
4	Employee behavior	41	59
5	Handling complaints, suggestions, and feedback	36	64
Average		38.6	61.4

Source: Community Satisfaction Survey Results, 2021

Based on the initial findings of this study, which can be seen in table 2, the majority of the community, namely; 61.4% stated that they were not satisfied with the services provided at the Kumun Debai District Office. This dissatisfaction comes from the service procedures provided, service time, competence in service, employee behavior in carrying out services and handling complaints, suggestions, and input provided by service user communities. Therefore, the services provided by the Kumun Debai Sub-district Office officers need to be repaired and revamped so that there are no more complaints from the public accessing the service.

Various factors also influence people's satisfaction with the services they receive from government institutions as the front line in service. Lupiyoadi (2018: 158), focuses more on seeing that service quality plays a very important role in determining the level of satisfaction. Meanwhile, Sutrisno and Mariyono (2016) put more emphasis on performance in addition to the quality of services provided. Furthermore, values, service quality, and organizational commitment to serving were put forward by (Hildayanti, et al 2018). Furthermore, Rezha et al, (2012) put more emphasis on developing issues related to public services, good service quality has always been the demand of society, easy, cheap, fast, quality service.

Factors that arise due to services in public institutions are the quality of work life. Lewis (2006) emphasizes attention to the quality of work life (*Quality Work Life*). Employee perceptions of a sense of security, relatively satisfied, and self-development, are the quality of work life conveyed by (Casio, 2006). While ways to increase productivity, morale, and efforts to improve the quality of output through participation and involvement in the decision-making process are the quality of work life described by (Sumarsono, 2004).

Various previous studies have shown that the quality of work life has a positive and significant impact on performance (Usman, 2015). The increased quality of work life provides a greater *positive feeling*, and a higher *self-system* and job satisfaction and commitment to the organization also increase. Furthermore, the quality of work life also fosters a desire from within employees to remain in the organization (Bernadin, 2018). Furthermore, studies conducted by; Gupta (2019) found that there is a high level of satisfaction among employees who obtain a good quality of work life.

Based on the results of observations made at the Kumun Debai sub-district office, several problems were obtained regarding service quality which caused community dissatisfaction with the services provided. Some of these problems become important points so that this study must be carried out including :

1. Public complaints reported to officers were not responded to quickly to improve the services provided.
2. Waiting room facilities/facilities are still not good for people who need service. This reduces comfort while obtaining services.
3. Friendliness and good attitude of officers toward people who need services are still lacking.

Moving on from the problems that have arisen, it is necessary to conduct further studies to obtain answers regarding the lack of public satisfaction with the services of the Kumun Debai Sub-district Office.

II. RESEARCH METHOD

This research was conducted using a survey method, while the type of research is descriptive qualitative. Descriptive research aims to reveal each variable that also influences the quality of service to employees of the Kumun Debai sub-district office. The survey method described by Sugiyono (2012) is a method for finding relative, sociological, and psychological events. The data used in the research comes from primary data and secondary data obtained from related agencies. Consists of quantitative data and qualitative data. The research instrument used a questionnaire that was distributed to the research object randomly. Measurement of variable indicators using a Likert scale.

Field research is an option for observing conditions in the field. According to Arikunto (2018), the object of research is a set of elements that can be in the form of people, organizations or goods to be studied. Then emphasized Martono (2015), the object of research, is the subject matter to be studied to obtain data in a more directed manner. While the object of research is; community users of the services of the Kumun Debai sub-district office. The number of community users of services at the sub-district office is unknown. Therefore the technique and formula used by Malhotra (2006: 291) are used where the number of samples used in the research must be at least four or five times the number of question items made in the questionnaire. Based on these provisions, this study used 144 samples obtained from 4 x 36 (number of question items) made in the questionnaire. Non-probability sampling is the technique used in this study. Because the number of people accessing services is not known with certainty, the accidental sampling technique is used where the respondents who are the object of research are coincidental or not predetermined.

The results of the research in the form of primary data were carried out by descriptive analysis, namely, the results of data processing were then described to describe the proportion of respondents' answers to the research variables presented in the questionnaire. The data is presented in the form of a frequency distribution table with descriptive statistical calculations such as calculating the mean, percentage, and level of achievement of the respondents and then interpreting this analysis so that the results of the tabulation provide information related to the problems in the research :

1. Percentage

$$P = \frac{F}{N} \times 100\%$$

Where :

- P = Percentage
- F = Frequency
- N = Number of respondents

2. The average score of each item

$$\text{Rata-rata skor} = \frac{\sum f_i \times W_o}{\text{total respondents (n)}}$$

Where :

- F_i = frequency
- W_o = wight

$$\text{Mean} = \frac{5A + 4B + 3C + 2D + 1E}{N}$$

Information :

- A = Very Strong / Strongly Agree / Always
- B = Strong/Agree/Often
- C = Enough/Indecisive/Sometimes
- D = Weak/Disagree/Rarely
- E = Very Weak/Strongly Disagree/Never

The total achievements of these respondents are; sized to calculate each answer category chosen by the respondent from the descriptive variable, then calculated using the following formula :

$$\text{TCR} = \frac{R_s}{n} \times 100\%$$

Information :

- TCR = Level of Attainment of Respondents
- R_s = Average answer score (mean)
- N = Answer score value.

Sudjana (2005:44) explained that the criteria for interpreting the score of the respondent's answer are as follows:

Table 3.4
TCR category

No	Scale Range	TCR
1	90% - 100%	Very good
2	80% - 89%	Well
3	65%- 79%	Pretty good
4	55%- 64%	Not good
5	0% - 54%	Not good

Source: Sudjana (2005:44)

III. RESULTS AND DISCUSSION

Primary data in this study were obtained from the results of distributing questionnaires to research respondents, namely people who received services from officers from the Kumun Debai Sub-district Office. Factors that influence community satisfaction in this study have previously been mapped into the quality of services provided, the quality of work life, and motivation in providing services to service user communities. Based on the results of the questionnaire distribution, it can be explained about the data on the characteristics of the respondents in this study, namely:

Table 3
Frequency Distribution of Respondent Characteristics

Characteristics	Number of Respondents (people)	Percentage (%)
Gender		
Man	82	57
Woman	62	43
Amount	144	100
Age (Years)		
< 25	20	14
25-35	35	24
36-45	39	27
> 45	50	35
Amount	144	100
Last education		
SMA/Equivalent	22	15
DIII	38	26
S1	72	50

S2	12	8
Amount	144	100

Source: Processed primary data, 2022

From the results of returning the questionnaire that was filled in by the respondent, it can be explained that; the number of respondents in this study who were male was 82 people or 57% while those who were female were 62 people or 43%. Based on this gender, it can be concluded that men prefer or are more dominant in utilizing the services provided by the Kumun Debai Sub-district Office. Because men have more time to deal outside the home than women who tend to have more activities in the household. Meanwhile, based on the age of the majority of respondents were aged over 36 years or 62%. This is because at this age more needs are taken care of, especially related to family interests, especially educational issues. Meanwhile, based on the education level of the respondents, none of them had an education level below SMA/equivalent. This means that from this data it was found that the education level of the respondents was good because no one had education in junior high school or elementary school. With a better level of education, respondents are more able to take advantage of services that require readiness in complete administration using a computer or online technology.

4.1 Service Quality

Quality of service is an important factor that becomes a measure of the services provided. Satisfaction and dissatisfaction with service users are largely determined by the quality of the services provided. The results of the research are based on service quality variables which are derived into several indicators, namely; affective commitment, continuing commitment, and normative commitment can be presented in table 4 below:

Table 4
 Service Quality Score Results

Indicator	Item No	Alternative Answers					Total Score	Average ²	TCR (%)
		SS	S	KS	TS	STS			
affective commitment	KO1	28	65	33	18	-	521	3.72	74,4
	KO2	38	58	21	27	-	539	3.74	74.8
	KO3	26	79	21	18	-	545	3.78	75,6
								3.75	74.9
Continuous commitment	KO4	29	67	30	18	-	539	3.74	74.8
	KO5	28	66	25	24	1	528	3.67	73,4
	KO6	35	52	31	25	1	527	3.66	73,2
								3.69	73,8
Normative commitment	KO7	37	56	35	16	-	546	3.79	75.8
	KO8	26	72	27	19	-	537	3.73	74,6
								3.76	75,2
Average								3.73	74,6

Source: Processed primary data, 2022

The results of the service quality score are illustrated in table 4, as information about the service quality of the officers of the Kumun Debai Sub-district Office. From the results of the descriptive test conducted it appears that the TCR of the service quality variable of 74.6 % is in the fairly good category. This implies that the quality of service for officers in the sub-district still needs to be improved through the indicators of affective commitment, continuance commitment, and normative commitment which have been tested in this study.

While the next indicator is; indicators of normative commitment with the highest TCR are; 75.2% and the average score is 3.76, the meaning is; Respondents ' response to normative commitment is in the pretty good category. Related to the statement about the respondent's opinion of people who can be fully trusted in providing information to the public are worth 75.8%, the value of this figure is in the pretty good category. Furthermore, in the statement that you can be relied upon to help people with difficulties, it is worth 74.6%, meaning that it is still in the pretty good category. Thus, it can be interpreted that the normative commitment to the task force felt by the community is in a good enough category and efforts are needed to be increased so that community satisfaction can be fulfilled even more optimally.

From the data that has been collected and tabulated, the TCR is then found the lowest TCR value found in the indicator; Continuance commitment is worth 73.8 % with an average score of 3.69. The point is; Respondents ' response to continuance commitment is in the quite good category. In the statement item, the task of realizing responsibility in providing services to the community has a value of 74.8 %, meaning that it is in a fairly good category. There is a flexible assignment statement when there is a service charge it is worth 73.4%. Meanwhile, in the PE statement, the task of making service adjustments to meet community needs has a value of 73.2 %, this

value is in the pretty good category. Based on the previous explanation, it can be concluded that the ongoing commitment felt by the community which is the target of the services provided, officers still need to improve so that community satisfaction with the services provided by Kumun Debai District Office officers can be fulfilled. Based on the information obtained from the responses of respondents to the questionnaires that have been distributed, the quality of service, in general is in the pretty good category. This fairly good category still needs to be improved by officials from the Kumun Debai sub-district office in terms of the quality of services provided.

4.2 Quality of Work Life

The variable of quality of work life is formulated in five indicators. From the variable quality of work life the data which is processed descriptively can be broken down into five indicators, that is; *Tangible (tangible)*, *Reliability (reliability)*, *Responsiveness (responsiveness)*, *Assurance (certainty)*, *Empathy (empathy)*. The detailed results of processed descriptive data on the quality of work life are shown in table 5 below:

Table 5
 Quality of Work Life Score results

Indicator	Item No	Alternative Answers					Total Score	Average ²	TCR (%)
		SS	S	KS	TS	STS			
<i>Tangible (tangible)</i>	KP. 1	27	57	35	24	1	517	3.59	71.8
	KP. 2	33	64	29	18	-	544	3.78	75,6
								3.69	73,7
<i>Reliability (reliability)</i>	KP. 3	44	57	25	18	-	559	3.88	77,6
	KP. 4	32	68	22	22	-	542	3.76	75,2
								3.82	76,4
<i>Responsiveness</i>	KP. 5	21	63	31	29	-	508	3.53	70,6
	KP. 6	22	55	34	32	1	497	3.45	69
								3.49	69.8
<i>Assurance</i>	KP. 7					-	540	3.75	75
	KP. 8					1	539	3.74	74.8
								3.75	74.9
<i>Empathy (empathy)</i>	KP. 9	35	61	23	24	1	537	3.73	74,6
	KP. 10	35	52	27	30	-	524	3.64	72,8
								3.69	73,7
Average								3.68	73,7

Source: Processed primary data, 2022

Based on table 5 can it was shown that, information about the quality of work life of task pe services at the Kumun Debai District Office. From the results of the descriptive test, it can be explained that the TCR value of the quality of work-life variable is 73.7 % This condition is in the pretty good category. Thus, it means that the quality of work life of service personnel still needs to be improved through indicators of tangible, *reliability*, *responsiveness*, *assurance*, and *empathy according to* the indicators in the quality of work life. The value is quite good, it still needs to be increased even higher, considering that community satisfaction in obtaining services continues to increase. Society wants to be served in a way that is far more satisfying.

The highest TCR value is in the *reliability* indicator, namely; 76.4% with an average score of 3.82, meaning that the public's response to the *reliability* indicator (*reliability*) is in a good enough category descriptively. The results of the responses given by respondents regarding the statement that the officers had provided their services according to the time they promised were 77.6% in the fairly good category. Furthermore, the statement of the task force in providing services quickly and precisely from the start is worth 75.2% in the pretty good category. Condition This can be explained that the indicators of *reliability* for service workers still need to be improved because there are still services that are carried out not according to the promised time, slow and inaccurate services that respondents feel are carried out by officers. For this reason, it is necessary to increase the reliability or *reliability* in service so that people's satisfaction can be increased.

The lowest score should be a reference for improvement to be more perfect than it already is. Based on research data, the lowest TCR value is on the *responsiveness* indicator sustainable with a score of 69.8 % with an average score of 3.49. From the results data, this research can be interpreted that; responses given by respondents to the quality of sustainable work life are in the pretty good category. At the point of the statement, the task force has a good response in helping public complaints related to service, with a value of 70.6%,

which is in the pretty good category. The statement that the person on duty is always willing to provide the information needed by the community has a value of 69%. The point is; the quality of work life assigned to the task of serving respondents feels like it hasn't been done optimally and still needs to be improved so that people feel satisfied right through services provided by officers of the Kumun Debai sub-district office. Based on data obtained from research respondents, the quality of work-life variable is in the fairly good category, meaning; The Kumun Debai Camat Office still has to improve the quality of work-life in service to the community.

4.3 Public Service Motivation

To measure the next variable that is used as an issue in this study is; variable public service motivation. This variable is described in several indicators that are measured in this study, including targets, quality, time of completion, adherence to principles. The following results of research related to public service motivation variables can be seen in table 6 below ;

Table 6
Public Service Motivation Score Results

Indicator	Item No	Alternative Answers					Total Score	Average ²	TCR (%)
		SS	S	KS	TS	STS			
Target	K1	27	48	32	34	3	494	3,43	68,6
	K2	34	48	28	30	4	510	3.54	70,8
								3.49	69,7
Quality	K3	28	55	24	35	2	504	3.50	70
	K4	29	52	27	33	3	503	3.49	69.8
								3.49	69,9
Completion time	K5	28	58	32	25	1	519	3.60	72
	K6	27	62	24	31	-	517	3.59	71.8
								3.60	71.9
Obey the principle	K7	22	62	32	27	1	509	3.53	70,6
	K8	30	59	25	30	-	521	3,62	72,4
								3.58	71.5
Average								3.54	70,8

Source: Processed primary data, 2022

Based on the indicators of a target, quality, completion time, and compliance with the principles measured in the research, the total TCR of the motivational variable for public service is 70.8 %. This category is quite good. Based on the results of this category, the motivation for public services still needs to be improved so that the level of public satisfaction with the services received is higher. Good service motivation gives enthusiasm for officers to work well in providing services. However, the services that have been carried out now still need to be improved according to excellent service standards.

On the completion time indicator work obtained the highest TCR value of 71.9 % with an average score of 3.60, meaning that the community's response to completion time was a pretty good category. The community's response to statements of work done and employees not being able to utilize working time in serving the community efficiently is 71.8% then employees finish on time with a value of 72%, this category is in the pretty good category. However, it is still required to improve service in the future.

Furthermore, the lowest TCR value is at the target indicator with a value of 69.7%, the average score is 3.49, meaning that the community's response to employee work targets is in a fairly good category. In the statement that employees can provide satisfaction for the community, it is worth 68.6% in a fairly good category. The statement that the employee understands well his work target in providing services is worth 70.8% in the fairly good category. This condition indicates that employees have not been able to meet work targets in serving the community so this causes the level of community satisfaction to decrease. For this reason, in the future, employees of the Kumun Debai sub-district office need to increase their work targets to achieve increasing community satisfaction from time to time.

4.4 Community Satisfaction

The dependent variable which is the main problem in this study is community satisfaction as users of public services. This variable is translated into 6 indicators which are made into 12 statement items to research respondents. The indicators in the statement are transparency, accountability, conditional, participatory, equal rights, and balance of rights, and balance of rights and obligations. The results of the questionnaire that has been filled in by respondents in detail from community satisfaction d can be seen in the following table ;

Table 7
Community Satisfaction Score Results

Indicator	Item	Alternative Answers	Total	Average	TCR
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	No	SS	S	KS	TS	STS	Score	²	(%)
Transparency	KM1	25	61	32	26	-	517	3.59	71.8
	KM2	25	58	35	26	-	514	3.57	71.4
								3.58	71.6
Accountability	KM3	32	63	28	21	-	538	3.74	74.8
	KM4	29	66	23	26	-	530	3.68	73,6
								3.71	74,2
Conditional	KM5	33	65	24	22	-	541	3.76	75,2
	KM6	29	57	30	21	1	506	3,6	72
								3.68	73,6
participatory	KM7	29	56	25	33	1	511	3.55	71
	KM8	26	61	33	24	-	521	3,62	72,4
								3.59	71.7
Equal rights	KM9	21	64	32	27	-	511	3.55	71
	KM10	29	51	36	28	-	513	3.56	71,2
								3.56	71,1
Balance of rights and obligations	KM11	41	59	24	20	-	553	3.84	76.8
	KM12	29	64	17	34	-	520	3.61	72,2
								3.73	74.5
Average								3.64	72,8

Source: Processed primary data, 2022

Based on Table 7 There is some important information can be drawn including; The results of the descriptive test explaining that the TCR value is the respondent's satisfaction variable of 72.8% is in the pretty good category. Based on the indicators tested in this study, namely; transparency, accountability, conditional, participatory, equal rights, and balance of rights, and the balance of rights and obligations, the service to the community in Kumun Debai District must be improved.

The crucial thing is; the indicator of the balance of rights and obligations has the highest TCR, that is; 74.5% with an average score of 3.73, that is is the response of research respondents to the balance of rights and obligations in the pretty good category. The response given by respondents regarding the employee's statement of providing fair service to every community that needs service has a value of 76.8% which is included in the fairly good category. Then the statement that there is a balance of rights between employees and the community has a value of 72.2 % which is in the pretty good category. This can be interpreted that the balance of rights and obligations *that* the research respondents felt the service they received was good enough and needed to be improved so that people's satisfaction could be fulfilled.

Meanwhile, the lowest TCR is in the sustainable equal rights indicator with a value of 71.1% with an average score of 3.56, which means; Respondents ' response to equal rights in the category is quite good. Statement items stating that employees provide services by applying the principle of equal rights, without any discrimination is 71% in the fairly good category. Statements about employees do not discriminate between ethnicity, race, religion, class, gender, or status, with a value of 71.2% being in the fairly good category. This means that research respondents still feel discrimination or differences in providing services so community satisfaction decreases.

IV. CONCLUSION

Based on the data analysis that has been done, the following conclusions can be drawn; community satisfaction caused by the quality of service, quality of work life, and public service motivation based on the results of the total achievement of respondents (TCR) are in the pretty good category. Thus the Kumun Debai Camat Office must improve the services provided to the community so that community satisfaction will increase.

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An Analysis of Fixed Assets Management of Sugar Industry in Karnataka

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Abstract- The capital expenditure is an important segment of capital investment with reference to fixed assets management and depreciation policy. The size of depreciation and method of depreciation adopted by factories influences its financial strength and adequacy to return on capital employed. The study tries to understand the size of depreciation with regard to gross block and depreciation to sales. It also tries to study the indices of gross block and depreciation in sample sugar factories and its impact on sales as well as return adequacy in sugar industry.

I. INTRODUCTION

Fixed assets management is the major capital expenditure incurred by the company to manage its capital structure; it deals with purchase of land & building plant & machinery, vehicles and other fixed assets which are essential in smooth running of business concern. Therefore when we talk about the fixed assets with usage it deteriorates its value and the role of depreciation policy plays a very important role in the fixed assets management. The depreciation policy blocks the gross fixed assets and decreases the financial strength of the concern. It forces the business concern to purchase the additional fixed assets for the further development of business. Over a period of time fixed assets are subject to obsolescence and the value becomes zero at a particular point in time. Therefore replacement of fixed assets is another issue in fixed asset management. It is advisable to the company to have a replacement policy to its fixed assets for avoiding the excessive capital expenditure in the years to come.

II. REVIEW OF LITERATURE

Pradeep Kumar Das¹, “Financing Pattern and Utilisation of Fixed Assets -A Study”, this study deals with analysis on the financing pattern and utilisation of fixed assets of Tata Steel Limited., the selected company have been studied with the help of several statistical measures during the period from 2011-12 to 2015-16. The study reveals the sufficiency of owners fund to finance fixed assets requirements and that the company had also enough long term funds to finance the entire fixed assets as well as part of current assets. The pace of expansion in gross block on sales was not impressive in the years of study. Apart from this, slow increase in the indices of depreciation points out that overall provision for depreciation was moderate in the company under reference.

Daniel Penkar², “fixed assets management with respect to WILCO Mather and Platt Pumps Private Limited”, fixed assets management is an accounting process that seeks to track fixed assets for the purposes of financial accounting, preventive maintenance and theft deterrence. Organisations face a significant challenge to track the location, quantity, condition, and maintenance and depreciation status of their fixed assets. This research paper addresses the role of fixed assets play in efficiency of a company to generate sales. At the same time, this paper addresses the area of improvement for the company's employees. The study is based on the research conducted at WILCO Mather and Platt Pumps Private Limited.

Biswas Bhaskar³, “Asset Management and Profitability: A Study of Selected Pesticides and Agro Chemical Companies in India”, Indian agriculture has been suffering from various problems like small and fragmented land holdings, use of low crop yielding seed, lack of mechanisation, soil erosion, uneven rainfall, lack of adequate storage and transport facilities. Consumption of agro based machinery, fertilizer, high crop yielding seeds, pesticides; irrigation facilities are the characteristics of present Indian farming system. The objective of the present study is to find out relation between ratio of assets

management and ratio of profitability of the ten select pesticides and Agro chemical companies in India for the period of the study. Ten companies of producing pesticides and Agro-chemical and listed in the stock exchange of India were selected for the study. The period of observation for the study is five years from 2014 to 2018 and correlation Matrix and regression analysis had been used for analysing the data collected from secondary source. As a result it can be said that there was significant correlation and regression between profitability and Asset Management ratio for selected companies for the Period of study.

Balavanthula SaiRam, Shireesha I, Vara Lakshmi Thavva⁴, “a study on fixed assets management in LG Electronics”, the study attempts to know capital expenditure made by the company during the study period. the study is conducted to evaluate depreciation and method of depreciation adopted by LG company. profit maximization is not considered as basic idea for making investment and financing decision through fixed assets management. it also evaluate the adequate return of the company. it deals with evaluation of fixed assets if liquidation take place, what is the proportion of fixed assets amount will contribute for the payment of owners fund and long term liabilities.

Research Gap

After reviewing various literatures, it can be observed that the study reveals that the efficiency of owners fund to finance fixed assets requirements and that the company had also enough long term funds to finance entire fixed assets as well as part of current assets. Slow increase in the indices of depreciation point out that the overall provision for depreciation was moderate in the company.

The other paper deals with the organisation faces a significant challenge to track the location, quantity, condition, maintenance and depreciation status of their fixed assets. The study addresses the role of fixed assets play in efficiency of a company to generate sales.

The another study tries to find out relation between ratio of Asset Management and ratio of profitability of ten select pesticides and Agro chemical companies in India for period of the study. There was a significant correlation and regression between profitability and Asset Management ratio for selected companies for the study period.

Another study attempts to know capital expenditure made by the company during the study period. The study is conducted to evaluate depreciation and method of depreciation. It also tries to evaluate the adequate return of the company. It can be said that, only a little literature could be found out in the fixed assets management, that too the literature review deals with fixed financing pattern of fixed assets, role of fixed assets in efficiency of company to generate sales, one of the study deals with relation between assets management and profitability and last literature deals with capital expenditure and adequate return. There is a lot of work need to be undertaken in the area of size of depreciation, adequacy of depreciation of fixed assets. In case of sugar industry which is a capital intensive industry as its, higher amount of capital is blocked in fixed assets. Therefore there is a need to know the size of depreciation to gross block and depreciation to sales as well as the indices of gross block and depreciation in sample sugar factories in Karnataka state.

III. STATEMENT OF THE PROBLEM

The capital expenditure is an important segment of capital investment with reference to fixed assets management and depreciation policy. the size of depreciation and method of depreciation adopted by factories influences its financial strength and adequacy to return on capital employed. The study tries to understand the size of depreciation with regard to gross block and depreciation to sales. it also tries to study the indices of gross block and depreciation in sample sugar factories and its impact on sales as well as return adequacy in sugar industry.

IV. OBJECTIVES OF THE STUDY

- To study the Performance of Fixed Assets Management.

Need for the Study

Sugar industry occupies a pivotal role in the world market, specifically in Indian market. There is a need to understand in depth the financial strength of sugar industry. The study attempts to know fixed assets management and depreciation policy adopted in sample sugar factories in Karnataka and its impact on sales and return adequacy in sugar industry.

Scope of the Study

The study covers only select sugar factories in Karnataka and excludes all other public and co-operative sugar factories from the study. At the same time the period is confined to 10 years starting from 2005-2006 to 2014-2015, and the performance of selected factories before and after study period excluded.

Research Design

The study is nature of desk research.

Sources of Data: The data required for the study collected from secondary source. The secondary data obtained from the Annual reports of the selected factories; magazines, Government reports, newspapers, internet surfing etc.

Sample Design: As on October 2011, the population for the study comprises of 38 private sugar factories in Karnataka. With the use simple random sampling technique the researcher selected 10 Sugar factories in the Karnataka State. However due to non-cooperation of two factories (GEM and Jamkhandi Sugars Limited) in providing data they have been out of the study. This leaves eight factories as sample and represents the sugar industry. The sample factories are given below:

1. Parrys Sugars Limited (Parrys)
2. Shri Prabhulingeshwara Sugars And Chemicals Limited (Prabhulingeshwara)
3. Shree Renuka Sugar Limited (Renuka)
4. The Ugar Sugars Works Limited (Ugars)
5. Athani Farmers Sugar Factory Limited (Athani)
6. Davangere Sugar Limited (Davangere)
7. Sri Chamundeshwari Sugar Limited (Chamundeshwari)
8. Bannari Amman Sugars Limited (Bannari)

Here on words the sample factories are called in short names.

Tools of Analysis

The data collected analysed with the help of ratio analysis, trend analysis and statistical techniques wherever necessary to draw meaningful inferences.

Limitations of the Study

The figures taken from the annual reports have been rounded off to two decimals of rupees in Lakhs. The data available in financial statements have been translated into pre-designed the structure format so that a meaningful interpretation could be made through inter-firm and intra-firm comparison. The format in which data have been classified is selected after careful consideration of the operations of the sugar factories. Nevertheless, the limitations do in No way act as a deterrent in drawing effective and meaningful inferences from this study.

Analysis of Depreciation Policy of Sugar Industry in Karnataka

Depreciation policy is of considerable importance to the financial manager because of its impact on profitability, its size in relation to total cost of operation, its effects on rate of return on investment and finally its relationship to replacement policy. Depreciation is a permanent, continuing and gradual shrinkage in the book value of fixed assets as a given rate as compared with its value at previous date. Depreciation is the systematic allocation of the cost of capital equipment to the revenues.

Most of the fixed assets may have productive use for many years, but eventually they will wear or become absolute and have little value. As depreciation is charged against revenues it denotes revenues consumed. Usually depreciation may be calculated either based on written down value method or straight line method. The choice of the method of depreciation has important consequences for financial management.

In India, business enterprises calculate depreciation as per the provisions of the Indian Companies Act, 1956. The amount of depreciation is calculated on historical cost of the Asset. Business firms provide depreciation on written down value method as per section 205 (2) (a) or straight line method in accordance with section 205 (2) (b) of Indian Companies Act 1956.

The sample factories have employed both methods for computation of depreciation. Among the sample factories, Parrys, depreciation has been provided on straight line method for tangible assets.⁵ Prabhulingeshwara charge depreciation on straight line method for tangible assets.⁶ Renuka provides depreciation on straight line method.⁷ Ugar charged depreciation under written down value method.⁸ Athani provides depreciation on straight line method on tangible assets.⁹ Davangere charged depreciation under written down value method on fixed assets.¹⁰ Chamundeshwari provides depreciation on straight line method.¹¹ Bannari provides depreciation on straight line method on fixed assets.¹² Regarding rate of depreciation all the sample factories under the study have charged depreciation, not exceeding the rates prescribed by the Income Tax Department. Therefore, the depreciation provided by the factories

presently may not be sufficient to replace the fixed assets whose costs have substantially increased. In spite of this known fact, an attempt has been made here to analyse the depreciation policy and the adequacy of depreciation provided in sample factories.

Size of Depreciation

The size of depreciation can be judged in relation to gross block and sales. The depreciation policy of the sample sugar factories has been studied by computation of two ratios, viz: i) depreciation to gross block and ii) depreciation to sales. Generally, upswing in the ratio of depreciation to gross block as well as sales indicates that a larger portion of sales revenue is consumed as depreciation; thereby the operating income is reduced.

Depreciation as percentage to gross block and sales is shown in Table -1 in consolidated position; sugar industry in Karnataka state has provided depreciation on an average to the extent of four percent on its gross block per annum. Depreciation to sales ratio on an average worked out at four percent as in the case of depreciation to gross block ratio. It points out that depreciation has consumed four per cent of sales on an average. Over the years, the ratio of depreciation to gross block has ranged between three percent and five percent over the years under observation. Further depreciation to sales varied between five percent in 2007 and three percent in 2015. It reveals that both the ratios recorded oscillations. The depreciation policy of the sugar industry was inconsistent. Depreciation to gross block tended to decline at the end under the study period.

Table-1											
Depreciation as a Percentage to Gross Block and Sales											
Name of the Factory	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average
Consolidated											
Depreciation to Gross Block	5	4	3	4	4	5	5	5	5	4	4
Depreciation to sales	4	5	4	4	3	3	5	3	3	3	4
Parrys											
Depreciation to Gross Block	4	4	3	3	4	6	3	4	5	5	4
Depreciation to sales	4	7	9	14	14	9	5	5	4	4	8
Prabhulingeshwara											
Depreciation to Gross Block	4	4	4	4	4	4	4	5	5	3	4
Depreciation to sales	5	4	5	4	4	3	4	4	4	3	4
Renuka											
Depreciation to Gross Block	2	3	3	4	4	5	5	5	5	5	5
Depreciation to sales	1	3	2	3	1	2	-	2	3	3	2
Ugars											
Depreciation to Gross Block	5	2	4	5	9	7	6	6	6	3	5
Depreciation to sales	3	4	3	4	8	5	4	3	4	2	4
Papri											
Athani											
Name of the Factory	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average
Depreciation to Gross Block	8	10	9	6	6	4	4	4	5	6	6
Depreciation to sales	4	5	4	3	5	3	2	3	4	3	4
Channideshwar											
Depreciation to Gross Block	2	2	1	4	4	4	5	5	5	3	
Depreciation to sales	8	8	8	7	6	5	4	4	5	4	4
Depreciation to sales	3	3	3	8	7	5	5	5	6	4	5
Amman											
Depreciation to Gross Block	8	6	5	4	4	6	6	5	4	3	5
Depreciation to sales	7	5	5	5	4	9	6	4	8	6	6

Source : i) Appendix-I(A) to I (I); and
 ii) Appendix-III(A) to III (I)

A study of individual factories reveals that all the sample factories have provided depreciation throughout the study period under reference. The lowest average of depreciation to gross block was four percent in Parrys, Prabhulingeshwara, Renuka, Athani and Chamundeshwari each, whereas the highest percentage of six percent in Davangere. The depreciation to sales ratio on an average reported a minimum of two percent each at Renuka. It indicates that depreciation has consumed two percent of sales and eight percent in Parrys on an average. Among the sample factories, the ratio of depreciation to sales has remained more or less constant over the years under study with the exception of Parrys that too 2008 to 2010. It indicates that large portion of sales revenue has not been consumed as depreciation in the sample factories but in Parrys higher part of sales revenue was consumed by depreciation. It implies that these factories adopted liberal depreciation policy. The mild variation in the ratio of depreciation to gross block is found in Renuka and Ugar. It indicates that these factories have followed consistent depreciation policy. In the rest of the factories, the ratio of depreciation to gross block trends to decline over the years under observation. It implies that these factories have not provided adequate depreciation in the latter years of the study.

The depreciation policy adopted by the sugar industry in Karnataka state is satisfactory as the factories could provide depreciation more or less continuously on a consistent basis over the study period.

Adequacy of Depreciation (on Historical Cost Basis)

The adequacy of depreciation is examined on historical cost basis. For this purpose, the trend of the depreciation is compared with the trend of gross block. As such index numbers are computed for the gross block and depreciation provision by taking 2006 as the base year. If both these trends move in the same direction, it can be inferred that sufficient depreciation has been provided. If the pace of increase in the Indices of depreciation exceeds that of the gross block, it is a sign of liberal provision for depreciation. If the gross block shows an increasing trend while depreciation reports a decreasing trend, it indicates insufficient provision of depreciation. An enterprise, which expects to continue in business, must provide depreciation obviously to replace its plant and equipment as they wear out.

A glance at Table -2 shows the overall trend of Indices of depreciation and gross block. In the consolidated position, it reveals that the Indices of gross block and depreciation were in upward direction (except 12). But, the pace of increase in the indices of depreciation was less than that of gross Block with exception (2010-2014). It points out that depreciation was not provided sufficiently in the sugar industry. An analysis of individual factories shows that in five sample factories – namely Prabhulingeshwara, Ugar, Athani, Davangere and Bannari, indices of gross block have recorded an increasing trend. But, indices of depreciation have reported ups and downs. It points out that all the factories have not provided adequate depreciation throughout the study period. The five factories namely Prabhulingeshwara, Ugar, Davangere, Athani, Bannari have shown an increasing trend in both the indices. However, the increase in gross block was more than that of depreciation. Therefore, the overall position of these factories in this regard shows a healthy state of affairs. In other words, these factories provided depreciation adequately.

Table-2										
Indices of Gross Block and Depreciation in Sample Factories										
Name of the Factory	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Consolidated										
Gross Block	100	131	176	206	249	305	158	301	322	339
Depreciation	100	112	133	176	229	337	166	311	321	283
Parrys										
Gross Block	100	112	179	207	210	218	235	40	45	48
Depreciation	100	127.5	140	173	261	356	228	48	62	69
Prabhulingeshwara										
Gross Block	100	117	135	148	158	190	233	246	252	261
Depreciation	100	104	118	123	152	155	219	261	269	187
Renuka										
Gross Block	100	170	262	334	45	-	649	667	692	695
Depreciation	100	284	415	711	928	1656	1812	189	1772	-
Ugars										
Gross Block	100	129	154	163	168	171	175	194	198	210
Depreciation	100	61	131	158	322	268	235	231	239	145
Athani Sugars Limited										
Gross Block	100	121	133	150	157	177	260	318	376	580
Depreciation	100	110	135	135	141	141	142	207	311	219

Table-2										
Contd.										
Name of the Factory	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Davangere										
Gross Block	100	105	108	112	115	126	148	186	196	226
Depreciation	100	110	135	135	141	141	142	207	311	219
Chamundeshwari										
Gross Block	100	128	183	187	198	202	170	174	175	178
Depreciation	100	151	149	459	451	541	544	537	564	391
Bannari										
Gross Block	100	118	134	159	205	217	224	232	278	295
Depreciation	100	87	81	79	89	164	155	139	121	119

Source : i) Appendix-I(A) to I (I); and
ii) Appendix-III(A) to III (I)

The other three factories- Parrys, Renuka and Chamundeshwari - have shown opposite trend. In other words, the rate of increase in indices of depreciation was more than the rate of gross block throughout the study period. It may be observed that these factories were providing more depreciation in all years of study.

To conclude, Prabhulingeshwara, Ugar, Athani, Davangere and Bannari have been providing depreciation adequately but Parrys, Renuka and Chamundeshwari provide more excess depreciation over the gross block.

V. FINDINGS OF THE STUDY

- In the sample factories, plant and machinery occupied highest position in the component of gross block. All the sample factories have registered a positive annual growth rate in their gross block (except Parrys). Renuka accounted for largest expansion in terms of gross block.
- Ownership funds were insufficient to finance fixed assets requirement in the industry. Consequently, the use of borrowed funds had become compulsory in financing the fixed assets. Analysis of individual sugar factories reveals that with an exception of Bannari, all other factories failed to offer adequate protection to their creditors and solvency of these factories was critical. In Bannari, proprietors' funds were adequate to finance the entire fixed assets requirements.
- Majority of sample sugar factories, long-term funds were sufficient to finance not only entire fixed assets requirements but also a part of current assets except in Prabhulingeshwara, this is a sound financial practice.
- The declining turnover of fixed assets indicates that the fixed assets were utilised inefficiently in the industry. However, Ugars is one company, which had shown an impressive performance as regard to the productive utilisation of its fixed assets. Fixed assets were used inefficiently in Parrys, Chamundeshwari, Athani, Bannari and Prabhulingeshwara. Due to short supply raw materials, labour unrest, power cuts and non-completion of expansion programmes.
- Expansion of fixed assets (gross) had positive impact on sales in the industry; the rate of growth in sales was comparatively higher than the growth in gross block. This indicates that the gross of block of fixed assets has been efficiently utilised in the industry. The indices of sales were higher than gross block of fixed assets in most of the years in individual factories like, Prabhulingeshwara, Renuka, Chamundeshwari and lower in case Ugars, Athani, Davangere and Bannari. This is the indication of a positive impact on sales of former sugar factories. The operating profits however, exhibited a fluctuating trend in all the sugar factories throughout the period due to other factors like heavy operating expenses, labour unrest and high cost of raw material.
- As far as depreciation is concerned the sugar factories have followed a uniform policy making provision based on historical cost. The depreciation policy was satisfactory as they could provide depreciation continuously over the study period.

VI. SUGGESTIONS FOR THE STUDY

- Financing of fixed assets through short-term funds is not a healthy practice. In order to avoid this situation, Prabhulingeshwara and Chamundeshwari have to improve proprietary funds.
- Profitability of any business enterprise depends on the effective utilisation of fixed assets. Fixed assets turnover needs to be maintained at a healthy level in the sample sugar factories. For this, they have to take necessary steps to ensure that they existing gross block (fixed asset) is put to the maximum possible use.
- Renuka, Ugars and Davangere have to cut down excess investment in fixed assets per tonne of sugar manufactured. This is possible through adoption of long-term planning, eliminating the cost overruns by strictly adhering to the time schedule of capital projects and proper monitoring and evaluation of the progress of such projects.
- The present technology adopted in sample sugar factories is out-dated. Modernisation programme is possible with the proper evaluation of projects and proper planning, active support of financial institutions and government and with the integrity of the management. The participants of financial institutions in the equity of these factories and extension of fresh loans at concessional rate of interest for undertaking modernised programs are necessary. Government, on its part, has to extend necessary support by way of allowing imports of capital equipment at concessional duty rates so that sample factories can update their production capacities along the lines followed elsewhere in the world. Production of qualitative sugar at low cost is possible only with modernisation of plant with latest technology.
- The sample factories have been providing depreciation on historical cost. Generally, such depreciation provision is sufficient to replace the obsolete assets, but, it is inadequate in the context of inflationary conditions. So, sugar factories have to provide depreciation continuously and also they have to create replacement reserve fund in order to provide for adequate funds for replacing obsolete fixed assets. In other words, these factories may need to provide depreciation on replacement cost basis.
- Establishment of sugar development fund for sugar factories on the lines of the existing Steel development and Cement development funds is the need of the hour. Setting up of this fund jointly by the industry and the financial institutions may be useful in updating technology and realising economies of scale.

VII. CONCLUSION

The depreciation policy adopted by the sugar industry in Karnataka state is satisfactory as the factories could provide depreciation more or less continuously on a consistent basis over the study period. The five factories namely Prabhulingeshwara, Ugar, Davangere, Athani, Bannari have shown an increasing trend in both the indices. However, the increase in gross block was more than that of depreciation. Therefore, the overall position of these factories in this regard shows a healthy state of affairs. In other words, these factories provided depreciation adequately. So, far as the depreciation is concerned, the sample sugar factories had provided depreciation more or less continuously over the study period. The amount earned marked for depreciation in all the factories might not be adequate to replace their assets in the context of inflationary tendencies in the economy and spiralling cost of capital goods.

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Socio-Cultural Dynamics Influencing Border Security Management along Kenya's Northern Border with Ethiopia

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Abstract: The purpose of this study was to assess the implications of the border security management on Kenya's national security. The study assessed selected socio-cultural dynamics that influence the interactions of the border communities and their impact on border security management at the Moyale One Stop Boarder Post. The study was anchored on the realism and Regional Security Complex theories and adopted a descriptive research design. A total of 493 respondents were targeted by the study, out of which a sample of 220 was obtained using the Yamane Formula. The respondents were sampled, using purposive, stratified and simple random sampling methods. Primary data was collected using both questionnaires and Key Informant Interview (KII) guide. Collected quantitative data was analysed using descriptive statistics and presented in tables and figures while qualitative data was organized into themes for analysis and reported using narratives. The study established that despite the increased revenues and a reduction in insecurity incidents within the territory of Kenya as reported by 64% and 79% of the respondents respectively, incidents of insecurity continued to occur. This points to gaps in the enforcement process, attributable to the absence of a functioning border management committee. There is also lack of cooperation from the local community in providing information on illegal immigrants living among the community. This is mainly due to cross border family ties whose social capital superseded their nationality. The study recommends activation of the border security management committee with clear terms of reference and standard operating procedures to ensure that all border security agencies operate within a multi-agency framework. Further, the national and county governments should collaborate in implementing the African Union Border Programmes in order to incentivize the border community to own the border security management initiative

Key Words: Boarder Security Management, One Stop Border Post, Social Cultural Dynamics

1.1 background of the Study

The modern state exists in a socio-spatial international system that has transformed over time due to a range of factors such as the globalization phenomenon, a dynamic that increases the opportunity for breaches to national security (Milner, 1992). Of significant concern has been the deterritorialization debate which has brought to the focus the subject of international borders and their place in the management of security. Okumu (2016) and Rosenblum (2013) observe that many countries, especially in Africa face numerous challenges in managing their borders, hence raising the question of territorial integrity and sovereignty of the states. The most significant border challenges include the illegal entry and exit of people and goods. In an attempt to address this threat to their security, some countries have resorted to building walls to control entry and exit (Oommen, 1995 in Belleza, 2013). These include the Botswana-Zimbabwe wall, Algeria-Libya wall, Kenya-Somalia wall and the Morocco-Spain border wall, to mention but a few. The effect of such border management practices besides boosting security has been the physical separation of border communities most of which have lived side by side for years and crossed the international borders with minimal or no barriers at all.

Adepoju (2005) maintains that migration has been a way of life for centuries due to economic, political, demographic and related factors as migrants search for various aspects of human security. In contemporary times, intra and inter country movements remain a central feature in Africa. Amin (1974) in Adepoju (2005) observes that the onset of colonisation failed to take into account the local ethnic and social set ups and consequently split communities into adjacent countries. For example, along the borders between Ghana/Togo and Nigeria/Benin, frontier workers commute to and from either country to their places of employment. The onset of independence in these countries had little impact on the cross-border migration as the extensive borders could not be policed effectively and strong social

relations had been established across the borders. This paper argues that recognition of the interests of communities inhabiting the borderlands should be embedded into the mechanism of border security management with a view to incentivize them as partners in an effort to enhance national security.

1.2 Research Problem Characterization

The management of cross border movement of goods and persons who wish to legally enter or leave the territory of Kenya has been fraught with many challenges. These include the presence of illegal armed groups, the porous and un-demarcated nature of the borders, lack of adequate border posts, poorly equipped personnel, and marginalized communities in the borderlands. The challenges portend an existential threat to Kenya's national security as typified by the presence of a flourishing informal cross border trade which denies the exchequer the needed revenue for national development thereby impacting negatively on national security (Barka, 2012).

Makokha (2020) writing on Kenya's border security management observes that the Kenya Ethiopia border along which the Moyale OSBP is located experiences smuggling and human trafficking by criminal networks in addition to other illegal activities. IOM (2018) estimated that approximately 20,000 people and associated illegal merchandise were being smuggled through the area annually at an estimated cost of 40 Million USD which roughly translates to slightly over Ksh 4 Billion.

While in theory there is a border committee to coordinate border security actors, there is no evidence of coordinated border security management by the committee. The challenges highlighted herein elicit critical questions regarding the effectiveness of measures adopted by Kenya's border security management actors and the place of the government therein. Further, cognisant of the interests of communities inhabiting the borderlands, it is unclear whether the mechanism of border security management takes into account the social-cultural context of the inhabitants with a view to incentivize them as partners in border security in an effort to enhance national security.

1.3 Literature Review

Freedom of movement imbues in people the opportunity to travel within and without the territories of their habitual residence. This poses serious challenges for the security community charged with ensuring safety and security of the state. Altai Consulting (2021) observes that there are always socio-cultural factors at play in cross border security management. These include transnational conflict actors, common livelihoods and resilience patterns, different political and administrative structures, as well as weak and informal governance actors who lack the capacity to address cross border issues. In most cases, cross border activity has often been constrained by government laws, priorities and policies that give rise to frameworks and perceptions resulting in harmful high-level decisions and inadequate laws that are only biased to the security dimension of cross border management. Pavanello (2010) concurs with Altai Consulting (2021), arguing that pastoralist communities move across international borders and advises that governments especially in the Horn of Africa region should endeavor to cooperate to grant legal backing to informal cross border trade. This is vital and consistent with Karkare et al (2021) contention that informal cross border trade is in part motivated by concern for social capital and networks. Stringent state regulation of cross-border movement elicits negative perceptions by the border communities who deem such efforts as an affront to their social ties. This perception runs counter to state interests especially in respect of revenue collection, concern for health risks from traded goods, and physical security for overall economic development.

Transnational networks often result in activities such as sharing of grazing land and water, opportunistic use of natural resources through cross border mobility, trading of livestock and other commodities. Pavanello (2010) observes that there is little recognition by national decision makers on the important contribution of these cross-border dynamics and rather than them being strengthened and conditioned towards advancing national security, they are often outlawed and securitized, thus the states losing on their potential benefits while encouraging the illegalities since these communities must live within a system anchored on the principle of survival for the fittest. This study argues that the unexplored potential of cross border activities needs to be harnessed for the good of the local community and the respective countries. However, effective harnessing requires deeper understanding of the wide range of activities, vulnerabilities and risks that cross international borders within the socio-cultural context (Pavanello, 2010).

Meanwhile, Shikuku, Okoth and Kimokoti (2020) in their study on the nature of the cross-border conflicts along the Kenya-Ethiopia border aver that both sides of the border have a similar environment characterized by arid and semi-arid conditions with the same ethnic groups, culture and customs. Their study cites the ethnic groups in the area as comprising the Borana, Burji, Gabra and Garre. This study concurs with Mkutu's (2022) assertion that the approach to management of interethnic conflicts in northern Kenya is flawed more so because of the tendency by communities for cross border support, in solidarity with the spirit of kinship. The drivers of instability in

the area are scarce resources especially pasture and water which are critical for the pastoralist lifestyle of the communities. Consequently, a recourse to violence to gain access to the scarce resources is an option routinely adopted. Whenever the conflict is protracted, inter cultural clan dynamics come into play. Further, in neighboring Oromia region of Ethiopia, the Oromo Liberation Front (OLF), an armed group that has been declared illegal by Ethiopian authorities is resident and when it engages the Ethiopian security elements and are pursued, they cross the border to find refuge among their Borana cousins in Moyale on the Kenyan side. The assistance of OLF is sometimes enlisted by the Borana whenever they violently clash with other ethnic groups in the larger Moyale area (Shikuku, Okoth, Kimokoti, 2020). Based on this dynamic, it can thus be argued that the Kenya-Ethiopia border region is a microcosm of the larger Horn of Africa security complex where conflict inevitably becomes transnational due to social-cultural links. Often, the conflict among communities in the border areas is either a derivative of competition for scarce resources, political competition and incitement, or presence of militia groups such as the OLF and other community-based militia.

Shikuku, Okoth and Kimokoti (2020) maintain that the seasonal migration that was previously a coping mechanism for scarce resources has become a source of conflict among the border communities especially when those of one ethnic group venture into another ethnic group's perceived area of control. As argued by Hagmann, (2003), resource-based conflicts permeate '...both the direct resource users, including pastoralists, cultivators or developers and indirect users such as businessmen involved in livestock trade; sale of harvested fodder; harvesting and marketing of natural salt-licks; politicians, warlords, chiefs and other local administrators...' Consequently, the entire strata of society get involved in the conflict as each try to protect its interests. Eventually, cross border coordination becomes inevitable due to the unique border environment failure to which national security is negatively impacted.

From the political perspective, conflict emerges when administrative borders are imposed by the government without due consideration to local sensitivities such as communal land ownership and access to resources. When such land is alienated, songs inciting the local leaders and taunting of youth by women for the loss become drivers of conflict. In a highly patriarchal society such as the Moyale area, taunting by women is considered one of the worst insults to the menfolk who take up arms to protect their interests. Cilliers (2018) maintains that politics has been a driver of conflict as each ethnic group seeks to establish supremacy in the area. People seeking political leadership rally their communities against others which results in politics of exclusion. Consequently, those who feel aggrieved resort to use of arms to assert 'their rights or perceived entitlement', leading to conflict. The end result is violence, psychological and societal destruction. Events in the larger Marsabit county in the month of November 2021 in which communities were pitted against one another and lives lost followed by political leaders pointing fingers at each other, and widely captured in mainstream media is illustrative of the political dynamics prevailing in the border county. The latest was the incident of Moyale where the OLF assistance was sought by the Borana community in their feud against the Gabra (Walter & Komu, 2021).

Contributing to the debate on the security situation in northern Kenya, Little & Mahmoud, (2005) opines that the larger Moyale area of Kenya has experienced political violence and insecurity emanating from the insurgency in Ethiopia which often spills over to as the insurgent OLF group has ethnic affinity to the Borana of Kenya. It is observed that while the OLF does not directly base operations in Kenya, its supporters are able to reside in Kenya, fundraise and do business among the Borana community and elsewhere. According to Abdulrahman (2006), in an attempt to address the cross-border security challenge posed by the OLF along the Kenya Ethiopia border in the Moyale area, the Ethiopian security elements have at times crossed into Kenyan territory in pursuit of the OLF causing casualties to Kenyans. The Ethiopian security agents comprise local para militaries known as the Tabaka who are clan based and rivals to the OLF. The Tabakas target the OLF and their perceived sympathizers who normally comprise the Borana of Kenya. The targeting of the Borana serves a dual purpose of fulfilling the Ethiopian government's desire to neutralize the OLF while advancing the clan interests of the Oromo/Borana border communities. The targeting has at times taken the form of assassinations and abductions (Abdulrahman, 2006). This study argues that the spillover of Ethiopian security and insurgency violence into Kenya is dangerous and especially because of the use of ethnic paramilitaries as tools of attaining government security objectives. This is because as such involvement occurs, it inflames wider communal violence of the targeted communities who resort to illegal acquisition of arms to defend themselves. Moreover, such cross-border incursions have a direct bearing on cross border security management thereby impacting on national security. It can therefore be surmised that cross border conflict on the Kenya-Ethiopia border is community driven and ethnic in nature with resources, politics, and illegal arms being the main drivers among others. As a consequence, any cross-border security management has of necessity to take the social-cultural dimension into account.

While the focus of study is the Moyale region, a review of a similar border area has been done in respect of Namanga along the Kenya-Tanzania border. Ndunda (2013) maintains that international cross border management is increasingly becoming complex due to the many state agencies involved and observes that 25 % of border delays in Africa is due to infrastructure challenges while 75% is due to poor trade facilitation courtesy of administrative bureaucracy. These challenges result in reduced efficiency hence higher costs and loss of revenue. Kieck (2010) in Ndunda (2013) aver that many countries having realized this gap have embarked on the establishment of One-Stop-Border-Posts (OSBP) points as a mechanism to improve cross border movement of goods and persons. Odero (2020) concurs arguing that meaningful development and regional integration will only be possible if their border crossing points are modernized. This

is the only way to facilitate faster movement of goods and persons while ensuring the security of the countries concerned through control of negative effects of increased movements. Masinde (2015) also argues that in the case of Namanga OSBP maize is one of the major commodities that is moved across the border into Kenya but is often impeded by non-tariff barriers, lack of harmonized tariff charges, and complicated customs procedures which need simplification. However, the World Bank (2012) in Masinde (2015) observes that trade policy restrictions have often driven the maize traders from the formal to the informal channels thereby resulting in loss of revenue to the government while posing health hazards due to non-inspection. This is the context in which the Namanga OSBP was established to help manage the security lapses associated with the illegal movement of goods and people across the two countries.

From a regional perspective, Wafula (2012) states that the re-establishment of the EAC common market protocol to enable free movement of goods and persons gave impetus to the OSBP concept in the region. Namanga OSBP is a critical center on the Kenya – Tanzania Border which serves as a transit point for goods and people to and from Tanzania. This has been realized by harmonizing and simplifying border clearance procedures into an interface of one window. At the core of the OSBP of Namanga is the ability of the two countries' border authorities to carry out joint patrols for enforcement functions to curb smuggling and entry of illegal substances resulting in interception of illicit traders and smugglers. The joint patrol has resulted in increased legitimate trade translating to more revenue hence contributing to national security of the two countries.

Masinde (2015) avers that while the OSBP concept has taken root at Namanga, it has not been without challenges which can broadly be categorized into institutional and operational challenges. Institutionally, the organizational culture among the individual border agencies poses a challenge as some fear losing the authoritative control they exercise to a collective approach under the OSBP concept. Private sector actors had concerns about the security of their livelihoods under the OSBP concept. Border actors who benefited from smuggling and contraband see the OSBP concept as a threat to their livelihood. Further the bureaucratic systems that preceded the OSBP concept conferred a lot of clout to the civil servants which many feared would be watered down under the new concept hence some element of resistance came into play. Moreover, lack of a clear line of autonomy in decision making and conflict of mandate among the various agencies has seen some deviate from their functions leading to turf wars. This has negatively affected the optimum functioning of the OSBP. Further, some border agencies have been more concerned with the results of their individual organizations to the detriment of the overall functioning of the OSBP that requires a whole of systems approach to succeed.

Meanwhile, from an operational perspective, the main challenges include inadequate human and IT resources which impact on efficiency, use of manual records, low IT literacy levels and exclusion of some stakeholders especially the private sector (Masinde, 2015). It is surmised that while Namanga is geographically different from Moyale OSBP, the border dynamics are similar to the socio-cultural aspects of Moyale which has the dominant communities leading a pastoral lifestyle and normally move across international borders.

1.4 Research Methodology

The research was conducted in the greater Northern area of Kenya, specifically in the Moyale OSBP-Marsabit County, which is located along the Kenya-Ethiopia border. This border post was selected because it is the only gazetted One Stop Border Post (OSBP) along the Kenya-Ethiopia border. Moreover, there is a common heritage between the Borana of Kenya and the Oromo of Ethiopia, who share various social characteristics such as language and family ties.

The target population in this study comprised the persons employed by the security and border agencies operating in Moyale namely the County administration, Kenya Defense Forces, the National Police Service, The National Intelligence Service, the Kenya Wildlife Service, Kenya Forest Service, customs, immigration and the local community. For the local community, the study specifically engaged the community opinion leaders comprising of the chairs of the councils of elders for the Borana and Gabbra ethnic groups, the elected political leaders and members of the business community. This was informed by the sparse population inhabiting the area. The summary of the target population is as presented in Table 1. below.

Table 1: Target Population

Population Category	Actual Population	Proportion/ Percentage
Kenya Defense Forces	145	29.4 %
National Police Service	266	54 %
National Intelligence Service	4	0.8%
Kenya Wildlife Service	10	2.0%

KEBS		2	0.4%
KEPHIS		4	0.8%
Kenya Forest Service		10	2.0%
Local	Elected Leaders	5	1.0%
Community	Elders	2	0.4%
	Business community Leaders	1	0.2%
Immigration Department		8	1.6%
Kenya Revenue Authority		36	7.3%
Total		493	100 %

Source: KDF, NPS, IEBC, KRA, KWS, KEBS, KEPHIS, NIS, Immigration Department (2021).

This study used the Yamane (1967) formula to arrive at the sample size of 220 from the target population. This sample size was proportionately distributed across the strata comprising the sample as shown in Table 2.

Table 2: Sample Size

Population Category	Population	Proportionate Percentage (%)	Sample size
Kenya Defense Forces	145	29.4 %	65
National Police Service	266	54 %	118
National Intelligence Service	4	0.8%	2
Kenya Wildlife Service (KWS)	10	2.0%	4
KEBS	2	0.4%	1
KEPHIS	4	0.8%	2
Kenya Forest Service (KFS)	10	2.0%	4
Local	Elected	5	1.0%
Community	Leaders		
	Elders	2	0.4%
	Business community	1	0.2%
Immigration Department		8	1.6%
Kenya Revenue Authority		36	7.3%
Total	493	100.00%	220

This study used stratified sampling, simple random sampling and purposive sampling procedures to distribute the sample size. The sample size was broken down into the constituent groups, where each group was treated as a stratum according to task specialty such as immigration, wildlife, quality standards, customs, KDF, NPS among others. The purposive sampling procedure was used to sample the heads of the various state institutions participating in the study such as the KDF, NPS, NIS, Immigration, Customs, County administration, chairs of the council of elders, the chair of the business community and the elected leaders such as MPs and MCAs. Simple random sampling was used to obtain responses from the rest of the strata comprising the sample that included the NPS, the KDF, KWS, KFS, immigration, community leaders, MPs, MCAs, customs and county administration.

This study used two data collection instruments namely a questionnaire and an interview guide. The questionnaire comprised of open ended and closed ended questions. The closed questions intended to guide the respondent on the range of responses to choose from while the open questions provided the respondent an opportunity to express their views in respect of the questions posed to them. The study used a list of standardized questions to guide the interviews with the key informants who were purposively selected on account of the offices that they occupy. The qualitative data in this study was analyzed through content analysis and presented in the form of narratives and verbatim. On the other hand, quantitative data was fed into the SPSS program and analyzed using descriptive statistics such as frequencies, percentages and means and presented using tables, graphs and charts.

1.5 Research Findings and Discussions

This study sought to establish the socio-cultural dynamics that influence the interaction of the border communities and how those dynamics impact on border security management within the OSBP framework. In terms of demographic composition of the population living in Marsabit County in which the Moyale OSBP is located, the study findings were as presented in Table 3.

Table 3: *Ethnic composition of Moyale*

Group	Frequency	Percentage (%)
Borana	102	55
Gabra	26	14
Rendille	41	22
Somali	17	8
Others (Turkana, Samburu, Ameru)	4	1
Total	187	100

Source (Field data, 2022)

A majority of the respondents, 55%, indicated the Borana as the most dominant ethnic group in the area. Instructively, the study established that indeed the Borana shared ancestral kinship ties with the Oromo of Ethiopia as highlighted by a key informant interviewee (KII):

The Moyale region and the larger Marsabit County by extension is occupied by the Borana who are the majority, compared to the Gabra and the Rendile. There are also Somalis and other communities such as the Turkana, Ameru and others who have largely come in for business. Being a border county, the Borana have their relatives called the Oromo living in Ethiopia with whom they share many cultural markers like language, cross border marriage among others. (KII B, 9th April 2022)

The study further established from the key informants that any interactions between the ethnic blocks including conflictual ones draws in the Ethiopian Oromo, some of whom could be members of the local militia group known as Tabakas or the Oromo Liberation Front (OLF) insurgents hence impacting on Kenya’s national security. This finding was found to be consistent with Herbert’s (2020) assertion border communities though separated by international borders share various socio-cultural aspects that keeps the bond between them strong. Cross border movement therefore occurs irrespective of the level of enforcement of existing laws due to the cultural ties and social capital prevailing. This movement in the case of the study area includes the community militia and OLF insurgents in the case of the Oromo whose Kenyan Borana kin seek their support whenever they engage in violent conflict with other communities in the area as established by the study. This in itself undermines Kenya’s national security and hence calls for creative solutions on the manner in which the security dimension can better be enhanced without undermining the strongly held social relations straddling the border. This study links ethnicity to border security management from the filial perspective: In cases where cross border communities are from the same ethnic background, the urge to shield one’s kin from law enforcement is higher than would otherwise be if such relations did not exist. Consequently, cooperation of such communities with law enforcement actors is affected, thereby impacting national security. Thus, the Borana as the majority group with cross-border ties with the Oromo should be targeted when designing and executing any intervention measures which should include cross border liaison by the administration to minimize any negative effects arising.

In order to determine the social-cultural dynamics influencing border security management along the Kenya-Ethiopia border, a five-point Likert scale (SA-Strongly Agree; A-Agree; N-Neutral; D-Disagree; SD-Strongly Disagree) comprising of eight items against which a respondent was to choose one of the five options to indicate their strength of agreement or disagreement with a particular socio-cultural item as it relates to border security. The responses were as summarized and presented in Figure 1.

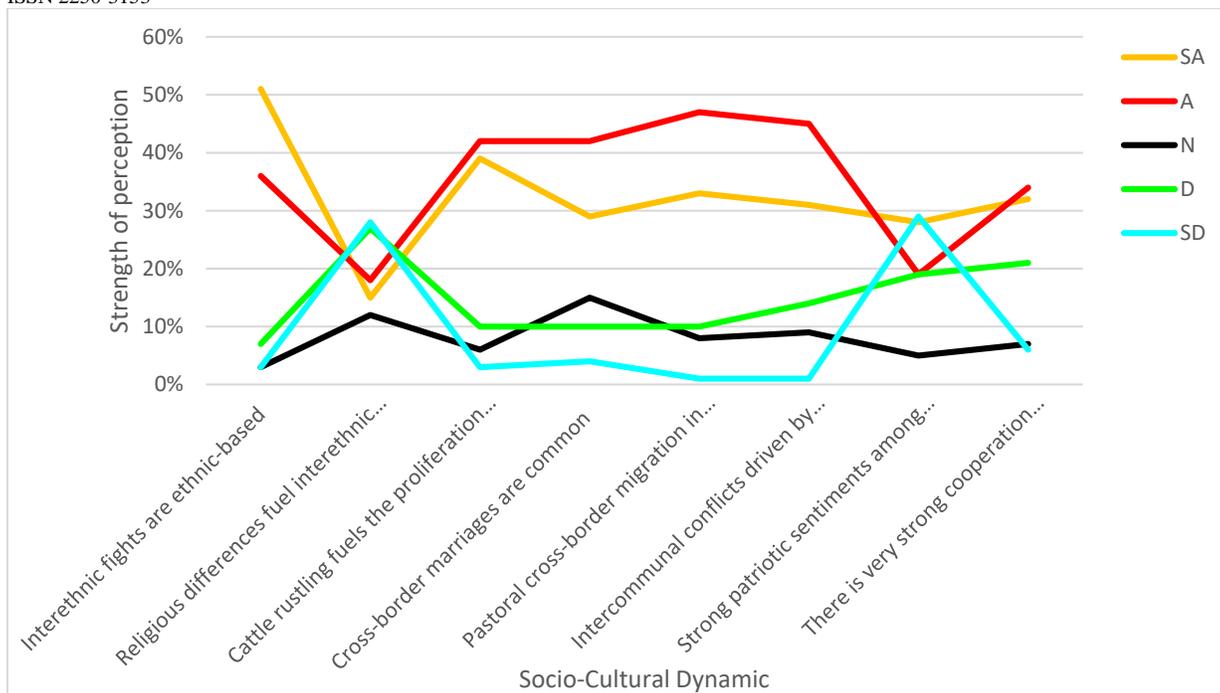


Figure 1: Social cultural dynamics influencing border security

Out of the eight socio-cultural dynamics presented to the respondents, six of them attracted strong majority responses of over 65% in favor of the assertion made by the statements, meaning that the six socio-cultural dynamics had a bearing on national security programming and thus any interventions had to be alive to them and the influence they had. The six statements were relating to inter-ethnic conflicts fought along ethnic lines, cattle rustling fueling proliferation of small arms and light weapons, cross-border marriages, role of elders in conflict management, cross-border pastoral migration in search of water and pasture during dry spells and cooperation between security agents and the local communities in driving the security agenda. In these six cases, the responses that indicated neutrality of opinion were not significant enough to the extent of tilting the majority finding were that to happen. On whether religious differences were fuelling violent clashes among the communities in Marsabit county leading to deaths and destruction of property, majority of the respondents at 55% disagreed. This implied that, religion was not a factor that could threaten national security in the study area. The statement on sense of patriotism and identification with the republic of Kenya among the communities living in Marsabit county attracted a split opinion as demonstrated by 47% of respondents concurring and 48% holding a contrary viewpoint. The neutral response was thus considered significant because it could tilt the split towards either side of the divide. The responses in the Likert scale were corroborated by KIIs during the interviews as illustrated by the excerpts hereunder:

Conflicts in this county have often been fought along ethnic lines, with the major antagonists being the Borana and the Gabra. The Gabra have always been on the receiving end because of the Borana numerical strength and the potential back-up they get from their Oromo cousins from Ethiopia. (KII F, 3rd March 2022)

Many Borana men have married Oromo women from Ethiopia and the vice versa is true. So, the cross-border marriages have strengthened the filial relations between the two communities. The fact that they share a language, despite the existence of dialects within it points to a possible common ancestry. (KII A, 9th February 2022)

Whenever there are intercommunal disputes, and especially during the dry season when herders are on the move looking for pasture and water, we coordinate with our colleagues from the other community to try solving it amicably because nearly every homestead has a firearm. You can imagine how protracted a violent conflict can get under such circumstance. Security agents and the local administration are very helpful in coordinating the talks and acting as a buffer zone. (KII C, 10th March 2022)

Relations among the border communities matter more than what the national government policies are since the government is far removed from the local communities and the challenges that confront them. Often, when there is a problem, it is the relations who come in to assist well before any government assistance comes and when it does, it is often too little too late. (KII N, 22nd February 2022)

The need to protect self against perceived adversaries, presence of clan militia, and the presence of OLF in Oromia region of Ethiopia has compelled the border communities to seek and own illegal firearms to protect themselves. This could be informed by the vast nature of the border stretch hence a challenge for security agencies to cover adequately. The deployment of more security personnel in addition to suitable equipment to cover the long distances could go a long way in handling the situation.

The occurrence of cross border marriages also presents a challenge as the communities have a long tradition of social capital that transcends national borders. It is this social capital that supersedes national security concerns whenever there are any illegal persons residing among the communities on either side and cannot be reported to the authorities. A KII suggested that the policy position in both Kenya and Ethiopia requires a person crossing the border to have official travel documents irrespective of how long they would be on the other side. The situation is compounded by the bureaucracy on acquisition of such documents by both countries as noted by a KII:

...the tight control on issuance of official travel documents such as passports by the Ethiopian authorities to minimize its citizens from travelling out of the country due to concern for the loss of manpower fuels illegal cross-border movements. (KII A, 9th February 2022)

This study argues that this obtaining situation would require a policy change and use of a structured approach such as basic registration of those visiting either side of the border for short durations for filial reasons instead of demanding official travel documents. This would incentivize the local community to be first responders in the event of any security breach hence enhance national security.

The study concurs with Shikuku, Okoth and Kimokoti (2020) that cross border migration in search of pasture and water during dry spells is a coping mechanism for the communities' survival. This in itself is an important national security endeavor which requires a synergistic approach given the security complex that characterizes the study area. Often, when there is scarcity of pasture, the few available ones become contested, leading to conflict which in turn triggers the demand for illegal weapons, effectively undermining national security at the peripheral areas of the state. The elders among the border communities are held in high esteem and their word is taken seriously by all members regardless of their status in the public service. They are therefore key opinion shapers. The study contends that any intervention that requires community wide acceptance would demand that the elders be brought on board and be the conveyers of the border security management program to ensure a quick buy in. Initiative that could help turn around the negative aspects of the discussed dynamics would include scaling up education provision, stopping early marriages, ending cattle rustling, increasing security agents presence and the empowerment of elders and the local communities to enhance peace within and between communities. In essence, these proposals suggest a systems approach to interventions aimed at tapping into the social cultural dynamics in the study area aimed at enhancing national security.

The study findings are consistent with Pavanello (2010) and Altai Consulting (2021) who argue that mobile pastoralist systems move across international borders and advises that governments should endeavor to cooperate to grant legal backing to informal cross border trade. This is vital because as Karkare et al (2021) have argued, informal cross border trade is oftentimes motivated by concern for social capital and networks. The study notes that state regulation of such movement especially in cases where the border community have similar ethnicity breeds negativity towards government programs, and this has the effect of worsening rather than alleviating national security. The findings amplify this view point as they indicated the existence of strong cross border ties that hold sway over the border communities and supersede any government laws and regulations that manage cross border movement.

The study findings that regulation by the state is informed by the desire for revenue, concern for health risks from traded goods, and security for overall economic development are corroborated by Karkare et al (2021). The local concerns on the other hand are informed by the social capital and networks in existence. This is characteristic of all border areas and Moyale is no exception. A key intervention would require bilateral arrangements to ensure the cross-border movement of persons without breaching security since the movement will take place regardless of the laws in place.

Karkare et al's (2021) observation that a substantial part of intra African trade is small scale, informal, unrecorded and cross border in character holds true based on the study findings. The study argues that while capacity building and simplification of complex border procedures may alter the current dynamics of informal cross border trade to a certain extent, they are unlikely to substantially change the character of the trade due to deep rooted relational structures. Consequently, border specific approaches are recommended due to the unique dynamics of each border area or point.

The shared history and culture with frequent cross border interactions between communities inhabiting Moyale cannot be wished away. Practices such as cross border marriages are common among the communities living on either side of Kenya-Ethiopia border. Further, the communities were unwilling to report to the authorities on the presence of any persons illegally in the study area. The study further found that in environments where the cross-border community is of the same ethnicity heightens the depth of the social capital and

networks whose interaction may be in contravention of the rules and regulations of the countries affected. This therefore calls for policies and approaches on cross border management that are specific and sensitive to the local communities' socio-cultural dynamics. Adoption of the AUBP (2012) pillar three on community development would be a timely intervention in addition to ensuring that such movements are not hampered by adverse national policies.

Conclusions

The study findings demonstrated the drivers of instability in the research area as competition for scarce resources especially pasture and water which are critical for the pastoral lifestyle of the inhabitants. Consequently, a recourse to violence to gain access to the scarce resources is an option routinely adopted which in turn triggers the demand for illegal weapons. Further, when the conflict breaks out, it is often along ethnic lines as reported by 87% of the respondents. Whenever the conflict is protracted, community dynamics come into play with the OLF from the neighboring Oromia region of Ethiopia, coming to the aid of their Borana cousins if they are affected. Their incursions impact on national security as casualties occur on the Kenyan side. Consequently, any conflict at the Kenya-Ethiopia border region inevitably becomes transnational due to social-cultural links thereby inflaming wider communal violence during which targeted communities resort to illegal acquisition of arms to defend themselves. This impacts national security. A key intervention measure would include cross border liaison and coordination by security agencies of both countries in addition to adequate manpower and equipment that is responsive to any security breaches arising.

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Appreciation of Synchronous Online Learning Class in English 10: A Focus on Design and Delivery

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Abstract- The paper aims to identify the students' level of appreciation of synchronous classes in the new normal. It is a descriptive-correlative type of study since it assessed the level of appreciation of students in synchronous class in English 10 and it quantified their level of academic performance in the same subject and it also tries to establish an association between the level of appreciation of the synchronous class design and delivery and the students' academic performance. The participants of the study are the students of the synchronous online class in English 10 from the two (2) big schools in the division of Butuan City, Philippines. The study revealed that the students are very much satisfied with their synchronous class design and delivery. It is recommended that teachers may consider attending learning and development opportunities to enhance their technological know-how for better navigation of different online platforms.

Index Terms- level of appreciation, online class, synchronous class design, synchronous class delivery

I. INTRODUCTION

The novel coronavirus disease (COVID-19) was declared by the World Health Organization as an international public health emergency. Owing to its high infectivity, countries all over the world implemented nationwide lockdowns with the hope of flattening the pandemic curve. Nearly 1.5 billion school children around the globe or 87 percent of Earth's student population are affected by this health problem since schools have closed because of the novel COVID pandemic, and more than 60 million teachers are forced to work at their homes as well, according to the United Nations (Sahu, 2020).

Public institutions such as schools, universities and further education providers ceased on site teaching and shift to distance learning. There are however perceptible challenges that have to be overcome by the implementation of this type of modality. The students who struggle to participate in this distance digital learning and the teachers who challenged to reach out students for effective learning and communication were among them (Li & Lalani, 2020).

Research regarding online learning and teaching showed that they were effective only if students have consistent access to the internet and computers and if teachers have received targeted training and supports for online instruction. Because these needed requirements for effectiveness have been largely absent for many, remote education during the pandemic has impeded teaching and learning (García, Weiss, & Engdahl, 2020).

The policy level intervention was also vital. Education system across the world needed to invest on the professional development of teachers, especially on ICT and effective pedagogy, considering the present scenario. Making online teaching creative, innovative and interactive through user-friendly tools is the other area of research and development (Pokhrel & Chhetri, 2021). This would assist and prepare the education system for such uncertainties in the future. And, the most critical opportunity gaps that education faces at present is the insufficient possessions of high-tech gadgets to and internet access critical to learning online. This digital divide has made it virtually impossible for some students to learn during the pandemic.

Acknowledging this gap, in the Philippines, the Department of Education conducted a survey among parents about the household's availability of gadgets and devices and access to internet and their preferred learning modality for school learners who enrolled in public schools (Mateo, 2020). Accordingly, parents prefer the modular learning modality for their children over other options. Data from Learner Enrollment and Survey Form (LESF) showed that 8.8 million parents preferred modular. Aside from modular learning, 3.8 million parents also voted for online learning (Arcilla, 2020).

Online learning was good news to these 3.8 million learners, but on its initial stage, it poses certain threats to students as well as to teachers. Attitude change and technological literacy would help them gain confidence in order to succeed in their courses with a positive vibe (Kumar, 2015).

A large part of the academic research had identified that online learning situations may it be in asynchronous or prepared online class materials and synchronous or real time online class inside the instructional innovation engage students essentially through specific correspondence (Malik, et al. 2017). Locally, major adjustments have been made. There is an increasing need among teachers to be equipped with training on technologies and in dealing with

students through synchronous online learning, as well as students too. Despite all these inequalities, teaching and learning still has to go on.

As part of the learning continuity plan, the teachers should design the synchronous sessions through pedagogical value and should give importance to the learning experiences of the students. While synchronous sessions may be new to some teachers, oftentimes students are also unfamiliar with this format. Even if they participated in synchronous sessions before, those experiences may vary greatly. Laying the foundations on why and how to conduct the class helps set expectations, creating a shared class culture where students take more responsibility for their participation (Lateef, 2020). Planning on how to conduct the classes is an effective way to offer quality education even in this new normal set-up.

There were various studies conducted before which pertain to online classes but there were only a limited number which focused on synchronous classes in the new normal. As there are limited studies written on the same nature, this study was conceptualized.

One particular study suggested that a formal assessment of effectiveness of synchronous online learning should be conducted, which must be distinguished from efficiency, can provide insight into how students learn and which subjects are the most suitable for which forms of delivery. This information will allow faster, more efficient convergence to effective course design and appropriate technologies for distance learning (Midkiff & DaSilva, 2000). Another study by Malik, et al (2017) emphasized the need for a synchronous course and program both must be designed on the basis of developmental research in the field of online learning.

The aforementioned issues and findings prompt the researchers to conduct the study about online synchronous learning. As teachers in English, they took interest in evaluating the synchronous class in the selected schools in Butuan City, Philippines. Hence, this investigation was conceptualized.

The study hoped to identify the level of students' appreciation of the synchronous classes with special focus on the design and delivery. Its results would be used as bases for designing a localized intervention program.

II. OBJECTIVES OF THE STUDY

The study generally aimed to identify the students' level of appreciation of synchronous class in the new normal and to compare it with their learning performance. In particular, it sought to achieve the following objectives:

1. Ascertain the students' level of appreciation of synchronous class in the new normal in terms of:
 - 1.1 design; and
 - 1.2 delivery
2. Determine the students' academic performance in English 10;
3. Establish consistency between the level of appreciation of the synchronous class design with the level of appreciation of the synchronous class delivery;
4. Correlate the level of appreciation of the synchronous class design and delivery with students' academic performance in English 10; and

III. SCOPE AND DELIMITATION OF THE STUDY

This study explored the students' level of appreciation of synchronous class through its design and delivery. The study was specifically conducted in the big schools in Butuan City Division, Philippines which include Butuan School of Arts and Trades (BCSAT) and Agusan National High School (ANHS) in Butuan City in the S.Y. 2020-2021. It involved Grade 10 students who were attending synchronous classes in English. Another aspect which was investigated in this study was the level of students' academic performance in English 10 synchronous classes which was significant in determining the efficacy of the modality to students' learning.

IV. METHODOLOGY

The study is quantitative in nature. It is used a descriptive-correlative research design. It is descriptive because it assessed the level of appreciation of students on synchronous class in English 10 and it quantified the students' level of performance in the same subject. Also, it was correlative since it would try to identify whether there was a significant relationship between the following: the level of students' appreciation on the synchronous class design and synchronous class delivery; and the level of students' appreciation on the synchronous class design and delivery and the students' level of academic performance. It was conducted in the big public secondary schools in the Division of Butuan City, Philippines which include the two (2) schools which were all holding synchronous classes particularly in English 10: Butuan City School of Arts and Trade (BCSAT) and Agusan National High School (ANHS). These big schools were classified as such in the Brigada Eskwela in the search of Best Implementing Schools. Both schools have total enrollees which hit the two highest numbers in the division. The Grade 10 students in English were the main participants of the study since they were the ones who have experienced the conduct of synchronous classes and they can give insights on the particular type of modality on its lesson design and delivery. Their level of academic performance in English was determined through their grade in the same subject. For economic and administrative considerations, only fifty percent (50%) of the student population were considered participants. Hence, there was total of 112 students in Grade 10 who were involved in this study.

In selecting the participants, simple random sampling was used which was done through a lottery. The participants responded to a questionnaire developed by the researchers which consists of three (3) parts. Part one contained the information about the participant. Part II is comprised of seven (7) sections with five (5) indicators each. Included in it are the items regarding the level of appreciation on synchronous class design in English 10 specifically on structure, instructions, student-centered learning, content and resources, technology and accessibility, student learning assessment, and support. Part III, the last part consists of indicators on synchronous class delivery. It is also comprised of seven (7) sections; each has five (5) indicators. Among the sections were the structure, instructions, student-centered learning, content and resources, technology and accessibility, student learning assessment, and support.

The data regarding the level of students' academic performance were collected based on their Form 138 or School Report Card with their permission as the study strictly observed the Data Privacy Act. Full respect to students' right to privacy and confidentiality is recognized. The instrument underwent a validity and pilot test. The results of the

reliability test of the survey tool revealed strong internal reliability statistics that is Cronbach’s Alpha 0.983. In other words, all questions were retained as they are in the tool.

V. RESULTS AND DISCUSSION

Level of Students’ Appreciation of Synchronous Class in the New Normal in terms Design

A. Structure

Structure	Level of Appreciation		Interpretation
	M	VD	
1 Using the online components in class is easy.	3.14	Good	Moderately Satisfied
2 The class has logically sequenced lessons that have overviews describing outcomes, activities, assignments, assessments/tests, and resources.	3.42	Good	Moderately Satisfied
3 The learning sequence in the e- class and the face-to-face class (in the old normal) are identical; both clearly state measurable learning outcomes.	3.16	Good	Moderately Satisfied
4 The e- class design facilitates readability with minimal distractions.	3.39	Good	Moderately Satisfied
5 The e- class lessons make use of the teacher’s skills or know-how into research-based e- learning design principles.	3.53	Very Good	Very Much Satisfied
Overall Weighted Mean	3.33	Good	Moderately Satisfied

Range of means: 1.00-1.49 (Poor); 1.50-2.49 (Fair); 2.50-3.49 (Good); 3.50-4.49 (Very Good); 4.50-5.00 (Excellent)

Among the indicators under the synchronous class design in terms of structure in Table I-A, the highest weighted mean 3.53 described as “very good” went to indicator 5 which states that the e-class lessons make use of the teacher’s skills or know-how into research-based e-learning design principles. Meanwhile, the lowest weighted mean

3.14 described as good is given to indicator 1 which states that using the online components in class is easy.

The overall weighted mean is 3.33 which is described as good. This means that the students are moderately satisfied with the synchronous class design specifically on its structure.

In consonance to the results above, Batts et al. 2010 as cited by LeShea (2013) posited that providing proper training for the instructors could help to overcome barriers regarding online course functionality. Although this need for training has been established, the previously mentioned study by Batts et al., reported that more than half of the participants of the study did not receive off-campus training for online teaching during the previous year.

Thus, in order to be successful with the implementation of online programs, the administration needs to develop systems that provide faculty with the resources and support they need to be successful in this type of learning environment.

B. Instruction

Instruction	Level of Appreciation		Interpretation
	M	VD	
1 Instructions clearly explain the class structure; how to begin the class/lesson and how to locate and use the e-class learning platform or set-up.	3.61	Very Good	Extremely Satisfied
2 Instructions clearly identify the differences between required and optional activities.	3.60	Very Good	Extremely Satisfied
3 Instructions clearly explain the purpose and use of the e-class materials.	3.63	Very Good	Extremely Satisfied
4 Instructions on the use of multimedia or audio-visual materials that are relevant to the e-class lesson content and outcomes are given or in place.	3.45	Good	Very Much Satisfied
5 Instructions on the use of multi-media or audio-visual materials that are in multiple formats (e.g. MP4, MPEG, et cetera) are given or in place.	3.38	Good	Very Much Satisfied
Overall Weighted Mean	3.53	Very Good	Very Much Satisfied

Range of means: 1.00-1.49 (Poor); 1.50-2.49 (Fair); 2.50-3.49 (Good); 3.50-4.49 (Very Good); 4.50-5.00 (Excellent)

Among the indicators under the synchronous class design in terms of instruction in Table I-B, the highest weighted mean 3.63 described as “very good” went to indicator 3 which states that the instructions clearly explain the purpose and use of the e-class materials while, the lowest weighted mean 3.38 described as good is given to indicator 5 which states that instructions on the use of multi- media or audio-visual materials that are in multiple formats (e.g. MP4, MPEG, et cetera) are given in place.

The overall weighted mean is 3.53 which is described as very good. This means that the students are moderately satisfied with the synchronous class design specifically in terms of instruction.

Based on the result above, synchronous sessions may be new to some instructors, oftentimes students are also unfamiliar with this format. Even if they participated in synchronous sessions before, those experiences may vary greatly. Laying the foundations of why and how the teacher conduct his or her class helps set expectations, creating a shared class culture where students take more responsibility for their participation (Latheef, 2020).

Student Centered-Learning

Student Centered-Learning	Level of Appreciation		Interpretation
	M	VD	
1 The e- class includes the requirements for student participation in learning activities and assignment completion.	3.85	Very Good	Very Much Satisfied
2 The e- class contains the requirements for assignment completion.	3.68	Very Good	Very Much Satisfied
3 Learning activities in e-class focus on student-centered learning; meaning they are designed for and focused on students.	3.71	Very Good	Very Much Satisfied
4 Learning activities in e-class support active learning through the promotion of student-to-student collaboration and teacher-to-student collaboration.	3.71	Very Good	Very Much Satisfied
5 Learning activities in e-class make use of a variety of teaching strategies, methods and materials.	3.61	Very Good	Very Much Satisfied
Overall Weighted Mean	3.71	Very Good	Very Much Satisfied

Range of means: 1.00-1.49 (Poor); 1.50-2.49 (Fair); 2.50-3.49 (Good); 3.50-4.49 (Very Good); 4.50-5.00 (Excellent)

Based on the results presented in Table I-C, among the indicators under the synchronous class design in terms of teaching and learning design, the highest weighted mean 3.71 described as “very good” went to indicator 1 which states that the e- class includes the requirements for student participation in learning activities and assignment completion.

On the other hand, the lowest weighted mean 3.61 still described as very good is given to indicator 5 which states that learning activities in e-class make use of a variety of teaching strategies, methods and materials. The overall weighted mean is 3.71 which is described as very good. This means that the students are very much satisfied with the synchronous class design specifically on teaching and learning.

Evidently, synchronous learning allows students to engage with class materials at the same time as their peers as long as they can connect to the internet. Likewise, teachers may choose synchronous delivery over asynchronous formats because the format allows a more conversational approach, especially if the material requires instant feedback and discussion (Wintemute, 2021). In addition, synchronous learning creates a sense of urgency in which, real-time deadlines and expectations lead to greater participation (Wind, 2020).

As browsed in Table I-D, among the indicators under the synchronous class design in terms of content and resources, the highest weighted mean 3.94 described as “very good” went to indicator 5 which states that all authors or owners of the borrowed resources and materials used in e-class are appropriately mentioned or given recognition.

Whereas, the lowest weighted mean 3.63 described as very good is given to indicator 2 which states that instructional materials are appropriate for e-learning; contribute to the achievement of the learning outcomes. The overall weighted mean is 3.73 which is described as very good. This means that the students are very much satisfied with the synchronous class design specifically in terms of the content and resources.

B. Content and Resources

Content and Resources	Level of Appreciation		Interpretation
	M	VD	
1 Instructions explain the purpose and use of e-class lesson materials.	3.74	Very Good	Very Much Satisfied
2 Instructional materials are appropriate for e-learning; contribute to the achievement of the learning outcomes.	3.63	Very Good	Very Much Satisfied
3 Instructional materials are updated and made available to students.	3.66	Very Good	Very Much Satisfied
4 The e-class provides student access to online databases (files and records), and resources.	3.69	Very Good	Very Much Satisfied
5 All authors or owners of the borrowed resources and materials used in e-class are appropriately mentioned or given recognition or credits.	3.94	Very Good	Very Much Satisfied
Overall Weighted Mean	3.73	Very Good	Very Much Satisfied

Range of means: 1.00-1.49 (Poor); 1.50-2.49 (Fair); 2.50-3.49 (Good); 3.50-4.49 (Very Good); 4.50-5.00 (Excellent)

In support to the results above, Teaching and Learning (n.d) explicated that synchronous learning allows students to engage with content and develop skills with immediate instructor guidance and supervision. This is especially true in classes where students require access to situations or equipment that they are unlikely to have at home. Questions can be answered immediately by the instructor, and the class navigates this content as a whole in a supported, structured way.

C. Technology and Accessibility

Technology and Accessibility	Level of Appreciation		Interpretation
	M	VD	
1 The e-class includes minimum technology requirements (hardware, browser, software, etc.) and requires technical skills of the student.	3.70	Very Good	Very Much Satisfied
2 The e-class provides an orientation opportunity for students to learn the basics of online learning.	3.51	Very Good	Very Much Satisfied
3 Proven effective and emerging technological tools are used to support student learning.	3.54	Very Good	Very Much Satisfied
4 A monitoring system is in place to determine the level of engagement and access of students to the e-class learning tools and materials.	3.57	Very Good	Very Much Satisfied
5 The e-class features accessible technologies and instructions for all types of students.	3.46	Good	Moderately Satisfied
Overall Weighted Mean	3.56	Very Good	Very Much Satisfied

Range of means: 1.00-1.49 (Poor); 1.50-2.49 (Fair); 2.50-3.49 (Good); 3.50-4.49 (Very Good); 4.50-5.00 (Excellent)

As viewed in Table I-E, among the indicators under the synchronous class design in terms of technology and accessibility, the highest weighted mean 3.70 described as “very good” went to indicator 1 which states that the e-class includes minimum technology requirements (hardware, browser, software, etc.) and requires technical skills of the student. Meanwhile, the lowest weighted mean 3.46 described as good is given to indicator 5 which states that the e-class features accessible technologies and instructions for all types of students. The overall weighted mean is 3.56 which is described as very good. This entails that the students are very much satisfied with the synchronous class design particularly in terms of technology and accessibility. Anent the results above, Francescucci and Rohani (2019) posited that there are growing trends in post-secondary education and emphasized the importance of online and technology-enabled learning. Besides, one has to consider integrating some synchronous learning tools into online courses and he or she should see the difference it can make for engaging and motivating students (McClelland, 2020).

In addition, Ahmadi (2018) stated that the use of technology has become an important part of the learning process in and out of the class. Every language class usually uses some form of technology. Technology has been used to both help and improve language learning. Technology enables teachers to adapt classroom activities, thus enhancing the language learning process. Also, technology continues to grow in importance as a tool to help teachers facilitate language learning for their learners.

D. Student Learning Assessment

Student Learning Assessment	Level of Appreciation		Interpretation
	M	VD	
1 The assessments (tests, quizzes, exams, et cetera) are appropriate for e-learning which means that they measure content mastery, critical thinking skills, and core or essential learning.	3.96	Very Good	Very Much Satisfied
2 The assessments (tests, quizzes, exams, et cetera) are differentiated and varied	3.88	Very Good	Very Much Satisfied
3 The grading policy is stated clearly and addresses specific and descriptive criteria for the evaluation of student work.	3.83	Very Good	Very Much Satisfied
4 Tests, quizzes, exams, and other types of assessments are appropriate to the student work being assessed.	3.79	Very Good	Very Much Satisfied
5 Tests, quizzes, exams, and other types of assessments are consistent with the activities and resources.	3.86	Very Good	Very Much Satisfied
Overall Weighted Mean	3.86	Very Good	Very Much Satisfied

Range of means: 1.00-1.49 (Poor); 1.50-2.49 (Fair); 2.50-3.49 (Good); 3.50-4.49 (Very Good); 4.50-5.00 (Excellent)

As gleaned in Table I-F, among the indicators under the synchronous class design in terms of student learning assessment, the highest weighted mean 3.96 described as “very good” went to indicator 1 which states that the assessments (test, quizzes, exams, et cetera) are appropriate for e-learning which means that they measure content mastery, critical thinking skills, and core essential learning. On the other hand, the lowest weighted mean 3.79 described as very good is given to indicator 4 which states that test, quizzes, exams, and other types of assessments are appropriate to the student work being assessed. The overall weighted mean is 3.86 which is described as very good. This suggests that the students are very much satisfied with the synchronous class design specifically in terms of student learning assessment.

In numerous instructive foundations, innovation has gone before the path for online evaluations and assessments. It is subsequently to be expected that many organizations are thus making progressive shift from utilizing on the web evaluation devices. Like, online assessment system lightening the workload of faculty members, online exams help saving a lot of time, money and paper usage (Fedena Online, 2020).

As indicated in Table I-G, among the indicators under the synchronous class design in terms of support, the highest weighted mean 3.95 described as “very good” went to indicator 5 which states that a forum (gc, gmail, fb messenger, SMS, et cetera) is set to accommodate students’ concerns while the lowest weighted mean 3.45 went to indicator 2 which states, training or orientation is provided to students in the mechanics and best practices for an e-class. The overall weighted mean is 3.64 which is described as very good. This means that the students are very much satisfied with the synchronous class design specifically in terms of support.

E. Support

Support	Level of Appreciation		Interpretation
	M	VD	
1 Technical support in e-class is provided to students; mostly provided by the teacher or by an IT expert.	3.48	Good	Moderately Satisfied
2 Training or orientation is provided to students in the mechanics and best practices for an e-class.	3.45	Good	Moderately Satisfied
3 Tutorials are given to students if necessary.	3.54	Very Good	Very Much Satisfied
4 The deadlines set for the e-class requirements are flexible; special considerations are given (if deemed necessary).	3.78	Very Good	Very Much Satisfied
5 A forum or medium (GC, Gmail, Fb messenger, SMS, et cetera) is set to accommodate students’ concerns	3.95	Very Good	Very Much Satisfied
Overall Weighted Mean	3.64	Very Good	Very Much Satisfied

Range of means: 1.00-1.49 (Poor); 1.50-2.49 (Fair); 2.50-3.49 (Good); 3.50-4.49 (Very Good); 4.50-5.00 (Excellent)

In view of the results above, Teachonline.ca. (n.d.) suggested that in order to have the best opportunity for success in studies, online learners need access to more than course content and effective teaching. They need access to a wide range of support services that help them to engage with their institution and instructors, succeed in their studies, connect with each other, and make a successful transition

to the workplace. The challenge is to provide all of the students, especially our under- served populations, with the breadth and quality of support they need and deserve in a user-friendly format so they can be nurtured, encouraged and supported throughout their academic careers.

Overall Mean Distribution of the Level of Students’ Appreciation of Synchronous Class Design in the New Normal

	Indicators	Level of Appreciation		Interpretation
		Mean	Verbal Description	
1	Structure	3.33	Good	Moderately Satisfied
2	Instructions	3.53	Very Good	Very Much Satisfied
3	Student Centered-Learning	3.71	Very Good	Very Much Satisfied
4	Content and Resources	3.73	Very Good	Very Much Satisfied
5	Technology Accessibility and Learning	3.56	Very Good	Very Much Satisfied
6	Student Assessment	3.86	Very Good	Very Much Satisfied
7	Support	3.64	Very Good	Very Much Satisfied
	Grand Weighted Mean	3.62	Very Good	Very Much Satisfied

Range of means: 1.00-1.49 (Poor); 1.50-2.49 (Fair); 2.50-3.49 (Good); 3.50-4.49 (Very Good); 4.50-5.00 (Excellent)

It can be gleaned on the table above that the student learning assessment got the highest weighted mean of 3.86 and which is described as very good. On the other hand, the structure garnered the lowest weighted mean of 3.33 described as good.

The grand weighted mean is 3.62 described as very good. This entails that the students are very much satisfied with their synchronous class design. This result further suggests that the students’ level of appreciation of the synchronous class design is in a very respectable level.

In consonance to the results above, McBrien, Jones, and Rui (2009) as cited by LeShea (2013) explained that in regards to students’ perception of online learning, there were positive results when a synchronous online platform was used. This was especially true for those students who are shy by nature and therefore feel more comfortable expressing their opinions in this type of environment versus a face-to-face class.

As viewed in Table II-A, among the indicators under the structure, the highest weighted mean 3.67 described as “very good” went to indicator 5 which states that when adding e-class lesson content, the teacher follows research-based e- learning design standards regarding accessibility, readability, and student-centered learning.

Meanwhile, the lowest weighted mean 3.21 described as good is given to indicator 3 which states that the sequence or order of the e-class lessons is similar to the face-to-face class (in the old normal) for student’s ease of transition from one platform (face-to face) to another (online) set-up. The overall weighted mean is 3.52 which is described as very good. This means that the students are very much satisfied with the synchronous class delivery specifically in terms of its structure.

In consonance to the results above, Hill (2012) explicated that each educational delivery model for online education has its own set of characteristics and goals. It is easy to get caught up in the media hype and throw all models for online education into the same bucket. In addition, online technology and its associated delivery models will continue to evolve at an accelerated pace, at least compared with the experience of the past decade.

II. Level of students' appreciation of synchronous class in terms of delivery

A. Structure

Structure	Level of Appreciation		Interpretation
	M	VD	
1 Using the online components in class is made easy by the teacher.	3.61	Very Good	Moderately Satisfied
2 The class provides multiple learning opportunities for students to master the content.	3.56	Very Good	Moderately Satisfied
3 The sequence or order of the e-class lessons is similar to the face-to-face class (in the old normal) for student's ease of transition from one platform (face-to face) to another (online) set-up.	3.21	Good	Moderately Satisfied
4 The teacher adheres to readability standards when adding e-class lesson content.	3.53	Very Good	Very Much Satisfied
5 When adding e-class lesson content, the teacher follows research-based e-learning design standards regarding accessibility, readability, and student-centered learning.	3.67	Very Good	Very Much Satisfied
Overall Weighted Mean	3.52	Very Good	Very Much Satisfied

Range of means: 1.00-1.49 (Poor); 1.50-2.49 (Fair); 2.50-3.49 (Good); 3.50-4.49 (Very Good); 4.50-5.00 (Excellent)

Moreover, synchronous sessions, regardless of how they are structured, offer opportunities for community building and connection for the students. building connection and community within remote settings is an essential component of student learning and engagement and having a clear plan around how one will use this time (and how students will benefit from it) will increase success in the course (Teaching and Learning, n.d.).

As observed in Table II-B, among the indicators under the instruction, the highest weighted mean 3.88 described as "very good" went to indicator

1 which states that the teacher uses available or accessible tools to promote student mastery of learning as (they) students are guided in each of the learning activity. Meanwhile, the lowest weighted mean 3.68 described as very good is given to indicator 3 which states that the teacher clearly engages with students via instructions on the proper use of each of the tools and materials used for e- class learning activities. The overall weighted mean is 3.76 which is described as very good. This manifests that the students are very much satisfied with the synchronous class delivery particularly in terms of instruction.

In view of this, Gardiner (2021) cited that synchronous learning is interactive, two-way online instruction that happens in real time with a teacher in the virtual classroom. Synchronous learning instruction allows educators to replicate many of the experiences found in an in-person classroom. This includes the ability for attendees to access lecture slides, respond to interactive questions and engage with their classmates in discussion threads.

B. Instruction

Instruction	Level of Appreciation		Interpretation
	M	VD	
1 The teacher uses available or accessible tools to promote student mastery of learning as (they) students are guided in each of the learning activity.	3.88	Very Good	Very Much Satisfied
2 Through clear instructions, the teacher makes sure that the student prioritizes required over optional activities; thus, ensures student learning.	3.71	Very Good	Very Much Satisfied
3 The teacher clearly engages with students via instructions on the proper use of each of the tools and materials used for e- class learning activities.	3.68	Very Good	Very Much Satisfied
4 The teacher encourages students to make use of personalized media and other media relevant to the content in ways that extend and contribute to student mastery of learning.	3.74	Very Good	Very Much Satisfied
5 The teacher encourages students to make use of multi-media materials in various formats to ensure that they can have full use in them.	3.77	Very Good	Very Much Satisfied
Overall Weighted Mean	3.76	Very Good	Very Much Satisfied

Range of means: 1.00-1.49 (Poor); 1.50-2.49 (Fair); 2.50-3.49 (Good); 3.50-4.49 (Very Good); 4.50-5.00 (Excellent)

As seen in Table II-C, among the indicators under the student -centered teaching and learning, the highest weighted mean 3.87 described as "very good" went to indicator 5 which states that the teacher uses a variety of strategies and techniques in delivering the e- class lesson to students to ensure student mastery of learning. Meanwhile, the lowest weighted mean 3.63 described as very good is given to indicator 1 which states that the teacher uses communication tools to encourage and promote student mastery of learning as they stemmed from the student's engagement in each of the learning activity.

The overall weighted mean is 3.65 which is described as very good. This reveals that the students are very much satisfied with the synchronous class delivery specifically on the student-centered teaching and learning.

C. Teaching and learning

Student-centered Teaching and Learning	Level of Appreciation		Interpretation
	M	VD	
1 The teacher uses communication tools to encourage and promote student mastery of learning as they stemmed from the student's engagement in each learning activity.	3.63	Very Good	Very Much Satisfied
2 Students achieve stated learning outcomes through the completion of the e-class activities.	3.71	Very Good	Very Much Satisfied
3 The teacher engages students in e-class activities designed appropriately for their level, needs, interests, et cetera.	3.73	Very Good	Very Much Satisfied
4 The teacher engages students in e-class activities that promote collaboration among themselves and with her or him.	3.71	Very Good	Very Much Satisfied
5 The teacher uses a variety of strategies and techniques in delivering the e-class lesson to students to ensure student mastery of learning.	3.87	Very Good	Very Much Satisfied
Overall Weighted Mean	3.65	Very Good	Very Much Satisfied

Range of means: 1.00-1.49 (Poor); 1.50-2.49 (Fair); 2.50-3.49 (Good); 3.50-4.49 (Very Good); 4.50-5.00 (Excellent)

In agreement with the results above, Riggs (2020) emphasized that while remote instruction during an emergency pandemic is not the same as carefully designed online education, remote educators can take some notes from experienced online colleagues about how to bridge the distance. Besides, thinking of the learning experience from a student-centered perspective is one valuable take- away begin to teach from a

distance, and to consider the new learning environment from a student- centered perspective.

Content and Resources

Content and Resources	Level of Appreciation		Interpretation
	M	VD	
1 Instructions explain the purpose and use of e-class lesson materials.	3.74	Very Good	Very Much Satisfied
2 Instructional materials are appropriate for e-learning; contribute to the achievement of the learning outcomes.	3.63	Very Good	Very Much Satisfied
3 Instructional materials are updated and are made available to students.	3.66	Very Good	Very Much Satisfied
4 The e-class provides student access to online databases (files and records), and resources.	3.69	Very Good	Very Much Satisfied
5 All authors or owners of the borrowed resources and materials used in e-class are appropriately mentioned or given recognition or credits.	3.94	Very Good	Very Much Satisfied
Overall Weighted Mean	3.73	Very Good	Very Much Satisfied

Range of means: 1.00-1.49 (Poor); 1.50-2.49 (Fair); 2.50-3.49 (Good); 3.50-4.49 (Very Good); 4.50-5.00 (Excellent)

As viewed in Table II-D, among the indicators under content and resources, the highest weighted mean 3.94 described as “very good” went to indicator 5 which states that all authors or owners of the borrowed resources and materials used in e- class are appropriately mentioned or given recognition or credits. On the other hand, the lowest weighted mean 3.63 described as very good is given to indicator 2 which states that instructional materials are appropriate for e-learning; contribute to the achievement of the learning outcomes. The overall weighted mean is 3.73 and which is described as very good. This suggests that the students are very much satisfied with the synchronous class delivery specifically in terms of content and resources.

Undoubtedly, teachers are doing all they can to support their students from afar, and they require unique distance learning resources through virtual classroom for the continuity of learning (Karbowski, 2020). On the other hand, prompt participations are required to interact with the content, including reading, watching, listening, and doing activities (Shank, 2020).

As viewed in Table II-E, among the indicators under the technology and accessibility, the highest weighted mean 3.78 described as “very good” went to indicator 1 which states that the teacher ensures that the technology used in the conduct of e-class is available to students and that it works with the identified hardware,

Consequently, one area that is key to online learning is the type of digital technology to be used. Digital technologies should be made available for students in different time zones and international contexts. Tools should also include accessibility features like enlarged cursors, closed-captioning, keyboard shortcuts, alternative text, high-contrast themes and text-to-speech capabilities. Above all, accessibility can be fostered through listening to the concerns and desires of their students and make changes accordingly (Hodge, 2020).

As reflected in Table II-F, among the indicators under the student learning assessment, the highest weighted mean 3.88 described as “very good” went to indicator 5 which states that the teacher gives assessments such as tests, quizzes, exams, et cetera that are consistent with the e-class lesson and activities. Meanwhile, the lowest weighted mean 3.58 described as very

browsers, and other software. Meanwhile, the lowest weighted mean 3.62 described as very good is given to indicator 2 which states that the teacher briefs or orients students on the basics of online learning to ensure students full participation in e-class with minimal distractions. The overall weighted mean is 3.70 and which is described as very good. This means that the students are very much satisfied with the synchronous class delivery, technology and accessibility in particular.

D. Technology and Accessibility

Technology and Accessibility	Level of Appreciation		Interpretation
	M	VD	
1 1. The teacher ensures that the technology used in the conduct of e-class is available to students and that it works with the identified hardware, browsers, and other software.	3.78	Very Good	Very Much Satisfied
2 2. The teacher briefs or orients students on the basics of online learning to ensure students' full participation in e-class with minimal distractions	3.62	Very Good	Very Much Satisfied
3 3. Evidence from student work and tools confirm that tools and media support student engagement and ensure effective learning.	3.67	Very Good	Very Much Satisfied
4 4. The teacher monitors student engagement and access to e-class tools and materials to determine delays and technical difficulties due to technology.	3.69	Very Good	Very Much Satisfied
5 5. The teacher makes sure of inclusivity in class which means that all students can have access to the e-class tools and materials.	3.74	Very Good	Very Much Satisfied
Overall Weighted Mean	3.70	Very Good	Very Much Satisfied

Range of means: 1.00-1.49 (Poor); 1.50-2.49 (Fair); 2.50-3.49 (Good); 3.50-4.49 (Very Good); 4.50-5.00 (Excellent)

Students' Learning Assessment

Range of means: 1.00-1.49 (Poor); 1.50-2.49 (Fair); 2.50-3.49 (Good); 3.50-4.49 (Very Good); 4.50-5.00 (Excellent)

With regard to the result above, it is not surprising that many educational institutes are making the progressive shift from practicing traditional assessment practices to using online assessment devices that benefit the students and teachers and also be worthwhile to the institutes. In addition, such a modality enables learners to meet for the exam at a location of their choice. It also assures that teachers can invigilate the estimates remotely. In which, decreases the stress of the learners and teachers and helps save the time and expense of travel (Bhojane, 2020).

E. Support

good is given to indicator 2 which states that the students are engaged in or exposed to differentiated and varied activities which is evident in their performance in e- class. The overall weighted mean is 3.74 which is described as very good. This means that the students are very much satisfied with the synchronous class delivery specifically on student learning assessment.

Support	Level of Appreciation		Interpretation
	M	VD	
1. The teacher makes use of appropriate communication tools and help resources within the class to quickly direct students for resolving technical obstacles.	3.87	Very Good	Very Much Satisfied
2. The teacher takes advantage of the training offered and demonstrates their learning by assisting students in handling basic technology in e-class	3.74	Very Good	Very Much Satisfied
3. The teacher provides tutorials or links to tutorials (if deemed necessary) to help students who experience the difficulty in using technology.	3.76	Very Good	Very Much Satisfied
4. The teacher gives due or considerations among students who missed requirements in e-class (if deemed necessary).	3.91	Very Good	Students'
5. Student's concerns and queries are addressed through a forum or any venue such as group chats, Gmail, fb messenger, SMS, et cetera.	4.05	Very Good	Very Much Satisfied
Overall Weighted Mean	3.87	Very Good	Very Much Satisfied

Range of means: 1.00-1.49 (Poor); 1.50-2.49 (Fair); 2.50-3.49 (Good); 3.50-4.49 (Very Good); 4.50-5.00 (Excellent)

As viewed in Table II-G, among the indicators under support to synchronous class delivery, the highest weighted mean 4.05 described as “very good” went to indicator 5 which states that the student’s concerns and queries are addressed through a forum or any venue such as group chats, Gmail, fb messenger, SMS, et cetera. Meanwhile, the lowest weighted mean 3.74 described as very good is given to indicator 2 which states that the teacher takes advantage of the training offered and demonstrates their learning by assisting students in handling basic technology in e-class. The overall weighted mean is 3.87 and which is described as very good. This indicates that the students are very much satisfied with the synchronous class delivery specifically in terms of support.

Significantly, in synchronous learning, students usually go through the learning path together, accompanied by their instructor who is able

to provide support while students are completing tasks and activities. The teacher must also make sure that the synchronous session offers novel content, insights, or activities and avoid duplicating what is covered elsewhere in the course, e.g., readings, videos, discussion boards (Norman, 2017).

half the time (Miller, 2019). Thus, the more online synchronous classes there are, the more that they should be make better for both students and teachers.

Overall Mean Distribution of the Level of Students’ Appreciation of Synchronous Class Delivery

	Indicators	Level of Appreciation		Interpretation
		Mean	Verbal Description	
1	Structure	3.65	Very Good	Very Much Satisfied
2	Instructions	3.76	Very Good	Very Much Satisfied
3	Student Centered-Learning	3.65	Very Good	Very Much Satisfied
4	Content and Resources	3.73	Very Good	Very Much Satisfied
5	Technology and Accessibility	3.70	Very Good	Very Much Satisfied
6	Student Learning Assessment	3.74	Very Good	Very Much Satisfied
7	Support	3.87	Very Good	Very Much Satisfied
	Grand Weighted Mean	3.71	Very Good	Very Much Satisfied

Range of means: 1.00-1.49 (Poor); 1.50-2.49 (Fair); 2.50-3.49 (Good); 3.50-4.49 (Very Good); 4.50-5.00 (Excellent)

As browsed on the table above, the support got the highest weighted mean of 3.87 and which is described as very good. On the other hand, the structure garnered the lowest weighted mean of 3.65 described as very good. The grand weighted mean is 3.71 described as very good. This entails that the students are very much satisfied with their synchronous class delivery. This result further suggests that the students’ level of appreciation of the synchronous class delivery is in a very respectable level.

Anent the results above, Emma (2020) explained that in synchronous classes, students can study where they feel most comfortable and can videoconference to their classes at the click of a button. While schooling at home, it is also easier to complete other hobbies and housework that otherwise would have been placed on the back burner. By being at home, many students are able to get things done in a safe and relaxing environment.

Moreover, today’s workforce is moving online. Forty-six percent of organizations recently surveyed by the Society for Human Resource Management (SHRM) said that they use virtual teams. With that, the number of professionals which include teachers who regularly work from home has increased 159 percent over the last decade, with more than 4.7 million employees working remotely at least

III. Level of Students’ Academic Performance in English 10

Grade	Frequency	Percentage	Interpretation
90 above	65	58.03%	Proficient
85-89	42	37.5%	Approaching Proficiency
80-84	5	4.46%	Developing
75-79	0	0%	Beginning
74 below	0	0%	Needs Intervention

Legends: 74 below (needs intervention); 75-79 (beginning); 80-84 (developing);); 85-89 (approaching proficiency); 90 above (proficient)

It can be gleaned from Table III above that 65 or 58.03% of the students are in the range of 90 above. This means that majority of them are proficient learners in English. Moreover, 42 or 37.5% of the them are in the range of 85 - 89; meaning they are still approaching to proficiency. Five or 4.46% of them are in the range of 80 – 84 or still developing. None of the students are in the range of 75 – 79 and 74 below described as beginning and need intervention respectively.

In agreement with the results above, the results of the study of Enriquez (2020) show that an online course can be as effective as the traditional on- campus, face-to-face format. The retention rates are almost the same for the online and on-campus groups, and the success rates are identical. There is no statistically significant difference in the levels of performance of the face-to-face and online classes.

One study also proposed that course design, quality of the instructor, prompt feedback, and students’ expectations are the four prominent determinants of learning outcome and satisfaction of the students during online classes. The above- mentioned factors should be considered in online synchronous classes in order to ensure greater student academic achievement (Lee, 2014).

IV. Association between the Synchronous Design and Delivery

Variables	Mean	SD	R	Sig. (2 – Tailed)	Remarks	Decision
Design	3.6237	.20102	0.524**	0.001	Reject Ho	Significant
Delivery	3.7091	.14286				

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

It can be gleaned from the Table IV above that the p-value is below the 0.05 level of significance set for analysis. Thus, the null hypothesis is rejected. This means that there is a significant relationship between the students' level of appreciation of the synchronous design and delivery. This indicates that the synchronous class design is associated with the synchronous class delivery. Hence, the better the design of the synchronous class, the better the synchronous class delivery gets.

In a 2009 study of Seaman as cited in Simon (2012), he found out that 80% of U.S higher education faculty with no online teaching or online course design experience believed that the outcomes of online learning were inferior to those of face-to-face courses. In contrast, the majority of faculty with experience in online teaching and course design believed that the outcomes were either equivalent or better. Despite evidence that carefully designed online courses yield excellent learning 15 outcomes (Means et al., 2009), the stigma attached to this teaching modality remains an important hurdle to overcome for those who have never taught online.

Correspondingly, Noren (2020) posited that faculty will need to rethink the role that both synchronous online delivery approach plays in creating effective flexible online learning experiences for students. It is evident that neither approach is perfect; there are pros and cons to both modalities for online delivery. Increasingly, faculty are opting for an approach that incorporates the delivery format and enables faculty to be more flexible and responsive to the diversity of learner needs. Ultimately, deciding on one's approach will depend on the learners, the curriculum, course materials and the time and capacity as an instructor and other contextual factors. If one considers designing online courses that incorporate the strengths of synchronous delivery models, one can create experiences that enable both flexibility and structure to co-exist, thus creating a more enriching teaching and learning environment for students and instructors.

Association between the Students' Performance in English and their Level of Appreciation of the Synchronous Class Design and Delivery

Variables	Mean	SD	R	Sig. (2-tailed)	Remarks	Decision
Students' Performance vs. Level of Appreciation	4.5089	.56942				
• Design						
a. Structure	3.3286	.78676	0.154	0.104	Failed to reject Ho	Not significant
b. Instructions	3.5339	.85039	0.163	0.086	Failed to reject Ho	Not significant
c. Student Centered-Learning	3.7125	.80260	0.130	0.172	Failed to reject Ho	Significant
d. Content and Resources	3.7321	.84579	0.207*	0.029	Reject Ho	Not significant
e. Technology and Accessibility	3.5571	.83458	0.088	0.356	Failed to reject Ho	Not significant
f. Student Learning Assessment	3.8643	.88601	0.106	0.266	Failed to reject Ho	
g. Support	3.6375	.80697	0.107	0.261	Failed to reject Ho	
• Delivery						
a. Structure	3.5161	.78207	.113	0.236	Failed to reject Ho	Not significant
b. Instructions	3.7554	.88173	.046	0.633	Failed to reject Ho	Not significant
c. Student Centered-Learning	3.6536	.84725	.197*	0.037	Failed to reject Ho	Significant
d. Content and Resources	3.7321	.83377	.115	0.227	Failed to reject Ho	Not significant
e. Technology and Accessibility	3.6982	.82221	.115	0.225	Failed to reject Ho	Not significant
f. Student Learning Assessment	3.7411	.77140	.126	0.184	Failed to reject Ho	
g. Support	3.8661	.78517	.049	0.608	Failed to reject Ho	

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

As viewed in the Table V, majority of the p-values are beyond the 0.05 level of significance set for analysis. However, on the students' level of appreciation of class design particularly the content and resources, it obtained the p-value (0.029) which is below 0.05. Thus, the null hypothesis is rejected. This indicates that there is a relationship between the students' performance in English and their level of appreciation of the synchronous class design specifically on the content and resources. The R-value (0.207) however suggests a weak correlation between the two mentioned variables. This result manifests that the students' performance in English is somehow associated with their level of appreciation of the synchronous class design specifically on the content and resources. This can perhaps be attributed to students' positive perception towards the activities and leaning materials that they have in their synchronous online class.

Also, between the students' academic performance and their level of appreciation of the synchronous class delivery, majority of the p-values are beyond the 0.05 level of significance set for analysis. However, on the students' level of appreciation of the class delivery particularly the student centered-learning, it obtained the p-value (0.037) which is below 0.05. Thus, the null hypothesis is rejected. This entails that there is a relationship between the students' performance in English and their level of appreciation of the synchronous class delivery specifically on the student centered-learning. The R-value (0.197) however suggests a weak correlation between the two mentioned variables. This result suggests that the students' performance in English is somehow associated with their level of appreciation of the synchronous class delivery specifically on the student centered-learning. This can somehow be attributed to students' positive

view on how the lessons were delivered and their views that their class is basically focused on them.

Moreover, as presented in the table, majority of the p-values are beyond the 0.05 level of significance set for analysis. This further implies that the students' performance in English is not associated on their level of appreciation of the synchronous class design and delivery. Hence, no matter how better the design of the synchronous class design and its delivery as viewed by the students themselves, it has nothing to do with their performance in English.

With regards to the results above, while much of the academic literature has paid attention to the effectiveness of an online learning environment compared with an F2F classroom environment, there has been no consensus on how online learning affects student performance. Some studies found that there is no statistical difference between students' grades and course delivery mode and others present opposite results (Driscoll et al., 2012).

As Cavanaugh as cited in Simon (2012) concluded that more importantly, when synchronous class is implemented with the same care as effective face-to face instruction, distance education programs can be used to complement, enhance, and expand education options for students, at least at intermediate, middle, and upper grades levels". In other words, the determinant of learning outcomes is not the modality, rather the quality of the instructional design.

Conclusions

The students are very much satisfied with their online English classes which suggests that their level of appreciation of the synchronous class design is at a very respectable level. Furthermore, when it comes to the level of students' performance in English, majority of them are proficient learners and no one is in the developing, beginning and needed intervention. This manifests that the students are performing well in their synchronous class in English 10.

When the synchronous class design is compared with synchronous class delivery, a significant relationship between the students' level of appreciation of the two aforementioned factors was established. This indicates that the synchronous class design is associated with the synchronous class delivery. Hence, the better the design of the synchronous class, the better the synchronous class delivery gets.

When the students' academic performance in English 10 and their level of appreciation of the synchronous class design and delivery are compared, no significant relationship between the two aforesaid factors was found. This manifests that the students' performance in English is not associated with their level of appreciation of the synchronous class design and delivery. Hence, no matter how better the design of the synchronous class design and its delivery as viewed by the students themselves, it has nothing to do with their performance in English.

There is, however, a weak positive correlation between the students' performance in English with their level of appreciation of the synchronous class design in terms of content and resources and class delivery in terms of student-centered learning. This entails that the students' performance in English is somehow associated with their level of appreciation of the synchronous class design particularly on the content and resources and their level of appreciation of the synchronous class delivery specifically on

student-centered learning. This can somehow be attributed to students' positive perception of the given activities and learning resources in their synchronous online class and their positive view on how the student-centered lessons were delivered.

Consequently, a localized intervention program is crafted that is entitled Enhancing English Teachers' Competence on Online Synchronous Instruction which aimed to upgrade teachers' digital literacy for a better navigation of different online platforms. This hopes to enhance the teachers' digital skills especially in maneuvering the technological tools which can positively affect the students' level of academic performance in English as well as in other disciplines.

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Level of Academic Stress and Extent of Perceived Social Support of the College Students During the COVID Pandemic in Caraga State University, Butuan City, Philippines

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Abstract- The study's primary goal was to identify the students' level of academic stress during the COVID-19 pandemic in relation to academic expectations, academic work and examinations, academic self-perceptions, and the extent of perceived social support from friends, family, and significant others. The study utilized a descriptive-correlational research design where the frequency and percentages, weighted mean, One-Way ANOVA, and Pearson Product Moment Correlation were used to analyze the collected data from 98 students. Online-generated survey questions were utilized for the data analysis. The results reveal that the students' level of academic stress related to academic expectation, work and examination, and academic self-perception is moderately extensive. Moreover, the extent of perceived social support from friends, family, and significant others tells the same results. No significant relationship was found between the level of academic stress and the extent of perceived social support. It was concluded that students' concerns about academic stresses and taking action with social support are crucial for nourishing and improving mental health.

I. INTRODUCTION

Stress is a bodily reaction to the external environment that generates it. It was also known as eustress or distress. The distinction between the two is that eustress is a stimulus in which the body responds positively to the external environment, whereas distress is the polar opposite (Sharma, 2018).

National Crime Records Bureau reported that one student every hour commits suicide. The bureau revealed that 1.8% of students committed suicide because of flanking from the exams and an 80% rise in suicide rates during a one-year time frame (Saha, 2017). A 2012 Lancet Report revealed that the 15-29 age group bracket in India has topped the suicide cases in the world (as cited in "India has the Highest Suicide Rate", n.d.) and these rates show no sign of declining (Reddy et.al, 2018).

Family, friends, coworkers, and others provide physical and emotional assistance in the form of social support. To measure the relationship between social support and academic performance of 272 Madonna University students, correlation analysis was used and the results revealed that the relationship between social support and academic performance is positively significant (Ogbeide & Ugwu, 2016). In other words, the higher the extent of social support availed and accessed, the higher the quality of academic performance delivered. (Ogbeide & Ugwu, 2016). In other words, the higher the extent of social support availed and accessed, the higher the quality of academic performance delivered.

In COVID-19 pandemic time, using the blended learning mode is important to the students' learning process. In the study conducted in Monkayo College of Arts, Sciences and Technology located in Monkayo, Davao de Oro, Philippines, it revealed that the factors that trigger academic stress are limited weekly internet allotment, more hours spent on modular learning as well as low monthly family income. Furthermore, students also struggle with fear of failure, lack of learning tools, personal inadequacy, and interpersonal conflicts with professors (Licayan et al., 2021).

Alipio (2020) stated that students benefit from adequate social support in assisting and supporting them in their shift from high school to college, as well as adjusting to the additional expectations, tasks, obligations, and needs of higher education life. In the Filipino context, social support can take several forms. It is as simple as spending time together, which is known as companionship support, or it can be directly tied to the topic at hand. Filipino youths cherish the wisdom they gain from their parents, teachers, and mentors. These forms of assistance differ from those seen in westernized countries, which place a greater emphasis on autonomy or independence, but in the Philippines, group harmony is cherished more (Reyes et al., 2020).

Acknowledging the Mental Health Awareness Month celebrated every October, the University has discussed the mental health and academic stress of the students and how to adequate social support in this challenging time. Despite the challenges faced, Dr. Anthony M. Penaso,

the president of Caraga State University (CSU), emphasized that aside from conducting online classes, flexible learning schemes is effective for college students (Lopez, 2020).

Acknowledging the fact that Bachelor of Elementary college students struggle on reaching university's learning standard causing them to feel stressed and unmotivated, the researchers are prompted to determine the student's level of the academic stress of Caraga State University and the extent of perceived social support they receive from their family, friends and loved ones.

The study is aimed to identify the level of academic stress of Caraga State University Bachelor in Elementary Education college students as basis in proposing intervention material that determined their current status and how the student's perceive social support when dealing academic stress.

Methods

The research design, research locale, participants, sampling design, instrumentation, validity and reliability of the instrument, data gathering procedure, scoring and quantification of data and statistical treatment of data are presented below.

1.1 Research Design

This research used a descriptive-correlational research design. It described the variables and the relationships on the level of academic stress in terms of academic expectation, work and examination, students' academic self- perception, and the extent of perceived social support received by the BEEd students from their family, friends and significant others.

1.2 Research Locale

The study is conducted in the College of Education (CEd) department particularly in the Bachelor of Elementary Education (BEEd) program designated in Caraga State University which is located in Butuan City, Agusan del Norte, Caraga Region, Philippines. Caraga State University is situated along the Phil-Japan Friendship Highway which traverses Butuan City, Surigao City, Bayugan City, Cabadbaran City and the provinces of Agusan del Norte, Agusan del Sur, Surigao del Norte and Surigao del Sur, northeastern of Mindanao, south of the Philippines. The Metropolitan Manila, the Philippines' business, political and industrial capital, is just one hour and twenty-five-minute-ride via plan to the City of Butuan. Caraga State University Campus is nestled in a 232-hectares area, thirty-two (32) hectares of which is allocated for academic buildings and support facilities including a Gymnasium, while the remaining two-hundred (200) hectares of land are for production, research and extension projects of the University.

1.3 Participants of the Study

This study involved the 98 Caraga State University College of Education students from Bachelor of Elementary Education as research participants. The number of the participants is showed in the table below.

1.4 Sampling Design

The researchers used a probability sampling specifically simple random sampling where the researchers select a smaller group from a larger group of the total number of the population. For economic and administrative considerations, the number of participants in the study is 30% of the total population of each year

level of the Bachelor of Elementary Education students in Caraga State University.

1.5 Research Instrument

The researchers used Google Forms to create an online-generated survey questionnaire. The first section of the questionnaire focused on the demographic profile of students by year level, economic status, and love-life status. The second section of the questionnaire focused on the students' level of academic stress. The researchers used the PAS (Perception of Academic Scale) questionnaire — a psychometrically instrument crafted to assess the academic stress among the university students developed by Bedewy and Gabriel (2015). There are 15 statements in the second section. The third section of the questionnaire focused on the extent of perceived social support received by BEEd students. The researchers used the MSPSS (Multidimensional Scale of Perceived Social Support) questionnaire which was designed to measure an individual's perception of support from 3 sources: family, friends and significant others (Zimet et al., 2019) There are 15 statements in the third section.

1.6 Validity and Reliability of the Research Instrument

The researchers used the PAS (Perception of Academic Scale) questionnaire adopted from a study's output "Examining Perceptions of Academic Stress and Its Sources among University Students", which goal is to developed a scale to measure perceived sources of academic stress among university students and MSPSS (Multidimensional Scale of Perceived Social Support) questionnaire adopted from a study's output about "The Multidimensional Scale of Perceived Social Support", which goal is used to measure an individual's perception of support from 3 sources: family, friends and significant others. The instrument is thoroughly checked and verified by the experts and immediately piloted to twenty (30) Bachelor of Secondary Education Major in Science and Bachelor of Secondary Education Major in Mathematics students in the College of Education department in Caraga State University, Ampayon, Butuan City. The responses of the participants gathered in the pilot test were statistically treated through Cronbach's Alpha reliability test. The alpha coefficient for the thirty (30) items is .945; which means that the items have relatively high internal consistency, hence yielding high reliability score.

1.7 Data Gathering Procedure

The researchers sent two (2) separate letters addressed to the Dean of College of Education through the BSED chairperson and BEED Chairperson to ask permission to allow the researchers to conduct the pilot test for the survey questionnaires. Upon the approval, the researchers distributed the survey questionnaires through Google form link to the participants' social media accounts specifically Facebook Messenger or active Gmail accounts that reduced participants' inconvenience. Subsequently, the data analyzed in percentage which was automatically generated by Google. It assured that the conduct of the survey upholds the confidentiality and privacy of the people involved.

1.8 Scoring and Quantification of Data

The answers of the participants on the level of academic stress and extent of perceived social support of BEEd students from their family, friends, and significant others are classified respectively with the use of the following scale of statistical mean, range, value, and its

descriptive equivalent. The responses, scale, range, and interpretation assigned for each item on the level of academic stress are shown below:

Responses	Scale	Range	Interpretation
Strongly Agree	5	4.50-5.00	The level of academic stress is very extensive.
Agree	4	3.50-4.49	The level of academic stress is moderately extensive.
Neutral	3	2.50-3.49	The level of academic stress is fair.
Disagree	2	1.50-2.49	The level of academic stress is low.
Strongly Disagree	1	1.00-1.49	The level of academic stress is very <u>low.</u>

The responses, scale, range, and interpretation assigned for each item on the extent of perceived social support of BEEed students from their family, friends, and significant others are shown below:

Responses	Scale	Range	Interpretation
Strongly agree	5	4.50-5.00	The extent of perceived social support is very extensive.
Agree	4	3.50-4.49	The extent of perceived social support is moderately extensive.
Neutral	3	2.50-3.49	The extent of perceived social support is fair.
Disagree	2	1.50-2.49	The extent of perceived social support is low.
Strongly Disagree	1	1.00-1.49	The extent of perceived social support is very low.

1.9 Statistical Treatment

The data is treated in using the following statistical tools: **Frequency Counts and Percentages.** This was utilized in describing the population of the participants.

Weighted Mean. This was used to get the measurement of student's level of academic stress.

One-way ANOVA. This was applied to determine the significant difference between the participants' profile and the student's level of academic stress and their perceived social support.

Pearson Product Moment Correlation. This was applied to determine the relationship between the participants' level of academic stress and extent of perceived social support of the participants.

II. FINDINGS

This chapter discussed the findings of research results and their implications. Consequently, similar literature is added to demonstrate the strong stand of the claim derived from the findings.

Problem 1. The Demographic Profile of the Participants in terms of Year Level, Economic Status, and Love Life Status

The participants' demographic profile in terms of the year level is shown in figure 1.

1.1 year level

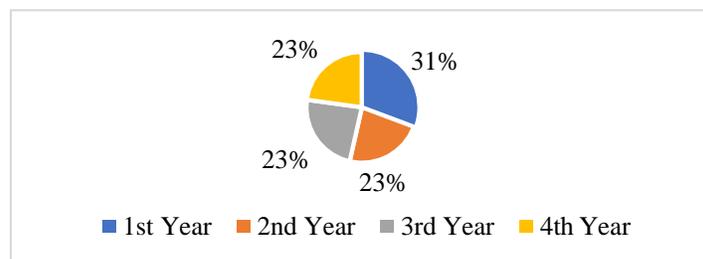


Figure 1. Graphical Representation of the Participants' Year Level

It can be gleaned on the figure that thirty-nine (39) or thirty-one percent (31%) of the participants were first (1st) year BEEed students, twenty-nine (29) or twenty-three percent (23%) of them were second (2nd) year BEEed students, thirty (30) or twenty-three percent (23%) of them were third (3rd) year BEEed students and twenty-three (23) or twenty-three (23%) of them were fourth (4th) year BEEed students. This revealed that the majority of the participants were from first (1st) year BEEed students.

The participants' demographic profile in terms of the economic status is shown in figure 2.

1.2 economic status

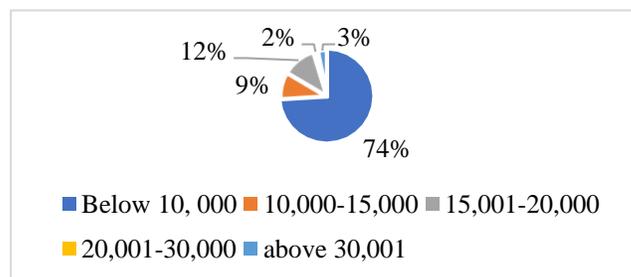


Figure 2. Graphical Representation of Participants' Economic Status

The distribution entails that two (2) participants or 2 percent (2%) of overall participants had 20,001- 30,000 monthly income, four (4) participants or three percent (3%) had above 30,001 monthly income, twelve (12) participants or nine percent (9%) had 10,001-15,000 monthly income, fifteen (15) participants or twelve percent (12%) had 15,001- 20,000 monthly income and ninety-four (94) participants or seventy-four percent (74%) had below 10,000 monthly income. It means that most of the participants had below 10,000 monthly incomes.

The participants' demographic profile in terms of love-life status is shown in figure 3.

1.3 Love-Life Status

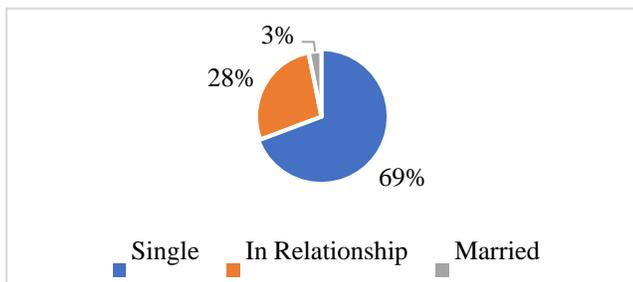


Figure 3. Graphical Representation of Participants' Love-Life Status

It reveals that four (4) or three percent (3%) of the participants were married, thirty-five (35) or twenty-eight percent (28%) were in a relationship, and eighty-eight (88) or sixty-nine percent (69%) were single. This denotes that out of 127 participants, majorities of them were single.

Problem 2. Levels of Academic Stress of the Participants in terms of Stresses Related to Academic Expectations, Stresses Related to Work and Examinations, and Stresses Related to Academic Self-Perceptions

2.1 Levels of Academic Stress of the Participants in terms of Stresses Related to Academic Expectations

Table 1 presents the academic stress related to academic expectations among the participants.

As shown in the table, indicator number three (3) states that "I feel pressured when my instructors give too many requirements" attained the highest mean of 4.14. This means that participants agreed that they have moderately extensive stress along this line. In contrast, indicator number two (2) which indicates that "I feel down when my instructor comment about my academic performance" obtained the lowest mean of 3.33. This means that participants' level of stress is neutral and defined as fair. The overall weighted mean on the stresses related to academic expectations is 3.90 or agree which is described as moderately extensive.

Table 1

Mean Distribution of the level of academic stress of the participants in terms of stresses related to academic expectations

Indicators	AcademicLevel of	Stress	Academic	Interpretation		
					Description	
					Mean	
1	I feel like I have let my parents down when my academic performance is poor.	3.86	Agree	The level of academic stress is moderately extensive.		
2	I feel down when my instructors comment about my academic performance.	3.33	Neutral	The level of academic stress is fair.		
3	I feel pressured when my instructors give too many requirements.	4.14	Agree	The level of academic stress is moderately extensive.		
4	I feel stressed because of the tight deadlines of academic-related activities.	4.11	Agree	The level of academic stress is moderately extensive.		
5	I feel anxious about maintaining my grades in each course.	4.06	Agree	The level of academic stress is moderately extensive.		
Overall Weighted Mean		3.90	Agree	The level of academic stress is moderately extensive.		

Range of means: 4.50-5.00 Strongly Agree; 3.50-4.49 Agree; 2.50-3.49 Neutral; 1.50-2.49 Disagree; 1.00-1.49 Strongly Disagree

This implies that students may experience academic stress over academic expectations set for them by others. This could be as a result of the unhealthy and unrealistic competition and expectations that exist in the classroom. It suggests that students may maintain healthy and realistic academic routines despite problems that they encounter including the amount of time given to the students to accomplish their requirements. According to Delavande (2014), setting expectations is a common human practice which affects many domains, such as education, economics, health, income, etc. Education is important as it equips learners with values, attitudes, skills and knowledge to adjust to their social

environment. Academic expectations play a significant role in the quality of student adaptation and academic success.

The study conducted by Krammer et al in 1970 that was cited by Casanova et al in the year 2019 found out that in combining cognition and motivation, academic expectations reflect student aspirations or what they intend to achieve in attending HE, and how they can overcome the challenges posed by the HE experiences.

As stated by Krammer et al., (2016), positive and realistic expectations reinforce the use of coping strategies when faced with initial adaptation difficulties. When the initial expectations of students are too high or unrealistic, they are more likely to fail to realize them. In this situation, students experience frustration and reduce their investment in acquiring new skills to deal with the challenges of HE (Kreig, 2013).

2.2 Levels of Academic Stress of the Participants in terms of Stresses Related to Work and Examinations

Table 2 projects the level of academic stress related to academic work and examinations among the participants.

The data exposes that indicator number two (2) articulating that there are too many deadlines in their tasks garnered the highest mean of 4.21 described as agree and conveyed that the level of the academic stress is moderately extensive. However, indicator number one (1) which express that the time allocated to classes and work is enough earned the lowest mean of 3.43 described as agree and interpreted that the level of academic stress is moderately extensive.

This attention is more and more important when students enter university with different academic competencies and motivations, as well as different vocational or career projects, or when they are first- generation students with a lack of sufficient and objective information concerning campus life (Braxton et al., 1995; Briggs et al., 2012). Therefore, these students are often somewhat idealistic in terms of what they can accomplish and frustration can emerge in the first weeks of college life (Credé & Niehorster, 2012).

Table 2
Mean Distribution of the level of academic stress of the participants in terms of stresses related to academic work and examinations

Indicators Academic Work and Examinations	Level of	Mean	Description	Interpretation
	Stress			
1	The time allocated to classes and academic work is enough.	3.43	Agree	The level of academic stress is moderately extensive.
2	I feel that there are too many deadlines in my work.	4.21	Agree	The level of academic stress is moderately extensive.
3	I believe that the amount of work assignment is too much.	3.80	Agree	The level of academic stress is moderately extensive.
4	The questions on the exams are frequently challenging.	4.13	Agree	The level of academic stress is moderately extensive.
5	The amount of time available to finish the answers on the exam is limited.	3.80	Agree	The level of academic stress is moderately extensive.
Overall Weighted Mean		3.87	Agree	The level of academic stress is moderately extensive.

Range of means: 4.50-5.00 Strongly Agree; 3.50-4.49 Agree; 2.50-3.49 Neutral; 1.50-2.49 Disagree; 1.00-1.49 Strongly Disagree

The collective weighted mean is 3.87, which indicates an “agree” overall response. It represents that the level of academic stress related to academic work and exams among BEEed students in CSU is moderately extensive.

This implies that academic workloads among CSU BEEed students is one of the factors that contributed in the academic stress among other factors. This implies that academic workloads among CSU BEEed students is one of the factors that contributed in the academic stress among other factors. Students may be given various activities by their instructors of the different courses which makes it difficult for them to manage their time for completing and catching up the deadlines. This includes the difficulty of the exams. Students are also being pressured due to the difficult questions given in their examinations or lessons that were not tackled in their class. Students may exercise adequate time management when undertaking classwork or tasks in order to avoid being overburdened with work and to complete projects efficiently, resulting in less stress.

As stated by Rodriguez (2020), challenge success polled almost 20,000 students from difficult, college- focused institutions. The biggest sources of stress for these students were "grades, tests, quizzes, finals, or other assessments," "total workload and assignments," and "college and their future," according to their responses.

Examination questions must undergo keen item analysis as we indulge in this new time. Assessing student performance will help teachers design or make changes with regards to creating exam items and likely help them evaluate if some questions are serving their function and are suitable to be modified or eliminated, that is according to Kadakia and Bradshaw (2020) as agreed in their article.

2.3 Levels of Academic Stress of the Participants in terms of Stresses Related to Academic Self- Perceptions among the Participants

Table 3 illustrates the stresses related to students' self-perception among the BEEed freshmen students in CSU.

As shown in the table, indicator number one (1) which states that "I became anxious when I feel unprepared for my academic journey" has the highest mean of 4.24 described as agree and conveyed that the level of academic stress is moderately extensive along this line. However, indicator number four (4) which indicates that "I feel that I will fail some courses this semester" got the lowest mean of 3.00 which tells as neutral and participants' level of academic stress is fair. The overall weighted mean on the stresses related to students' self-perceptions is

3.66 and obtained agreed response which is described as the level of academic stress is moderately extensive.

This implies that the student's future career goals and academic self-belief are causing them stress and this is possibly due to the fact that they are just in their college journey, where they are already thinking about future uncertainties and are concerned academically due to the pressure they felt from expectations and other factors. This means that while still in college, students may focus on managing their scholastic demands rather than worrying about their personal impressions of their future job. On the other hand, it may cause confusion and educational disruption, affecting their ability to enroll in or stay engaged.

Table 3
Mean Distribution of the level of academic stress of the participants in terms of stresses related to academic self-perception

Indicators of Academic Self-Perception	Level of Stress Mean	of Academic Description	Interpretation
1 I become anxious when I feel unprepared for my academic journey.	4.24	Agree	The level of academic stress is moderately extensive
2 I am not confident about succeeding in my goal.	3.35	Neutral	The level of academic stress is fair
3 I become stressed when I had to make academic decisions (e.g. procrastinating or studying well).	3.72	Agree	The level of academic stress is moderately extensive
4 I feel that I will fail some courses this semester.	3.00	Neutral	The level of academic stress is fair
I am worried about getting a job even if I pass my exams.	3.96	Agree	The level of academic stress is moderately extensive
Overall Weighted Mean	3.66	Agree	The level of academic stress is moderately extensive

Range of means: 4.50-5.00 Strongly Agree; 3.50-4.49 Agree; 2.50-3.49 Neutral; 1.50-2.49 Disagree; 1.00-1.49 Strongly Disagree

As claimed by Johnson (2020), forty-four percent of those who have experienced some kinds of educational disruption are concerned that it will affect their or their family's ability to enroll in or remain enrolled in college. Sawchuk (2020) stated that students' regular report cards and performance reviews are generating a large rise in the amount of failing or near-failing grades from coast to coast in schools that have primarily served students by distance education.

Putwain and Aveyard (2018) observed that the cognitive aspect of test anxiety (worry) has long been shown to be negatively linked to exam results. Academic buoyancy, perceived power, test competence, and cognitive test anxiety were all self-reported and matched to exam grades in English, Science, and Mathematics. Worry and perceived power had an interaction, according to the findings. At low levels of worry, students who felt more in charge performed better. Examination output was unaffected by high levels of worry regulation. Worry-reduction interventions do not actually increase exam performance unless they also target better control.

Problem 3. Extent of Perceived Social Support Received by the Participants in terms of Friends, Family and Significant Others

3.1 Extent of Perceived Social Support Received by the Participants in terms of Friends

Table 4 presents the extent of perceived social support among the BEEEd students of CSU in terms of friends.

Table 4
Mean Distribution of the extent of perceived social support of the participants in terms of friends

Indicators	Extent of Perceived Social Support		Interpretation
	Mean	Description	
1 I know my friends really try their best to help me.	4.19	Agree	The extent of perceived social support is moderately extensive.
2 I know I can rely on my friends when things go wrong.	3.94	Agree	The extent of perceived social support is moderately extensive.
3 I have friends with whom I can share my joys and sorrow.	4.05	Agree	The extent of perceived social support is moderately extensive.
4 I can talk about my problems with my friends.	3.81	Agree	The extent of perceived social support is moderately extensive.
5 I get the usual advice about important things in life.	4.05	Agree	The extent of perceived social support is moderately extensive.
Overall Weighted Mean	4.01	Agree	The extent of perceived social support is moderately extensive.

Range of means: 4.50-5.00 Strongly Agree; 3.50-4.49 Agree; 2.50-3.49 Neutral; 1.50-2.49 Disagree; 1.00-1.49 Strongly Disagree

As shown in the table, indicator number one (1) states that “I know my friends really try their best to help me” attained the highest mean of 4.19. This means that participants agreed that they have moderately extensive social support along this line. In contrast, indicator number four (4) which indicates that “I can talk about my problems with my friends” obtained the lowest mean of

3.81 which means that the participant’s extent of perceived support is agree and defined as moderately extensive.

The overall weighted mean on the extent of perceived social support in terms of friends is 4.01 or agree which is described that the extent of perceived social support is moderately extensive. This implies that students receive good amount of social support from their friends which is important as it helps them to be motivated despite the tasks that trigger their stress including given many school works. Their friends are there by their side to extend their support in times of need. It suggests that students may preserve the trait of sociability and the ability to communicate their feelings to someone they trust.

3.2 Extent of Perceived Social Support Received by the Participants in terms of Family

Table 5 presents the extent of perceived social support among the BEEEd students of CSU in terms of family.

Table 5
Mean Distribution of the extent of perceived social support of the participants in terms of family

Indicators	Extent of Perceived Social Support		Interpretation
	Mean	Description	
1 I get the emotional help and support I needed from my family.	3.95	Agree	The extent of perceived social support is moderately extensive.
2 I can talk about my problem with my family.	3.54	Agree	The extent of perceived social support is moderately extensive.
3 I feel delighted when my family helps me in making decisions.	4.09	Agree	The extent of perceived social support is moderately extensive.
4 I am grateful when my family makes every effort to help me.	4.31	Agree	The extent of perceived social support is moderately extensive.
5 I feel blessed when my family is considerate of my time when I'm attending any class work.	4.35	Agree	The extent of perceived social support is moderately extensive.
Overall Weighted Mean	4.05	Agree	The extent of perceived social support is moderately extensive.

Range of means: 4.50-5.00 Strongly Agree; 3.50-4.49 Agree; 2.50-

3.49 Neutral; 1.50-2.49 Disagree; 1.00-1.49 Strongly Disagree

The data exposes that indicator number five (5) articulating that “I feel blessed when my family is considerate of my time when I’m attending any class work.” garnered the highest mean of 4.35 described as agree and conveyed that the extent of perceived social support is moderately extensive. However, indicator number two (2) which expressed that “I can talk about my problem with my family earned the lowest mean of 3.54 described as agree and interpreted as having a moderately extensive extent of perceived social support. The collective weighted mean is 4.05, which indicates an agree overall response. It suggests that the extent of perceived social support in terms of family among BEEd students in CSU is moderately extensive.

As stated by Dubow and Ullman (1989) as cited by Permatasari et., al (2021) there are three aspects of perceived social support when it comes to sources of social support, like a family support, which is perceived social support that comes from family— such as feelings of respect, being loved, caring, and the family's availability to provide assistance and input when people are experiencing problems.

As believed by Hadi (2020), the family plays a significant role and is one of the most important social resources that influence the online learning experience of the students. This is because, during the current pandemic, one of the social components that interact with pupils directly is the family. Parents serve as motivators by encouraging and supporting their children to be enthusiastic about the online learning experience.

3.3 Extent of Perceived Social Support Received by the Participants in terms of Significant Others

Table 6 presents the extent of perceived social support received by the participants in terms of significant others among the BEEd students of CSU.

As shown in the table, indicator number five (5) states that participants got the chances to talk to someone they trust on their personal and academic problems attained the highest mean of 3.84. This means that participants agreed that they have moderately extensive extent of perceived social support.

In contrast, indicator number four (4) which indicates that students have special person in their lives that cares about their feelings obtained the lowest mean of 3.57. This means that the extent of perceived social support of student received from significant others are moderately extensive. The overall weighted mean on the extent of perceived social support in terms of significant other is 3.67 or agree which is described that the extent of perceived social support is moderately extensive. This implies that students obtained social support from their significant others which is substantial because they have someone whom they can share their feelings and emotions regarding their academic experiences including stress and pressures. It suggests that students may be open, socialize more and communicate well with someone they can rely or trust.

Table 6

Mean Distribution of the extent of perceived social support of the participants in terms of significant others

Indicators	Extent of Perceived Social Support	Interpretation	
Significant Others	Description		
	Mean		
1	I am lucky to have a special person who is around in times of need. 3.76	Agree	The extent of perceived social support is moderately extensive.
2	I can share my joys and sorrows with my special person. 3.60	Agree	The extent of perceived social support is moderately extensive.
3	I have a special person who is a real source of comfort to me. 3.59	Agree	The extent of perceived social support is moderately extensive.
4	I have a special person in my life that cares about my feelings. 3.57	Agree	The extent of perceived social support is moderately extensive.
5	I get chances to talk to someone I trust about my personal and academic problems. 3.84	Agree	The extent of perceived social support is moderately extensive.
Overall	Weighted Mean 3.67	Agree	The extent of perceived social support is moderately extensive.

Range of means: 4.50-5.00 Strongly Agree; 3.50-4.49 Agree; 2.50-3.49 Neutral; 1.50-2.49 Disagree; 1.00-1.49 Strongly Disagree

As stated by Kugbey (2015), significant others' social support has been found to have a positive impact on university students' mental health. Students who are more burned out on their studies are more likely to believe that their significant others are less supportive of them (Boram et. al., 2017). Even in the absence of family support and social support from peers, significant others play a vital protective function in hopelessness and anxiety (Li et. al., 2021).

As stated by Malinauskas and Malinauskiene (2020), significant others also have an important role in improving the quality of life of university students in the social interactions domain. Female students reported much higher levels of social support from significant others than male students, according to the findings. The findings that women received less social support from a significant other is similar to a study that some women's relationships with significant others were strained during the pandemic (Sikar et. al., 2020).

Students who are more burned out on their studies are more likely to believe that their significant others are less supportive of them (Boram et. al., 2017). Even in the absence of family support, social support from

peers and significant others plays a vital protective function in hopelessness and anxiety (Li et. al., 2021).

Problem 4. Significant Difference on the Levels of Academic Stress and Extent of Perceived Social Support by the Participants when Grouped According to Profile

Table 7 shows the significant difference of the level of academic stress of the BEEEd freshmen students in CSU when the participants are grouped according to the year level.

Table 7
Significant Difference in the Levels of Academic Stress and Extent of Perceived Social Support by the Participants When Grouped According to Year Level

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.939	3	.313	2.049	.111
Within Groups	17.720	116	.153		
Total	18.659	119			

*tested at 0.05 level of significance

It can be inferred from the table that there is no significant difference in the level of academic stress and extent of perceived social support by the BEEEd students of CSU between and within groups having significant values which are higher than 0.05 levels of significance tested for analysis. It insinuates that the participants have a similar level of academic stress and extent of perceived social support regardless of the varied year level. However, Elias et.al (2011) reported that the final-year students were found to be the most stressful group among the undergraduate students, followed by the middle year(s) undergraduate students. The first-year undergraduate students scored the least. Both the middle(s) and final-year students faced moderate level of stress while the first-year students experienced low level of stress. As stated by the results of the study conducted by McLean et.al (2022), there was no significant difference found between older and younger students on measures of perceived social support.

Table 8 shows the significant difference of the level of academic stress of the BEEEd students and extent of perceived social support of CSU when the participants are grouped according to the economic status.

The table represents that there is no significant difference on the level of academic stress and extent of perceived social support between and within groups having significant values which are higher than 0.05 levels of significance tested for analysis. It insinuates that the participants have a similar level of academic stress and extent of perceived social support regardless of the varied economic status.

Table 8
Significant Difference on the Levels of Academic Stress and Extent of Perceived Social Support by the Participants When Grouped According to Economic Status

Table 9
Significant Difference on the Levels of Academic

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	2.891	4	.723	2.317	.060
Within Groups	45.232	145	.312		
Total	48.123	149			

*tested at 0.05 level of significance

However, according to the results of the study conducted by Deb et.al (2015), academic anxiety is reported to be the least in case of adolescents from high socio-economic status – which may be due to secured future in material aspects. The prevalence of anxiety disorders tends to decrease with upper socio- economic status. Another study has also revealed that social disadvantage is associated with increased stress among students.

Furthermore, according to the study conducted by Geckova et.al, (2003), significant socio-economic differences in social support unfavorable for lower SES (socio-economic status) groups were also confirmed using all five types of SES (socio- economic status) indicators. adolescents reporting low social support more frequently considered their health as only good, fairly good or bad in comparison with adolescents reporting high social support. They suffer from more health complaints. ‘Low social support adolescents’ reported worse psychological health, and they were also indicated as a ‘case’ more frequently in comparison with adolescents reporting high social support. In addition, they reported lower vitality and worse mental health than “high social support adolescents”. The influence of social support on health remains significant in all explored models. As a result, there is no significant differences in the effect of social support on health among gender and socioeconomic groups of adolescents were confirmed. The effect of social support on health is independent of gender or SES (socio-economic status).

Table 9 shows the significant difference of the level of academic stress of the BEEEd students and extent of perceived social support of CSU when the participants are grouped according to the love-life status.

Furthermore, as stated by Thomas et.al (2012), all of the students reported a marked increase in seriousness and focus towards their studies since getting married. Marriage and parenthood were reported as the motivating factor behind this change. Some reported an improvement in their academic performance: one student reported that after getting married and having her child her GPA improved.

Problem 5. Significant Relationship Between the Level of Academic Stress and Extent of Perceived Social Support of the Participants

Table 10 shows the significant relationship between level of academic stress and extent of perceived social support of the BEEEd students.

Table 10
Correlation Analysis Between the Level of Academic Stress and Extent of Perceived Social Support of the

Variables	Mean	SD	R	Remarks
Sig. (2 – Tailed)				Decision

Stress and Extent of Perceived Social Support by the Participants When Grouped According to Love-Life Status

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.358	2	.179	.784	.460
Within Groups	19.874	87	.228		
Total	20.232	89			

*tested at 0.05 level of significance

Academic Stress	3.8087	.69944	0.045	0.617	Not Do not reject Ho
Perceived Social Support Students	3.9098	.80928	significant		

The table represents that there is no significant difference in the level of academic stress and extent of perceived social support by the BEEd students of CSU between and within groups having significant values which are higher than 0.05 levels of significance tested for analysis. It insinuates that the participants have a similar level of academic stress and extent of perceived social support regardless of the love-life status

However, in terms of marital status, Thomas et al. (2012) show that married undergraduates outperform their unmarried peers in various worldwide studies. For example, Smith and Naylor (2001) found that married students (both men and women) perform better than single students. Moreover, according to Al-Mutairi (2010), married students at the AOU outperform their unmarried colleagues and concluded that marital status has a major impact on student performance.

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

This implies that there is no significant relationship between the level of academic stress and extent of perceived social support of the BEEd students. However, Talwar et.,al (2013) stated that several studies have highlighted the relationship between social support and stress among university students. Knowledge on how social support could help students to excel in study and cope with any psychological disturbances, much information could be derived to enhance the amount of support provided. Social support may be described as, having a family and a network of close friends who provide social and emotional attachment, and the feeling of being able to depend on them for all physical and emotional needs.

III. CONCLUSIONS

Majority of the participants were from first year level. Most of the participants' families have below 10,000 monthly income. Meanwhile, out of 127 participants, majority of them are single. The BEEd

students' level of stress related to academic expectation is moderately extensive, this implies that students may experience stress over expectations set for them by the academe. This could be as a result of the unhealthy and unrealistic competition and expectations that exist in their studies.

Moreover, the freshmen's level of stress related to academic work and examination is moderately extensive which implies that academic workloads among CSU BEEed students is one of the factors that contributed in the academic stress among other factors. Moreover, students are being subjected to academic pressure as the survey revealed. Also, the students' level of academic stress related to academic self-perceptions is moderately extensive which suggests that the students' future career goals and academic self-belief are causing them stress and this is due to the fact that they are trying to survive their college journey of which they are already thinking about future uncertainties and are concerned academically due to the pressure they felt from expectations and other factors.

The extent of perceived social support among the BEEed students of CSU in terms of friends is moderately extensive. The students receive good amount of social support from their friends which is important as it helps them to be motivated despite the tasks that trigger their stress including given many school works. Their friends are there by their side to extend their support in times of need. Also, the extent of perceived social support among the BEEed students of CSU in terms of family as well as their support received from their loved ones are moderately extensive. This indicates that students obtained social support from their families and significant others which is vital especially in the new normal because these people are their confidantes and advisers who they can share their feelings with regarding their academic experiences including stress and pressures.

Generally, the level of academic stress and extent of perceived social support of the BEEed students is similar to each other when grouped according to year level, economic status, and love-life status. Furthermore, there is no significant relationship between the level of academic stress and extent of perceived social support of the BEEed students which means that the former is not, as found in this study, associated with the extent of students' perceived social support from their friends, families, and significant others. Perhaps there are other factors which may be associated with the academic stress but are not explored in this study.

IV. SUGGESTIONS AND RECOMMENDATIONS

Based on the results of this study, the following recommendations are forwarded:

1. Students may maintain healthy and realistic academic routines despite problems that they encounter including the amount of time given to the students to accomplish their requirements. Moreover, students may exercise adequate time management when undertaking classwork or tasks in order to avoid being overburdened with work and to complete projects efficiently, resulting in less stress. Furthermore, students may focus on managing their scholastic demands rather than worrying about their personal impressions about their future job. On the other

hand, it may cause confusion and educational disruption, affecting their ability to enroll in or stay engaged.

2. Parents may continue understanding and supporting their children in their studies as parents' relationship towards their children plays a vital role in their academic performance.
3. Friends may encourage and uplift one another to alleviate their anxiety.
4. Significant others can learn patience, understanding, and empathy, which is important for character development.
6. This study's findings may differ from those of other schools. As a result, the researchers recommend to the future researchers working in the same variables to expand the scope of the study to include more universities and participants. Also, given the limitations of this study, it is proposed that future research look into students' coping methods, notably how they deal with academic stress, as well as their mental health strategies as preventive ways to fight stresses.

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Automation: Deep Dive Into Web, Mobile & API – Part 1

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Abstract- Testing is a phase in software application development lifecycle. This process validates whether the application which is developed conforms to the requirements provided. This process could be accomplished using both manual as well as code based automated solutions. This paper mainly talks about the different types of test automation approaches which could be implemented to enhance the productivity and efficiency of the testing life cycle. The different automation strategies, generic framework architecture, the features and advantages and how returns are generated on the investment is discussed in detail.

Index Terms- SDLC – Software Development Life Cycle, AST – Automated Software testing, MT – Manual Testing, API – Application Programming Interface, IDE – Integrated Development Environment, POM – Page Object Model, E2E – End to End Tests, OTP – One Time Password, UI – User Interface, CI/CD – Continuous Integration/Continuous Delivery (Deployment), ROI – Return On Investment, VCS – Version Control System

I. INTRODUCTION

Any process which happens n number of times consistently with only change in data are known as static processes. An intelligent decision making is not required for such type processes. Any process which has this kind of property is an ideal candidate for Automation. Automation is the process by which such repeatable steps could be made to do by machines or by software code. This results in the process becoming faster, highly efficient, reliable and error free. This drastically reduces the human intervention required for the process to be completed. Automation techniques can be broadly classified into two viz. hardware-based automation and software-based automation.

IT software testing refers to analyzing and interrogating a software program to unearth errors and secret faults. Software testing is projected to ensure that an integrated software program performs to meet satisfaction thresholds, access, and quality preservation. For an Information Technology system to be complete, the software testing realm should not miss in the Software Development Life Cycle. Under the requirements of SDLC, software development is not absolute under it is subjected to the testing process. Inherently, testing is not performed to demonstrate

an error-free system but to establish a confidence wall that supports the installation and performance of the entire system.

In this research paper, the major discussion will be on the software automation practices. Software testing is expensive, labour intensive and consumes lot of time in a software development life cycle. There was always a need in software testing to decrease the testing time. This also resulted to focus on Automated Software Testing, because using automated testing, with specific tools, this effort can be dramatically reduced and the costs related with testing can decrease. Manual Testing requires lot of effort and hard work, if we measure in terms of person per month. Automated Software testing helps to decrease the work load by giving some testing tasks to the computers.

In software automation software code is created, which helps to configure and run repeatable processes, n times consistently. Key points of discussion will revolve around software testing area and how automation practices helps in performing automated software testing effectively. In software testing, Test Automation is the use of software separate from the software being tested to control the execution of tests and the comparison of actual outcomes with predicted outcomes. The testing process mostly adheres to the static process category wherein there exists pre-defined input steps and corresponding outputs steps. Here a known outcome of a particular action is presented which is in turn validated via code.

II. TYPES OF TEST AUTOMATION

Test automation could be employed in software testing on the below types of applications:

1. Web based application automation
2. Mobile based application automation
3. API automation

Web automation includes automation testing an application which is hosted over web on a particular URL and validating and verifying its conformity to the requirements outlined during the application development. The web automation is done from a UI standpoint and tests are run which mimics the action of a manual user via code. The applications developed caters to various fields like travel, tourism, banking, hospitals, insurance etc.

Mobile automation is similar to that of web, but instead of the application being hosted on a URL it is developed as a distributable installer which is installed and accessed over multiple type of mobile devices. The automation testing of this is again

accomplished via UI components and it also mimics the action that a manual user would perform on the device via code.

API automation is different from the above two approach. API's are the internal connections which are present on both web and mobile application, which is hidden from the user, but critical for the application to function. It is analogous to human body containing blood vessels and nervous system. Hence when performing automation in this layer it requires specific targeted information, inputs and outputs.

Advantages of Automation

Test Automation is highly advantageous as compared to MT. That is the reason why it is highly adopted. Some of the key advantages of test automation are given below.

1. Enhanced Results

Since automation testing saves plenty of time even when complex and enormous systems are taken into consideration. This allows testing to be carried out repeatedly, delivering better and faster results with significantly lesser efforts and reduced time.

2. Swifter Feedback System

Automation testing is extremely crucial during the validation phase of any software project. It significantly enhances communication among the developers, designers, and product merchants, and provides space for the potential glitches to be rectified immediately thus enhancing the efficiency of the development team. The feedback loop is extremely faster.

3. Brand Enhancement

The effectiveness of testing is always dependent on the quality of test data that is being used. Testing is often performed on the copies of live databases as creating relevant and quality test data takes copious amounts of time. Automation solutions allow you to re-use your data time and again. This saves a lot of costs from project handling and project maintenance perspective.

The best aspect of automated testing is that it adds value to all the stakeholders. Automated testing systems not only enhance the system's capability but also pave the way towards digital innovation and revolution. It not only improves the brand name but also increases brand recall value, thus ensuring far greater customer retention. Due to automation testing, there are permanent fixes generated to issues long pertained as unsolvable.

4. Cost-effective

Even though the initial investment needed for automation testing is on the higher end, it saves a lot of money for the company in the longer run. It is predominantly due to the reduction in the amount of time required to run the tests. It also contributes a much higher quality of work as there are no chances of neglect or human error. This decreases the necessity of fixing glitches in the post-release phase, thus saving huge amounts of project costs. Additionally, the number of runs is also one of the factors that results in returns over investment,

5. Efficiency testing

Testing is one of the most pivotal parts of the entire application development cycle. The most attractive part of the automation testing is that it can be left virtually unattended. This leaves a lot of room for the results to be monitored towards the end of the process. Tests could be triggered and run-on nightly basis. This allows for increasing the overall efficiency of the application.

6. Increase in coverage area

Through the use of automation testing, more tests can be allotted pertaining to any application. This leads to higher testing coverage

and a reduction in software anomalies. It also allows room for testing more features and complex applications. By covering the smoke and regression tests via automation quality time could be invested in ad hoc testing. However, in order to do the same thing in a manual testing scenario would require a massive team along with heavy time constraints.

7. Detailed testing

All testers tend to have different testing approaches with different focus areas as per their exposure and level of expertise. With the help of automation, there is an equal focus on all areas of testing, thus assuring the best possible quality of the end product with greater emphasis on each aspect of the product. Automation testing is known for its atom level approach of testing due to which it is considered robust & error-free.

8. Reusability

Test Automation is repetitive in nature due to the nature of its test automation cases. It is easy to setup, configure and gives the software developers an opportunity to assess the program's reaction. Automated test cases are totally reusable and hence can be utilized for testing any aspect of the code as per significance and through a plethora of different approaches. Framework based models helps to achieve this with ease.

9. Earlier detection of defects

Automated test runs are triggered instantly when the development code is updated on the main branch. Automation testing documents the software defects and hence making it considerably easier for the testing teams. This also makes it relatively easier for the development and support team to together contemplate the defects and give a faster output. The overall development speed of the project is increased while ensuring correct functionality across relevant areas. The earlier any defect is identified, the better and cost-efficient it is to solve and deploy it.

10. Time to market

Test automation helps significantly in reducing the time-to-market launch of an application. Automation testing allows constant and regular execution of test cases. Post automation the test library execution is extremely swift and runs longer. Environment wise releases are triggered on successful completion of each stage. This results in faster production deployments.

III. WEB AUTOMATION

Web automation testing technique is where manually written test cases are converted to have a corresponding code and the code gets validated against the application for the same steps as in manual mode.

Consider the example below. The below given is a generic scenario in web application test.

Scenario Description	Steps	Expected Result
Login	1. Launch the application 2. Navigate to the home page 3. Enter valid user id and password 4. Click on Login	The user should be successfully logged in to the system

During automation for each of the steps defined will have a corresponding code snippet which performs that operation and finally a validation piece of code, which validated the expected result.

There are many open-source as well as paid tools which could be leveraged for Web Automation purposes. The below table (Fig 1. Web Automation Tools) lists a set of tools that are available in market, which is used for Web Automation. The parameters under consideration during the evaluation of the software's are License Cost, Application Type, Record & Playback, Programming Language support, Platform Support, Browser Support, Technical Support, Dialog box Support, Creation of Scripts, Usage, Data Driven Framework & Report Generation.

Features	Selenium	Quick Test Professional	Test Complete
License Cost	Open source	Licensed. Very expensive, costs about 13000\$	Licensed. Costs about 1999\$
Application Type	Web applications only	Web and Mobile applications	Any type of application (web, desktop)
Record Playback	Support	Support	Support
Programming Language Support	Java .Net Perl PHP Python Ruby	VBScript JavaScript	VBScript JavaScript Delphi Script C++ C#
Platform Support	Windows MAC UNIX LINUX	Windows only	Windows only
Browser Support	All browsers	IE Firefox Chrome	All browsers
Technical Support	No official technical support	Good technical support	Good technical support
DialogBox Support	Partially supports	Supports all major kinds of dialog boxes	N/A
Creation Of Scripts	Not powerful as many actions are not recorded by the IDE	Powerful to some extent than selenium	N/A
Usage	Need experience and programming skills	Easy to learn/use/edit/parameterize/playback the VB script	Need experience
Data-Driven Framework	Excel- CSV	Excel files Text files XML DB files	CSV Excel SQL
Report Generation	HTML	HTML	HTML, XML

Fig 1. Web Automation tools

IV. MOBILE AUTOMATION

In the modern world majority of the handheld mobile device market is ruled by two Operating System (OS), namely iOS & Android. Android is used globally by around 71.62% of devices whereas iOS contributes 27.73%. On the remaining 0.6% is occupied by other vendors. Hence when mobile automation is considered it is mainly referring the automation of devices using iOS and Android OS. There are three types of applications that runs on mobile devices:

- a. Native Applications
- b. Browser based Applications
- c. Hybrid Applications

Native applications are applications which are coded and developed in the language which is supported by the OS. i.e, for iOS applications developed using swift language in Xcode IDE and which has a file extension of .ipa. In Android it uses either Android Java or Kotlin and the applications are developed in Android Studio which are having the file extension as .apk.

Browser based applications are developed to be consumed via mobile browsers. These are hosted on URLs and accessed via mobile browsers. For example, applications like amazon.com, booking.com etc. Automation of test cases on these applications can also be accomplished via mobile automation tools.

Hybrid applications are developed for both Android and iOS platforms using a single programming language. Ionic is a framework which leverages JS libraries such as Angular, React and Vue to build mobile applications that can be used by iOS and Android platforms together. In this approach the core development language for a specific platform is not used, rather a different programming language is used altogether.

The below given table (Fig 2,3. Mobile Testing Tools) contains a list of Mobile Automation tools and its capabilities listed. The major criterions included are License Type, Application Supported, Programming Language support, Platform Support, Mobile App Type Support, Technical Support, Usage, Supported Devices, Data Driven Framework, Mobile Specific Feature Support & Report Generation.

Features	Appium	Calabash
License Type	Open Source	Open Source
Application Supported	Mobile	Mobile
Programming Language Support	Java, Objective C, C#, Python, Ruby etc	Gherking, Ruby, Cucumber
Platform Support	iOS, Android	iOS, Android
Mobile App Type Support	Mobile Native and Mobile Web	Mobile Native only
Technical Support	Huge Community Support available	Limited Community Support
Usage	Requires intermediate level technical programming knowledge to start, setup and use the framework	Requires intermediate technical knowledge to setup and start using the framework
Supported Devices	Real Device, Emulators, Device over cloud	Real Device, Emulators, Device over cloud
Data Driven Framework	Excel, CSV	Cucumber examples, Excel, CSV
Mobile Specific feature Support	Touch, Swipe, Tap, Double Tap, Location, Camera, Barcode	Touch, Swipe, Tap, Double Tap, Location, Camera, Barcode
Report Generation	HTML	HTML

Fig 2. Mobile Testing Tools

Features	SeeTest	UFT Mobile
License Type	Paid	Paid
Application Supported	Web & Mobile	Mobile
Programming Language Support	All programming languages	VB Script
Platform Support	iOS, Android, Backberry, Windows	iOS, Android
Mobile App Type Support	Mobile Native and Mobile Web	Mobile Native and Mobile Web
Technical Support	Dedicated 24*7 support team available	Dedicated 24*7 support team available
Usage	Very less programming knowledge required	Very less programming knowledge required
Supported Devices	Real Devices, Device over cloud	Real Devices, Device over cloud
Data Driven Framework	Custom support provided by the vendor	Custom support provided by the vendor
Mobile Specific feature Support	Touch, Swipe, Tap, Double Tap, Location, Camera, Barcode, Battery, Call, SMS, Network	Touch, Swipe, Tap, Double Tap, Location, Camera, Barcode, Battery, Call, SMS, Network
Report Generation	HTML	HTML, XML

Fig 3. Mobile Testing Tools

Features	Rest Assured	Rest Sharp
License Type	Open source	Open source
Application Supported	API	API
Programming Language Support	Java	C#
Platform Support	MacOS, Windows, Linux	MacOS, Windows, Linux
Technical Support	Open source Community support	Open source Community support
Usage	Automation could be done using testing framework which supports both BDD & TDD based implementation	Automation could be done using testing framework which supports both BDD & TDD based implementation
Proficiency Required	Intermediate Java and API knowledge	Intermediate C# and API knowledge
Data Driven Framework	Excel, CSV	Excel, CSV
Report Generation	HTML	HTML

Fig 4. API Automation Testing Tools

V. API AUTOMATION

API Automation involves the test automation of the invisible components present in every application built today. These components are the core part of the system which makes it functional, easy to use and helps in effective data handling. API is the middle layer of the application. For example, when a user registers the first time when using an application, this whole data is stored on the backend and is later retrieved when a specific condition/request invokes it. This process is handled by APIs. Automating the APIs of an application is really helpful as it gives very fast feedback and generally acts as pre requisite step before any UI based tests are triggered. That is, if an API test fails then there will definitely be an issue present in the UI of the application as all UI based tests basically invokes an API in the backend. Hence API Automation is highly effective in identifying issues in the system in a fast-paced manner.

The below given table (Fig 4.5. API Automation Testing Tools) contains a list of API Automation tools and its capabilities listed. The major criterions included are License Type, Application Supported, Programming Language support, Platform Support, Technical Support, Usage, Proficiency Required, Data Driven Framework & Report Generation.

Features	Postman	SOAP UI
License Type	Paid	Paid
Application Supported	API	API
Programming Language Support	Javascript, Python	Groovy, Javascript
Platform Support	MacOS, Windows, Linux	MacOS, Windows, Linux
Technical Support	Dedicated 24*7 support team	Dedicated 24*7 support team
Usage	Evaluation and custom checks are written on the test section provided for conditional validation	Evaluation and custom checks are written on the test section provided for conditional validation
Proficiency Required	Basic Javascript knowledge	Basic Javascript knowledge required
Data Driven Framework	Excel, CSV, Json, XML	Excel, CSV, Json, XML
Report Generation	Custom report provided by the tool which can be exported different options like csv, json etc	Custom report provided by the tool which can be exported different options like csv, json etc

Fig 5. API Automation Testing Tools

VI. AUTOMATION FRAMEWORK GENERIC ARCHITECTURE

For any type of test automation, it is always better to build it via a framework. Frameworks basically helps to handle different modules as individual components operating independently. This makes the code more readable, robust, re-usable and easy to maintain. In addition to this as the number of test cases grow, it would become impossible to maintain the code if it is not properly structured. There are multiple types of architecture which are available for creating a test automation framework. The most widely used and common one is referred to as the Page Object Model (POM).

In POM Model separate classes are created for each specific pages of an application. Each of these page classes will contain the elements which are present on the corresponding web page and its corresponding actions functions that helps to perform some activities on the page. For example, on a login page of an application there will be two text field, viz. User name, Password and a button Login which when clicked would validate the data entered and allow the user to login. Hence on the login page class of the code that is written, element identification for the three fields will be present. Additionally, it would contain the enter text actions for User name, Password and a click action for Login button. These would leverage functions which are written on a common class accessible by all the page classes for click and enter text with only difference in data. The below given architecture

diagram (Fig 6. Generic POM Architecture) explains how a basic page object framework works.

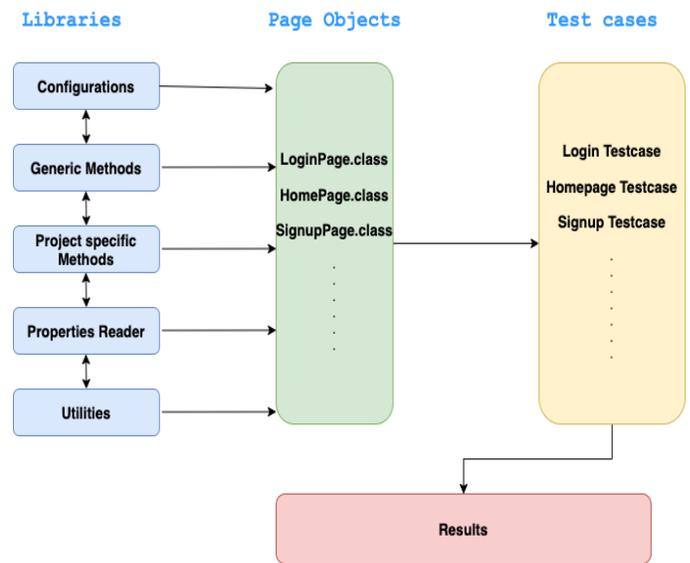


Fig 6. Generic POM Architecture

In the above diagram, the utilities libraries, including the core of the project includes and two-way binding which helps to access the methods and functions written in those libraries between themselves and the page object classes. The page object classes then leverage all the required reusable functions present in those libraries and the test case then call the custom functions created on the page classes to accomplish the expected steps and conditions defined on the test cases written. On top of the test cases a testing framework is also implemented on the framework to order and run the tests in an effective manner. Finally, once the execution gets completed results are generated which includes, passed, failed and skipped test cases. The report could have details like screenshots, logs added, which is really useful when there is a requirement to debug the test failures.

VII. THE AUTOMATION TRIANGLE

The Automation Triangle is a pyramid which, if followed makes test automation more efficient and effective. It helps to visualize the steps to be taken to tackle automation testing. The below figure shows the automation triangle (Fig 7. Automation Triangle).

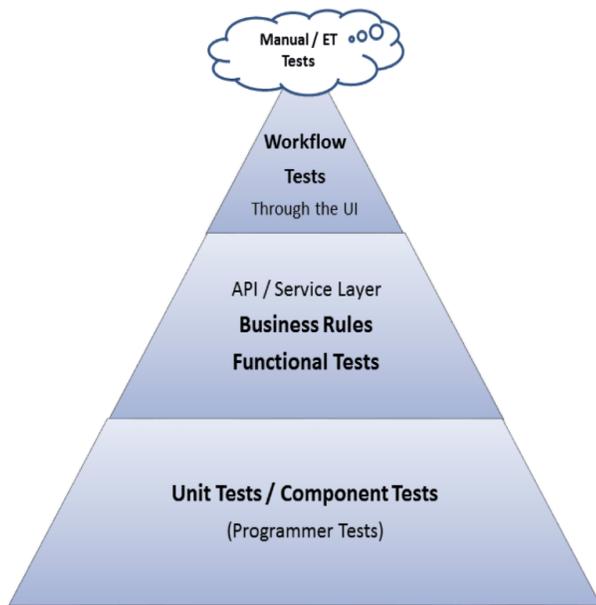


Fig 7. Automation Triangle

The lowest layer of this pyramid is occupied by the Unit Testing piece. This is most effective in covering many of the standard error scenarios which are present inside a piece of code. The unit tests are created by the developers to cover the boundary and basic positive and negative scenarios, present in the code that they develop. Unit tests are quick to write, assure internal code correctness, and can be run in minutes before committing new code changes. These tests provide the solid foundation for automation testing. However, these tests are not good enough to cover all aspects of a software.

The next layer where automation needs to be implemented is the API layer. The API layer contains core functional and business rules which enables the application to function properly. It is highly important to validate the rigidity and accuracy of the APIs, as these are the core components of the system. Hence providing automation in this layer helps in enhancing the correctness and reliability of the application. These tests may take more time to create and, if they access databases and other services, provide slower feedback. If business stakeholders need to collaborate on acceptance tests to verify business rules, these middle layer tests can be written in plain language that everyone can understand.

Now the topmost layer for automation is the workflow through the UI. UI automation tests written for this layer helps in reducing the functional testing overhead. In order to validate basic UI flows in an application having UI it is best to have automation take care of this. On simple applications, the number of UI tests might be lower, likely between 50-100 tests. Whereas on complex application there exists >1000 tests from UI that needs to be validated on every release. By providing automation in this layer, it helps reduce the overall testing effort considerably especially when the product has multiple release cycles.

The little cloud at the top of the pyramid represents testing that's done manually. Even with solid automation at all layers of the triangle, the product might require a huge cumulonimbus cloud that includes exploratory testing, accessibility testing, security testing and many other critical testing activities. Automation will help to speed up this manual testing process.

Prerequisites for Automation

There are multiple types of test suites which are considered as candidates for automation. The major three types of such test suites

1. Smoke tests
2. Regression tests
3. End to End tests (E2E)

Smoke test suite basically contains the least number of tests, which ensures that the application is functional. It is executed as the first type of tests on a new release build provided for an application. Since the number of tests are minimal, it runs the fastest.

Regression tests are those which requires a huge time to complete as it will cover all the existing as well as newly created functional components of an application. Regression suites typically contain the greatest number of test cases.

E2E tests includes the complete end to end flow of an application. Suppose the application is an e commerce application where suppliers list their products and the users buy from them. Here, one E2E script will start with the supplier adding the item on the platform till the buyer checks out and receives the item. This covers the flow of the application in its entirety.

There are certain things which should be obtained when starting with test automation in any project. Those are listed below:

- Ensure that proper test cases are available in the Project Management tool that could be leveraged for automation.
- Proper mapping of test cases with requirements is mandatory.
- Review each test case before automating to ensure ambiguous steps are not present.
- Identify a proper sample of tests, which could be first worked on as a Proof of Concept (POC) before the actual automation starts.
- Ensure that efforts including test scripting, debugging and review is considered during the estimation phase.
- High level strategy should be prepared to be followed during the entire phase of automation.
- Some test cases like OTP based on mobile, should be considered as non-automatable initially because the automation of these process would be highly time consuming and would reduce the overall productivity of the automation process. Hence such test cases should be taken as last.
- Consider the smoke suite for the initial phase of automation, as these would most reused and hence provide ample reduction in efforts.
- If APIs are present then automate the API layer first as it is faster to run and provided results in a fast pace manner. Also, API automation is more reliable than UI.
- Ensure that automation tests are having a proper architecture and a framework that supports it.

VIII. ROI STRATEGY

Most of the time it is thought that automation is a magic which would bring huge savings for an organization, if implemented. This would work only if test automation is implemented with a really good strategy.

For implementing test automation in a project, a strategy needs to be devised first. Mostly the smoke tests are taken for initial implementation followed by regression tests. Only after these cases are covered, in sprint automation tests should be considered in an agile project. In sprint should be taken in an N-1 sprint approach, i.e., if the current sprint is Sprint 10, then automation test cases would be of Sprint 10-1. This reduces the risks associated with automation as properly working scenarios and functionality is automated rather than the ones which are being built. The below graph (Fig 8. Medium complexity UI Manual vs UI Automated test case) represents how test automation implementation reduces the testing effort in a project.

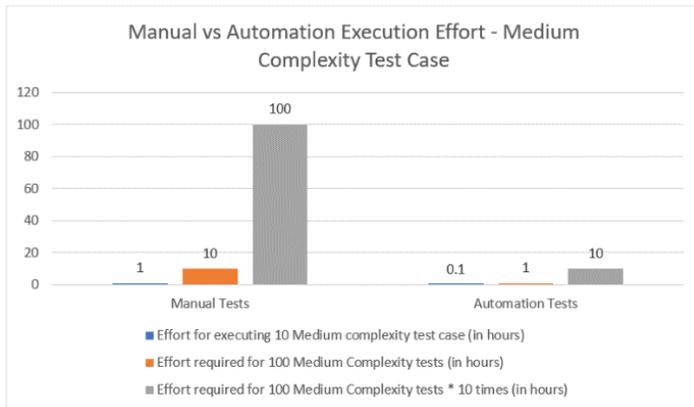


Fig 8. Medium complexity UI Manual vs UI Automated test case

In the above graph a medium complexity UI test case is considered. Medium complexity test case here is defined as test case which contains > 5 steps but < 10 steps. Typically validating one such test case would require 5-6 mins from a manual standpoint. However, if it is triggered via automation, it would only require 20-30 seconds to complete. This applies to one test case. So, when the tests are run manually, in an hour, 10 such test cases could be successfully run. Whereas if it is done via automation that would require only 6 mins to complete. When the number of runs increases, especially when multiple environments are present, this effort reduction becomes very much visible. Hence in the third set the 100 tests are run 10 times which requires 100 hours to complete manually. But in case of automation, it requires only 10 hours to complete. Considering the net reduction in effort the calculation points to an effort reduction of 90% via automation.

When smoke tests and regression tests are automated, it considerably reduces the overall testing effort. However, when such tests are triggered through CI CD pipelines there is an associated cost for maintaining the hardware required to run automation. This needs to be factored in when considering the overall returns on investment.

CI/CD Potential

Continuous Integration happens when small changes are frequently added to a main branch in a version control system. A VCS is basically used to store code in either a central or a distributed environment. Code is added onto a VCS by developers using the branching concept. For each of the feature being

developed a corresponding branch would be created which is then combined onto a main branch. From this main branch the product release is carried out.

Continuous Delivery is the process when teams produce software in short cycles with high speed and frequency so that reliable software can be released at any time, and with a simple and repeatable deployment process when deciding to deploy. The CD part is driven by CI process. Hence this goes hand in hand. Continuous Deployment happens when the new software releases occur without any human intervention, i.e., the build to the deployment entire process happens automatically. Some of the major companies like Google, Apple, Facebook, Amazon, LinkedIn employ very mature CI CD process. That is the reason for 99.9% uptime for their software products.

From a test automation standpoint, the CI/CD part is of crucial importance as this helps to run the testing anytime anywhere with complete accuracy. Primarily the code for automation should be stored in a VCS system such as Git, Azure Devops Git, Bitbucket etc. Then this CI component is integrated with a CD tool preferably Jenkins, Azure Pipelines etc which helps to trigger and run the automated tests on a VM machine or devices over cloud and obtain either a success or failure result. Once the tests are successful the development code gets promoted from one environment to another. This helps to ensure that the product remains reliable and at the same time helps to avoid time delays for releases. If the test stage passes successfully the code is auto promoted to the higher environments.

However, there is a cost associated with CI CD implementation as provisioning a full time running VM, network security groups, devices over cloud all these comes at a price. Hence when calculating ROI on automation these costs also need to be factored in to understand the overall profitability of the test automation implementation.

IX. CONCLUSION

A high-level discussion about test automation is accomplished through this paper. The advantages, the features and the types of automation are covered here. Test automation has a huge potential in a Project lifecycle when implemented based on the discussion above. It would result in huge time savings whereby giving adequate savings on the budget as well. The potential for implementation of CI CD and how it affects the overall automation cost is also covered at a high level. The automation triangle is an effective approach and based on that a strategy could be developed during the project instantiation phase. When that strategy is effectively implemented the team can reap in the benefits of the same.

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English Teachers' Perception on Applying MSLT Approach in Accommodating Learning Difficulties of Dyslexic Students to Promote Inclusive Education

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Abstract- In accommodating Dyslexic students MSLT approach and Inclusive education go hand in hand. According to statistics, 10% of the world population suffer from Dyslexia and related learning difficulties. Therefore, there might be such students in an English language classroom in Sri Lanka too. Since English language acts as an international language it is significant for the student to learn it. Therefore in this investigation it was focused on English teachers' perception on applying MSLT approach in accommodating learning difficulties of Dyslexic students in order to promote Inclusive education. Thus, the research questions were, to what extent the English teachers in Dehiowita zone are aware of the learning difficulties of Dyslexia and how far they are aware of the relationship between MSLT approach and Dyslexia. In addition, the perception of these teachers regarding 'Inclusive Education' and its relationship to 'MSLT approach' too was investigated. It was a qualitative research and Case study method was implemented to collect data and derive the conclusion. The data were collected from ten teachers via interviews and non-participant observations. In ultimate findings it was evident that 100% teachers were aware of the learning difficulties related to Dyslexia and problems with pronunciation (70%), spelling (100%), memorizing vocabulary (100%), poor reading skills and literacy skills (100%) were prominent. In the group 20% identified the relationship between MSLT and Dyslexia. Moreover, 40% was aware of Inclusive education and 40% was aware of that Dyslexic student and normal students can learn in the same classroom under the concept of Inclusive education. According to observation, only 20% used all the visual, auditory, kinesthetic and tactile sensory systems to enhance the learner and the other 80% used them in different degrees which are 100%, 50%, 30%, 30% respectively. Therefore, it was concluded that there are teachers in Dehiowita zone who learnt about MSLT approach, Inclusive education and Dyslexia separately but lack knowledge in inter relationship among them. Further, it was suggested to provide continuous training sessions, projects and awareness programmes to teachers regarding Dyslexia, MSLT approach and Inclusive education to maintain the sustainable professional development of teachers.

Index Terms- Dyslexia, Inclusive education, Learning disability, MSLT approach, Perception of English teachers

I. INTRODUCTION

With the evolution of science of reading many scholars started to engage in researches which are related to reading development, reasons for reading disability and aspects of reading instructions. These three research areas deal with nature of memory, neurosciences and nature of learning (Moats & Farrell, 2005). Moreover, these three research areas support Multi-sensory Structured Language Teaching Approach (MSLT) which is applied to develop the reading ability of Dyslexic students. Dyslexia is a learning difficulty related to reading disability. In addition it is introduced as a neurobiological learning disorder (Rose, 2009). Dyslexic students mainly showcase drawbacks in vocabulary acquisition, spelling, literacy skills, phonological abilities and reading comprehension (Kormos & Smith, 2012). In accordance with International Dyslexia Association (IDA), MSLT is a successful approach to accommodate Dyslexic students. Further, multisensory learning includes utilizing visual, auditory, kinesthetic and tactile sensory systems to develop the memory and learning procedure (Birsh & Schedler, 2005). Dyslexic students need to learn according to their own pace and the teacher has to handle these students with great patience (Kooij, 2013).

In accordance with the statistics, 10% of the world population suffers from Dyslexia and learning difficulties related to it (Kormos & Smith, 2012). This record indicates that there should be considerable number of students with learning difficulties in a language classroom. Since English language functions as an international language (Jenkins, 2000) and linking language (Neelam, 2013), students have to learn it for their communication with the world, higher studies and world of work. Therefore it is significant for them to learn English language to cope with globalization.

Simultaneously, the concept of Inclusive education is suggested to support Dyslexic students (Kormos & Nijakowska, 2017). The basic principle of Inclusive education is providing equal opportunities to all the children to achieve education (Peterson et al, 2012). The ultimate aim of Inclusive education is creating an effective classroom where both normal and students with learning difficulties would learn together (Sin et al, 2010). Furthermore there are scholars who mentioned that the techniques used to teach Dyslexic

students would bring benefits to normal children too (Reason, 2001). In the past, the students with such learning difficulties were neglected and punished, but in the present the concept of Inclusive education has come into light providing all students with different abilities to learn in the same classroom simultaneously. In accordance with this concept all individuals in a classroom are catered and their differences, disabilities and weaknesses are accepted. Thus all of them should be in the learning system and no one is deprived of education (United Nations' Children's Fund, 2011). On the other hand, it was found that Dyslexic students can be supported if appropriate teaching techniques are applied in classroom. As a result it is suggested that Dyslexic pupils can be taught using Inclusive teaching methods such as MSLT (Kormos & Nijakowska, 2017).

The individual support and awareness of teachers and parents are very significant facts in treating Dyslexic students in inclusive classroom (Kormos & Nijakowska, 2017). In the world there are many schools and organizations which applied quick steps to solve this problem of Dyslexic students (IDA.2009). Nevertheless Dyslexia cannot be overcome quickly and it takes a period of time to be resolved (Sawyer, 2009). In addition the role of teachers and parents are significant as they should be provided with awareness and training regarding how to handle Dyslexic students (Aronin & Floyd, 2013).

This is a study which investigates English teachers' perception on applying MSLT approach in accommodating learning difficulties of Dyslexic students in order to promote Inclusive education in Sri Lanka. In Sri Lanka these students lack proper learning environment (Indrarathne B., 2019). Although the study is focused on Dehiowita educational zone in Sri Lanka, the research study is applicable to the whole country.

II. RESEARCH ELABORATIONS

A. Significance of the study –

The significance of English language as a 'lingua franca' (Jenkins, 2007) has been increasing throughout the world in parallel to globalization. As the first world language it is the mostly used language in international diplomacy, trade, politics and scientific publications. Therefore learning English language is very significant for students in Sri Lanka as it is a key for them to enter higher studies as well as global world. In this process one cannot forget the students with learning difficulties such as Dyslexia, Dysgraphia, Dyscalculia, Dyspraxia and Attention Deficit and Hyperactive Disorder (ADHD). In this research it is expected to investigate whether English teachers have any awareness of MSLT approach, Dyslexia and Inclusive education and the relationship among these three fields. If they are not aware of these aspects regarding English language learning, it is expected to equip them with proper training sessions. If the teachers have prior knowledge about Dyslexia, MSLT and Inclusive education, through the research it is anticipated to investigate the degree of their knowledge regarding these three aspects. Then the responsible people can organize the relevant sessions in accordance with the teachers' prior knowledge.

Especially investigating English teachers' knowledge regarding Dyslexia, MSLT approach, Inclusive education and their inter-relationship is important as the teachers play a vital role in identifying and evaluating in accommodating Dyslexic students. On the other hand, the concept of Inclusive education will be cascaded to teachers, parents, and stake holders and in return students will be benefitted by all of them.

B. The background of the study –

Many researches attempt to identify how the action of reading functions in the brain making it related to functional neuroimaging. It further elaborates how language is processed in the brain (Blachman, Schatschneider, Fletcher, & Clonan, 2003; Eden et al., 2004; Shaywitz, 2003; Simos et al., 2002). Moreover there are many systems in the brain to process the symbols into sounds. Dyslexia is a result created by the disruption of this language processing system and finally it leads to phonological weaknesses. Further it disturbs the decoding process (Shaywitz, 2003). In MSLT approach this neutral disruption is accommodated by the multisensory components utilized by the teacher in the lesson. On the other hand, Dyslexic students prefer to have learning friendly environment in the classroom (Johnson, 2004). Therefore MSLT approach supports the teacher to create such an environment for the students with learning difficulties. Further, researches conducted by National Institute of Child Health and Human Development (NICHD) states that explicit, structured language teaching is more suitable to overcome the difficulties of Dyslexic students.

According to several researches conducted in Sri Lanka regarding students with learning disabilities, it was found that the teachers have neglected them having negative attitude towards them (Hettiarachchi & Das, 2014). In addition teachers' lack of awareness of both Dyslexia and Inclusive education go hand in hand (Indrarathne, B., 2019). On contrary a research conducted in UK brought out that when the teachers are aware of Dyslexia, they started to showcase somewhat positivity towards Dyslexic children (Taylor & Coyne, 2014). There are some other investigations which uplift the teachers' poor awareness of application of Inclusive education in practical scenarios. (Fayez, Dababneh & Jumiaan, 2011; Hodkinson, 2006 and Mc Cray & Mc Hatton, 2011).

When Sri Lankan context is considered, it is recorded that most of the pupils are with poor performance in their Ordinary Level examination although English acts as a main subject in the curriculum (Perera, 2010). One reason for this poor performance is identified as lack of teacher training courses or poor quality teacher training courses (Wijesinghe, 2014). Further the learners with Specific Learning Difficulties (SpLDs) have been neglected in these teacher training courses. Therefore this fact has become a barrier to reach the concept of Inclusive education.

C. Research Problem –

In accordance with statistics, 10% of the world population suffer from Dyslexia and related learning difficulties (Kormos & Smith, 2012). This is a common issue in English language learning too and there might be many students in a language classroom who suffer from Dyslexia. Therefore there is a possibility of presence of Dyslexic students in a language classroom in Sri Lanka too. Nevertheless most of the English language teachers are not aware of that these Dyslexic students can be accommodated with special teaching methods such as MSLT approach. In addition it is doubtful whether Dyslexic students are identified and supported with proper teaching techniques. In Sri Lanka too Dyslexic students are deprived of proper learning environment (Indrarathne B., 2019).

In the past as well as in the present, students with Dyslexia do not have any favourable environment in a classroom. In fact, the tradition was to punish these children due to teachers' lack of knowledge in accommodating Dyslexic students. Even among peer groups these students were humiliated and despised. The teachers labeled them as 'misfits' to gain education and were neglected.

In later period, it was found that there are students in a classroom with learning difficulties such as Dyslexia. It does not convey the idea that these students are not in a position to learn, but they need special attention and their own pace of learning. They mainly showcase drawbacks in reading comprehension and get embarrassed in loud reading. They are reluctant to have very rude and strict teachers. Their capabilities and abilities are hindered when they are treated rudely. On the other hand there is no quick treatment for Dyslexic students and it takes a long period to accommodate them with teacher's great patience. Therefore, if these Dyslexic students are applied with MSLT approach, they will be supported a lot in their learning procedure.

In Sri Lankan context both teachers and parents are not aware of Dyslexia much. Although there were some teacher training programmes, these were not adequate to update the teachers. In the past it was difficult for Dyslexic students to learn in the normal classroom and in the present too there is no any difference in that situation. Nevertheless the concept of Inclusive education creates a platform for both normal and Dyslexic students to learn in the same classroom simultaneously.

According to the experience of the researcher, in Sri Lanka there are no adequate awareness programmes regarding Dyslexia and Inclusive education. Due to these reasons, most of the English teachers have negative attitudes towards children with learning difficulties. Another issue related to this is lack of training platforms opened to teachers regarding Dyslexia and MSLT (Chitsa & Mpofo, 2016).

D. Research Questions –

The research questions of this investigation are,

- 1) To what extent are the English teachers in Dehiowita zone aware of the learning difficulties of Dyslexia?
- 2) How far are the English teachers of Dehiowita zone aware of the relationship between MSLT approach and Dyslexia?
- 3) What is the perception of English teachers in Dehiowita zone regarding the concept, 'Inclusive Education' and its relationship to MSLT approach'?

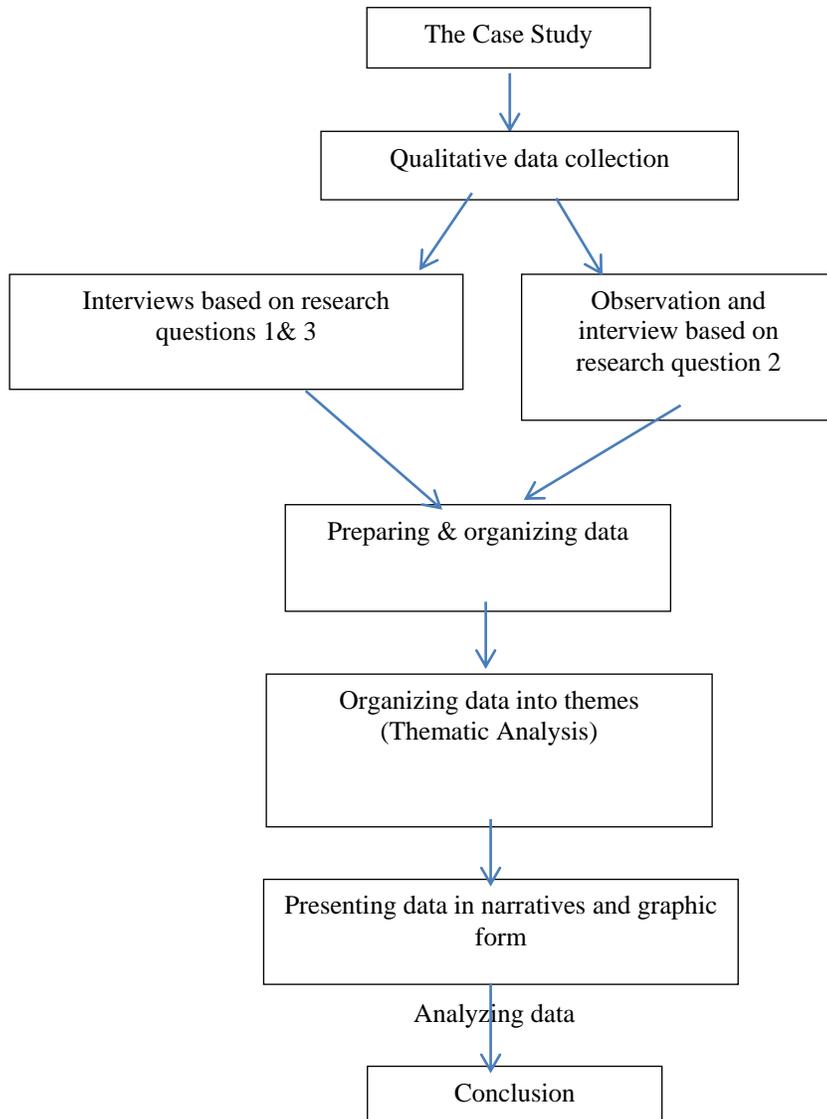
E. Methodology –

This research is an exploration done on English teachers' perception on applying MSLT approach in accommodating learning difficulties of Dyslexic students to promote Inclusive education. In this study, the qualitative research approach was selected and Case study method was applied. In accordance with Cresswell, "Case study research is a qualitative approach in which the investigator explores a bounded system (a case) or multiple bounded systems (cases) over time, through detailed, in-depth data collection involving multiple sources of information and reports a case description and case based themes" (Cresswell, 2007).

The data in need of carrying out the Case study were collected by interviews and non-participant observations. Accordingly, ten English teachers in Dehiowita educational zone were interviewed and their reading lessons were observed and assessed with the help of a check list. The interview questions and the competencies in the check lists were based on research questions. Collected data were presented in tables, bar graphs and pie charts.

The research framework is displayed by the Diagram 1 which includes all the steps; selection of method, data collection, analysis and conclusion.

Diagram 1: The Research Design



The interviews were conducted in order to make findings based on research questions 1, 2 and 3 while observation checklist was based on research question 2. Some interviews were conducted face to face mode while others were conducted via phone and Zoom modes. Related to the interviews, the following questions were asked by the teachers. Each teacher was interviewed for 15 minutes.

Questions related to Research Question 1 -

- a) Are there students with learning difficulties related to reading in your classes?
If so, what are these difficulties?
- b) How do you react to these learning difficulties of the students?
- c) Have you made their parents aware of these learning difficulties? What was their response?
- d) Have you heard about learning difficulty called Dyslexia? Then, what is it?
- e) Were you given a training regarding how to accommodate with Dyslexic children?
If so, from where did you get the training?

Question related to Research Question 2 –

f) What is the relationship between MSLT approach and Dyslexia?

Questions related to Research Question 3 –

g) What do you understand by Inclusive education?

h) Can the Dyslexic children learn in the normal classroom under the concept of Inclusive education? Is it successful? What are the challenges the teacher might face?

i) What is the relationship between MSLT approach and the concept of Inclusive education?

The observation is based on research question 2 –

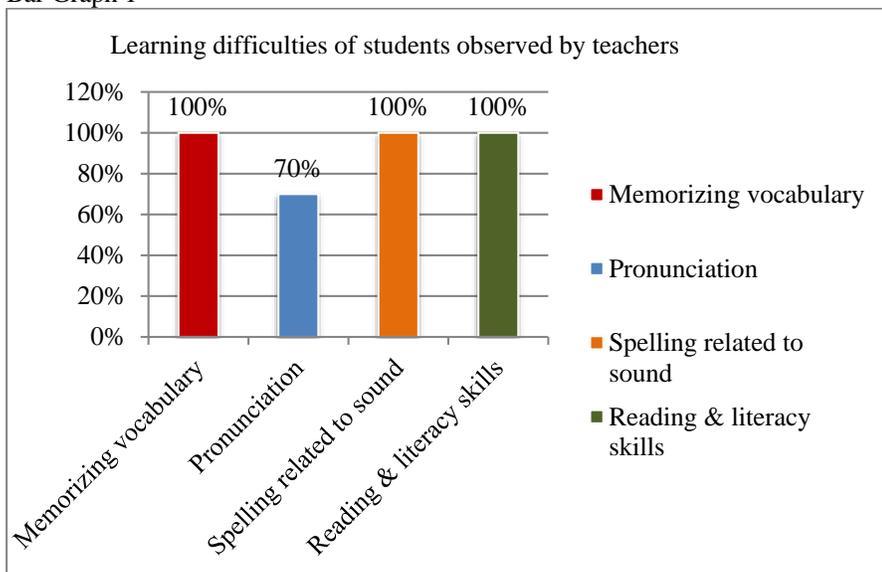
It was observed whether the teachers used visual, auditory, kinesthetic and tactile sensory systems simultaneously to enhance the memory and learning of the children. Accordingly ten English teachers who teach English for secondary classes were observed. Moreover it was a non-random or purposive sample.

III. DATA PRESENTATION, ANALYSIS AND FINDINGS

A. Data Presentation and Analysis –

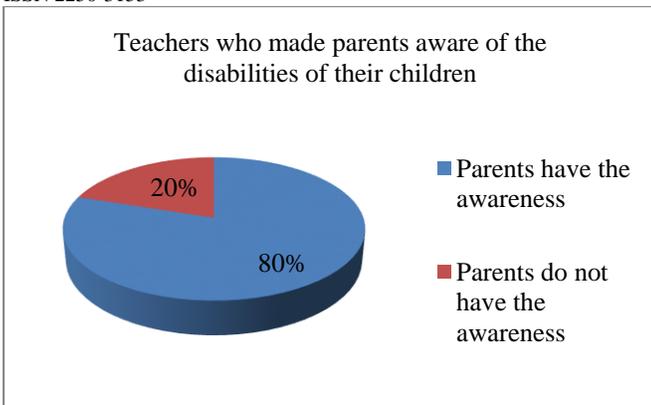
The responses given by the teachers are presented in tables, pie charts and bar graphs below.

Bar Graph 1 -



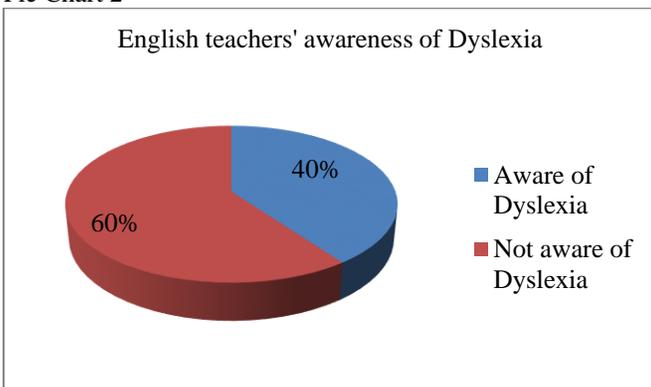
The Bar graph 1 presents the learning difficulties of students observed by teachers. There are four types of learning difficulties which are drawbacks in memorizing vocabulary (100%), difficulty in proper pronunciation (70%), inability to identify spelling related to sound (100%) and weaknesses in reading and literacy skills (100%).

Pie Chart 1 -



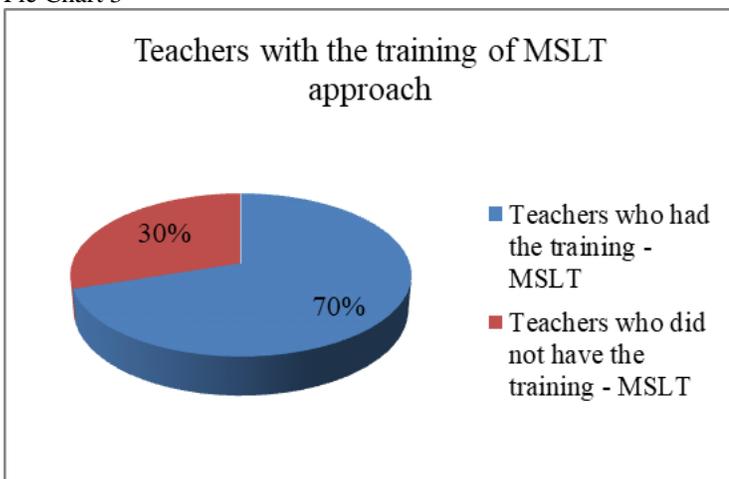
The Pie chart 1 displays the percentages of teachers who made parents aware of the disabilities of their children. In the group 80% of teachers made parents aware of the disabilities of their children while 20% did not make parents aware of it.

Pie Chart 2 -



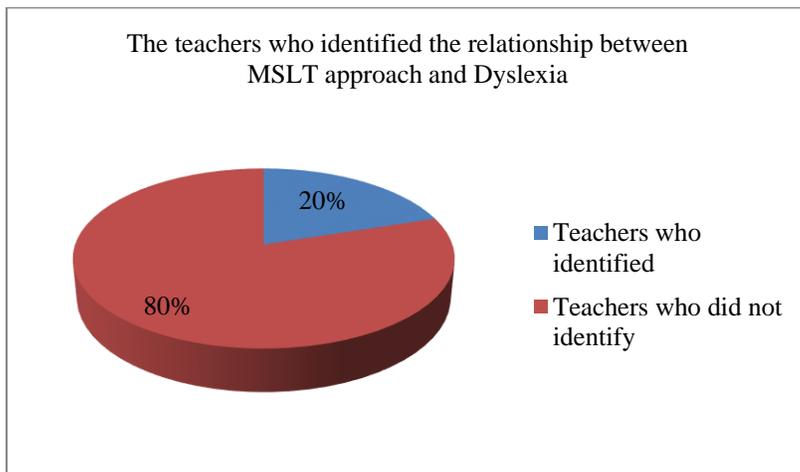
The Pie chart 2 shows the English teachers' awareness of Dyslexia. With reference to Pie chart 2, 40% in the group of teachers are aware of Dyslexia and 60% of the group are not aware of Dyslexia.

Pie Chart 3 -



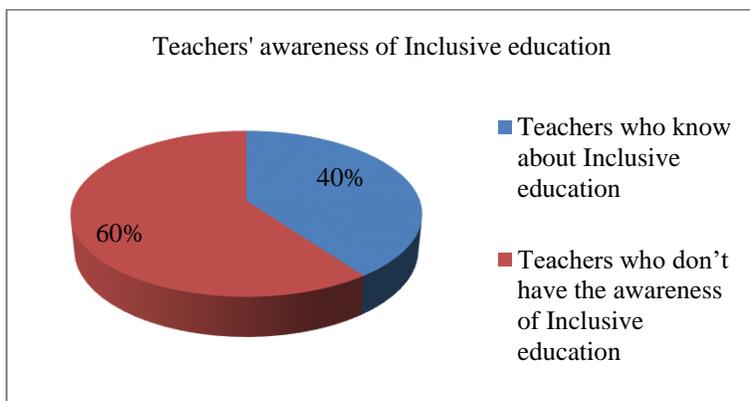
The Pie chart 3 illustrates the percentages of the teachers who had the training of MSLT approach (70%) and who did not have the training of MSLT approach (30%) respectively.

Pie Chart 4 –



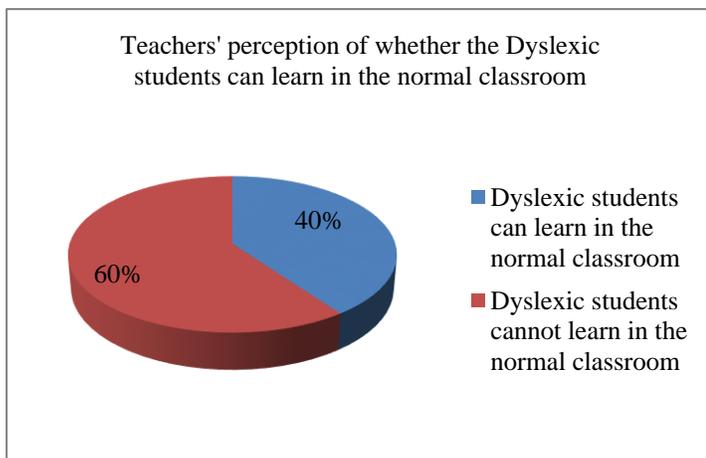
The Pie chart 4 presents the percentages of the teachers who identified the relationship between MSLT approach and Dyslexia. Accordingly, 20% of the group of teachers identified the relationship between MSLT approach and Dyslexia whereas 80% failed to identify it.

Pie Chart 5 –



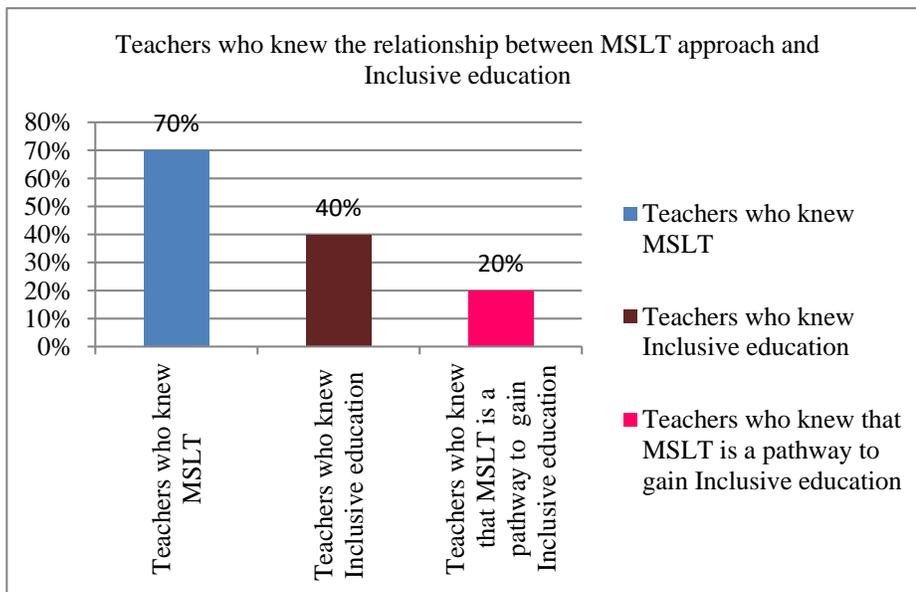
The Pie chart 5 indicates teachers' awareness of Inclusive education. With reference to Pie chart 5, 40% in the group was aware of Inclusive education while 60% was not aware of it.

Pie Chart 6 –



The Pie chart 6 displays teachers' perception of whether the Dyslexic students can learn in the normal classroom or not. In the group of teachers 40% stated the positive response while 60% declared the negative response.

Bar graph 2 -



The Bar graph 2 indicates the percentages of teachers in the group who knew the relationship between MSLT approach and Inclusive education. The Bar graph shows that there are 70% and 40% in the group who knew about MSLT approach and Inclusive education respectively whereas only 20% was aware of the relationship between these two.

The observation based on research question 2 –

The observation sheets were prepared in order to examine whether the 10 teachers use the visual, auditory, kinesthetic and tactile sensory systems (VAKT) simultaneously to teach the students.

Table 1 –
Teachers’ use of MSLT approach to teach students

Teacher	Visual	Auditory	Kinesthetic	Tactile	Total
Tr. 1	✓	✓	-	-	02
Tr. 2	✓	✓	✓	✓	04
Tr. 3	✓	-	-	✓	02
Tr. 4	✓	✓	✓	-	03
Tr. 5	✓	-	-	-	01
Tr. 6	✓	✓	✓	✓	04
Tr. 7	✓	-	-	-	01
Tr. 8	✓	✓	-	-	02
Tr. 9	✓	-	-	-	01
Tr. 10	✓	-	-	-	01
Most popular pathway	10 100%	05 50%	03 30%	03 30%	

The Table 1 presents the teachers’ use of MSLT approach in teaching students. Accordingly teachers’ use of visual, auditory, kinesthetic and tactile sensory systems in enhancing the memory and the learning of students was marked.

B. Discussion and Findings –

a) In accordance with research question 1, all the teachers in the research sample (100%) reported that there are students in their classes with learning difficulties related to reading. All the teachers (100%) told that these students are with great difficulty in memorizing the vocabulary and the meanings related to them. Moreover, 70% mentioned that these students are poor in pronunciation and they cannot relate the symbol with the sound. In addition these teachers reported that pronunciation problem is more common in boys than girls. All the teachers (100%) stated that there are children who cannot write spelling related to the sounds. Moreover all the teachers (100%) mentioned that all these drawbacks are related to students’ reading skill and literacy skills. These findings can be related to what Kormos and Smith investigated regarding children with SpLDs which is 10% of the world population suffer from Dyslexia and related learning difficulties (Kormos & Smith, 2012). Therefore there is a possibility of having such children in an English classroom too.

b) All the teachers (100%) said that they had to pay special attention to the pupils with learning difficulties. In group work they were put into mix ability groups to get the support of the others. Furthermore 20% mentioned that they give some extra activities to them which cope up with their standards and do MSLT projects with them. As mentioned in the “Background of the study”, the neutral disruption occurs in the brain of Dyslexic students is accommodated by multisensory components used by the teacher. But all the teachers (100%) stated that it was difficult to teach them in a normal classroom as they need a slow pace to learn. Further the teachers

said that they were unsuccessful in teaching these students because they have to consider the normal children as well as covering the syllabus. According to them, too much time spending with students with learning difficulties makes other normal students bored with the lesson. The teachers experience these challenges due to poor awareness of application of Inclusive education and MSLT approach in the classroom.

c) According to teachers' remarks 80% of them made parents aware of the learning difficulties of their children where as 20% stated that parents are not in a position to understand these problems as they are from uneducated rural background. Those who made parents aware of the problem reported that these parents prefer if their children would learn in the same normal classroom thinking that they will be labeled as disable children if they are grouped into a separate classroom. According to Jenkins, Dyslexic students need the support and awareness of both teachers and parents in their treatment (Jenkins, 2000). As Aronin and Floyd (2013) mention, parents and teachers should be provided with awareness and training regarding handling of Dyslexic students.

d) Only 40% of the sample has heard about Dyslexia. They knew that it is a name given for learning disability but they were neither able to define it nor explain it properly. They reported that they have forgotten about Dyslexia although they have learned about it. Therefore it was evident that 60% of the group was not aware of what Dyslexia is. These results can be related with the findings made by Indrarathne B. (2019) in Sri Lanka and it was found that English teachers were not aware of both Dyslexia and Inclusive education much. But by the end of 2022, 40% of the selected group became aware of Dyslexia.

e) With regard to the training given for the teachers about how to accommodate Dyslexic students, 70% teachers mentioned that they were provided training on MSLT approach nevertheless they were not much aware of that Dyslexic students can be accommodated by this approach. These teachers told that they were trained by Regional English Support Centre (RESC), Kegalle regarding MSLT approach. The training was implemented as physical interactive sessions as well as online sessions. There are 30% teachers in the selected group who did not receive the training. In the 'Background of the Study' it was mentioned that lack of teacher training courses or poor quality teacher training courses are the reasons for students' low performance (Wijesinghe, 2014) and the learners with Specific Learning Difficulties (SpLDs) have been neglected in these teacher training courses. Nevertheless 70% of the group became aware of MSLT approach because of the training courses provided for them.

f) Out of 10 teachers only 2 (20%) were able to identify the relationship between MSLT approach and Dyslexia. They said that MSLT approach is a successful teaching method that a teacher can use to teach both normal and Dyslexic students who are in the same classroom. The other 80% of the sample did not have any idea about the relationship between MSLT approach and Dyslexia. It is evident that teachers knew about Dyslexia and MSLT approach separately but they were not aware of the relationship between these two.

g) With reference to research question 3, 40% of teachers were aware of Inclusive education and the other 60% did not have any idea about it. Those who knew about it have gained the knowledge through the sessions conducted by NIE (National Institute of Education), Sri Lanka. Moreover, those who have heard the word had a rough idea about it. Teachers' lack of awareness of Inclusive education can be related to accommodating Dyslexic children (Indrarathne, B., 2019). Therefore those who are unaware of Inclusive education might neglect Dyslexic children in their teaching process.

h) In the research sample 40% mentioned that Dyslexic students can learn in a normal classroom under the concept of Inclusive education whereas 60% was doubtful whether it would be successful. They further explained that it would be challengeable to cope up with Dyslexic students in the same classroom while paying special attention to them as they are very slow in tackling the language. On the other hand, another challenge that the teacher faces is making lots of preparations for the lesson. The former 40% stated that it would be possible to handle both normal and Dyslexic children in the same classroom if they utilize the proper teaching method. In the 'Background of the study' it was stated that there are many systems in the brain to process the symbols into sounds and Dyslexia is resulted by the disruption of this language processing system. Further it results phonological weaknesses and disturbs the decoding process (Shaywitz, 2003). It is evident that the 40% of the group were able to handle children with learning difficulties as they utilized MSLT approach to accommodate these children.

i) In the group 70% knew what MSLT approach is and 40% was aware of what Inclusive Education is. Nevertheless, only 20% were aware of that the key to reach Inclusive education is MSLT approach. They declared that they knew no about the relationship between MSLT approach and Inclusive education. MSLT approach includes visual, auditory, kinesthetic and tactile pathways to enhance the memory and learning procedure of a child (Birsh & Schedler, 2005). Therefore it should be an appropriate teaching method which assists children with SpLDs.

In accordance with the table 1, it is transparent that only two teachers (20%) have used all the visual, auditory, kinesthetic and tactile sensory systems to enhance students learning process. Only one teacher (10%) has applied visual, auditory and kinesthetic sensory systems while three teachers (30%) have used only two sensory systems. Moreover three teachers (30%) have used only one sensory system which is the visual one. When the Table 1 is observed it is evident that visual sensory system is popular among teachers as all of them have utilized it. The next popular one is auditory sensory system as 5 teachers (50%) used it. The kinesthetic and tactile sensory systems are less popular than Visual and Auditory sensory systems as these two were utilized by only three (30%) teachers.

IV. CONCLUSION

With reference to the research question 1, all the teachers (100%) were aware of learning difficulties of their students related to reading. The identified learning difficulties were problems in pronunciation (70%), inability to memorize the vocabulary (100%), spelling problems (100%), poor reading skills and literacy skills (100%).

In accordance with research question 2, only 20% of the group identified the relationship between MSLT approach and Dyslexia. Therefore it is evident that 80% represents who are not aware of this relationship.

With reference to research question 3, 40% of the selected group was aware of Inclusive education while 60% were not. Consequently, only 40% of the group was aware of that Dyslexic students can learn in a normal classroom under the concept of Inclusive education. The findings of the teacher observation brought out that only 20% of the group has used visual, auditory, kinesthetic and tactile pathways to enhance students' memory and learning. Moreover, the most popular mode utilized by teachers was visual pathway.

As a whole, it is very transparent that Dyslexia, MSLT approach and Inclusive education are inter related with each other. With reference to the findings of the research, it is obvious that the teachers in Dehiowita educational zone have learnt them separately but they were not much aware of the relationship among them.

In addition, it is suggested to provide continuous training programmes to teachers regarding Dyslexia, MSLT approach and Inclusive education emphasizing the relationship among these three areas in accommodating students with learning difficulties. Further the teachers who are empowered with the knowledge of Dyslexia, MSLT approach and Inclusive education can launch language projects in order to assist students with SpLDs.

According to the researcher's experience these findings, facts and suggestions are common to Dehiowita educational zone and further researches can be done on the same topic.

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Pre-Analytical Variables In Coagulation Studies

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Abstract- Background: All coagulation tests critically depend on the quality of the plasma specimens obtained. Pre-analytical variability is a common source of errors in coagulation testing, as clotting assays are susceptible to poor standardization of the whole analytical process. Many misleading results in blood coagulation arise not from errors in testing but from carelessness in the pre-analytical phase. Pre-analytical factors influencing the reliability of laboratory testing are commonplace. Control is critical, since this has a direct influence on the quality of results and their clinical reliability. Internal Quality control should be maintained while performing the tests in the laboratory.

Aim: The aim of the study was to evaluate pre-analytical variables that influence the coagulation tests results.

Materials and Methods: A sample size of 100 were included in the study. The Pre-analytical variables during the sample collection and processing were analysed as per the proforma.

Results: It was found that the entire collection was done by vacutainer system. 83% of the collections were from non-fasting patients. Regarding tourniquet application, all the 100 were collected with tourniquet application. Of that 15 were applied for over one minute and 41% of the samples showed frothing. The tube order (2nd) of collection as per the NCCLS guidelines was followed for 96 samples. Mixing was adequate by inverting the tube (8-10) times for most (97%) of the collections. It was found that, the volume was inappropriate for 26 samples. And it was found that the samples were transported to the laboratory from the outpatient sample collection room within the stipulated time.

Ninety three out of hundred samples were centrifuged at a speed range of 4000-4500rpm. There was a yield of <10000/ul platelet in the PPP from 44 samples which is the acceptable limit, and the remaining 49 samples had a platelet count in the range 10,000-60,000/ul. Of the 49 samples, thirty six samples showed a platelet count in the range 10,000-20,000/ul, 9 samples were in between 21,000-40,000/ul and 3 samples in the range of 41000-60000/ul. Among the 49 samples, only 2 samples showed platelet count of 50,000- 60,000 and their PT and aPTT were affected. The occurrence of high platelet count may be due to the variation in the centrifugation speed. It was found that not even a single sample was lysed or clotted. Although, 83% of the collections were from non-fasting patients, the plasma was clear and there was no significant lipemia. It was also found that the three samples high HCT (> 55%) of the sample if not corrected, leads to false prolongation of the results. The time lapse between the sample collection and the report despatch was analysed and

found that for 92 out of 100 samples, the turnaround time was within the acceptable limits as defined by the laboratory.

Conclusion: Among the pre-analytical variables analysed in the study, tourniquet application, duration of application, order of draw, method of collection and mixing and centrifugation duration were found to be well under control. A better control is required in centrifugation speed to obtain PPP where the platelet count is less than 10000/ul.

Index Terms- Pre-analytical variables, Coagulation, Haemostasis, Icteric, Lipemic, Haemolysis

I. INTRODUCTION

Haemostasis is a host defence mechanism that protects the integrity of the vascular system after tissue injury. The mechanism has several important functions. It helps to maintain blood in a fluid state while it remains circulating within the vascular system, to arrest bleeding at the site of injury / bleeding loss by formation of a hemostatic plug and to ensure eventual removal of plug when healing is complete.[1]

There are five different components of haemostatic mechanism

- Blood Vessels
- Platelets
- Plasma coagulation factors
- Inhibitors
- Fibrinolytic system [2]

Any defect in the haemostatic mechanism can lead to excessive bleeding or thrombosis. Thrombosis occurs when the endothelial lining of blood vessels is damaged or removed. The processes include coagulation and platelet aggregation that cause formation and dissolution of platelet aggregation.[3]

There are four phases for haemostasis:

- (i) Constriction of the injured blood vessel to diminish blood flow.
 - (i) Formation of a loose and temporary platelet aggregate at the site of injury, platelets bind to collagen and are activated by thrombin. After the activation, platelets change their shape and in presence of fibrinogen, aggregate to form haemostatic plug in haemostasis or thrombus in thrombosis.

- (ii) Formation of a fibrin mesh that binds to the platelet aggregate, which gives to a more stable haemostatic plug or thrombus.
- (iii) Partial or complete dissolution of the haemostatic plug or thrombus by plasmin.

Stasis alone may not be a sufficient stimulus for generation of thrombin locally addition of activated clotting factors rapidly results in thrombosis. Blood coagulation takes place by the action of thrombin on soluble fibrinogen and numerous insoluble fibrin threads are formed.[4] Principal function of fibrinolytic system is to ensure that fibrin deposition in excess that required to prevent blood loss from damaged vessels is either prevented or rapidly removes.

The routes by which thrombin forms in cell-poor plasma has been called intrinsic pathway, since it does not require the participation of substance extrinsic to the blood. Most of the clinical investigations are on the intrinsic clotting system.[5] Many of the reactions have been demonstrated with plasma obtained from patients with congenital deficiencies and with partially purified preparations of clotting factors. The laboratory screening tests of coagulation include Prothrombin Time, activated Partial Thromboplastin Time, & Thrombin Time. All coagulation testing is critically dependent upon the quality of the plasma specimen obtained. So, quality control should be maintained while performing the coagulation tests.

Q.C Pre analytical variables
Analytical Variables
Post – analytical variables
In which the analysis part is done by the automated machines and the pre-analytical variables should be monitored and controlled to minimize errors in test results.

Hence, an analysis of pre-analytical variables in coagulation tests is very important because many misleading results in blood coagulation arise not from errors in testing but from carelessness in the pre-analytical phase.

Control of pre-analytical phase is critical, since this has a direct influence on the quality of results and on their clinical reliability. The aim of this study is to evaluate pre-analytical variables that may affect the coagulation tests in our laboratory

II. AIM AND OBJECTIVE

To study the pre-analytical variables that influence the coagulation tests results.

III. MATERIALS AND METHODS

100 outpatient samples received in the central diagnostic laboratory of St. Johns Medical College Hospital for coagulation studies are analysed for pre analytical variables. The following are the pre-analytical variables assessed.

1. Patient Identification
2. Sample Collection
 - Open/Closed, Single/Double puncture
 - Sample volume
 - Type of sample – anticoagulant
 - Method of sample mixing after collection.
3. Transportation

- Timing
- 4. Processing
 - Clot in the sample
 - Centrifugation speed, time and Temperature
 - Clear/turbid/lysed/icteric/lipemic plasma after centrifugation.
- 5. Hematocrit volume
- 6. Measurement of platelet in Platelet Poor Plasma
- 7. PT, aPTT analysis

METHODS:

3.1 Platelet count and hematocrit percentage

Platelet count and HCT% were performed on automated haematology analyser Sysmex XT – 1800 I using anticoagulated fresh venous blood sample based on DC detection method.

3.2 Analysis of PT and aPTT

PT and aPTT were measured by ACL ELITE PRO. The mechanisms used for the measurement of the coagulation end point are conductivity, mechanical resistance, and turbidity.

IV. 4. RESULTS

the study was conducted on 100 outpatient samples received in central diagnostic laboratory of SJMCH, for the coagulation parameters. Present study was performed to analyse the preanalytical variables which may affect the reliability of test reports. All the age groups both males and females were included in the study. The preanalytical variables of coagulation tests were analysed as per the proforma

- Patient status(fasting/non-fasting)
- Tourniquet application
- Order of collection
- Collection method(opened/closed)
- 1/>1 puncture
- Presence of frothing
- Appropriate mixing (inverted mixing for 8-10 times)
- Volume of sample
- Proper centrifugation criteria for PPP
- Packed cell volume of the sample
- Platelet count of PPP
- Plasma status(clear/icteric)& Volume

Fig 1. Preanalytical variables during sample collection

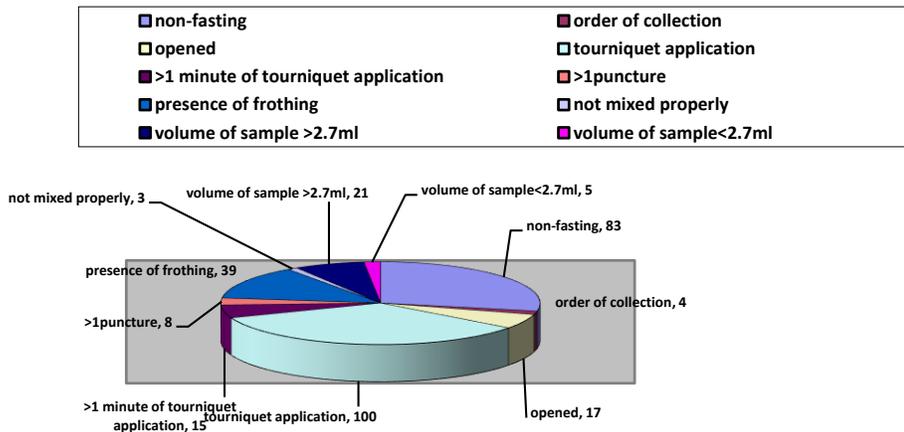


Fig 2. Preanalytical variables of sample processing

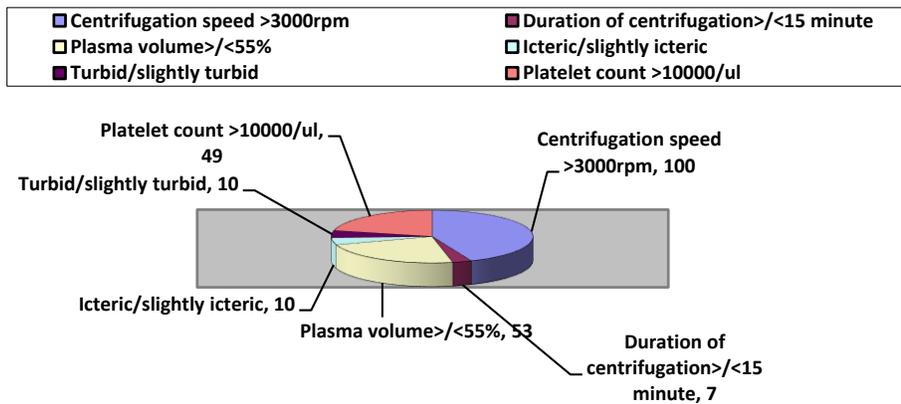


Fig 3. Correlation of variables during sample collection

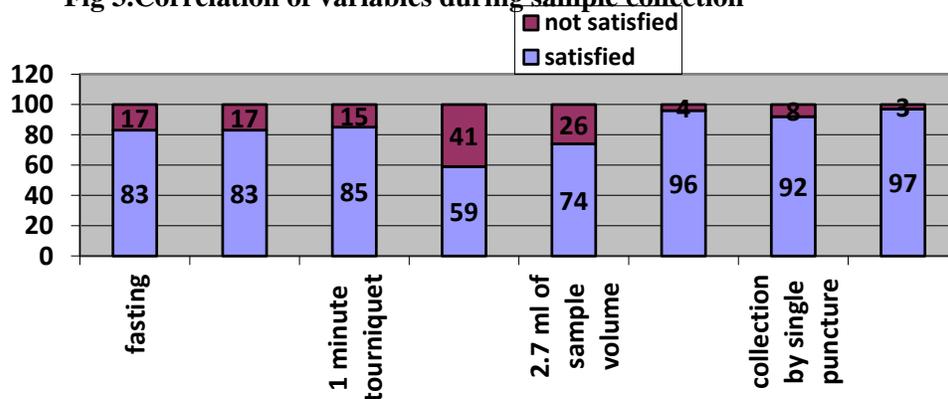
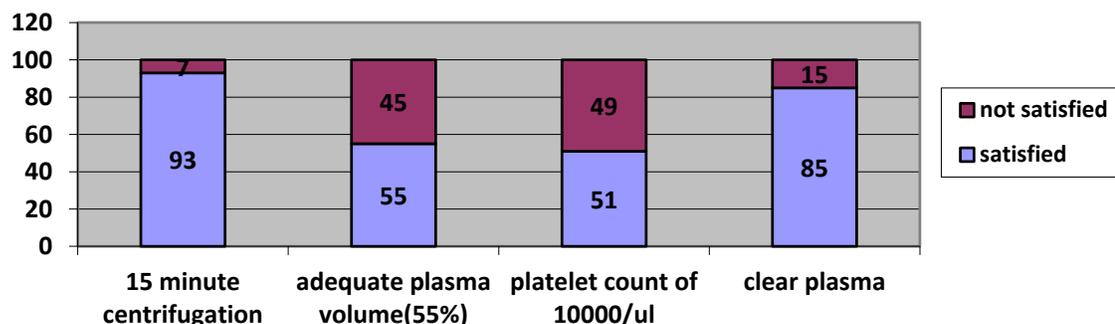


Fig 4. Correlation of variables during sample processing



The pre-analytical variables analyzed as per the proforma are:

Table I Pre analytical variables Phase 1

Patient status	Fasting	17
	Non fasting	83
Method of collection	Closed collection	83
	Opened collection	17
Tourniquet application	+	100
	-	0
Duration of tourniquet application	Duration >1 minute	15
	1 minute	85
Order of draw as per NCCLS guidelines	+	96
	-	4

In the present study, out of 100 patients, percentage of fasting patients is 17 and non-fasting is 83%. Of the total 100 samples except 17, all were collected by closed collection system in the study. Among the 100 samples in the study 96 were collected according to the NCCLS guideline order. (96%)

Table II. Pre analytical variables Phase 2

Collected by (no. of punctures)	>1 puncture	8
	1 puncture	92
Presence of frothing	+	41
	-	59
Proper inverted mixing	+	97
	-	3

Sample volume	Appropriate (2.7 ml)	74
	Inappropriate(>2.7ml)	21
	(<2.7 ml)	5

Ninety-seven of the total samples followed the correct method of mixing. (97 of the total). Out of 100, it was found that the 41 samples showed the presence of frothing in the study. The tube should be adequately filled to 2.7 ml to meet the sample anticoagulant ratio(9:1).In the present study, It was found that 5 were underfilled,21 were overfilled and 74 were adequately filled.

Table III. Pre analytical variables Phase 3

Proper duration of centrifugation	+	93
	-	7
Centrifugation speed	3000 rpm	0
	3500-3700 rpm	7
	4000-4500 rpm	93

Of 100 patients, 93 were found to be centrifuged for appropriate time. Of 100 samples included in the study, not even a single fulfilled the requirement of centrifugation at 3000 rpm. 5 out of the 7 which were centrifuged at a speed range of 3500-3700rpm, yielded a platelet count <10000/µl. Among the 93 samples centrifuged at 4000-4500 rpm, 44 yielded <10000/µl of platelet count.

Table IV. Pre analytical variables Phase 4

Platelet count in PPP	<10000/ul	51
	10000-15000/ul	26
	16000-20000/ul	10
	21000-30000/ul	7
	31000-40000/ul	3
	41000-50000/ul	1
	51000-60000/ul	2
Plasma volume in the whole blood	55%	47
	>55%	42
	<55%	11

Requirement of PPP is mandatory in coagulation tests. Among the 100 total samples, the percentage of samples which met the requirement were 51. And in the rest of 49% platelet count was found to be more than 10000/ul. It was found that, 47% of the total sample, yield 55% plasma volume(1.48ml) of the total volume(2.7ml).

Table V. Correlation of HCT and PT results

HCT (%)	PT (seconds)
56	44.1
55.6	27.4
57	32.1

In the present study, except 3 of the 100, the HCT % was found to be in the range of 15-55%.

Table VI. Plasma status of the centrifuged samples

Status	Percentage
Clear	85%
Icteric	9%
Turbid	5%
Lipemic	1%
Lysed	0%

Although the samples were collected in non-fasting, the number of lipemic sample in the present is 1. And not even a single sample was lysed. The time laps between the sample collection and the report dispatch for 92 out of 100 total samples were found to be in the limit of the turnaround time as defined by the laboratory and it was found that the samples were transported to the laboratory from the outpatient sample collection room within the stipulated time.

In the present study, PT was done on 63 samples. aPTT on 37 samples and out of that both PT & aPTT done on 34 samples. Out of the 63 samples of PT analysis, 36 were prolonged and 13 out of 37 samples of aPTT analysis showed abnormal results. Both PT and aPTT were abnormal in 6 samples. PT prolongation of the 15 samples among the 36 were due to the patient's clinical condition and rest were of some of the preanalytical errors.

V. DISCUSSION

In haemostasis, even more than in other disciplines of biology, quality is determined by a pre-analytical step that encompasses all procedures, starting with the formulation of the medical question, and includes patient preparation, sample collection, handling, transportation, processing, and storage until time of analysis. (6) A sample size of 100 was included in the study which was conducted to analyze the preanalytical variables in coagulation tests. The errors that can occur during the sample collection and processing were analyzed.

5.1 Fasting status of the patient

Non-fasting samples may cause lipemic plasma, which interfere the assay by optical detection method (light scattering). Rajesh kapur and et al in 1996 conducted a study on Postprandial Elevation of Activated Factor VII in Young Adults and they hypothesized that postprandial elevation of FVIIa would produce intermittent activation of factor X to Xa and, subsequently, prothrombin to thrombin. (7)

In the present study, of 100 samples, 83 were collected in non-fasting and only 17 samples were collected in fasting. Among that only 1 sample was found to be lipemic and the PT, aPTT values of that samples were not affected. It was found that non fasting samples do not influence the PT, aPTT values. And the post prandial activation of FVII is not clear from the study.

5.2 Short term venous stasis and influence of frothing

Prolonged tourniquet times will induce increased vessel pressure, hypoxia, and lower pH below the tourniquet, thereby potentially masking mild deficiencies in VWF, FVIII, tPA, and other endothelial associated coagulation proteins. Application of the tourniquet for longer than 1 minute can result in hemoconcentration and endothelial cell release of proteins and elevate coagulation factors such as FVIII, VWF, and tPA, thereby affecting the accuracy of the diagnosis of coagulation defects. Prolonged tourniquet application may also create an acidic microenvironment, potentially leading to factitious prolongation of clotting assays. (8)

Among the 100 samples in the present study it was found that, tourniquet was applied in 85 patients for 1 min and 15 patients for more than 1 min and PT, aPTT values were not affected for

the samples consistent with reports of previous investigation. Of 100 samples 41 samples showed frothing and 59 samples did not showed the presence of frothing. It was found that frothing and tourniquet application does not affect the PT, aPTT values.

5.3 Sample volume and method of mixing

Khayati Siham et al in their study, the filling of the tubes, whatever its origin, is evaluated according to the latest recommendations of the GFHT: Recommended filling: to the mark noted on the tube, or more than 90%; Acceptable filling: tube filled to more than 80%; Under-filling: tube filled to less than 80%. (9) The tube should be adequately filled to 2.7 ml to ensure the sample anticoagulant ratio. Specimen tubes should be filled to at least 90% of capacity to avoid falsely elevated PT or APTT results, but values within the reference range may be acceptable even from underfilled tubes. (10)

Volume(ml)	PT(seconds)	aPTT(seconds)
2.4	74.5	-
2.5	22.6	-
1.62	24	54.5
1.89	11.1	-
2.65	14.1	97.9

In the present study among the 100 samples, five were under filled All the 5 were subjected to PT analysis. 3 gave prolonged PT results. The recommendation is to mix the tube properly by inverting the tube 8-10 times for the adequate mixing of the sample with the anticoagulant. (1) Proper mixing can avoid the incidence of clot formation. And the mixing should never be so vigorous as to cause frothing. (11)

5.4 Centrifugation duration

Lippi G and et al performed a study on the influence of the centrifuge time of primary plasma tubes on routine coagulation testing in 2007 to establish a minimal suitable Centrifuge time for primary samples collected for routine coagulation testing. Five sequential primary vacuum tubes containing 0.109 mol/l buffered trisodium citrate were collected from 10 volunteers and were immediately centrifuged on a conventional centrifuge at 1500 x g, at room temperature for 1, 2, 5, 10 and 15 min, respectively. Hematological and routine coagulation testing, including prothrombin time, activated partial thromboplastin time and fibrinogen, were performed. The centrifugation time was inversely associated with residual blood cell elements in plasma, especially platelets.

Statistically significant variations from the reference 15-min centrifuge specimens were observed for fibrinogen in samples centrifuged for 5 min at most and for the activated partial thromboplastin time in samples centrifuged for 2 min at most. Meaningful biases related to the desirable bias were observed for fibrinogen in samples centrifuged for 2 min at most, and for the activated partial thromboplastin time in samples centrifuged for 1 min at most. According to their experimental conditions, a 5-10 min centrifuge time at 1500 x g may be suitable for primary tubes collected for routine coagulation testing. (12)

Ninety-three samples were properly centrifuged for 15 minute in the present study which included a sample size of 100. Seven were centrifuged for less than 15 minute. The present study suggests that no significant differences were seen in the PT and aPTT reports of the samples centrifuged for less than 15 minutes.

5.5 Centrifugation speed

In 2006, Montagnana M and et al performed a study to investigate the influence of Centrifuge temperature on Routine coagulation Testing. They collected samples from patients, and mixed and finally divided into 3 identical 4-ml aliquots. The 3 aliquots were centrifuged at 1500g for 10 min at 4^oc, 12^oc, or room temperature (21^oc). After centrifugation, plasma was separated and immediately analysed. The study suggested that, centrifugation of whole-blood specimens at temperatures different from those currently recommended is not likely to generate significant analytical or clinical biases. (13) In the present study all the 100 samples included in the study was processed at RT.

The recommended speed of centrifugation to yield PPP for coagulation assay is 3000 rpm. In the present study, of hundred samples none of the samples were centrifuged at 3000 rpm. 7 samples were centrifuged at 3500-3700 rpm and out of the 7 samples, in 5 samples, there was a yield of <10000/ul platelet and in 2 samples the count was found to be 10000-11000 and the PT, aPTT values were not affected. 93 samples were centrifuged at a speed range of 4000-4500rpm and there was a yield of <10000/ul platelet from 44 samples and in 49 samples platelet count was >10000/ul. Of 49 only 2 samples showed platelet count of 50000-60000 and their PT and aPTT were affected.

5.6 Effect of haemolysis

A study was conducted by Laga and colleagues in 2006 on the effect of specimen hemolysis on coagulation test results. "Specimens from healthy human subjects were subjected to mechanically induced hemolysis, and PT and aPTT results compared with concurrently drawn non hemolyzed control samples. In 50 paired patient specimens, there were statistically significant differences in PT (15.8 ±8.4 vs. 16.3 ±8.7 seconds, p<.01) and aPTT (31.6 ±18 vs 32.5 ±19 seconds, p<.01) between hemolyzed and nonhemolyzed specimens, respectively. Specimens from healthy subjects showed no difference in PT and a minor difference in aPTT." (14)

In 2006 another study was conducted on Interference of blood cell lysis on routine coagulation testing, in which they found that a significant increase occurs in prothrombin time and dimerized plasmin fragment d were observed in samples containing final lysate concentrations of 0.5% and 2.7% respectively, whereas significant decreases were observed in aPTT and fibrinogen in samples containing final lysate concentration of 0.9%. And they conclude as that, although slightly hemolysed specimens might still be analyzable, a moderate blood cell lysis, as low as 0.9% influences the reliability of routine coagulation testing.

In the present study, on 100 samples, vacutainer system was used, and the percentage of lysis was zero. This confirms that, blood collection by vacutainer system by well-trained staffs can avoid the incidence of cell lysis that can occur in a syringe collection.

5.7 Hematocrit percentage of patient sample

Samples with high HCT (>55%, like in severe dehydration, neonates, burn patients & patients of polycythemia vera etc) may lead to factitiously increased clotting times due to presence of excess citrate in the sample [13]. To address this issue of HCT, Labs may use vacuum tubes with a lesser volume of anticoagulant; for example, by using small gauged needle and removing 20% volume of anticoagulant (without eliminating the vacuum). (15) In a study conducted on the Effect on Routine and Special Coagulation Testing Values of Citrate Anticoagulant Adjustment in Patients with High Hematocrit Values, they compared the effect of adjusted and non-adjusted citrate concentrations on coagulation test results in samples from 28 patients with high hematocrit values (55%-72% [0.55-0.72]). Prothrombin time (PT) and activated partial thromboplastin time (aPTT) results from nonadjusted and adjusted samples were statistically different and exponentially increased with increasing hematocrit values. Results for fibrinogen, factor VIII, and protein C activity were statistically different and increased linearly with increasing hematocrit values; however, the difference was not as clinically significant. The protein C antigen value increased with increasing hematocrit values but was not significant. The effects on PT and aPTT are due to a dilutional effect of plasma and an interference effect of the higher final citrate concentration on the clotting test result. For patients with high hematocrit values, citrate concentrations must be adjusted for accurate results. (16)

In the present study, 3 out of 100 samples had high HCT. Since correction of anticoagulant volume was not done, the PT results were prolonged for those samples consistent with reports of previous studies.

HCT Vs PT

HCT(%)	PT(seconds)
56	44.1
55.6	27.4
57	32.1

5.8 Platelet count in PPP

Platelet count in the Platelet poor plasma should be less than 10000/ul. (1) The present study reveals that a platelet count in the range 10000-15000/ul is not significant to affect the PT results. Whereas, platelet count more than 50000/ul was found to correlate with shortened PT values. The platelet count in the PPP is related with the speed of centrifugation. In the present study 7 samples were centrifuged at 3500-3700 rpm and out of the 7 samples centrifuged at 3500-3700rpm, 5 samples, there was a yield of <10000/ul platelet and in 2 samples the count was found to be 10000-11000 and the PT, aPTT values were not affected. Ninety three out of hundred samples were centrifuged at a speed range of 4000-4500rpm. There was a yield of <10000/ul platelet from 44 samples and the rest 49 gave a platelet count in the range 10000-60000/ul. Of 49 only 2 samples showed platelet count of 50000-60000 and their PT and aPTT were affected. Hence it was found that PT was shortened in that two cases probably because of high platelet count in the PPP.

VI. CONCLUSION

Among the preanalytical variables analyzed in the study, tourniquet application, duration of application, order of draw method of collection and mixing, centrifugation duration were found to be well under control. A better control is required in centrifugation speed to obtain PPP where the platelet count is less than 10,000/ul.

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CONFLICT OF INTEREST

There is no conflict of interest

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Area/Section: Allied Health Sciences/Pathology

The Impact of ICT on Enhancement of CIT Protocols (Efficient use of resources)

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Abstract- Over the course of its history, the tax administration has been beset by a broad range of problematic difficulties and aspects. For instance, tax evasion and tax avoidance have been exceedingly common, as has the failure of tax authorities to preserve accurate records. The existence of these factors necessitates the use of IT. Tax administration is undergoing this change so that it may become more efficient and successful. This motivates the study under review, which investigates the strengthening of CIT protocols through the deployment of information and communication technology. Based on the findings, it was concluded that the use of ICT had significantly improved the process's efficiency and effectiveness. Study results suggested that the FIRS should invest more in updating its ICT infrastructure and purchasing cutting-edge tax collection, contribution, and compliance systems.

I. INTRODUCTION

As oil prices decline, the world economy is shifting its focus from crude oil to tax oil and striving for economic diversification to make up the difference in lost income and foreign cash (Adeyeye, 2019). This action according to Adeyeye (2019) was taken to make up for the loss in revenue caused by the drop in oil prices. Taxes must account for a significant portion of government income in Nigeria if the country is to finance its fight against the global oil surplus and the pandemic (Irefe-Esema and Akinmade, 2020). In this light, it becomes clear that digitising tax collection and tax administration is crucial for achieving the goals of greater tax system transparency, and decreasing compliance risks (Olise and Emeh, 2020; Irefe-Esema and Akinmade, 2020).

The federal government plans to conduct data and intelligence investigations as part of its attempts to increase tax income and streamline the tax collecting procedure (Ofurum et al., 2018). The greatest threat to Nigeria's ability to meet its debt service obligations comes from the pandemic's effects on the African economy, the impacts of lockdowns on economic activity, and the combination of these factors with a decrease in oil income (Mustapha and Nwani, 2018). Despite operating throughout the most difficult part of the 2020 fiscal year, the "Federal Inland Revenue Service (FIRS)" witnessed a tremendous rise in performance, collecting N4.9 trillion in taxes, or 98% of its goal amount. Although the Petroleum Profits Tax was formerly responsible for over half of this, its share has now decreased to 30.6% (Adeyeye, 2019).

The success of the FIRS may be traced back to the agency's decision to change its emphasis from oil taxes to non-oil taxes. This objective was reached via the use of CIT for tax assessment, compliance, and collection. This marks the start of a new decade and heralds a promising time for the growth of non-oil income via the collection of Stamp Duties, which will be shaped by technology and a variety of automated methods (Oladele, 2020). Electronic tax filing (e-filing) is

one example of how using automated technologies may boost a business' efficiency while cutting costs (Okunogbe and Pouliquen, 2022). It expands monetary research and improves public service delivery without demanding ever-increasing budgetary outlays (Sifile et al., 2018).

II. RESEARCH ELABORATIONS

However, in the modern era, most developed and developing nations alike have fully embraced the use of ICT to boost tax collections (Sifile et al., 2018). Another major advantage is the help it has given the government in combatting tax evasion. It is not that keeping records manually was not useful; it is just that digital record-keeping makes manual record-keeping seem inefficient, particularly

when it comes to data retrieval. This is because electronic record-keeping can accommodate more data in the same physical footprint than paper-based record-keeping systems (Lustgarten, Sinnard, and Elchert, 2020). The government was also able to increase its tax revenue by adopting this strategy. This has been possible because of the large number of people who are willing to pay taxes because they are pleased with the services they get from the government (Adeyeye, 2019).

The primary goal of ICT innovation for the CIT protocols was to improve the functionality and efficient use of resources. It is crucial that Nigeria's key players understand that the country's socioeconomic success is contingent on it making certain investments to fully actualise its potential (Adeyeye, 2019). These funds should not be reserved just for the oil industry, but rather widened to include the whole economy, with a special emphasis on digital economy taxes and other crucial sectors like stamp duty collection (Olatunji and Ayodele, 2017). Investments in non-oil industries, especially tax reform, would boost Nigeria's economy to new heights (Igwe et al., 2018). Furthermore, these alterations will contribute significantly to the enhancement of both technology and infrastructure, which in turn will contribute significantly to the improvement of technological skills.

Due to the proliferation of ICTs, the FIRS has shifted its primary revenue stream from the oil industry to other sectors of the economy (Pacheco et al., 2017). The "Integrated Stamp Duties Solution (ISDS)", was developed by the FIRS with the explicit goal of facilitating the online assessment and payment of stamp duties. Stamp duty (SD) revenues were consistently between \$6-7 billion between 2010 and 2016, with a peak of \$11 billion in 2014 (Adeyeye, 2019). When all of the manual leaks are sealed, it is expected that the amount of money collected in SD will go up.

III. RESULTS OR FINDINGS

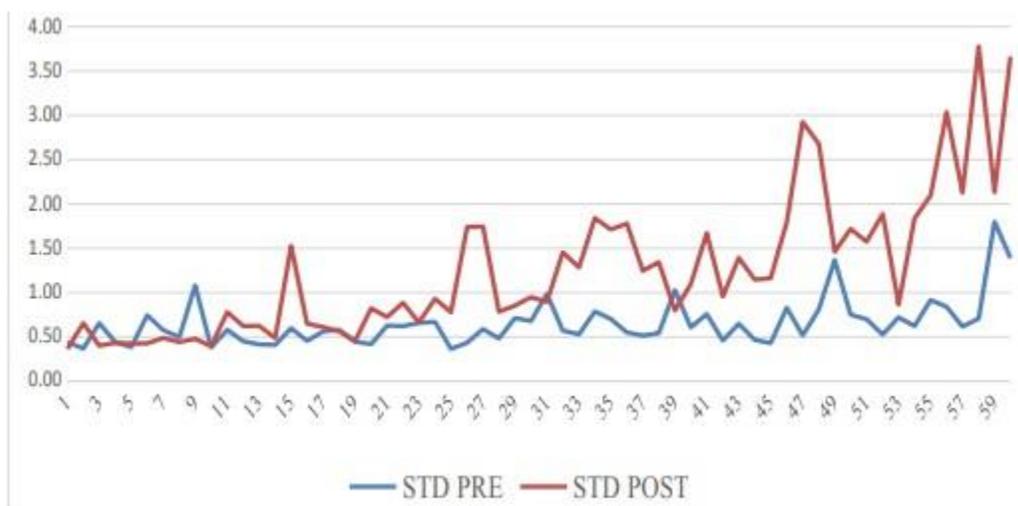


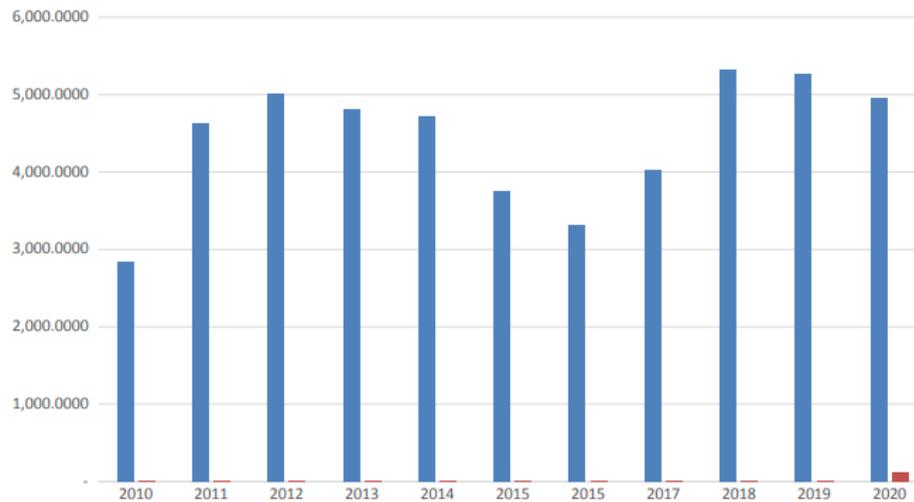
Figure 1: A line graph showing the movement in stamp duty revenue collection pre and post ICT support service system 2010 to 2020

Figure 1 depicts, on a line graph, the development of stamp duty revenue collection both before to and after the adoption of an electronic payment system. The graph demonstrates quite plainly that the collection of income from stamp duties has been on the rise

ever since the implementation of electronic payment systems, and that this increase can be seen most clearly when compared to the time period that occurred prior to the implementation of electronic payment systems.

Figure 2: A histogram showing the contributions of stamp duty to total revenue generated pre and post ICT

The above histogram suggested that the overall revenues obtained from 2010–2020 are much higher than the annual contributions



made to revenue in each individual year. On the other hand, it is crystal clear that the contributions of stamp duty to revenue in 2020 are beginning a road that will ultimately lead to an increase in their overall impact. It is possible that the use of ICT in addition to other technologies, such as electronic stamp duty, is the cause of this surprisingly quick growth.

In conclusion, it is feasible to state that the imposition of stamp duties has not resulted in any substantial changes either before or after the implementation of ICT. As a consequence of this, it is hoped that the upkeep and improvement of ICT support systems would lead to an increase in the total amount of contribution that is generated via stamp duties.

The study's findings suggested that the efficiency with which stamp duty is collected and its contribution to the FIRS total revenue has been significantly boosted by the introduction of ICTs.

The quantity of stamp duty collected has skyrocketed since computerised procedures were put into place. Stamp duty's contribution to overall collections after the electronic era was greatly beyond its contribution at the preliminary levels, although its total contribution to the complete income earned yearly in percentages did not approach a praiseworthy proportion.

IV. CONCLUSION

To sum up, the introduction of cutting-edge tech into the process of collecting stamp duties allows the tax administration to re-evaluate its approach to the management of different commercial operations. To achieve this goal, the whole tax system, from filing to assessment to payment to the collection, maybe computerised, leading to more strong revenue generation. It is essential to highlight that the FIRS should focus on identifying and resolving present gaps in the system for the collection of income from stamp duties, given the success of previous attempts to automate the revenue systems.

In addition, the FIRS should be dedicated to fostering an environment that allows for the unhindered development of ICT solutions and the regular maintenance and updating of technological systems to guarantee the system's smooth operation and enable it to expand into new areas. However, the FIRS team, at every level, needs constant training and retraining. A tax payer education and enlightenment campaign on the use of ICT to pay stamp duties is, therefore, critically important.

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Significance Of Ferritin In Pregnancy Associated Iron Deficiency Anemia, GDM And Other Complications

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Abstract- Purpose: Analysis of ferritin is very important in pregnancy for predicting risk factors such as GDM, IDA, preeclampsia, preterm delivery, childbirth weight, and other pregnancy-related complications. The only commonly used laboratory test for determining iron reserves is the determination of serum ferritin concentration. As a result, the complications associated with ferritin is caused by an increase or decrease in body iron stores.

Methodology: The review is intended to look into the impact of ferritin in pregnancy.

Sources of data and study selection: Relevant articles were chosen through a database search on Google Scholar, PubMed, and ScienceDirect. The journal papers were chosen from the years 2015 to 2022, with the majority falling between 2017 and 2022. Excludes papers published before 2015 and reviewed only full-text articles.

Findings: We investigated the bond between serum ferritin levels and pregnancy-related complications in this systematic review. We discovered that high maternal serum ferritin levels play an important role in the occurrence of GDM. We've also discovered that ferritin in gestating women can be implicated as a marker for preeclampsia, preterm birth, and decreased ferritin levels are related with IDA and low birth weight. We also discovered some negative correlations. As a result, more research is needed to establish this relationship and identify vulnerable populations.

Paper Type: Systematic Review Paper.

Index Terms- Ferritin, Iron stores, Pregnancy, Iron deficiency, Gestational diabetes, Preeclampsia

I. INTRODUCTION

FERRITIN
Ferritin is an intracellular protein that surrounds the nucleus. It stores iron, a nutrient that is necessary for the production of healthy red blood cells and the distribution of oxygen throughout the body. When the body uses iron, a small amount of ferritin is released from cells and circulates in the blood. Ferritin level reflects the total iron stored in the body.

Without inflammation, ferritin concentrations are positively correlated with the storage form of iron in the body. Low serum ferritin levels show that these stores have been depleted, resulting in iron deficiency.

IRON DEFICIENCY

In both developed and developing countries, iron deficiency is the most common nutritional disorder among pregnant women. Iron deficiency affects approximately 41.8% of pregnant women, according to UNICEF (1998). [1] Iron is required for all cellular functions, such as oxygen transportation, electron transport, and enzyme activity. Cells with high metabolic rates require more iron and become more dysfunctional when there are insufficient iron stores. [2] Iron deficiency ranges from iron depletion to iron deficiency anemia. The amount of stored iron (as measured by serum ferritin) is reduced in iron deficiency, but the amount of transportable and functional iron may not be affected. People who are iron deficient do not have iron stores to call on when their bodies require more iron. Stored iron is depleted, and transport is impaired in iron-deficient erythropoiesis.

The definition given to anemia in pregnancy by WHO as a hemoglobin concentration <110 g/l (WHO, 20 01) [3]

Diagnosis of iron deficiency

Clinical symptoms and signs

Laboratory tests

Full blood count, blood film and red cell indices.

Serum ferritin

Serum iron (Fe) and total iron binding capacity (TIBC).

Zinc protoporphyrin (ZPP)

Soluble transferrin receptor (sTfR)

Reticulocyte hemoglobin content and reticulocytes

Bone marrow iron

Trial of iron therapy.

It is established that iron deficiency affects several bodily functions, including physical and mental performance, enzymatic functions (eg, the respiratory chain), thermoregulation, muscle function, immune response, and neurological function. Only some of these potential effects have been reported and specifically

studied in iron deficiency anemia. Iron deficiency anemia usually causes several symptoms. [5]

IRON DEFICIENCY IN PREGNANCY

The need for iron increases trivially during gestation as the mother's blood volume increases and the fetus get bigger and increase in weight. Thus, pregnancy is a state of imminent or current iron deficiency that can be difficult to detect because of the limitations of generally implicated biomarkers like hemoglobin and ferritin levels. Iron deficiency is linked to negative pregnancy outcomes such as increased risk of premature birth, low birth weight baby, and postpartum depression. The swiftly evolving fetal brain is especially vulnerable to iron scarcity, which can be caused by depleted iron in the mother, high blood pressure, smoking, or glucose intolerance. Some neuro developmental conditions, mental disorder which is distinguished by a wide range of unusual behaviors in offspring, are linked to low maternal iron intake during pregnancy. Despite postnatal iron supplementation, iron-deficient neonates have impaired recognition memory, slower processing speed, and poor communication. [2] A decrease in iron stores in a newborn baby can last up to one year and cause iron deficiency anemia.[6]

Iron deficiency anemia (IDA) is the most common reason for anemia during pregnancy in developing countries and is coupled to an increased risk of low-birth-weight babies. In developed countries, iron supplementation is based on serum ferritin levels.[7]

COMMON IMPACTS

The aftereffects of iron deficiency during pregnancy are noteworthy and widespread. These were previously thought to be limited to increased maternal risk, but recent work has illustrated that the fetus and newborn also suffer both short- and long-term consequences, particularly in brain function.[4] Some of these implications are outlined in this review. Anemic mothers often experience increased fatigue, reduced exercise capacity, and mental performance.

GESTATIONAL DIABETES

Of the exclusive pregnancy-related complications, gestational diabetes is the predominant. The incidence of gestational diabetes has increased. Gestational diabetes is estimated to be found in approximately 14% of all Pregnancies. Gestational diabetes is a disease caused by impaired carbohydrate metabolism tolerance. The disease occurs in varying degrees of severity and is detected in primary pregnancies. Gestational diabetes begins most often after the 24th week of pregnancy and the disease resolves after delivery. The worry about gestational diabetes is that the onset of diabetes coincides with the period of maximum fetal growth during pregnancy. One of the fundamental mechanisms used to explain the development of Gestational diabetes is obesity-related to oxidative stress and systemic inflammation. An abnormally high level of elemental iron is one factor that causes free radical production and inflammation. There is evidence that evaluation of ferritin in patients with gestational diabetes can predict delivery outcomes accurately, but there are some gaps that need to be answered, especially in India.[12].

OTHER COMPLICATIONS

Severe anemia (Hb < 90 g/l) can accompany preterm delivery, resulting in low birth weight, small gestational age, and spontaneous abortion. In addition, maternal IDA may contribute to low iron levels and poor health in children. Fetal iron metabolism completely depends on maternal iron transfer to the placenta, so the effect of anemia on the fetus is directly related to the extent of maternal iron deficiency and the increased mortality associated with severe IDA.[8] Serum ferritin is significantly elevated in pregnant women with preterm labor and preterm PROM.[9] [11] If the serum ferritin level is high, treatment can be prevented premature birth. The study result adds to the existing evidence that high serum ferritin is a risk factor for preterm birth.[10]

The impact of iron deficiency anemia in mother and fetus is described in table 1

Table 1:

MOTHER	FETUS
Increased risk of developing pre-eclampsia and bleeding. Increased risk of developing gestational diabetes Tiredness	Premature labor fetal death low birth weight

FERRITIN IN PREGNANCY

The evaluation of ferritin in pregnancy can be used as a marker of iron deficiency anemia, gestational diabetes, and other complications. This systematic review was prospectively designed to investigate serum ferritin's significance in diagnosing iron deficiency, gestational diabetes, and other maternal and fetal complications.

II. OBJECTIVE :

Evaluation of ferritin is becoming an important issue of concern nowadays in pregnancy.

This analysis studies the significance of ferritin assessment in pregnancy in predicting the risk of IDA, gestational diabetes, and other complications of mother and the baby.

III. METHODOLOGY :

This review is assigned to evaluate the sense of ferritin during the gestational period. Database search selected relevant articles on Google scholar, PubMed, and Science Direct. I selected the journal papers from the year 2015-2022. Excludes the papers before 2015 and reviewed only full papers.

IV. REVIEW OF LITERATURE :

For both the health of the mother and the growth and development of the fetus, iron is crucial throughout pregnancy. Much research has concentrated on the effect of low hemoglobin levels on pregnancy outcome since iron deficiency anemia affects

billions of individuals globally. Iron, however, is necessary in lot of functions as well, such as the formation of neurotransmitters, myelination, intracellular oxygen transport, cellular respiration, and cell growth. Even without anemia, these processes can be hampered by iron deficiency. Currently, ferritin, transferrin saturation, or soluble transferrin receptor concentration (sTfR) are used to evaluate iron status. Preferable techniques and clinically significant cut-offs for iron insufficiency or overload in pregnancy have not yet been established.

Pregnancy-related iron insufficiency poses dangers to both the mother and her unborn child. However, there is still a dearth of proof that systematic iron supplementation improves clinical outcomes other than hematological indicators. Investigations on both humans and animals have suggested that too much iron may be hazardous. An excessive amount of iron increases the incidence

of cardiovascular disease, gestational diabetes, and fetal difficulties, as well as produces oxidative stress and cellular damage.[13] Although hemoglobin is a late measure and might not accurately mirror the iron in tissue, ferritin concentrations and hemoglobin percentage are both indicators of iron shortage. Serum ferritin (SR), however, is typically regarded as the most accurate indicator of iron insufficiency in pregnancy. The level drops early in the progression of iron insufficiency, and recent iron intake has little impact on it.[14]

To determine the importance of ferritin in pregnancy for the prior diagnosing of iron deficiency anemia, gestational diabetes, and other pregnancy outcomes, the current study evaluated several studies.

Table 2: Related articles: Elevated ferritin and GDM

Sl.no	Research topic	Findings	Reference
1	Ferritin and intrapartum diabetes mellitus	The case-control study was conducted at a general hospital in Iran. Researchers ruled out a major tie between serum ferritin level and GDM irrespective of BMI and c-reactive protein.	15
2	Plasma Ferritin in Early Pregnancy Associated Gestational Diabetes mellitus	The prospective nested case-control study of pregnant Women proved the fact that plasma ferritin in early pregnancy were outstanding and positively associated with GDM risk even after adjustment for pre-pregnancy BMI and additional GDM risk factors. The association remained significant after adjustment for markers of systematic inflammation and oxidative stress.	16
3	Serum ferritin in early pregnancy	Researchers showed correlations between increases in serum ferritin levels during the first trimester of pregnancy and the GDM risk for expectant mothers. As a result, having a high ferritin level is a serious risk factor for developing gestational diabetes.	17
4	Outcome in GDM pregnancies	From December 2016 to July 2020, the Ks Hedge college Hospital served as the site of this case-control study. The study involved pregnant women between the ages of 20 and 40 who were diagnosed with gestational diabetes mellitus (GDM) by the American College of Obstetricians and Gynecologists (ACOG) at the time of their antenatal checkup and non-GDM pregnant women. They came to the conclusion that GDM is likely to be associated with high serum ferritin levels compared to non-GDM moms and that it is possible to predict the prognosis of the mother and the newborn by evaluating serum ferritin levels.	12
5	Ferritin: A meta-analysis of observational studies.	Prior to May 10, 2019, they conducted relevant searches on the databases to ascertain the connection between ferritin and GDM. The consequence of this meta-analysis imply that higher ferritin levels are hooked up to a higher risk of developing GDM; however, additional prospective cohort studies are needed to corroborate the findings, particularly the dose-response association between ferritin and GDM.	18
6	Correlation between plasma ferritin level and gestational diabetes mellitus and its impact on fetal macrosomia	Pregnancy-related diabetes mellitus poses a significant public health risk since it raises the likelihood of maternal, fetal, and neonatal problems. OS, which is regarded as a risk factor for GDM, is linked to iron. When the plasma ferritin level is greater than 70 ng/mL, taking iron supplements is not advised. Ferritin levels and other features between	

		pregnant women with gestational diabetes mellitus (GDM) and pregnant women without GDM were retrospectively compared by Zhiguo Wang et al. Researchers have investigated the association between ferritin, glucose, and hemoglobin levels. They evaluated the macrosomia risk factors in the interim. They also looked into the connection between ferritin levels and the prevalence of macrosomia. According to the study, those with high ferritin levels may be more susceptible to GDM and a standalone reason for macrosomia. Therefore, it may be noted that iron supplementation during pregnancy has a deleterious impact on non-anemic pregnant women.	
7	Role of ferritin and oxidative stress index	According to Surabhi Gautham et al. in 2021, elevated pre-pregnancy BMI raises blood ferritin and OSI, which predisposes to gestational diabetes.	20
8	Association of Serum Ferritin with Gestational Diabetes Mellitus	Recently, it has been reported that GDM also exhibits elevated blood ferritin levels, which are generally linked to insulin resistance and diabetes. Serum ferritin's function has gained more recent attention. Type 2 diabetes and other illnesses are more likely to develop because of iron excess and the oxidative stress it causes. The extraction, synthesis, and release of insulin are hampered by the accumulation of iron in cases of iron overload. A high ferritin level is very much related to a high possibility of gestational diabetes mellitus (GDM) Dr.Shameem Mahmood et al. Concluded that those with GDM showed high ferritin than without GDM. Therefore, raised ferritin can be considered as a sign of GDM.	21
9	Association of ferritin in mid-pregnancy and the risk of gestational diabetes mellitus	Serum ferritin levels, in addition to iron store activity, are an excellent predictor of developing GDM, according to DR. V Sumathy et al. Early in the prenatal weeks, elevated ferritin is linked to a higher risk at the beginning of GDM. Partially, mother's fat mass and obesity handle this relationship.	22
10	Serum ferritin thresholds: a systematic review	This systematic analysis illustrates the heterogeneity in serum ferritin thresholds used in research settings to identify iron insufficiency in pregnancy. This difference was observed in many study designs evaluating the results of therapies involving iron in various populations and geographical regions. A review based on the ferritin threshold to interpret iron scarcity in pregnancy is clogged due to the lack of published data. The information in this evaluation shows that there is no agreement on a particular serum ferritin threshold for determining iron deficiency. The difference in thresholds complicates the diagnosis and treatment of iron deficiency during pregnancy, which has negative effects on mother and the unborn child.	23
11	The effect of ferritin, vitamin B12 and folic acid on pregnancy outcomes	The body's iron stores are thought to be showed by the serum ferritin level. Even though plasma dilution may impact the ferritin level later in pregnancy, iron depletion is indicated at all stages of pregnancy by a concentration below 15 g/l. Pinar kalem et al, in their retrospective study, found that the style of delivery, the timing of delivery, the weight, and the overall health of the infant are unaffected by anemia in the third trimester.	24

12	Evaluation of iron deficiency by serum ferritin assay in a population of anemic moroccan pregnant women	As in many poor nations, this study showed that iron deficiency is a problem in our nation as well. It is the major factor in anemia in expectant mothers. Serum ferritin assays continue to be the ultimate precise iron metabolism exploration test to determine pregnant women's iron stores, surpassing the straightforward full blood count that is advised in the early stages of pregnancy. The initial sign of iron deficiency is a decrease in this parameter, but it is also the last test to be standardized with replacement therapy, which must be continued until the iron store is normalized.	25
13	Low serum ferritin and G6PD deficiency as potential predictors of anemia in pregnant women visiting Prime Care Hospital Enugu Nigeria	Anemia in pregnancy is closely correlated with low serum ferritin levels and G6PD deficiency as potential risk factors, according to the study's conclusion by Goodwill Azeh Engwa et al.	26
14	First Trimester Ferritin Outperforms Soluble Transferrin Receptor and Hepcidin in Predicting Anemia in the Third Trimester: Results from an Indonesian Cohort Study	According to the cohort study, the best predictor for predicting anemia in the third trimester was the serum ferritin level in the first trimester (27.23 ng/ml). It will be helpful in identifying subjects for a stricter approach to the prevention and treatment of anemia in pregnancy, particularly in settings with limited resources. A carefully planned randomized controlled study would be required to determine the utility of ferritin as a marker to treat anemia in pregnancy.	27
15	Serum ferritin as an indicator of iron status: what do we need to know?	In most circumstances, it is impractical to determine the lack of bodily iron stores. The most often used biomarker for identifying ID is ferritin and low SF concentrations directs to iron deficiency status. Suggestion: Future research is critically required to establish the proper SF cutoffs, and this will provide us the chance to compare this signal to other established and developing iron indexes. Future study should also concentrate on clarifying cutoffs and indexes related to iron adequacy.	28
16	Population-based study in pregnancy	This was a population-based study on ID from three different blood-based indicators in a multiethnic sample of healthy pregnant women, where only a small percentage of women (18%) used iron supplements in the early stages of pregnancy and anemia was not commonly seen in Western Europeans. Depending on the iron indicator utilized, there were significant differences in the prevalence of ID. Ferritin had the highest prevalence of ID, whereas sTfR had the lowest.	29
17	Assigning ferritin thresholds.	The goal of the review was to understand the landscape of serum ferritin in diagnosing iron deficiency in the aetiology of pregnancy anemia. In defining the ferritin threshold of iron deficiency in pregnancy, the literature, including national guidelines and primary studies of iron interventions, there was variation. Suggestion: further studies have to be done in determining serum ferritin threshold for the diagnosis of anemia in pregnancy.	30
18	Comparison of Ferritin with Other Iron Status Markers	KELD-ERIK BYG et al. conducted the study to determine the true positive and false positive rates of iron status markers (serum iron, serum transferrin, transferrin saturation, hemoglobin, hematocrit, mean corpuscular volume (MCV), mean cell hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), erythrocyte count) in the diagnosis of iron depletion during normal pregnancy and postpartum. And they found that, the sensitivity of the other iron status markers was too low, and the false positive rates were too high, to be clinically useful in the diagnosis of iron deficiency. Despite physiological variations caused by hemodilution, serum ferritin concentration is currently the	

		most reliable non-invasive indicator of iron status in pregnancy and postpartum.	
19	IRON DEFICIENCY ANEMIA Significance of serum ferritin in diagnosis of pregnant females of Pakistan	According to the findings of this study, serum ferritin is a better and more reliable marker than hemoglobin for detecting iron deficiency anemia during pregnancy, especially at the latent stage, and ferritin should be included in routine antenatal care programmes to improve the health of Pakistani women.	32
20	Serum or plasma ferritin concentration as an index of iron deficiency and overload	In the review the author found that blood ferritin concentration is reasonably sensitive and specific for iron deficiency in people presenting for medical care at a threshold of 30 micrograms/L, according to low-certainty evidence. There is very little certainty that high ferritin concentrations provide a sensitive test for iron overload in people with this condition. There is insufficient evidence to determine whether ferritin is beneficial, When screening asymptomatic people for iron deficiency or overload.	33
21	Increased Ferritin and Iron Levels in Preeclampsia	Dr,Sujatha Maithra et al. in their study concluded that serum ferritin levels are significantly higher in pregnant women with preeclampsia. Excess iron may be a causative factor in oxidative stress, which may be involved in preeclampsia. Suggestion: more research is needed to back up this claim. Pregnant women with preeclamptic toxemia should have their iron status checked before receiving iron supplements, as these may cause more harm than benefit.	
22	Evaluation of coagulation factors and serum ferritin in preeclamptic Pakistani women	The study sought to ascertain the role of coagulation factors and ferritin in the susceptibility to PE in Pakistani women. The researchers collected blood samples from 100 normotensive and 100 preeclamptic women, including 73 with mild PE and 27 with severe PE, to assess activated partial thromboplastin time (aPTT), prothrombin time (PT), international normalized ratio (INR), fibrinogen levels, platelet count (PLT), and ferritin levels. When compared to the control groups, both PE groups had prolonged aPTT, PT, and INR, as well as lower platelet and fibrinogen levels. Researchers found that Ferritin levels were not statistically different across all study groups, but routine ferritin testing in conceived women with PE may aid in establishing a diagnosis prior to clinical manifestations, and non-anemic pregnant women should stop taking iron supplements.	34
23	Association between Serum Ferritin and Pre-eclampsia	In the review, they discovered a clear link between hauled up ferritin levels and preeclampsia. Suggested to conduct further research in a larger population may be conducted, including other parameters such as serum AST, LDH, hemopexin, total bilirubin, transferrin, and transferrin percent saturation, which may affect serum iron levels in preeclampsia	35
24	Prospective Hospital Based Assessment of the Serum Ferritin Level as A Marker of Preterm Labor	According to the findings, serum ferritin levels may be an important parameter for detecting preterm labor. Treatment to prevent preterm birth may be instituted in cases of high serum ferritin levels. The study's findings add to the growing body of evidence that high serum ferritin levels are a risk factor for preterm birth. As a result, early detection and intervention could easily prevent adverse pregnancy outcomes associated with elevated serum ferritin levels.	36
25	Elevated Serum Ferritin and Interleukin-6 Level are Risk Factors for Preterm Labor	Serum ferritin and IL-6 levels were found to be a risk factor for preterm labour. As a result, serum ferritin and IL-6 levels can predict preterm labour in the early stages. Thus, the rate of preterm labour can be reduced, as can the rate of neonatal mortality.	37
26	Serum Ferritin as a Marker for Preterm Premature Rupture of Membranes	Because it reflects an acute-phase response to subclinical infections, researchers found that an elevated serum ferritin level predicts early spontaneous preterm premature membrane rupture. When compared to a control group of women with the same gestational period, serum ferritin was significantly higher in preterm premature rupture of membranes. Serum ferritin acts as a marker for preterm premature membrane rupture	38

		and could be used by obstetricians to predict complications; it is considered more specific for prediction.	
27	Comparison of serum ferritin levels in pregnant women with preterm and term deliveries	The study found that the mean serum ferritin level was significantly higher in all preterm groups than in both term and normal pregnancies at the same gestation age. A ferritin level of 37.5 ng/mL, with a sensitivity of 78.7% and specificity of 68.7%, could also indicate preterm delivery. As a result, serum ferritin seems to be a good predictor of preterm birth.	39
28	Serum ferritin level as a marker of preterm labor	The study shed light on the serum ferritin level and role in preterm labour. Ferritin levels were significantly higher in preterm labour patients (p0.001), which gives a productive interrelation between increased ferritin and preterm labor.	40
29	Maternal iron and low birth weight	Researchers discovered that low birth weight has public health implications in this predominantly rural setting and necessitates community intervention. Iron deficiency during pregnancy has been linked to lower birthweight. Babies born to iron-deficient mothers are at risk of having a low birth weight.	41
30	Dietary iron intake, iron status, and gestational diabetes	The relationship between iron intake from food and GDM has been studied in several studies. Accumulating data suggest that dietary iron, particularly heme iron intake during or before pregnancy, is significantly and positively associated with GDM even after controlling for major dietary factors and other major well-documented risk factors for GDM.	42
31	A systematic review and meta-analysis of the correlation between maternal and neonatal iron status and hematologic indices	Maternal iron and hematologic status biomarkers correlate poorly with those in newborns/ neonates. These findings highlight the need for new methods of estimating foetal/neonatal.	43
32	Correlation of Serum Ferritin with Red Cell Indices and Hemoglobin in Indian Women in Second and Third Trimester of Pregnancy	In the study, they discovered that 59.1% of non-anemic pregnant women had iron deficiency; we recommend that iron supplementation be continued in all pregnant women in India, unlike in developed countries where iron supplementation is based on serum ferritin levels.	44
33	Association Between Serum Ferritin Concentration and Risk of Adverse Maternal and Fetal Pregnancy Outcomes: A Retrospective Cohort Study	Elevated SF concentrations between the 16th and 18th weeks of pregnancy were linked to an increased risk of GDM and SGA. Women with higher SF concentrations faced an increased risk of SGA between the 28th and 32nd week of pregnancy. Furthermore, the risk of SGA was reduced when SF concentrations were reduced appropriately at the 28-32nd week of gestation in pregnant women with GDM. As a result, SF concentration is a good predictor of the risk of adverse maternal and fetal pregnancy outcomes and can help pregnant women receive personalized iron supplementation advice at various stages of pregnancy.	45
34	Hypothyroidism and ferritin	For the first time, the study found a link between hypothyroidism and IDA during the first trimester of pregnancy. Further research with larger sample sizes, as well as thyroxine therapy in hypothyroid pregnant women and its impact on IDA, will pave the way for new therapeutic approaches to the management of IDA during pregnancy. Furthermore, serum ferritin measurements during pregnancy may provide useful information in the diagnosis and management of IDA.	46

35	Association between Maternal Plasma Ferritin Level and Infants' Size at Birth: A Prospective Cohort Study in Rural Bangladesh	The research found a negative correlation between ferritin and birth size. The researchers discovered an inverse relationship between higher maternal ferritin levels in late pregnancy and infant birth weight in their study. The findings suggested that elevated plasma ferritin levels during pregnancy could have a negative impact on birth weight.	
36	Reciprocity of high Serum Ferritin Level and Gestational Diabetes	According to the review, elevated serum ferritin in gestational age is coupled with the development of diabetes. And it can be implemented as a diagnostic marker to assess GDM in the first and second trimesters of pregnancy. Inflated iron stores have a positive relationship with GDM by causing oxidative stress.	48
37	Evaluation of serum ferritin and thyroid function in the second trimester of pregnancy	Researchers hypothesize that SF is a risk factor for thyroid dysfunction during pregnancy, although the occurrence of thyroid dysfunction in pregnant women is influenced by a variety of factors with complicated interactions. Thyroid function and SF status should return to normal quickly. Suggestions: Thyroid function and SF should be investigated in different trimesters of pregnancy, particularly in the first and third trimesters. Second, the study should be expanded to include people living in iodine-deficient or iodine-rich areas. More research is needed to ascertain the part of maternal thyroid dysfunction in fetal development in conjunction with iron deficiency.	49
38	Association of Cholecalciferol, Ferritin, and Anemia among Pregnant Women: Result from Cohort Study on Vitamin D Status and Its Impact during Pregnancy and Childhood in Indonesia	The first trimester state of cholecalciferol was found to be unrelated to ferritin in the study. Subjects with vitamin D deficiency in the first trimester were more likely to develop anemia, with the proportion increasing as the pregnancy progressed to the third trimester. Anemia in the first trimester was linked to ferritin levels in the first trimester.	50
39	Maternal Ferritin Levels during Pregnancy and ADHD Symptoms in 4-Year-Old Children: Results from the INMA-Infancia y Medio Ambiente (Environment and Childhood) Prospective Birth Cohort Study	According to the findings of a prospective birth cohort study, maternal ferritin levels during pregnancy are independently associated with ADHD symptoms in 4 to 5-year-old offspring. More specifically, maternal ferritin levels appear to influence inattention symptoms in boys, while girls appear to be more protected. Other maternal factors, such as BMI and education level, are also linked to ADHD and inattention symptoms.	51

40	Estimation of vitamin D3 and ferritin in pregnant women and relationship with hair loss.	In the study, they discovered that the level of Vitamin D3 was significantly lower in women with hair loss, and the ferritin level was low in these women during the first and second trimesters, whereas in the other group with no hair loss, the levels of Vitamin D3, serum ferritin, and other factors such as white blood cell and platelet count were normal.	52
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V. RESEARCH GAP:

Serum ferritin is a well-known acute-phase reactant, with levels that correlate with the severity of acute and chronic inflammation in infectious, rheumatologic, hematologic, and malignant diseases. It is a good indicator of iron stores; however, it is usually elevated in chronic disease anemia. As a result, diagnosing IDA and other pregnancy complications that coexist with ACD is difficult. If these anemias overlap and biochemical markers cannot be used to differentiate them, a bone marrow aspiration smear stained with Prussian blue could demonstrate iron storage. Hcpidin appears to perform at least and recent additions to the repertoire of available iron indices such as sTfR and reticulocyte hemoglobin as a diagnostic test for iron deficiency. However, further analysis is needed to establish a biological marker to diagnose IDA, GDM and other complications during pregnancy and also ferritin threshold should be determined to be used as a marker.

VI. CONCLUSION:

In the review we found that high level of gestational ferritin levels presents a major contribution to the development of GDM. We've also discovered that a high ferritin level during pregnancy can be used as a marker for preeclampsia, preterm birth, and decreased ferritin levels are associated with IDA and low birth weight. We also discovered some negative correlations. As a result, more research is needed to acknowledge the correlation and identify vulnerable populations.

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Analysis Of Project Portfolio Management Maturity Model At Indonesia Construction State-Owned Enterprise

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Abstract- This paper aim to explain what parameters that create a PPM Maturity Model and determine the PPM Maturity Level for BUMN Construction Services companies. It begins with analyzing which PPM parameters affect the PPM Maturity Model, then create maps of the PPM maturity level and finally determines the most influential parameters in the PPM Maturity Level in BUMN Construction Service Companies in Indonesia.

Index Terms- Indonesia Construction State-Owned Enterprises, Competitiveness, Project Portfolio Management, PPM Maturity Model, PPM Maturity Level

I. INTRODUCTION

In The Standard for Portfolio Management – Seventh Edition (Project Management Institute, 2017) it is explained that Portfolio is defined as projects, programs, subsidiary portfolios and operations that are managed as a group to achieve strategic goals. Project Portfolio Management (PPM) is the centralized management of the processes, methods and technologies used by project managers (PMs) and project management offices (PMOs) to analyze and collectively manage current or proposed projects based on key characteristics.

Maturity models generally provide a starting point for organizations to benchmark the current level of quality of portfolio management activities and provide guidance for improvement. There are several best practices for identifying the maturity level of project portfolio management within an organization. The general characteristic of the maturity model is that the model is divided into 5 (five) different levels. An increase in maturity level is described as progress from a lower level to a more advanced level. An organization there is no need to aim at achieving the highest maturity level as soon as possible. On the other hand, the targeted maturity level must be in accordance with the current business needs of the organization, the organization's ability to accept change, and the availability of resources that will build change.

II. PPM MATURITY MODEL LITERATURE

A project portfolio management maturity model is a tool used to assess and measure the progress of an organization's project portfolio management capabilities. The model typically consists of a set of levels or stages, each of which represents a different level of capability. Organizations can use the model to track their own progress, as well as to benchmark their capabilities against those of other organizations.

A project portfolio management maturity level is a measure of the ability of an organization to manage its projects effectively. The maturity level is determined by the organization's ability to identify and prioritize projects, allocate resources, and track and report on project progress.

The Capability Maturity Model (CMM) was developed by the Software Engineering Institute (SEI) in the 1980s and can be applied to a wide variety of organizations in all business settings. CMM was originally created after a study showed that there was a relationship between the quality of software use and the quality of the development process used. This model provides best practice examples for the development and identification of maturity processes within an organization. The model also takes into account an analysis of the current situation, past experiences, shared practices, and a framework for prioritizing future actions and plans that the organization should be able to set targets for and the corrective steps needed to achieve them. Definition for each level of maturity level is described below:

- Level 1: The first level "Initial" offers as a starting point for implementing new processes to a disordered situation. Individual efforts play remarkable role for project success. The success of a single project or program cannot be transferred to becoming projects as there is no definition and documentation for the processes used.
- Level 2: The second "Repeatable" level emphasizes the disciplined repetition of documented processes. The earlier success can be repeated and projects benefit for defined essential processes and basic project management methods.
- Level 3: On third level the organization has gained benefit from the repetition and processes are being defined as a standard processes. CMM refers to standard software

processes, but the model may be applied to business processes as well. Standardization, documentation and integration play the key role on “Defined” level.

- Level 4: On fourth “Managed” level processes are managed, monitored and measured by examining the gathered data.
- Level 5: On the fifth level the organization is improving the processes through monitoring feedback from the processes that are in use. The level is “Optimizing”.

Gartner has developed their own maturity levels that can be applied to any type of business that needs upgrading. Gartner (2014) stated that the model is particularly suitable for program and portfolio management maturity, which is abbreviated as PPM. In the Gartner model, each level has specific dimensions which are the characteristics of business functions at a certain maturity level. Improvements and upgrades to a higher level are cumulative. In the Gartner model, there are 5 (five) core dimensions that are interconnected:

- People
- PPM Practices and Processes
- Value and Financial Management
- Technology and Relationships

Definition for each level of maturity level is described below:

- Level 1: Characteristic for level one in this maturity model is that there are no standards for project or program management that would be in use in an organization. Resource management is limited to critical projects and do not support the resourcing requirements of less critical projects. As the organization has no capability to manage larger projects, they may be outsourced to external vendors. There is no financial management for projects and programs, instead they may be funded out of a departmental budget. Tools for managing projects and programs are modest and not commonly used, the tools are often used by a single person such as project manager (PM) and thus serve no bigger purpose providing valuable information to higher level of organization such as portfolio and executive level. Therefore the organization has no visibility over the entity of projects and programs, and cannot react proactively to changes until they have occurred. That is the reason why the level one has been named “Reactive”. An external factor may awaken the organization for improvement of internal processes and practises. A change in the demand is a positive external factor that can consequently lead the organization to put effort for raising up to a higher maturity level.
- Level 2: Level two in Gartner’s model describes an organization that is driven by repeatable processes, a terminology that has been introduced as Capability Maturity Model Integration (CMMI). On level two, the organization benefits from visibility to single projects, which provides the organization with an ability to make proactive and accurate decisions, however there the benefits do not reach the portfolio level, as there is no oversight into multiple programs or projects and the data may be unreliable for value and financial management purposes. The organization may have taken project and program management tools in

use as well as supportive functions and practices such as workspaces for team working. The internal relationships and interdependencies between the business and IT are not steady as IT does not necessarily have capability to adopt huge amount of processes, but business either may not recognize IT within the organization as a service provider or as a reliable partner. The level two organizations have established some required processes and practices that serve the purpose on operative level, but the organization is not quite capable to manage the entirety and come across with hindrances. Hence level two is “Emerging Discipline”.

- Level 3: Level three maturity refers to “initial integration”, where the organization has started to reach a systematic and balanced way of working among the five core dimensions. On level three the organization is capable for proactive resource allocation that is being managed from portfolio level, where also projects and programs are being approved according to predefined project benefits that are described in the form of a business case. The organization is also focusing on individual performance improvement and career paths are defined as mentioned in figure three. Along with the portfolio management thinking comes the visibility over multiple areas that enhances effective decision making. The organization is able to take into account the effects of changes and plan how the changes should be executed in order to maximize benefits. Also the communication flow and knowledge transfer is improved as the portfolio perception provides organization with an understanding of the selected projects and programs, their expected results and business benefits as well as the chances for the success. However, on level three the organizations do not have the adequate technology and tools to support the intelligent analysis behind the decision making. The lack of tools prevents real time visibility over reliable financial data.
- Level 4: According to the Gartner’s model, on level four organizations change their focus from building portfolio management maturity to capability of business value generation. The organization is mature enough for effective project and program management practices, which consequently are aligned with the corporate strategic execution. On portfolio level portfolio optimization takes place along with risk management, and there is monitoring processes established for value and benefit realization. The people dimension is being affected by the competence development and centres of competency, which enable advanced workload management, on-going capacity planning as well as resource pools to utilize for finding experienced internal candidates. Level four requires internal integration within the organization and has therefore been named as “Effective Integration” that improves the enterprise adaptability and resilience.
- Level 5: The highest level five is “Effective Innovation”. The level emphasizes change management and communications as core competencies. IT is expected to bring strategic and tactical value and is seen as a future market facilitator. The established project, program and PMO practices are in place and fulfilling their expected roles and responsibilities. The technology provides

accessible and up to date data, resources are being managed across the organization to serve project initiatives in the most expedient way. Constant innovation is being encouraged and expected across the organization, as the foundation is now mature but requires continuous innovation that the organization may stay on top of operations and markets. The organization is running both change operations and innovative development initiatives.

Consulting firm Lee Merkhofer explains the five stages of project portfolio management in detail. Each stage shows the reasons behind selecting unsuccessful projects in an organization. This model helps with detecting performance gaps and realistic targets and provides practical suggestions for improvement. Definition for each level of maturity level is described below:

- Level 1: In figure five the level one is described as a foundation, in which the organization has some project type of work and the business benefits of projects have been introduced on a very general level and there is no proper business case analysis if any. The organization has no selection criteria for project decisions, there is no regular portfolio management that would provide real-time data for business strategic purposes, there is no clear definition for roles and responsibilities, risks may be identified but are not being managed and there is lack of project resource coordination which lead to resource over-commitment. The organization is not able to make proactive decisions based on real-time data as the organization does not manage an entire project portfolio, instead projects are being funded, reviewed and managed separately from each other with the exception of shared resources that are competed between the projects. Termination of a project is usually executed for the reason of cost or duration overrun.
- Level 2: Level two describes the basics for project portfolio management maturity. On the second level the organization is able to collect projects into a portfolio according to the ability to accomplish the projects with the available resources. The organization may be able to create business case analyses for larger projects, but there is no clear connection to value creation. Project prioritization is unpretentious, even though the organization can rank projects based on the resource over allocation that is clearly visible at the portfolio level. However besides of the awareness on portfolio level, the resource needs are not being methodically managed. Projects may have overlapping business benefits. On the second level of project portfolio management maturity the project data will be received collectively and the portfolio data is being updated on regular basis, but there is no performance monitoring or forecasting, and planning is mainly focused on scheduling. Program management exists on technical level, when interrelated projects are being managed under a program. Risks are being identified at the early stage but not managed throughout the project. Knowledge sharing is not organization wide.
- Level 3: Level three is the Value Management. Reaching the third level gives an organization a maturity that allows proactive decision making based on reliable and accurate project data. The organization is able to select the right mixture of projects, which create value and return on

investment. Project portfolio is being fully managed with standardized, documented processes, roles and responsibilities. Different tools, metrics and processes are applied on portfolio level such as performance monitoring, forecasting, quality assurance, auditing, risk management and for validating the realization of project benefits to business. The projects under project portfolio are being managed and their dependencies have been recognized. In general, the level three provides an organization with a logical and systematic way of aligning business initiatives into value adding projects.

- Level 4: Level four is the Optimization, which is a level with mature and systematic business processes. Project portfolio is being proactively and analytically managed and profound quantitative analysing methods are supporting decision making. Characteristic for level four is that risks have clear ownership, risks are being monitored, controlled and evaluated against the organization's tolerance for them, aiming at supporting the portfolio optimization. Value management from level three has been brought to an advanced level, as there is a measured and validated model for value estimating. The same model supports several portfolio level decisions such as project prioritization, funding and resource allocation. Stakeholder communication and cooperation is efficient and informative. The senior executives are committed to project portfolio management and they are provided with high-quality and up-to-date reports about progress, costs and risks for enhanced decision making.
- Level 5: Level five is the highest level and called Core Competency, in which an organization obtains the best value for project portfolio management. Besides of the company wide competence in portfolio management, there are processes for continuous improvement develop knowledge and skills. The planning and optimization, funding and resourcing decisions are made in order for obtaining the greatest value for business according to the defined strategic objectives. Processes take place for risk, benefit, stakeholder and resource management, as the importance and impact has been acknowledged on portfolio level. Therefore organization is able for proactive future planning as executive level is aware of the future capacity and resource requirements. The value can be measured and tracked for business initiatives and based on the information, crucial decisions can be made to mitigating risks, identifying business opportunities and ensuring sustainability in business operations.

The Office of Government Commerce (OGC) provides the most usable set of maturity models. PRINCE2 Maturity Model (P2MM) defines a model for the best project management, including the project management activities required to fulfill the project according to the quality, scope, and cost within the agreed timeframe. P2MM acts as a method under the broader Portfolio, Program, Project Management Maturity Model (P3M3), which identifies five progressive levels of maturity model similar to CMM. Definition for each level of maturity level is described below:

- Level 1: The level one “Initial process” ask if the organization is able to identify projects and programs and manage them separately from ongoing business activities.
- Level 2: The second level “Repeatable Process” questions organization’s ability to run processes according to standards that are at least minimally specified.
- Level 3: “Defined Process” is the third level that examines if the organization have controlled processes that allow adjustment to individual project purposes.
- Level 4: Fourth level that is “Managed Process” highlights the quality performance measurability and predictability.
- Level 5: Level five “Optimized Process” underline proactive management of technology and continuous improvement of processes.

Managing portfolio maturity is a critical process for ensuring that organizations develop the right amount of process based on the needs of the organization. Acuity PPM is hyper-focused on this concept of organizational maturity because they have seen many companies fail to adopt and utilize traditional PPM software. Portfolio management maturity models are very useful for assessing the current state of the portfolio processes and how to arrive at a higher level of maturity. Definition for each level of maturity level is described below:

- Level 1: The key word for level 1 is “inconsistency”. No standards exist at this level, many project and portfolio processes do not exist at this level, and what does exist is applied in an ad hoc way. What little processes are in place are carried out in an ad hoc fashion..
- Level 2: At level 2, some standardization of processes exist, although most processes are still immature. Nevertheless, some processes are defined and documented, and the organization is getting some benefit from portfolio management. At this stage, the organization should have visibility of all major projects in a central tool. The primary focus is on getting basic governance standards and processes set up for reviewing project requests. Basic prioritization may begin at this point with rudimentary understanding of resource capacity management.
- Level 3: Level 3 is a significant step for the organization as it regularly and effectively uses portfolio mechanics. Processes are well defined and established in the organization, with process documentation made freely available to the organization. Level 3 signifies the real shift from a single project view to an aggregate portfolio view. In the previous two levels, even though there is visibility of the portfolio as a whole, emphasis was placed on individual projects. By level 3, organizations better understand how projects interact with each other. Governance bodies seek to understand the implications to the portfolio based on specific project decisions, the key question being “what will this do to the portfolio?”
- Level 4: Level 4 marks the advance of the organization in its use of portfolio management. Here governance bodies begin to utilize optimization techniques to drive even greater value to the portfolio with little or no extra cost. Project Management Offices (PMO’s) are advanced as well, enabling the organization to collect higher quality data that can be used for various optimization techniques, such as

resource capacity optimization. The organization feeds the portfolio system regularly with accurate and up-to-date project information. Users of the portfolio system feel very comfortable with the tool and can use many of the advanced features. Prioritization as a project selection tool has been replaced by efficient frontier analysis. Schedule optimization is used to unlock even greater value from the portfolio.

- Level 5: The key difference between level 4 and 5 is that at level 5, there is so much organizational rigor and process discipline that the organization proactively uses optimization techniques, and does so with little or no resistance. Quality data is constantly fed into the portfolio system. Several enterprise systems are integrated with the portfolio system making it a critical system for the performance of the organization. Senior management from across the company rely upon project and portfolio reports for making organizational decisions.

The IPMA Delta Model offers a perspective for project management competencies by applying competency baselines at different organizational levels from project, individual and organizational perspectives. The IPMA Delta Module uses the same five definitions as CMM and P3M3, but refers to them as competency classes, not maturity levels. These competency classes assist with the identification of an organization’s current project management competencies and offer assistance for competency improvement. These classes sequentially from one to five are initiation, determination, standardization, management, and optimization. This class aims to assess the use of project management standards, structures and processes, the scale of which varies from a minimal level of knowledge to active management and continuous improvement. The assessment is based on IPMA Organizational Competence Baseline (IPMA OCB) standards, IPMA Project Excellence Model, and ISO21500, which are best practices, concepts and processes for project management (IPMA 2015). Definition for each level of maturity level is described below:

- Level 1: The achievements of PM are at a personal level. There are individuals who perform well, but performance is coincidental. The organisation has no formal PM standards, structures and processes in place.
- Level 2: There are partially defined PP&PM standards, structures and processes in place which are partially applied in the organisation.
- Level 3: There are fully defined PP&PM standards, structures and processes in place which are mostly applied throughout the organisation.
- Level 4: There are fully defined PP&P standards, structures and processes in place which are fully applied throughout the organisation, which the Management actively controls.
- Level 5: There are fully defined PP&PM standards, structures and processes in place which are fully applied throughout the organisation, which the Management actively controls and continuously develops.

The International Organization for Standardization (ISO) has established ISO9001 which is a standard similar to CMM. The ISO9000 standards are geared towards software development and maintenance practices. ISO 9001 does not provide a larger framework for process improvement. Instead,

this standard defines a minimum level for quality software processes.

Project Institute Finland Ltd. has developed a five-level maturity model for project portfolio management, which is based on the ABC Project Model. According to Matti Haukka, there is usually a governance model for investment projects but not for development projects that use personal resources (Haukka, 2013). He stated that the use of personal resources in project work creates a challenge for an organization that can only be controlled by adequately tested project portfolio management. To get the benefits of the tested PPM, there are prerequisites that must be met. Definition for each level of maturity level is described below:

- Level 1: On the first maturity level the organization is able to collect all on-going projects in a database. The database forms a portfolio of projects. To reach the maturity level, an organization should have project complexity classification methodology in use, definition which type of work is considered as a project and managed under PPM, clear ownership with role and responsibility definition for all projects and harmonized project management model used for project work. Project ownership is the main prerequisite on level one as it guarantees that there is at least one person held responsible for basic project information and awareness of decision-making.
- Level 2: Regular reporting practises define the level two. Project Management Office (PMO) plays the role of

maintaining and developing harmonized project management model that give the instructions for reporting practises. The reporting should serve the purpose on portfolio management by providing accurate data that supports decision making when weighting the balance of portfolio and its alignment with strategic objectives.

- Level 3: The continuous resource allocation updating and awareness of the current allocation rate is the key element on level three. Project institute Finland considers that the responsibility of resource allocation is on competent project managers. echnology is mentioned as an enabler, which should bring efficiency in resource management.
- Level 4: On level four it is suggested that PPM Board can select and prioritize the right projects according to the resources available. PMO is an administrative function that provides data for PPM Board. Project owners create the business cases and hand them out to PMO, which delivers them further to decision making level.
- Level 5: On level five the entire organization has been changed to function according to project and program orientation. Management practices focus on project ownership and management activities that ensure that the business benefits will be realized.

III. INVESTIGATING OF PPM MATURITY MODEL FOR INDONESIA CONSTRUCTION STATE-OWNED ENTERPRISES

After looking at the definition of each level in the PPM maturity model, we will divide them into 5 key process areas (KPA), namely:

- Project Management
- Program Management
- Portfolio Management
- Knowledge management
- Bussiness and Organization

We can find the parameters that build the project portfolio management maturity model and we will put them into KPA. These parameters can be summed up as follows:

Key Process Area (KPA)	PPM Maturity Level Parameter
project management	personal skill
	project process
	project standards
	resource management
	change management
	risks management
	communication management
	project manager
program management	project decisions
	project interdependencies
	program standard

	program process
	business case analysis
	benefit management
	funding and resource management
	business initiatives
	competence development
	executives commitment
	value management
	Schedule optimization
	management control
portfolio management	portfolio standards
	portfolio structures
	portfolio processes
	project selecting
	project prioritization
	optimization techniques
knowledge management	knowledge transfer
	knowledge management
	knowledge improvement
Bussiness and Organization	Enterprise capability
	organization's standards
	corporate strategic
	technology

	data monitoring
	Enterprise adaptability and resilience
	innovative development
	sustainability in business operations
	internal integration
	financial management

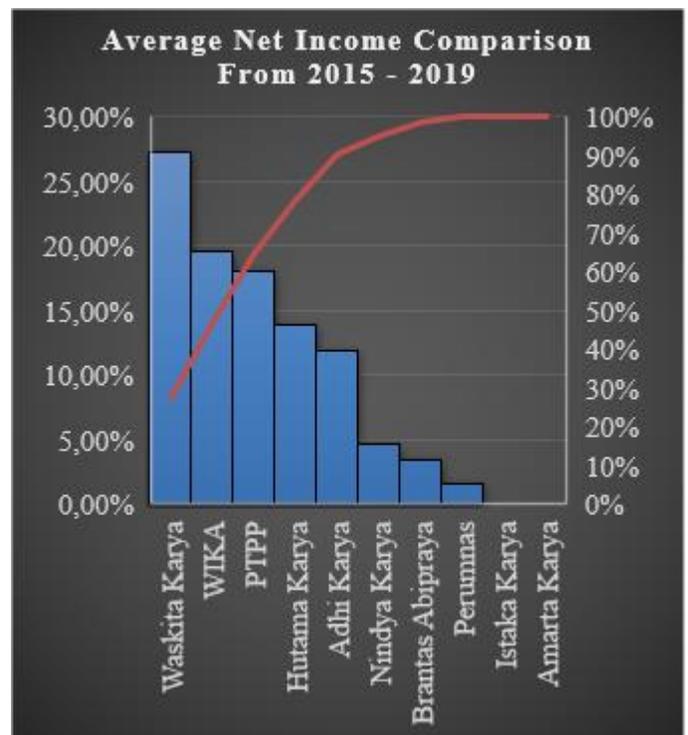
The target for this research is Indonesia Construction State-Owned Enterprise. Quoted from the official website of the Ministry of State-Owned Enterprises, there are 10 Construction Service State-Owned Enterprises, namely:

1. Perum Pembangunan Perumahan Nasional / Perumnas
2. PT Adhi Karya (Persero) Tbk / Adhi Karya
3. PT Amarta Karya (Persero) / Amarta Karya
4. PT Brantas Abipraya (Persero) / Brantas Abhipraya
5. PT Hutama Karya (Persero) / Hutama Karya
6. PT Istaka Karya (Persero) / Istaka Karya
7. PT Nindya Karya (Persero) / Nindya Karya
8. PT Pembangunan Perumahan (Persero) Tbk / PTPP
9. PT Waskita Karya (Persero) Tbk / Waskita Karya
10. PT Wijaya Karya (Persero) Tbk / WIKA

To find out which company is dominant, a comparison of the net income earned by the company is carried out. The following results are obtained:

No	State-Owned Enterprise	Average Net Income Comparison From 2015 - 2019
1	Waskita Karya	27,19%
2	WIKA	19,55%
3	PTPP	17,95%
4	Hutama Karya	13,81%
5	Adhi Karya	11,88%
6	Nindya Karya	4,68%
7	Brantas Abipraya	3,42%
8	Perumnas	1,51%
9	Istaka Karya	0,00%
10	Amarta Karya	0,00%

After getting the above results, a pareto analysis was carried out with the help of a chart. Pareto analysis is used to identify what contribution the individual components of a system make to the whole system. Companies that are the target of research are only companies that are in the "top 80% net". From that result, we can summarize that Waskita Karya, WIKA, PTPP, Hutama Karya and Adhi Karya will involved to this research.



IV. CONCLUSION

Project portfolio management (PPM) is the centralized management of the processes, methods, and technologies used by project managers and project management offices (PMOs) to analyze and collectively manage current or proposed projects based on numerous key characteristics. It is a method of organizing, controlling and prioritizing all the projects within an organization to ensure that they are aligned with the organizational strategy and to ensure that resources are used efficiently and effectively. PPM is used to help organizations identify, select, prioritize, manage, and report on projects, programs, and portfolios.

A project portfolio management maturity model is a tool used to assess and measure the progress of an organization's project portfolio management capabilities. A project portfolio management maturity level is a measure of the ability of an organization to manage its projects effectively.

This research aim to explain what parameters that create a PPM Maturity Model and determine the PPM Maturity Level for Owned-State Construction Services companies. Research will involved 5 Construction Service State-Owned Enterprises.

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Impact associated with the lack of sewerage and treatment systems, a source of emerging contaminants in urban water resources. A review case study of Kigali city Rwanda.

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Abstract- According to the census report of household living conditions of March 2016, showed that 81.6% of the improved sanitation in Rwanda, uses pit latrines with solid slabs, as a result of the absence of a sewerage system/network in the country. Topography at high altitudes has caused significant surface and groundwater contamination in various areas, including Kigali, the capital city. Additionally, the high standard of living in the region and the lack of government funding to develop different projects for centralized sanitation have contributed to the complexity of wastewater management. A count of 1.3 million people in Kigali city has neither centralized sewage treatment nor central sewage networks. Due to untreated sewage being disposed inappropriately into the environment, they may have potential negative impacts on surface and groundwater resources. The problem of water pollution is getting worse as anthropogenic contaminants enter the water cycle. Emerging organic contaminants (EOCs) are of particular concern. For example, pharmaceutical and personal care products are not regulated under current environmental laws. Therefore, they may cause ecological or human health impacts. The paper reviewed the major sources of water pollution in densely populated areas of Rwanda specifically in capital Kigali; impacts that may be associated with the lack of urban centralized sewerage systems and inadequate operation of available decentralized technologies to human life and ecosystem as well as by providing snapshot information about awareness of the emerging organic water contaminants. Moreover, some of the best management practices in protecting Rwanda's water resources were also recommended.

Index Terms- Sewerage system, Sanitation, Water pollution, Emerging contaminants, Rwanda

I. INTRODUCTION

Water pollution has become a serious environmental problem as well as an increasing worldwide concern. Wastewater

effluents are major contributors to a variety of water pollution problems. Sewage is one of the main causes of several water pollution problems. Most cities in developing countries produce an average of 30 to 70 cubic millimeters of wastewater per person per year [1]. Due to the lack of wastewater treatment plants or inadequate treatment, wastewater is often discharged into surface water sources that are subject to domestic and industrial waste, causing pollution [1].

A 2015 report by the United Nations Economic and Social Commission for Asia and the Pacific states that 80-90% of the wastewater generated in developing countries is discharged directly into water bodies [2]. The UN World Water Development Report 2017 found that 62% of urban dwellers in sub-Saharan Africa discharge wastewater directly into bodies of water due to a lack of sanitation infrastructure [3].

The urban areas of Rwanda are the first to experience this problem. For example, the current wastewater situation in Kigali poses a direct threat to the environment and public health. This problem mainly concerns the Rugezi River in the east and Ruzizi River in the north. These rivers are a tributary of the Nyabugogo River, which flows east into the Nyabarongo River. The river's biological oxygen demand (BOD5) ranges from 10 to 20 mg/L in the wet season and 25 to 35 mg/L in the dry season. [4].

Unlike other cities in East Africa, which have sewer networks and sewage treatment facilities that cover a small part of the population, Kigali has no centralized sewage treatment facilities or sewage networks. As a result, large amounts of wastewater generated in the city can either be discharged untreated into wetlands around the city or infiltrate into groundwater and contaminate both freshwater resources and soil [5]. Current way of handling wastewater in Kigali relies on the use septic tanks and soak-away, or in some cases leads to open waterways. Currently, septic tanks are emptied by tankers that dump fecal sludge into

ponds intended to bury the city's central solid waste, but the wastewater from these ponds seeps into the ground [4].

Decentralized wastewater treatment systems are considered a good alternative in rural areas. However, local governments should monitor and offer guidelines [6, 7]. The decentralized wastewater treatment systems are in two main categories: on-site and off-site sanitation systems. On-site decentralized sanitation systems include wastewater management systems at the level of the individual or collective communities while off-site decentralized sanitation systems include treatment of fecal sludge collected from individual families before their treatment and disposal into the environment [8].

The majority of Rwandans rely on affordable local sanitation systems, of which 65% have visibly improved sanitation facilities by international standards for the Millennium Development Goals [9]. Flush toilets are rare in Rwanda as a country. This means that water is used primarily for washing and cooking and then drained to the surface, while feces are drained or publicly disposed of in waterless toilets [9]. Moreover, [10] also studied the environmental impact of the local sewage system in the city of Kigali and found that soak pits are commonly used in slums settlement and planned housing as a system of wastewater disposal at 73.5% and 63.2%, respectively. The sewage treatment rate for slums and planned dwellings was 22.1% and 36.8%, respectively. These soak pits can slowly infiltrate the soil layer with effluents, causing some buildings to collapse and increasing groundwater pollution.

The absence of a sewer network and centralized wastewater treatment systems has made the Kigali population dependent on septic tanks and pit latrines for their facilities, with 95% using on-site sanitation systems, of which 80% are pit latrines[11]. However, this exacerbated sewage problems and poor sanitation in septic tanks, and improved pit latrines. This is because only 2% of Kigali households empty sludge from their pit latrines[12]. The emptied sludge is then disposed of in pits at a site (Nduba site located in Kigali city). Because the latter does not fulfill the requirement of a sanitary site, the disposed of sewage is now like a small sewage lake (pond) [13].

Due to rapid population growth, urbanization, increasing demand for industrial development, and limited financial resources to provide reliable wastewater infrastructure to cater to the increasing quantity of wastewater generated from different sources (households, industries, hospitals, businesses, among others), there is a perception that Rwanda is still having a low advancement concerning wastewater management and water pollution control infrastructure. As a result, the so-called emerging organic contaminants might be already in our surface and groundwater and unexpectedly inducing their effect on human life and the aquatic environment.

Therefore, the paper aims to review the impact that is associated with the absence of sewerage systems/networks and their centralized sewage treatment systems; inadequate operation of available decentralized sewage treatment systems; poor disposal of solid and liquid (sewage mixed with other harmful processed chemicals from septic tank or toilets) waste on an aquatic environment (surface water& groundwater), and human life. Our main focus is the current situation in Rwanda's urban area, especially Kigali city. The paper will also provide insights and a good perception to policymakers of what should proactively

be done in the countryside's fast-growing satellite cities of Kigali to protect Rwanda's water resources for a safer aquatic ecosystem and human life. Additionally, the case study is a reflection of other East African country's cities where the paper provides a big picture of what could be done to protect water resources in the fast developing cities in the region.

II. WATER RESOURCES IN RWANDA

Rwanda is located in the Great Lakes region of Africa. The total area of Rwanda is 26,338 square kilometers. Its topography increases gradually from east to north with an average height of 1250 m. It culminates in a mountain range called Congo-Nile Divide in the west region, which ranges from 2200 m to 3000 m. Rwanda has a dense network of waterways, with approximately 1881.90 square kilometers of lakes; rivers occupied by 72.6 square kilometers and 770 square kilometers of wetlands [14]. Furthermore, there are approximately 22,300 springs [15]. The country is divided into two main basins: The Congo River Basin in the west and the Congo-Nile Divide (which covers 33% of the country territory and receives 10% of the total national waters). The Nile River Basin in the east covering 67% of the territory receive 90% of national waters [16].

III. MAIN WATER POLLUTION SOURCES IN RWANDA

Water quality is affected by anthropogenic source pollutants, including domestic and industrial activities, agriculture, and climate change which create severe storms and alter precipitation patterns, which in turn affect the quality of runoff. [17-19]. In Rwanda, high population density, industrialization and urbanization, poor waste management, heavy rains, and high altitudes are among the main sources of water pollution [14, 20]. This pollution goes hand in hand with travel costs to and back from piped water in rural areas, which cause people to use unsafe water. There are also poor sewage systems and the common use of public latrines and septic tanks in both rural and urban areas.

3.1. Population growth

According to the United Nations, (U N) report showed that in the next 15 years, the world population will increase by over 1.1 billion, and more than 6.3 billion people around the world will increase by 2050 in urban centers [21-23]. In urban settlements, there is a high and rapid expansion of a large number of the population moving from rural to urban areas, as a result of obtaining basic infrastructure and improving their living conditions [24]. The reports of the United Nations [25] and the National Institute of Statistics of Rwanda [26] revealed that both Rwandan rural and urban dwellers increased rapidly. The current population of Rwanda is about 13.5 million with population densities of 512.5 per kilometers. This number is predicted to be about 25 to 28 million [14] in 2050 and 2095 respectively. Noting that population growth is associated with daily water demands such as bathing, cooking, and other social and economic development activities that require the use of water such as agriculture, industry, public utilities among others.

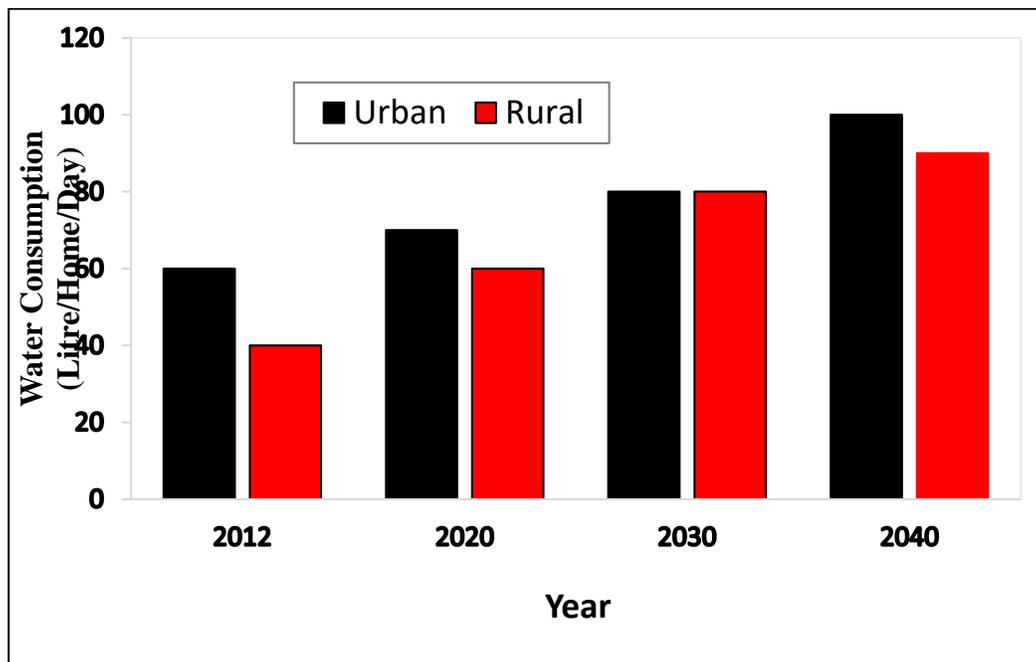


Figure. 1. Water demand per settlements in Rwanda between 2012 and 2040 (liter/home/day) [27]

3.2 Urbanization and industrialization

A United Nations report [28] showed that the world's urban population will increase from 746 million in 1950 to 3.9 billion in 2014 and exceed 6 billion in 2045. The majority of this planned urbanization will mainly be observed in developing countries especially African countries. Therefore, the urban population's demand for water and the sources of water expected to be used in the future remains unknown [29].

Most of Africa's big cities are crowded because of the charm of the city. Poor management of urban development leads to poor management of solid and liquid waste from cities [13]. This causes many related sanitation problems. In these cities, sanitation is usually dominated by self-purification works (for example disinfection of drinking water). They often move sewage that flows through the streets of residential areas and emits a strong unpleasant odor [30].

The total population of Kigali, the capital of Rwanda, gradually increased from 357 in 1907 to 236,000 in 1991, reaching 1,000,000 in 2010 and was predicted to be 1,132 million in 2020 [26]. However, it impacts municipal waste management due to informal settlements, urban expansion of the city, and industrialization. This also resulted in water quality degradation and pollution [31].

Nearly 22% of the world's water is used by industries as well as their improper wastewater management impact the water quality [32-34]. This lack of proper determination of water sources that could be used due to the growing industrialization era and improper wastes management affects its quantity and quality management. The industries in Rwanda have been dislocated to wetlands areas or near the watershed and this has adversely led to wetland and biodiversity degradation. Although the government has taken the initiative of re-allocating these industries in a well-equipped and environmentally friendly place (Rwanda Special

Economic Zone), it hasn't completed yet to reduce the continuous health hazard of the aquatic ecosystem. [35, 36].

3.3 Solid and liquid wastes generation

The city of Kigali is dominated by slums built in previous years before the completion of the Kigali City Master Plan in 2006. Kigali has an estimated daily solid waste production of over 400 tons mainly dominated by food wastes [13]. In addition, homes produce 3,240 m³ of wastewater per day, 50% of which is released into the environment without treatment [37]. When the septic tanks or pit latrines are full, they are discharged and the sewage is only treated by the crude dumpsite site, which comes in contact with an open environment without further treatment [38]. Not all dwellers can empty their pit latrines. However, the little quantity of sludge that is emptied by some dwellers is not environmentally friendly disposed of at the Nduba site. In addition, instead of sludge disposal, the site also receives solid wastes. Nduba dumpsite daily receives 400 tonnes of solid waste. Because the site is unsanitary, the sewage sludge from pit latrines and solid wastes is not handled efficiently. Therefore, the site bears environmental problems. For example, the displacement of the neighborhood population due to the bad smell from dumpsite [13].

3.4. Food demand and topography (steep-slope)

In Rwanda, agriculture employs about 80% of the total population. It suffered a decline due to the 1994 genocide and caused several socioeconomic failures [36]. However, as the United Nations International Children's Emergency Fund (UNICEF) reports demonstrated in 2015 after the 1994 genocide, high food demand-imposed cropland expansion from 13,150 to 18,425 km² in 1990 and 2013, respectively. The crop expansion was about growing crops in suitable and productive areas (Crop Intensification Program (CIP) with selected seeds and fertilizers,

which increased from 6,537 tons in 2000 to 44,264 tons in 2012 [27].

However, despite these advances in agriculture, this practice is known to pollute the watershed [27, 39, 40]. As the majority of Rwandans survive by Agriculture, farmers own small plots of cultivated land for local consumption, mostly near or inland watersheds. In addition, agricultural land is also found on steep soils that are easily subject to erosion, floods, and landslides, which is a major soil and water quality problem in Rwanda [41-43]. Furthermore, the over-exploitations of marshland, large quantities of agrochemicals, and the lack of a better approach to farmers on the suitable and timely use of fertilizers are the major watershed degradation and pollution drivers [44, 45]. As a result, it refers to water quality management on the increase in food demand, therefore it is necessary to consider agriculture-environmentally best practices for the management of Rwanda water quality. Also, as reported by [28], periodic changes in personal agriculture land area are predicted to mean that only 0.10 hectares will be used by a single person by 2050. It showed that the lack of arable land will increase the demand for food as well as deplete water resources.

3.5. Climate change

The effect of climate change on water quality is attributed to air temperature change and hydrology [46, 47]. From 1970, climate change kept rising the air temperature by 1.4°C and the prediction showed that the air temperature will increase by 2.5°C with more impacts on the water resource. Currently, climate change is known to severely impact Rwanda's water resources in different ways. For example, heavy rainfall patterns that cause flooding, landslides, and periodic droughts, all discharge pollutants into water resources. Rwanda's water quality is being mostly influenced by both natural and man-made degrading and polluting forces. According to the findings from the past reports about physicochemical water quality parameters, showed the low pH level of 5.9 in the Nyabugogo river compared to the standard of the World Health Organization and European (pH 6.0-8.0) [48-52]. Moreover, the total suspended solids of the Rweru-Mugesera wetland, Congo, and Nile basins (Rwandan side), 67.91, 920.90, and 162.86 mg/L, respectively, were above the standards (<30 mg/L). Whilst, the estimated concentration of Iron, Manganese, and Lead were higher in the Lake Muhazi, Cyohoha, Akagera Transboundary, and Nyabugogo rivers compared to the WHO water quality standards [40, 53].

IV. DRINKING WATER TREATMENT IN RWANDA

To ensure pre-treatment of water and improve access to clean drinking water, more than 16 drinking water treatment plants are running across the country. These initiatives increased public access to safe drinking water from 23% in 1990 to 82% in 2016 [54]. Access to water supply in Rwanda is still inadequate. More than 38% of the population of Rwanda uses natural water sources, including springs and boreholes. In Africa, as in Rwanda, there are two main drinking water supply systems; Centralization and decentralization [55]. In centralized systems, raw water is collected, treated, and distributed by a network of pipes. In general, conventional water treatment techniques are widely used to combine treatment processes such as coagulation,

sedimentation, filtration, and disinfection to provide clean and safe drinking water to the public [56]. For decentralized systems, this could be a borehole where groundwater is abstracted or fetched directly from the wells/springs. However, the information on the water quality of these springs is currently unknown.

V. WASTEWATER IN RWANDA

Most developing cities do not have good wastewater management due to aging, missing or insufficient, and inadequately operated infrastructure. According to the 4th World Water Development Report, only 20% of wastewater produced worldwide is adequately treated [57]. Global sewage treatment is failing and as a result, most sewage and fecal sludge are discharged into the environment untreated, spreading disease and polluting ecosystems [58]. Rwanda faces challenges related to land use, water scarcity, sludge management, and climate change [58-60]. Despite the achievement of the Millennium Development Goals related to improving sanitation by the government of Rwanda, it is easy to see that Rwanda, as a country, has unsafe and inadequate operated decentralized wastewater treatment systems for wastewater and fecal sludge before discharge into the environment [61].

VI. CENTRALIZED AND DECENTRALIZED WASTEWATER TREATMENT SYSTEMS IN RWANDA

5.1. Centralized sewage treatment systems (off-site)

Except for a few developed sewerage systems constructed or installed by estate developers (cluster of houses) for small communities of high-income household levels in Kigali city, there are no installed sewerage systems in Rwanda's densely populated urban areas, including Kigali. Furthermore, some semi-centralized sewerage systems have been developed by business owners in public areas such as hospitals, hotels, and governmental institutions by government regulations [11]. There are plans to construct a sewage treatment plant, but funding remains a significant challenge. The government lacks financial resources and, as a result, cannot afford a centralized sanitation system due to the high cost of associated physical infrastructures such as a network of pipes, treatment plants, and maintenance [62]. Although it is well known that well-managed systems for piped water, sanitation, drainage, and garbage removal would improve city residents' health, introducing and maintaining centralized treatment systems in developing cities has been hampered by political and economic situations in various regions of the African continent [13].

5.2. Decentralized (on-site)

Decentralized Wastewater Treatment Systems (DWWTSS) are on-site wastewater treatment systems that treat small volumes of wastewater generated by individual homes, clusters of dwellings, or businesses [63]. Because of the low required costs and expertise, DWWTSS is an excellent choice for sanitation in developing countries, particularly in small communities [7, 58]. As aforementioned, there are currently no central sewerage systems in Rwanda's urban areas, including the capital city of Kigali. Kigali continues to rely on a few decentralized wastewater

treatment systems. In Kigali, semi-centralized wastewater treatment plants (SCWWTPs) or semi-centralized sewerage systems (SCSSs) are examples of such decentralized wastewater treatment systems. SCSSs transport sewage from households to wastewater treatment plants units (WWTUs). SCSSs are common in some of Kigali's high-income estates, as well as in other institutions. Hotels, hospitals, and large commercial buildings, for example, are required to install private semi-centralized sewerage systems (SCSSs) to treat their wastewater before it is discharged into the environment.

Recently, approximately 18 estates have semi-centralized sewerage treatment plants that connect approximately 150 households. However, due to insufficient government oversight, the standards for their discharged treated wastewater do not meet national standards [11]. SCSSs are more advantageous in densely populated small community areas. However, the findings of a study conducted by [61] revealed that the levels of sustainability for the evaluated systems were low in the technical, socioeconomic, institutional, and legal dimensions. The dimensions associated with community involvement and institutional framework were the ones that reduced SCSS and STP efficiency. As a result, the case study's decentralized wastewater treatment demonstrated significant performance failures in terms of effluent quality requirements.

Pit latrines in informal settlements are frequently overlooked and rarely emptied; the pits are not typically lined with bricks and can collapse after a period of use [63]. Besides that, few suction trucks are available to empty soakage pits and septic tanks, and many sites are inaccessible due to the narrow, steep roads that lead to the latrines. Even when it is possible to empty liquid from pits, sludge is not always disposed of properly. As a result, there is still a significant lack of required knowledge on decentralized wastewater treatment systems, as well as a critical need for good implementation strategies based on wastewater management policy initiatives that can ensure the long-term viability of wastewater treatment systems [62].

VII. COMPARISON BETWEEN CENTRALIZED AND DECENTRALIZED TREATMENT SYSTEMS

When compared to decentralized systems, centralized wastewater treatment systems are more expensive. [64] stated that sewage collection systems typically account for 60–70% of total project costs for a conventional centralized system, implying that decentralized systems are more cost-effective. According to a study conducted by the United Nations for South-East Asia, the decentralized system is more cost-effective than the centralized system because treatment facilities for decentralized treatment facilities can be built incrementally and require less initial capital investment than centralized treatment, which requires millions of dollars [2].

Table 1. Comparison between centralized and decentralized systems

[1] Parameter	[2] Centralized system	[3] Decentralized system
[4] Collecting system	[5] Large diameters, long distances	[6] Small diameters, short distances
[7] Requirements space	[8] Large area in one place	[9] Small areas in places
[10] Operation and maintenance	[11] Full-time technical staff requirements	[12] Less demanding, can be monitored remotely
[13] Uniformity of water	[14] Many types of water	[15] More uniform water
[16] Dilution grade	[17] Less control over the storm water, more dilution	[18] More control over the storm water, more concentrate
[19] Risk	[20] Risk on a larger scale	[21] Risk distributed
[22] Water transfer	[23] Increase the need for water transfer	[24] Water is used and reused in the same area
[25] Social control	[26] Social control is lost	[27] More social control
[28] Ease of expansion	[29] High costs, more complexity to the implementation	[30] Low cost, less complexity to the implementation
[31] Potential to reuse	[32] All water is concentrated in one point	[33] Water can be reused locally

Source [65]

VIII. IMPACTS THAT MIGHT BE LINKED WITH THE LACK OF CENTRALIZED AND INADEQUATE OPERATION OF DECENTRALIZED SYSTEMS FOR WASTEWATER TREATMENT AND MANAGEMENT IN RWANDA.

Inadequate sludge management and disposal practices caused by a lack of a clear fecal sludge management (FSM) system have been identified as a problem in densely populated areas, as they generate resilient environmental pollution and associated health risks [66]. In developing countries, urban wastewater management systems are increasingly failing due to a lack of scientific knowledge in both technology selection and the design of the most appropriate and sustainable wastewater treatment plants, particularly for semi-centralized wastewater treatment systems. Furthermore, the lack of sanitation infrastructure in rapidly growing cities and emerging urban and peri-urban areas has significantly increased water source contamination [62]. As a result, our surface and groundwater may be exposed to microorganisms (e.g., bacteria, viruses) that can cause diseases, as

well as emerging contaminants (e.g., pharmaceuticals and personal care products (PPCPs), etc...) that can have serious consequences for aquatic ecosystems and human life.

7.1 Surface water pollution in Rwanda

More than 2 billion people worldwide drink feces-contaminated water, facilitating the spread of diseases such as diarrhea, cholera, dysentery, typhus, and polio [67].

Even though the Rwandan government's strong efforts to improve access to clean water, sanitation, and hygiene [68], surface water in Rwanda is still severely polluted by anthropogenic sources such as agricultural fertilizers and pesticides use (MINIRENA, 2011). Moreover, dwellings and farms in Rwanda are frequently located along valley slopes where water run-off flushes manure, human excretions, and wastewater into rivers and streams, resulting in increased levels of dissolved nitrogen. These agricultural and domestic activities pollute surface water, causing eutrophication and serious public health problems in various regions of Rwanda [40].

Furthermore, some wastewater is discharged directly into open waterways without treatment, eventually ending up in streams and rivers. For example, in Kigali, rivers such as the Ruganwa, Rwanzekuma, Yanze, and Mpazi, as well as all tributaries of the Nyabugogo river, are currently receiving improperly disposed sewerage [4].

According to World Health Organization (WHO) drinking water quality standards a recent study on drinking water quality that analyzed heavy metals pollution in the Eastern province revealed that drinking water is primarily polluted during the rainy season. This exposes consumers to several risks because some parameters, such as iron (0.35 mg/L) and manganese (0.25 mg/L) have been detected in Nyagatare, Eastern Province of Rwanda. Their concentrations were found higher than WHO-recommended standards for drinking water quality. WHO recommended that the concentration of iron and Manganese should not exceed 0.30 and 0.10 mg/L respectively [27]. As a result, consumers may develop cancer, liver disease, heart disease, or pancreatitis. This is consistent with the findings of [40] who found that drinking water sources are more polluted during the rainy season than during the dry season when sediments and other wastes easily accumulate in bodies of water.

These water pollution phenomena have a variety of effects on the quantity and quality of water, such as reducing river flows and lake levels, drying up some water sources, and undermining water biodiversity. As a result, despite its abundance, this expresses the problem of water quality in Rwanda and calls for appropriate adaptation measures.

7.2 Groundwater pollution in Rwanda

According to the thematic report utilities and amenities approved in March 2012, EICV4, there were 13.5 percent pit latrines without solid slab (unimproved sanitation), 3.1 percent with no toilet facility, and 83.4 percent of the improved sanitation (flush toilet and pit latrines with solid slab). Among the 83.4 percent of the improved sanitation in Rwanda, only 1.8 used flush toilet and 81.6 percent used pit latrines with solid slab due to the country's lack of sewage system/network [69].

Therefore, the high dependence on use of pit latrines raise concerns about groundwater pollution. Full pits is the potential

for groundwater pollution under or near pit latrines, particularly in areas with high water tables [70], as is the case in the majority of Kigali's informal settlements. This is a serious issue because it has an impact on the quality of drinking water. Botswana, for example, experienced high groundwater pollution as a result of its high water table, which could be linked to the widespread use of pit latrines as a sanitation option [70-72].

7.3 Human life and Aquatic ecosystem

Human life and aquatic ecosystems are expected to be jeopardized due to pollution of surface and groundwater from direct wastewater discharges, improper management of solid wastes and fecal sludge (unimproved sanitation, poor pit emptying services, and disposal) as afore-mentioned.

Pit latrines with slabs represent improved sanitation in its most basic form; however, once the pit is full, it no longer provides this service, and the pit must either be covered over and a new latrine built, or the existing pit emptied [20, 21]. Nevertheless, unlike other developing cities such as Kampala (Uganda), Nairobi (Kenya), and Dar-es-Salaam (Tanzania), Kigali lacks a clear strategy for pit latrine emptying with only 2% of households emptying sludge from their pits [5, 12]. As a result, there is a risk that the latrine will overflow, contaminating the environment with large amounts of excreta containing harmful pathogens and causing offensive odors [73]. Neglecting pit emptying or using low-quality emptying services, on the other hand, could have serious health and environmental consequences. Flies and insects are serious issues because they are reported to be responsible for the propagation of fecal-oral diseases such as diarrhea or intestinal worms [74, 75]. The quantitative results of the survey indicated low percentages for insect nuisance (32.4 percent) [74, 75].

Children are especially vulnerable because they are accustomed to playing in stagnant wastewater. Poor quality pit emptying services, for example, in Freetown, Sierra Leone, have contributed to diarrhoeal disease, cholera outbreaks, and high infant mortality, particularly in informal settlements and poor unplanned areas [76, 77]. As a result, controlling odors, flies, and mosquitoes are a top priority for reducing household and environmental health hazards.

IX. OVERVIEW OF EMERGING ORGANIC CONTAMINANTS IN THE CONTEXT OF THE AQUATIC ENVIRONMENT

Pharmaceuticals and personal care products and other contaminants such as endocrine-disrupting chemicals among others are commonly found in surface and groundwater primarily from the main sources for example; urban wastewater, industrial effluents, and agricultural runoff. The situation is especially critical in developing countries, where large amounts of insufficiently treated or untreated municipal wastewater and industrial effluent are discharged into surface waters and coastal zones daily. This is in conformity to the fact that the pharmaceutical concentrations in surface water bodies of developing countries are higher than those in developed countries [78]. Due to the lack of centralized or well adequate decentralized wastewater treatment technologies, the Rwanda water resource might be experiencing emerging water contaminants either from households or industrial effluents that are directly poured into rivers and streams. Figure (2) shown below typically provides a

good understanding of how these emerging contaminants could be reaching the aquatic environment (surface and groundwater) even in drinking water. However, their occurrence, detection, and removal haven't been taken yet into account in Rwanda's surface water quality parameters and even in waterworks. This is because most emerging contaminants (e.g. Pharmaceuticals and personal care products etc..) are not regulated by wastewater discharge standards. Therefore, their monitoring data and information on their presence in water resources and wastewater are very scarce. Moreover, even in some of the developed countries that use centralized WWTPs with other advanced technologies, these kinds of contaminants are still being detected in their wastewater effluents which in turn reach streams, rivers and are finally detected in their drinking water [79-81]. This is due to that most WWTPs might not be designed to remove this kind of pollutants. According to the study [82], it is now established that Emerging Organic Contaminants (EOCs) enter the environment from a wide range of sources and pathways, including WWTPs that are not equipped to remove them (effluents from municipal treatment plants), septic tanks, hospital effluents, livestock activities (e.g., waste lagoons and manure application to soil), and subsurface storage of household and industrial waste among others. As a result, current technologies are ineffective, particularly against novel contaminants [81, 82]. For example, the elimination of selected pharmaceuticals (clofibric acid, diclofenac, carbamazepine, bezafibrate) during drinking water treatment processes was investigated at lab and pilot scale and in real waterworks in Germany [83]. The results showed that sand filtration under aerobic and anoxic conditions, as well as flocculation with iron(III)chloride, did not eliminate the target pharmaceuticals significantly.

Following the findings of [84], the presence of a wide range of pharmaceutical and personal care products (PPCPs) in water

and wastewater has been widely reported [85]. PPCPs account for an increasing proportion of the trace organic micropollutants found in urban and domestic wastewaters that reach sewage treatment plants (STP), whether metabolized or not [86]. Many of these substances evade conventional activated sludge wastewater treatment plants, allowing them to enter surface water streams and spread throughout the environment [87]. Acidic pharmaceuticals, surfactant degradation, and acidic pesticides are among the various compounds considered emerging organic contaminants, both because of their ubiquity in the aquatic environment and potential impacts.

The presence of low levels of PPCPs has been linked to chronic toxicity, endocrine disruption, and pathogen resistance development. Because aquatic organisms are subjected to multigenerational exposure, the consequences are especially concerning [88]. The need for treatment technologies capable of producing safely treated effluents prompted proposals to upgrade STP and implement new competing technologies for biological degradation of organic matter, such as membrane bioreactors [89]. Although advanced technologies such as membrane filtration, ultrafiltration, nanofiltration, and reverse osmosis can remove some endocrine-disrupting chemicals and pharmaceutically active compounds, they can only do so partially. Even if these technologies exist, their use is limited due to high costs that many developing countries cannot afford. As a result, humans and ecosystems may be continuously exposed to these new and emerging pollutants through drinking water and agricultural products, as wastewater is widely used to irrigate crops in water-stressed areas, primarily in Sub-Saharan Africa, including Rwanda.

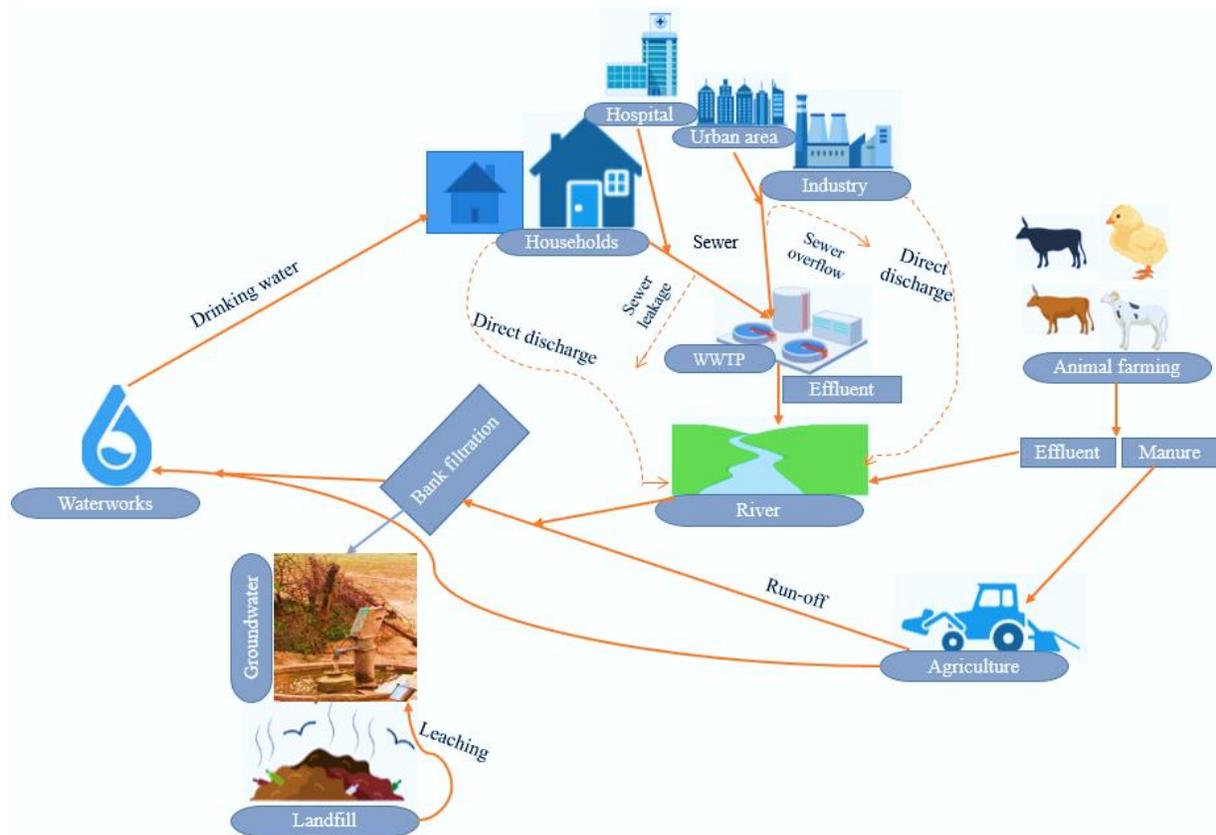


Figure.2. Transport and fate of emerging organic contaminants in the aquatic environment

X. CONCLUSION

Water quality and scarcity are widespread issues, and long-term management is proving difficult. Rwanda as a country has ambitious targets with good strategies to sustain improved access to both household and collective sanitation coverage, as evidenced by the achievement of MDG No. 7 in 2015. However, it does not make sense to have 100 percent coverage of improved sanitation facilities that are not sustainable and safe for public health and the environment because, whether directly or indirectly, these facilities and poor practices of wastewater and excreta disposal will generate both health and environmental costs, limiting economic development and poverty reduction. As a result, the long-term viability of municipal wastewater treatment systems (WWTSS) in densely populated areas of rapidly developing cities such as Kigali necessitates a sustainable sanitation policy that focuses on various wastewater management practices such as storm water management, among others.

According to the 2007 Kigali City Conceptual Master Plan report, the city will continue to grow in size and its population will nearly triple in the next 25 years. As a result, it is prudent to plan for appropriate municipal wastewater treatment facilities as well as adaptive measures to improve water quality. This can be accomplished through the comprehensive development and management of both on-site and off-site sanitation systems, as well as the use of the best available technology.

Rwanda's government has launched Integrated Water Resources Management, a strategy for developing, monitoring, and managing water resources. Nevertheless, for the policy to be

fruitful and sustainable, there is a significant need for wastewater management, as well as the rapid expansion of urbanization and informal settlements, as well as industrial and mining activities. According to poor solid and liquid wastes treatment, management, disposal, and to low operation and inadequacy of the available decentralized treatment systems, the novel emerging contaminants for example active pharmaceuticals, including those with endocrine-disrupting properties (EDCs) might have reached Rwanda's water resources therefore, special measures might be taken especially for drinking water treatment plants and in irrigation for food crops.

XI. RECOMMENDATION

The global population is expected to reach 8.1 billion by 2025, and together with the effects of climate change, the world may face the greatest scarcity of freshwater ever. According to recent research, two-thirds of the world's population currently lives in areas where water is scarce. As a result, wastewater treatment should become a valuable water resource, with reuse being a critical issue that should be addressed quickly. Water quality preservation and improvement are critical for survival. Sediment flows into watersheds is a major pollution problem in Rwanda. It could be addressed by ensuring maximum rain harvesting to increase underground storage and allowing local communities to supply water to their infrastructure because Rwanda receives a lot of precipitation throughout the year.

Due to climate change and dramatic population growth, irrigation is proposed to boost the agricultural production for

enough food, however, it would be good to first check on the quality of water to be used in any irrigation technique concerning foods crops to prevent bioaccumulation of some emerging pollutants and heavy metals in plants and aquatic organisms.

Centralized sewerage systems are too expensive and require high monitoring, management as well as very skilled operators and technician to extent that some developing countries couldn't afford it. However, decentralized sewerage systems have been found cost-effective and low maintenance cost. Therefore, if their performance is improved in Rwanda, water quality and safety will be highly expected in streams and rivers as in underground water.

Pharmaceutical inputs to the aquatic environment should be reduced at all stages of the product lifecycle, from production to consumption to waste management. Such initiatives should include both technological solutions and policy tools for preventing pharmaceuticals and their metabolite released into wastewater.

Rwanda's legal and institutional regulation or framework on solid and liquid waste should be reinforced to achieve well-informed and sustainable management policies that are strictly applicable to all institutions. In addition, community change behavior mobilization regarding solid and liquid wastes disposal is needed in different areas to ensure knowledge and safety first which might result as one of the best management practices.

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Comparative Assessment Of Fasting Plasma Glucose And Hba1c Values In Type Ii Diabetes Mellitus In A Tertiary Care Hospital

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Abstract- Background: Diabetes is a growing public health problem throughout the world. As a consequence of hyperglycemia in diabetes, every tissue and organ of the body undergoes biochemical and structural alterations which accounts for major diabetes complications. The prevalence of Type II Diabetes mellitus is rising more rapidly because of obesity and reduced physical activity levels as countries, become more industrialized.

Aim and Objective: To determine the levels of glycosylated hemoglobin (HbA1c) and fasting plasma glucose (FPG) in patients with Type II Diabetes mellitus and to compare with healthy controls and also the study of the correlation between Fasting plasma glucose and HbA1c levels in diabetic patients.

Material and Methods: In this study total of 138 subjects were included. 69 clinically diagnosed type 2 diabetic patients and 69 normal subjects were recruited as control. HbA1c and fasting blood glucose levels were measured by the methods of HPLC and Hexokinase respectively.

Results: The mean value of HbA1c in Type II diabetic patients was significantly higher than in the controls. The mean value of fasting blood glucose levels was significantly higher in type 2 diabetics when compared with controls and a significant correlation was observed between levels of fasting plasma glucose and HbA1c in diabetic patients.

Conclusions: The diagnostic potential in diabetes is enhanced when both HbA1C and FPG are used in combination. And hence this strategy is useful in assessing the status and therapeutic progress of diabetes mellitus.

Index Terms- Type II Diabetes mellitus, HbA1c, fasting plasma glucose

I. INTRODUCTION

Diabetes is a metabolic disorder characterised by chronic hyperglycemia along with significant long term complications. The term "diabetes" was coined by Aretus of Cappadocia as early as 81-133AD. Later in 1675 the term

"mellitus" (honey sweet) was added to "diabetes" by Thomas Willis as the urine of these patients were found to be sweet. In 1776 Dobson confirmed that the 'sweetness' was due to the presence of excess sugar in urine and blood of these individuals. Subsequent years witnessed various significant developments in the history of Diabetes mellitus. The roles of liver and pancreas in glucogenesis and pathogenesis of diabetes were such important milestones. In 1921 Banting and Best isolated insulin and explained its clinical utility in diabetes. Diabetes mellitus (DM) can be broadly divided into two categories- Type I and Type II. In type I diabetes mellitus, there is complete deficiency of insulin secretion. This deficiency may be due to an autoimmune destruction occurring in the β -cells of islets of Langerhans of pancreas. This form of diabetes, accounts for only 5–10% of those with diabetes and is also termed insulin dependent diabetes (IDDM) or juvenile-onset diabetes. The reason for the cause of autoimmune destruction is still poorly explained and could be due to genetic predispositions and also environmental factors. Ketoacidosis is an important complication noted in type I diabetes. These patients are also prone to other autoimmune disorders such as Graves' disease, Hashimoto's thyroiditis, Addison's disease, vitiligo, celiac sprue, autoimmune hepatitis, myasthenia gravis, and pernicious anemia. Type II diabetes mellitus which accounts for 90–95% of those with diabetes is also referred to as non-insulin-dependent diabetes (NIDDM) or adult-onset diabetes. It results due to a combination of resistance to insulin action and an inadequate compensatory insulin secretory response. Age, obesity and lack of physical activity are predisposing factors of developing type II DM. Women with history of diabetes during pregnancy are also more prone to develop this disease. In contrast to type I diabetes, autoimmune destruction of β -cells does not occur. Hyperglycemia which is the cardinal feature of type II diabetes, persist for a long period of time and can cause pathologic and functional changes in various target tissues. Symptoms described in type II diabetes are polyuria, polydipsia and polyphagia. Obesity is an important feature noted in majority of these patients. Patients who are not obese by traditional weight criteria may have an increased percentage of body fat distributed

predominantly in the abdominal region. Ketoacidosis seldom occurs spontaneously in this type of diabetes and when seen, it usually arises in association with the stress of another cause such as infection. As the development of hyperglycemia is gradual this form of diabetes frequently goes undiagnosed for many years and such patients are at increased risk of developing macrovascular and microvascular complications. The increased glucose load in these patients should normally stimulate increased secretion of insulin from the pancreas. But as patients with this form of diabetes have abnormal beta cells, their insulin levels do not rise as expected which results in insulin resistance. Insulin resistance is defined as an abnormality in which the peripheral tissues are resistant towards the action of insulin. It is an integral feature of the metabolic syndrome and most often progresses to Type II

Diabetes mellitus. (1)Complications of diabetes can be acute or chronic. Acute and potentially dangerous complications are hyperglycemia with ketoacidosis or nonketotic hyperosmolar syndrome. Long-term complications include retinopathy leading to visual impairment; nephropathy leading to renal failure; peripheral neuropathy with risk of foot ulcers, amputations, and Charcot joints; and autonomic neuropathy causing gastrointestinal, genitourinary, and cardiovascular symptoms and sexual dysfunction. Patients with diabetes have an increased incidence of atherosclerotic cardiovascular, peripheral arterial, and cerebrovascular disease. Hypertension and abnormalities of lipoprotein metabolism have also been associated with diabetes.

DIAGNOSIS OF DIABETES MELLITUS

Criteria for the diagnosis of diabetes – ADA 2014
HbA1c \geq 6.5. The test should be performed in a laboratory using a method that is NGSP-certified and standardized DCCT assay
OR
FPG \geq 126mg/dl. Fasting is defined as no caloric intake for at least the past 8 hrs
OR
Two – hours PG \geq 200 mg/dl during an OGTT. The test should be performed as described by the WHO, using a glucose load containing the equivalent of 75g of anhydrous glucose dissolved in water
OR
In a patient with classic symptoms of hyperglycemia or hyperglycaemic crisis, a random plasma glucose \geq 200mg/dl

HbA1c for diagnosis of DM

The most commonly used assay to measure chronic hyperglycemia is HbA1c test. Glycated hemoglobin or HbA1C indicates the average blood glucose levels over a 2- to 3-month period of time. Initially this was not used as diagnostic criteria of diabetes as the assay was not standardised adequately. HbA1c test are performed using different methods like High performance liquid chromatography, affinity chromatography, cation exchange chromatography, Ion- exchange chromatography, isoelectric focussing, radioimmunoassay spectrophotometric assay, electrophoresis and electro spray mass spectrometry. But now this assay is highly standardized and hence it can be utilised as a biomarker. It plays a critical role in the management of the patient with diabetes, since it correlates well with both microvascular and, to a lesser extent, macrovascular complications. After ADA 2010

recommendation there has been a gradual increase in acceptance of HbA1c as a diagnostic test for diabetes mellitus

Hemoglobin A1c (%)	Degree of glucose control
>8	Action suggested
<7	Goal
<6	Non-diabetic level

Estimation of HbA1C should be performed using a method that is certified by the National Glycohemoglobin Standardization Program (NGSP) and standardized or traceable to the Diabetes Control and Complications Trial reference assay (DCCT). Point-of-care A1C assays are not sufficiently accurate at this time to use for diagnostic purposes.

Glycemic control is the key strategy in managing diabetes. Many prospective clinical trials have clearly shown that achieving glycemic control or reducing hyperglycemia significantly decrease the microvascular complications of diabetes. Each 1% reduction in haemoglobin HbA1c was associated with a 37% decrease in risk for microvascular complications and a 21% decrease in the risk of any end point or death related to diabetes. (3, 4)

Even though the ADA criteria advises the measurement of either of FBS or HbA1c for diagnosis it would be better to combine these two parameters as each one carries its own merits and demerits. Fasting plasma glucose is considered as a valid test for diagnosing people with type II diabetes when we have a patient with 2 discrepant HbA1c results. In this situation, a fasting glucose test may be used to clarify the diagnosis. (24) But it is a fact that measurement of glucose itself is less accurate and precise than most clinicians realize (6). There are some potential pre-analytic errors owing to sample handling and the well-recognized lability of glucose in the collection tube at room temperature (7,8). This is because studies have shown that storage of samples at room temperature for as little as 1 to 4 h before analysis may result in decreases in glucose levels by 3–10 mg/dl in non diabetic individuals (7,8,9,10). The fact that the HbA1c values are more over stable after collection (11), and the introduction of a new reference method to calibrate all HbA1c assay instruments, has improved HbA1c assay standardization in most part of the world (12,13,14). The variability of HbA1c values is also considerably less than that of FPG levels, (15,16,17). The convenience for the patient and ease of sample collection for HbA1c testing (which can be obtained at any time, requires no patient preparation, and is relatively stable at room temperature) compared with that of FPG testing (which requires a timed sample after at least an 8-h fast and which is unstable at room temperature) support using the HbA1c assay to diagnose diabetes. At the same time it also possess certain disadvantages like increased cost so that providing the assay for its routine use can be an important limitation in India. Another drawback is that any condition that changes red cell turnover, such as haemolytic anaemia, chronic malaria, major blood loss, glucose-6-phosphate dehydrogenase deficiency, sickle cell anaemia or blood transfusions, will lead to spurious HbA1c results. Thalassaemias, hereditary persistence of fetal haemoglobin, renal insufficiency, malignancy, iron deficiency anaemia, vitamin B12 and folate deficiency and splenectomy can alter the HbA1c values. (18,19,20).

There are many reports showing the acceptable correlation between HbA1c level and fasting blood glucose (FBS) level. Hence the aim of our study was to assess, whether HbA1c and Fasting plasma glucose levels correlated in type II diabetes mellitus.

II. REVIEW OF LITERATURE

According to the International Diabetes Federation, an estimated 381 million people had diabetes in 2013(25). Its prevalence is increasing rapidly, and by 2030, this number is estimated to be almost double (26). Apart from genetic predisposition, the increase in incidence of type II DM in developing countries could be due to the drastic changes in life style of individuals.

India has more diabetics than any other country in the world. The more recent data of Indian Heart Association suggest that India is the diabetic capital of world with a projected 109 million individuals with diabetes by 2035.(27) and a study by American Diabetic Association reports that India will see the greatest increase in people diagnosed with diabetes by 2030(25,26). Currently, the disease has affected more than million peoples in India (28, 29)

Ran AL et al (1979) conducted a study in which HbA1c levels were assayed by chromatography in 167 patients undergoing glucose tolerance test (GTT) and in 105 patients who have been diagnosed with type II diabetes. In 95 % of patients with normal GTT level, the HbA1c level was in the range of 6.8% to 9.8%. High levels of HbA1c were observed in patients with poorly controlled diabetes. According to their study, in patients with normal GTT values the HbA1c levels correlated positively with fasting plasma glucose and glucose tolerance value. Significant correlation was also observed in patients with abnormal GTT results or diabetes. (30)

Rahman MA et al (1990) studied the extent of non enzymatic glycosylation in 85 diabetic patients with or without chronic complications. They found out that the fasting plasma glucose was increased in all diabetic patients and correlated significantly with glycosylated haemoglobin, glycosylated plasma proteins and serum fructosamine concentration. (31)

Bonora E et al (2001) conducted a study in which one of their objectives were to evaluate the relationship between plasma glucose level and HbA1c in non insulin treated type II diabetic subjects. Their results showed that HbA1c is more related to preprandial than post prandial plasma glucose levels. (32)

Goudsward et al (2004) conducted a study in which they tried to find out which characteristics of type II diabetes patients treated in primary care predict poor glycemic control. They concluded that FPG appeared to be a strong predictor of HbA1c, which underlines the usefulness of this simple test is daily diabetes care.(9,33).

A prospective study done by Arthur FKN in 2005 involved assessing the FBG and HbA1c levels of diabetes mellitus patients as an index of glycaemic control. High levels of HbA1c were noted in majority of the patients and they came to the conclusion that there was a linear correlation between the fasting blood glucose and HbA1c. (34)

Peter R et al conducted a study to analyse the relationship between HbA1c and other indices of glycemic status in newly diagnosed subjects with type II diabetes. 262 patients were involved and were divided into three subgroups according to their HbA1c levels - Group 1: $\leq 7.0\%$; Group 2: 7.1-9.0%; and Group 3: $> 9.0\%$. They found out that HbA1c was more strongly correlated with the fasting plasma glucose than the overall postprandial glucose exposure.(35)

A study by Svendsen P et al (2009) evaluated the usefulness of HbA1c determination in the diagnosis of diabetes mellitus. The prevalence of elevated fasting plasma glucose and abnormal OGTT were found to increase with increasing age. In their study, 16% of individuals with normal OGTT had fasting plasma glucose concentration above the upper normal limit and high HbA1c values were found in subjects with high fasting plasma glucose.(12,36)

Chi-Chau Liang et al (2010) studied the relationship of fasting glucose and HbA1c and attempted to establish a conversion equation between them. They analysed 3411 cases enrolled during 4 years period. The fasting blood sugar and HbA1c data of each case was collected. It was seen that the HbA1c values among the general healthy population tends to be higher as age increases. According to the regression coefficient from their study, the fasting glucose that corresponds to 6% HbA1c was 108.2mg/dl. (37)

Ghazanfari Z et al (2010) assessed the association between HbA1c and FBS through a cross-sectional population-based study. Samples of 604 peoples were collected and their HbA1c and fasting blood sugar were tested. The association between HbA1c and FBS, their sensitivity, specificity and predictive values in detection of abnormal values of each other were determined. Results showed that the association of HbA1c with FBS was relatively strong particularly in diabetic subjects. It was also seen that FBS was a more accurate predictor for HbA1c compared with HbA1c as a predictor of FBS. Although the optimum cut off point of HbA1c was >6.15%, its precision was comparable with the conventional cut off point of > 6%. (38)

Shrestha L et al (2012) conducted a cross sectional study to determine the correlation between glucose monitoring by fasting blood glucose or two hours postprandial blood glucose with glycated haemoglobin (HbA1c) in type II diabetic patients. 60 inpatients with type 2 diabetes mellitus were assessed for HbA1c, daily fasting and postprandial blood sugar for 15 consecutive days. According to their study results both postprandial blood glucose and fasting blood glucose significantly correlated with HbA1c. (39)

Baura A et al (2014) examined FPG and HbA1c of type II diabetes mellitus patients in 4 and 8 weeks after starting treatment and determined liner and nonlinear regression between these two parameters. They concluded that the corrected HbA1c is a better predictor of the corresponding Fasting Plasma Glucose and a steady state excellent regression exists between HbA1c and FPG. (40)

Swetha N K et al (2014) aimed to find the correlation between HbA1c with FBS, PPBS & RBS so as to assess their usefulness in monitoring glycemic control in diabetic patients. The study population was divided into three groups based on the HbA1c values i.e. Group 1

(HbA1c < 7% - good control) Group 2 (HbA1c 7-9% -fairly controlled), Group 3 (HbA1c >9% -Poorly controlled). They found that there was a significant correlation between HbA1c & FBS, PPBS & RBS in the study population, and there was a direct correlation between FBS, PPBS & HbA1c levels in both controlled & uncontrolled diabetic patients, (41)

Kaur et al (2014) studied the correlation between glycated hemoglobin and fasting/random blood sugar levels for the screening of diabetes mellitus. It was a retrospective observational study conducted in 600 already diagnosed patients of diabetes mellitus who came for a regular check-up of fasting/random blood sugar and glycated hemoglobin levels. The mean \pm SD of HbA1c, FBS, and RBS levels were $8.84 \pm 2.5\%$, 159.84 ± 79.6 mg%, and 241.18 ± 103.8 mg% respectively with an insignificant difference between males and females. Their study results show, there was an excellent correlation between HbA1c and FBS ($r=0.755$), (42)

A study conducted by Asmita P.B et al (2014), the aim of their study was to determine the levels of glycosylated hemoglobin (HbA1C) and fasting blood glucose (FBG) in patients with type II diabetes mellitus and to compare with healthy controls and also to find out the correlation between fasting blood glucose and HbA1C levels in diabetic patients. 40 clinically diagnosed type II diabetic patients and 40 normal subjects were recruited as control. Their results show that the mean value of HbA1c in type II diabetic patients was significantly higher than in the controls. The mean fasting blood glucose levels were significantly higher in type II diabetics when compared with controls and significant correlation was observed between levels of fasting blood glucose and HbA1c in diabetic patients. (43)

III. MATERIALS AND METHODS

The study was conducted as a cross-sectional prospective study. Blood samples were collected from the Clinical Biochemistry Laboratory attached to the hospital. The study consisted of 68 diabetic individuals.

Subjects

The study was conducted over a period of 6 months from October 2015 to March 2016 and included 68 individuals diagnosed with diabetes based on ADA criteria. Based on the available literature on HbA1c, and fasting plasma glucose with 95% confidence and 80% power, the minimum sample size came to be 68.

Method of collection of data is based on inclusion and exclusion criteria.

Inclusion Criteria:

1. Age group 35 – 60 years
2. Patients diagnosed with Type II Diabetes Mellitus based on ADA criteria (FPG > 126mg/dl OR HbA1C \geq 6.5%)

Exclusion Criteria:

- Age < 35 and > 60 years
- Patients diagnosed with anemia, malaria and haemoglobinopathies.
- Patients with hypertension, proven cardiovascular, renal, thyroid or hepatic disorders

IV. METHODOLOGY

Study Parameters

Fasting plasma glucose
HbA1c

Sample collection

The blood samples were obtained under aseptic precautions. Blood was collected in grey vacutainers for the estimation of fasting plasma glucose after 10-12 hours of fasting. These samples were centrifuged at an RPM of 3000 for 5 minutes for separating the serum. Simultaneously, the whole blood was collected in a violet vacutainer containing EDTA for the estimation of HbA1c.

V. ESTIMATION OF FASTING BLOOD GLUCOSE

Fasting Blood Glucose was estimated by enzymatic UV test (Hexokinase method)

Principle

Glucose is phosphorylated by Hexokinase in the presence of adenosine diphosphate (ADP). Glucose -6 -phosphate dehydrogenase (G6PDH) specifically oxidizes glucose 6 phosphates to gluconate 6 phosphates with the concurrent reduction of NAD+ to NADH. The increase in absorbance at 340 nm is proportional to the glucose concentration in the sample.

Linearity

800mg/dl

Measuring interval

10-800mg/dl

Interferences

Ascorbate : interferences less than 3% up to 20 mg/dl ascorbate

Icterus: interferences less than 10 % up to 40% bilirubin

Haemolysis: interferences less than 3% up to 5 gm/l haemoglobin

Lipemia: interferences less than 10% up to 100 mg/dl

Biological reference intervals

Fasting; 70 -110 mg/dl

ESTIMATION OF HbA1c

Principle

Estimation of HbA1c was performed using D-10 Haemoglobin A1c program, which utilizes principles of ion exchange high performance liquid chromatography (HPLC).

Linearity

HbA1c level of 18.5%

Interferences

Icterus are indicated by bilirubin concentration up to 20 mg/dl does not interfere with the assay

Lipemia as indicated by triglyceride concentration up to 5680mg/dl does not interfere with the assay

HbF concentration up to 10 % do not interfere with the assay

Labile A1c concentration up to 4 % do not interfere with the assay

Carbamylated Hb (CHb) concentration up to 35% do not interfere with the assay

Reference interval

Haemoglobin A1c (%)	Degree of glucose control
>8	Action suggested
<7	Goal
<6	Non-diabetic level

Statistical analysis

- Statistical analysis was performed using IBM SPSS version 20.
- For all continuous variables the results are given in mean ± standard deviation
- To compare the means of fasting plasma glucose between two groups, the Mann-Whitney test was applied
- To compare the means of HbA1C between two groups, an independent two-sample t-test was performed.
- Pearson's correlation coefficient was used to find out the correlation between fasting plasma glucose and HbA1c
- Probability value (p) ≤ 0.05 is considered for statistical significance.

VI. RESULT

Table-1: Mean distribution of Fasting plasma glucose (FPG) in cases and controls

Groups	N	FPG		p Value
		Mean	SD	
Control	69	102.55	18.79	0.001
Case	69	184.52	75.18	

Mean Fasting plasma glucose was found to be significantly high in cases than controls.

Fig:1 Graph showing the mean distribution of Fasting plasma glucose (FPG) in cases and controls

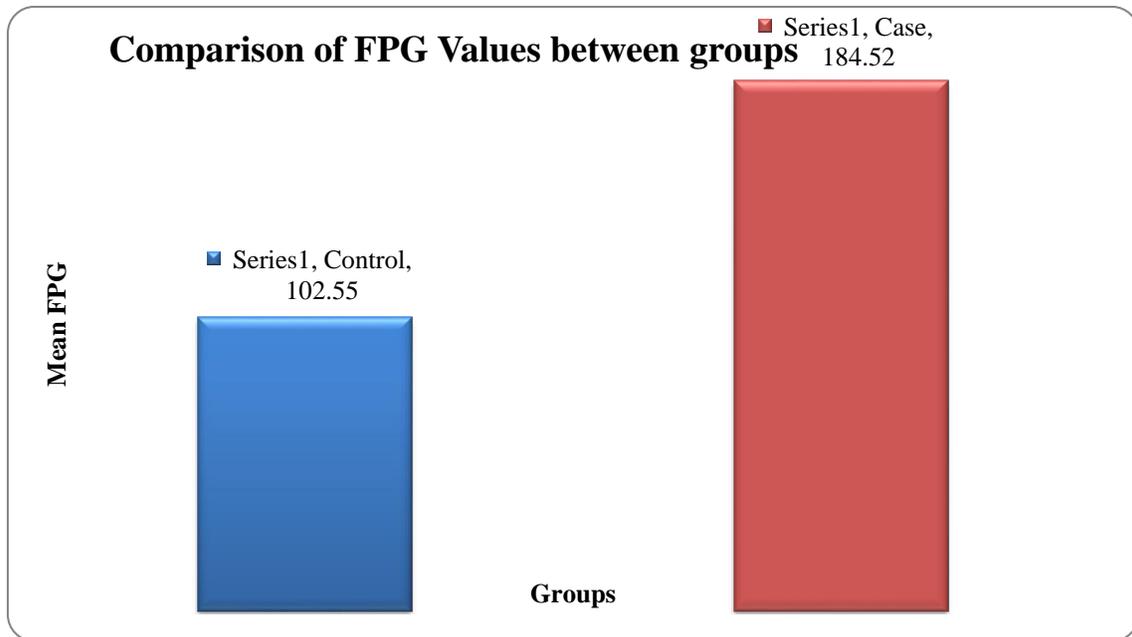


Table-2: Mean distribution of HbA1C in cases and controls

Groups	N	HbA1C		p Value
		Mean	SD	
Control	69	5.58	0.28	<0.001
Case	69	8.75	1.67	

Mean HbA1C was found to be significantly high in cases than controls.

Fig: 2 Graph showing the mean distribution of HbA1C in cases and controls

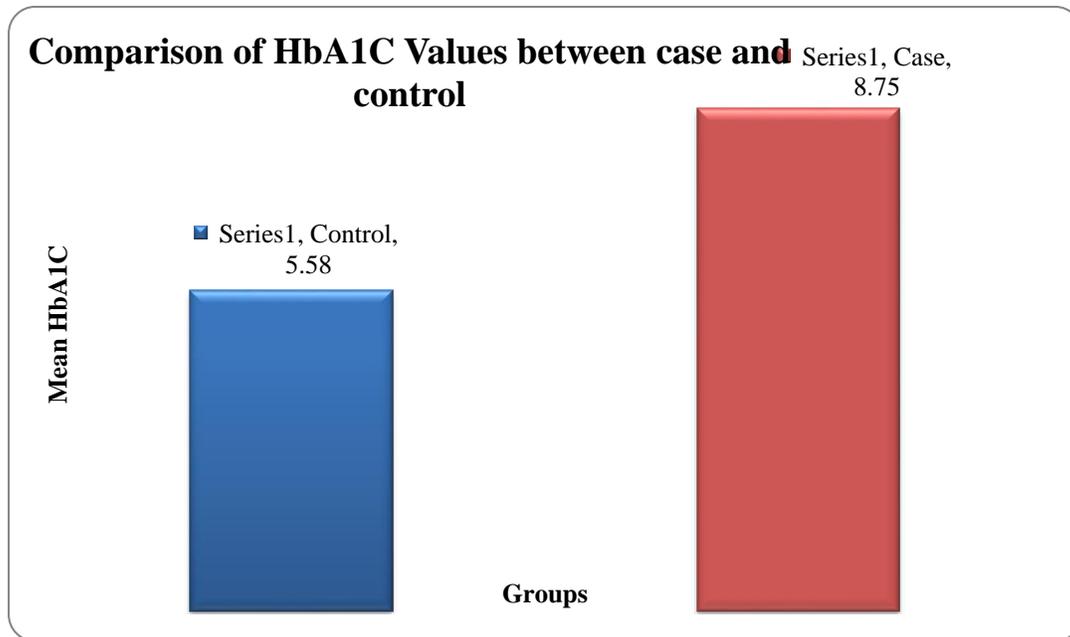
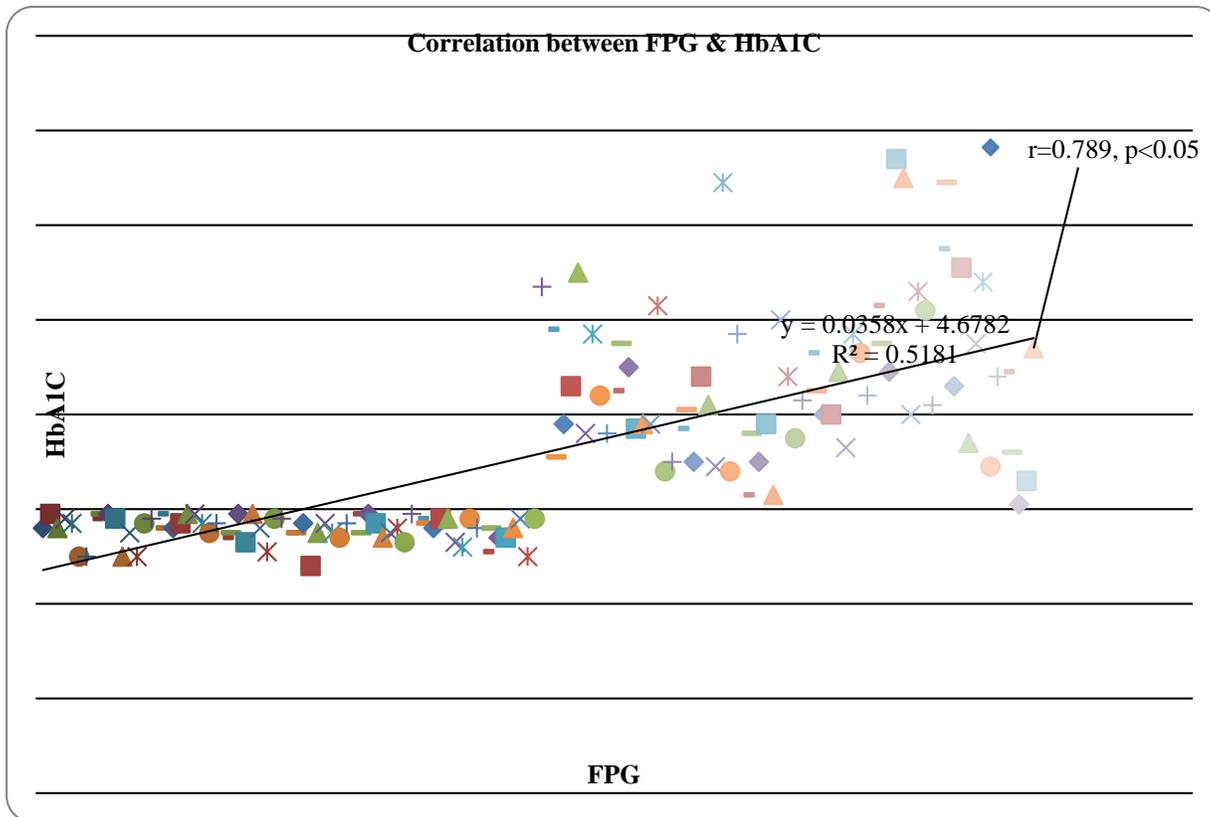


Table-3 Correlation between FPG and HbA1C

Variable	FPG		
	N	Pearson Correlation	p Value
HbA1c (%)	138	0.790	<0.001

Significant correlation was found between HbA1C and FPG

Fig: 3 Scatter plot showing the correlation between FPG and HbA1C



VII. DISCUSSION

Type II Diabetes Mellitus is a metabolic disorder characterized by chronic hyperglycemia resulting from defects in secretion of insulin its action or both. It is also associated with significant microvascular and macrovascular complications.

In 1980 about 108 million people were estimated to be affected by diabetes and in 2014 it has peaked to about 422 million. It was observed that in 2012 about 1.5 million deaths were caused due to the complications associated with diabetes.

India holds the dubious distinction termed the “diabetes capital of the world” as the largest number of diabetic subjects are present in India. According to the Diabetes Atlas 2006 published by the International Diabetes Federation, the number of people with diabetes in India is currently around 40.9 million and is expected to rise to 69.9 million by 2025 unless urgent preventive steps are taken. The so-called “Asian Indian Phenotype” refers to certain unique clinical and biochemical abnormalities in Indians which include increased insulin resistance, greater abdominal adiposity i.e. higher waist circumference despite lower body mass index, lower adiponectin and higher high sensitive C-reactive protein levels. This phenotype makes Asian Indians more prone to diabetes and premature coronary artery disease. (46) .

Hence diagnosing diabetes, predicting and preventing complication accurately is of paramount importance in Indian context considering the high prevalence of both the disease and its complications.

The universally accepted biochemical test parameters for assessing glycemic status in Type II Diabetes mellitus is HbA1c

and fasting plasma glucose values. HbA1c level is considered as a gold standard for long term glycemic control and the half life of HbA1c is approximately 34 days, which is a factor that favours the estimation being accepted widely.

Various clinical trials have proved that fasting plasma glucose concentration along with HbA1c is often used to monitor the progress of diabetic patients. These parameters alone were not sufficient for diagnosing hyperglycemia and are often used in combination. In addition, HbA1c was found to be useful in predicting the risk of chronic complications of Diabetes mellitus and Cardiovascular diseases.(38,39) HbA1c > 9% indicates dyslipidemia, so the dual role of HbA1c in the prediction of glycemic status and as a lipid profile indicator can be used to screen for high risk diabetic patients and providing them with lipid lowering drugs and preventing the chances of coronary heart diseases. Thus measurement of HbA1c and FPG levels provides a definitive means of diagnosis and prognosis of diabetes which lead to the current advances in healthcare delivery.(39)

Our study aimed for the estimation of fasting plasma glucose values and HbA1c in type 2 DM and also whether these parameters correlated with each other.

In our study we observed significantly high levels of FPG in cases when compared to controls ($p < 0.001$). Hyperglycemia is one of the most important finding in DM; progression of which leads to the long term complications of this disease. As the condition progresses the individuals are at risk for developing specific complications like retinopathy, nephropathy, neuropathy and atherosclerosis and later on to gangrene, stroke or coronary artery disease. Chronic hyperglycemia leads to increased glycation

of HbA1C; the measurement of which is useful in the long term control of glucose. HbA1C levels predict the complications of DM which are said to be due to the formation of advanced glycation end products. In our study we obtained significantly ($p < 0.001$) high HbA1C levels in cases when compared to controls.

Study done by Arthur et al, and Rosediani et al also found an increase in the fasting blood glucose and HbA1C in diabetic patients when compared to controls.

HbA1c levels are found to increase along with fasting plasma glucose levels because as the blood glucose levels increase the glycation of HbA1C also occurs simultaneously. In our study, a positive correlation was observed between levels of fasting glucose and HbA1c in diabetic patients ($r = 0.790, p < 0.05$).

Our findings go in hand with those of Asmita P et al where a significant positive correlation was found between FBS and HbA1C in diabetics. Similar findings were also seen in studies done by Arye L. V et al and Rahman M.A et al.(32,33) Studies have shown that if FPG test is conducted individually without HbA1c, the results fail to explain the variance of fasting plasma glucose values. (47)

VIII. CONCLUSION

This study, points towards the association between blood glucose and HbA1C. The diagnostic potential in diabetes is enhanced when both HbA1C and FPG are used in combination. And hence this strategy is useful in assessing the status and therapeutic progress of diabetes mellitus. HbA1c and FPG correlate well and its utility is widened from diagnosis to prognosis of Type II Diabetes mellitus. Both of these parameters when used in combination is highly precise than when used individually.

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Research To Study The Damage Caused To The Construction Projects Due To The Lack Of Workers On Site

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ABSTRACT

Construction is an integral part of the global economy and research has found that there is currently a labor shortage in this industry. This is causing difficulties in economic growth. In today's competitive environment, absenteeism is a problem. It can be difficult for organizations to keep their employees happy and productive, especially if they're absent too often. The problem is that there are many reasons why it's hard to be successful at your job, such as not being given enough support or not being given a good enough salary. If you want your workers to be available all the time, it's essential to keep them on schedule. There is no evidence that workers who are not on construction projects cause any damage. There isn't enough information available to help us figure out how to do these projects and recover the money we lost. Construction workers are not available to work on-site as often as they used to, which has caused the productivity rate to drop. Therefore, this study addresses this gap by identifying the damages to the projects due to the worker's absence and providing strategic measures to reduce the absence rate and recover the loss. If people don't show up to work, businesses can't do their jobs as well as they would if everyone were there. This can lead to less productivity, less service delivery, and less performance. This can have a negative impact on the company's sustainability. Several companies have closed because there aren't enough workers to do the work. It is important that we take care of this gap to succeed in construction projects. The problem is that there are a lot of people who can't work because they're injured or sick, and this means that businesses can't get as much done as they would if there were more workers. This is a problem for all countries because it's hard to get the economy moving when so many people are out of work. This investigation is important because it will help close the construction industry gaps. This study used qualitative research methods to get a better understanding of what was going on. A systematic review of research was done to find strategies to help minimize workers' absences. This study is going to help all the contractors and other people in the construction industry, who are planning or doing construction projects. The study is more important in that it serves as a reminder to the organization of the importance of human resources to its growth. If a worker is absent from a construction site, they will likely know what will happen to the project and take appropriate measures to avoid it.

Key Words: *Absenteeism, Contractors, Construction Projects, , Mitigation, Project damages.*

1. INTRODUCTION

The absences of workers in a project result in a shortage of workers for that project. When manpower is not available to manage projects, project timelines and financial budgets suffer. It should be noted that construction workers play an essential role in the execution of the project. Lack of manpower or absenteeism affects both the clients and the workers themselves. Believe that no job, no pay! We need money to meet our daily needs Hussain1, Xuetong1, and Hussain2 (2020) observed that unskilled labor has a significant negative impact on project performance during the construction phase, while the results confirm that skilled labour has a significant positive impact on project performance to increase the success rate of projects during the construction phase. According to Matemani1 and Ndunguru2 (2019), it is generally believed that project performance is based on the skills of workers in the project implementation process, and their skills and abilities will affect the progress of the project. This is especially the case for construction projects. Typically, projects are managed and supervised by a project manager, assistant project manager, construction engineer, project architect,

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contractor, or subcontractor, and tasks are performed by performing manual labour on a construction site. The construction industry is a labor-intensive industry. The performance of any industry is important to achieve measures to ensure sustainability and competitiveness. To address widespread labour shortages, many companies have begun offering aggressive incentive programs, including wage increases, benefits, and more overtime opportunities that can be extended from region to region, local to neighboring regions. However, these solutions are only temporary, and if the potential impact of labour issues is not considered, companies may incur greater liability over time.

RESEARCH AIMS

This study will focus on identifying the damage caused to the construction projects as the workers are staying away from the sites and the measures to be taken to complete these projects and recover the loss?

RESEARCH QUESTIONS

- a. What are the damages to the construction projects if workers are always absent from site?
- b. What measures can be taken to complete these projects and recover the loss?

2. MATERIALS AND METHODS

Information from the participants was gathered through the use of a qualitative research method in this study. The main goals of the research were attained through the utilization of both primary and secondary sources. Six active contractors in the construction sector were interviewed. The interview question was left open so that the contractors would have an opportunity to express their opinions on the harm that the lack of labor on the job site had caused to the projects. Face-to-face interviews were conducted. To eliminate bias, interviews with each contractor were conducted independently. Through an open question, the participants' unambiguous opinions were gathered. There were no records of participant names, contact information, or biographical information. However, participant cost impacts were not considered in this investigation. This study primarily considered more peer-reviewed books, journals, and papers published during the last ten years to retain quality. This is because it's wise to base a study on sources that were published within the last ten years. These resources represent the most recent findings, theories, procedures, and best practices and are more up-to-date. The most recent research enables academics to keep pace with fresh arguments, advancements, and trends in this area of study as well as discover new writers. However, both public and private construction projects were considered in the analysis. The problem was researched via a literature review, and evidence acquired through interviews supported the findings of the review on the harm projects suffer from a shortage of staff on site.

3. LITERATURE REVIEW

According to Matemani¹ and Ndunguru² (2019), a lack of skilled laborers can have a significant impact on a project's production. The authors discovered that labour issues were related to training, craft worker, supervisor, and foreman competency. Additionally, they discovered that the essential element with the greatest potential for increasing project productivity is the laborers' qualifications. Improved labourer training effectiveness has a considerable impact on increased project productivity. According to the report, the absence of trained laborers with experience or their availability directly contributes to the productivity of construction projects declining. The scientists also discovered a strong correlation between the inability to hire skilled staff and the decline in project productivity. Projects with a shortage of experienced labor typically experience higher material and labour costs, longer project timelines, scheduling issues, and poor quality. According to the authors, a labour shortage happens when there is a gap between the supply and demand of individuals who are qualified, available, and eager to work in a given occupation. According to this paper, recognition and a positive work environment are crucial for keeping employees and addressing labour shortages within a business. The survey also revealed that many academics emphasize low pay and promotion as the sole important factors while ignoring a positive workplace culture and appreciation. The findings demonstrated the significance of promotions and a positive work environment in retaining employees. Poor service delivery and economic stagnation are the results of the construction industry's severe human resource problems, which include insufficient staffing, and imbalances in the deployment and retention of professional construction specialists and supporting staff. The government is responsible for developing effective regulations and safe working conditions.

Sicani, Lee, and Robinson (2011) revealed that several research efforts have been made to address absenteeism in the construction industry. The study found that the measures to minimize worker absenteeism from construction sites were: (1) Absenteeism is reduced when management stresses that absenteeism is averse. (2) Absence rates are lower when employees find their work rewarding. (3) Management plays an important role in reducing absenteeism from the workplace. However, there are still unknown factors that prevent us from fully understanding absenteeism and how to reduce it. For example, the understanding of absenteeism in industrial construction is outdated or not comprehensive. A

more systematic and thorough understanding of absenteeism is required due to the complexity of large-scale industrial development (such as the lengthy operational periods and the enormous range of trades and roles involved). To better understand absenteeism in industrial construction, for instance, a tool that can be used in a variety of industrial projects to gather and analyze absenteeism data would be highly beneficial (e.g., the difference between the causes of absence in remote vs. local job locations). However, the knowledge of absence is limited because this kind of technology has not yet been created. Workflow and task completion are disrupted by absenteeism, which also raises overtime and worker weariness. If the employee's absence is not anticipated by the supervisor, the effects of employee absenteeism on workflow interruption and productivity loss may worsen. In addition, the authors divide absenteeism into planned and unintentional absences.

According to Hui (2018) report, human resources, particularly construction employees, are crucial to the construction industry. For construction to succeed, a human workforce is essential. Despite the importance of the human workforce to the construction industry, it is also thought that this resource is the most difficult to manage. Employee absenteeism is a problem at construction sites since the industry as a whole is severely affected by its negative effects. The supply of welfare measures to employees should be used to address job tiredness, which is the major factor causing employee absenteeism and having led to the loss of productivity on construction sites. According to the study, productiveness can be increased with the help of efficient resource management. Labor productivity has a significant role in determining how quickly a project can be completed in the construction industry. Construction labour is therefore a crucial factor in determining whether a project is successful or unsuccessful.

According to Alvanchi and Hashemi (2020), the performance of labour-intensive construction projects is significantly impacted by workers' absence. Construction project managers may better organize their projects, cut down on absences, and increase productivity by recognizing certain absence trends. Among the most important determining factors are the working group sizes, organizational policies, and the time of year. One of the suggested policies for lowering the absence rate is to improve the sense of teamwork. Another is to enforce severe consequences for workers' absences. A third is to increase managers' site visits. They advocate enhancing safety, encouraging an open-door policy for the management, and making workers' attendance known to the public as the best approaches for lowering absenteeism. According to the study, organizational managers could allocate day-care facilities, offer both part-time and full-time contract choices, and include workers' absence control policies throughout the recruitment process to minimize the number of workers. When the unemployment rate was high in Canada, it was discovered that using punitive measures for employee absences was successful. They also discovered that disclosing the typical absence rate at the employment site will work. According to the study, changing personnel policies, getting workers regular medical check-ups, feeding them every day, and establishing organizational policy can all help reduce worker absenteeism from construction projects.

Engetou (2017) believed that people are employed by organizations to help them continue to interact profitably with their customers. Employees build businesses for an organization's failure or success. The author found that the best way to accomplish each task was to carefully match each worker to each task, closely monitor workers, and use rewards, punishments, and motivations. In this study, the problem of carefully matching each employee to each task requires that each organization have enough employees and that managers closely monitor employees, motivated by rewards and punishments. In addition, well-trained and qualified personnel are needed to work closely with the company, not just your employees, to achieve your company's goals. The report describes influence as a force or action that exerts a powerful influence on a situation or person. Influence is conceived as a situation primarily intended to control something or someone. The report describes influence as a force or action that exerts powerful domination on a situation or person. Influence is conceived as a situation primarily intended to influence something or someone. The author further warns that understaffing causes stress. However, stress is considered a universal factor. Therefore, people inevitably feel stress. Analysis showed a negative association between stress and job performance, indicating that increased motivation and increased administrative support in the work environment leads to improved performance. The study found that staffing shortages within organizations lead to increased workload and decreased oversight. Many managers and supervisors are under the impression that the level of employee performance at work is proportional to the size of the workforce. Workloads are responsible for more work. This is a normal phenomenon in many organizations today. Intra-organizational workload occurs when employees take on and perform more activities within an organization than is expected of them. More work leads to less supervision.

A report by Sichani, Lee, and Robinson-Fayek (2022) found absenteeism to be particularly common and a major problem in large industrial construction projects. The negative effects of absenteeism on construction projects are well known, the authors say. The study added that absenteeism leads to further increases in the workforce to meet staffing needs. It also leads to lost revenue because project schedules are not met. Capital investments such as tools and equipment are underutilized due to absenteeism. Workflow and task fulfilment are interrupted. This increased the need for overtime and increased employee fatigue. The authors also found that absenteeism leads to a loss of employee productivity and goodwill. Replacing absent highly skilled workers with similarly skilled workers still poses performance and safety problems, the report warns. The study argues that these negative outcomes are exacerbated by the long-term detrimental effects of absenteeism on job satisfaction, performance, and organizational climate.

Pailwan¹ and Tatar² (2020) emphasized that today's construction industry is labour-oriented and its work depends on human labour. The study reiterates that, among the many problems facing the Indian construction industry, absenteeism is one of the major issues directly impacting productivity on construction sites. The report found that the higher the absenteeism, the greater the loss of productivity in the field. The authors showed that the absenteeism of Indian workers was due to rural orientation and frequent urges to flee the country. According to Pailwan¹ and Tatar² (2020), in the modern construction industry, the occurrence of job fatigue, malnutrition, and poor working conditions exacerbates the sense of change of industrial workers, sometimes requiring them to rest and relax frequently. They will have to visit their homes. Social and religious rituals also divert workers from work to social activities. Workers further face housing problems and a loss of interest in work. Low wages force workers to look for part-time jobs to earn extra income. This often leads to constant fatigue that forces them to miss work the next day. Working conditions on construction sites are frustrating and intolerable.

Volo and Beveridge (2022) indicated that heat, humidity, noise, vibration, lack of lighting, dust, and overcrowding affect worker health and cause workers to be absent for long periods of time. The high absentee rate is also due to the lack of adequate social facilities. Social activities include clean drinking water, canteens, accommodation, toilets, washrooms, bathing facilities, first aid supplies, etc. Some regular drinkers donate their entire salary to drinking purposes on the first week of every month. Therefore, they are off work for 2-3 weeks after receiving their salaries. Every worker who engages in financial transactions usually borrows from moneylenders at very high-interest rates. To avoid moneylenders, they usually decide to be out of work because they are unable to return the money within the prescribed time. Favouritism and nepotism-based policies in the construction industry frustrate workers. This also leads to reduced efficiency, lower productivity, and adverse relationships between employees and managers, leading to absenteeism. When employers fail to provide time off opportunities, workers are forced to take unscheduled leave, resulting in unexpected absenteeism.

According to Ahn et al. (2013), one of the primary causes of absenteeism is a schism or division between construction management and workers. Personal and family illness, reluctance to work, doctor or dental appointments, drug or alcohol use, and a lack of responsibility were identified as the primary reasons for the lack of workers on site, according to the study. Furthermore, worker absences were discovered to be influenced by accidents, severe weather, and hazardous working conditions. Managers frequently attribute a significant portion of employee absences to discretionary mechanisms, according to the survey, but employees typically blame their own absences on a variety of uncontrollable life events.

Absenteeism, according to Kocakülâh et al. (2017), is more than just missing a day of work. However, Employees who take longer breaks during the day than planned, or who arrive or leave early are on a partial shift absence. While the occasional extended lunch or late start may have no effect on productivity, repeated abuse reduces output and morale. Employees who see their co-workers taking an extended lunch break or leaving the office early believe they have the same right to the same amount of time off. Even when employees arrive at work, this does not always imply that they will be fully functional. According to a growing body of research, the problem of employees working but not producing at their usual level can reduce individual productivity by up to one-third (Kocakülâh et al. 2017). The term "absenteeism" refers to a phenomenon that is most clearly associated with illness. For example, when employees arrive at work sick, they not only work slower than usual, but they also hinder others' ability to recover and spread the illness throughout the office. The authors contended that presenteeism refers to any situation in which an employee is physically present but not performing to the best of his or her ability. A worker's absence from work can have a wide range of general effects on the organization's productivity. The only disadvantages of missing work for the employee are potential pay loss and disciplinary penalties, but the co-worker will bear the brunt of the blame immediately. Co-workers will have a lot of work to do to compensate for the decrease in corporate productivity, which may result in more overtime and its associated costs. This increase in co-workers' workload will influence the entire work group. Coordination issues will worsen if the replacement worker has lower skill levels than the missing worker, and productivity may suffer.

According to Utting (2010), the skills gap is not limited to South Africa and is exacerbated by some of the hiring practices used abroad. Other people's ideas are not always viable and have yet to be tested. According to the report, there are no real-world examples of the construction industry successfully resolving skill shortages, and the problem is global. According to the paper, the issues in South Africa are exacerbated by the legacy of a government that ensured that more than 80% of the population was unprepared to run a construction sector before handing over a building industry that had been decimated. The situation became so bad that construction could not fulfil its promises of providing for most of the population's fundamental necessities due to the injection of enormous sums of money for reconstruction and development and the exodus of vital talents. The author found that the dangers facing the construction business include a lack of skilled labour, high government spending on healthcare and education, capacity issues in the sector, and clients' strict deadlines for delivery. With a higher percentage of unskilled workers, the quality of output is at stake, and a skills shortage is a growing risk making the business less appealing as a career.

Oyomba (2017) found that wages have an impact on absenteeism. According to the respondents, the organization's performance-based employee compensation system encouraged employee absenteeism. According to the study, attitude

affects absenteeism. The author thought that the organization's absenteeism was impacted by employees' unfavourable attitudes at work. The survey also found that job design has an impact on absenteeism, and most respondents claimed that because job design in the organization was not clearly specified, it resulted in goals that were in contradiction. According to the survey, working conditions have an impact on absenteeism, and employees stressed that their atmosphere at work was unfriendly. The organization now suffers a worker shortage because of this.

The effective use of all resources, including human resources, is essential for a construction's financial stability and success. Absenteeism is a situation that can have a substantial negative influence on construction. The results show that absenteeism is primarily caused by family obligations, especially childcare. Other causes included strikes, exhaustion, transportation issues, and actual illness. The findings make it clear that the misuse of sick time and the expense of absenteeism can have a negative impact on the provision of quality services. The degree of a job is directly correlated with absenteeism. According to reports, blue-collar workers who make less money, have fewer responsibilities and work more repetitively have higher rates of absenteeism. When compared to white-collar workers, this group of workers also has fewer fulfilling jobs. Income and job levels are directly correlated. The low wages in the construction sector are a well-known truth, and this has impacted the consistency of the labour input (Mukwevho, Nesamvuni, & Roberson 2020).

To guarantee that they are not influenced by labour availability, contractors must completely comprehend the clauses specified in contracts, according to Lorenz (2018). According to the report, there is still a significant labor shortage in the construction sector, particularly for projects that are both commercial and residential. According to the author, many businesses must offer strong incentive programs that include higher compensation, more perks, and more opportunities for overtime that can extend beyond local areas to neighbouring areas to overcome this pervasive scarcity. The paper argued that if the possible consequences of labour difficulties are ignored, the offered solutions will only be a short-term remedy and may eventually expose businesses to more risk. Even though each construction contract is unique, all of them will have clauses that specify how much money is paid and when the project must be completed, both of which could suffer from a labour shortage. Companies should address these concerns upfront when examining contracts to prevent future obligations for all parties.

Karimi et al. (2018) reveal that a skilled labour shortage in the North American construction industry started in the 1980s and has persisted as a cyclical pattern over the past three decades. Researchers have given this issue a lot of attention, but the report found that quantifying the effect of skilled labour availability on project success has gotten less attention. The authors also stated that by quantitatively modelling and clarifying the impact of skilled labour availability on construction project cost performance; this work contributes to the body of knowledge by filling a gap in the existing literature. The major analysis of the results, according to Karimi et al. (2018), reveals that projects with artisan shortages saw noticeably larger growth in cost overruns than projects without. The study found that the main advantage of performing risk estimation in a project is to give project management teams the ability to decide whether mitigation methods are necessary to avoid probable shortages in project cost performance. Developing motivation for industry leaders, communities, and construction stakeholders to address the issue of skilled labor scarcity in the construction industry can start with an understanding of the extent to which craft shortages affect project performance.

4. DAMAGE TO THE CONSTRUCTION PROJECTS DUE TO THE LACK OF WORKERS ON SITE

According to Jones (2022), previous studies have shown that industrial labour is frequently characterized by absenteeism. It prevents industrial growth. According to the report, a labour shortage has an impact on both the company and the employees. A worker's pay is significantly diminished because of his or her frequent absences. This is due to the basic tenet of "no work, no compensation." As a result, workers lose money when they are absent from work. However, the employer must bear a bigger loss because of absences. However, there is less production on the job site since it disrupts efficiency and discipline.

Batra (2022) added that industries should also keep a second labour force on hand to deal with emergencies and strikes. In certain circumstances, workers that show up at the site gates are hired. They are substituted for workers who are not present during strikes. Because such personnel typically do not demonstrate that they are capable of working, their adjustment causes major issues. Higher absenteeism is bad for both employees and employers, and it eventually has a negative impact on how much an industry produces. The country suffers a tremendous loss due to a lack of workers, according to earlier literature. The construction industry is a significant contributor to the nation's economy, both directly and indirectly, and it primarily relies on its workforce. As a result, the country will also suffer losses because of the construction workers' absenteeism.

Cushard (2022) asserts that the inability to complete projects on time due to a lack of workers results in revenue loss. That could also result in construction projects being delayed if there are fewer personnel on site. Each day a project is put off, additional expenses are incurred to keep it going. Costs are borne by the project owner, the contractor, or both, which results in revenue losses. Companies must take all steps possible to increase their profit margins because of declining

profit margins. This entails lowering the absenteeism rate. Unplanned absences cause project delays, which lower revenue, and they are a common construction project problem since they indicate poor planning.

Medcalf (2022) cautioned that overmanning (increasing the number of labour crews above the ideal) can result in a scarcity of resources, whereas having fewer workers can result in underutilization of investments. Because businesses spend a lot of money on equipment, the cost should be recouped over the life of the equipment. However, underutilization of resources may result in a poor return on investment for the company. Only by successfully managing equipment operation (a requirement that cannot be met when there are insufficient personnel on site) can productivity from equipment use be ensured. Work crews with new or inexperienced members, according to the author, become inefficient due to absenteeism.

Waldschmidt (2022) was of the view that contractors must hire new employees to fill in for qualified workers who are absent to complete projects on time. Paying for the shifted disparity may have a negative impact on performance, safety, and cost per unit. Adding more people disrupts the flow of ongoing tasks being worked on by the original crew. As a result, the work crew's productivity and task completion suffer. Extensive training is required to acclimate new employees to the project and site. This adds time to the project's expected completion date. The original staff may be required to work more slowly to mentor the new employees or give them time to catch up with the project. All of these factors contribute to workplace inefficiencies, which reduce labor productivity.

Cushard (2022) cautioned that retaining existing employees is less expensive than recruiting new employees. Hiring, training, and recruiting all cost money. As a result, attracting and retaining employees is the most profitable investment a construction company can make. When there are fewer people on the job and project deadlines are approaching, businesses are forced to hire more people. Construction companies may end up spending more money than expected on recruiting and training new employees, increasing labour costs and decreasing project profitability. The report warns that replacing absent employees costs both money and time. Employers must spend a significant amount of time and money in order to find talented employees. This includes creating job advertisements, conducting interviews, screening candidates, recruiting them, onboarding them, training them, and correcting any errors they make during the training process. The amount of time lost during the hiring process is frequently greater than the amount of time required to train a new employee.

According to Singh, Chetty, and Karodia (2016), employee absenteeism is linked to low morale; thus, a high absenteeism rate may contribute to low morale, which may then lead to an increase in absenteeism. Employee morale has been shown to suffer because of absenteeism in the construction industry. Employees who are absent frequently become disengaged from their jobs. The inverse is also true, which means that underutilized employees frequently have poor attendance. All these influence employee productivity at work. This also has a significant economic impact. Once the bids are sealed and the contractors are awarded the job, a completion date is set for the project. To remain competitive, businesses must adhere to the estimated timeline and complete the project as planned. Other employees are forced to work extra shifts when some employees fail to show up due to the pressure to complete projects on time. When this happens, employees become tired, which reduces their productivity at work.

A report by Norman and Paul Jr. (2021) revealed that a labour shortage could have serious and long-term consequences for the economy. Furthermore, in contrast to previous labour shortages, the current one affects both skilled and unskilled workers. All of the evidence points to a much larger problem that will linger for years and have a variety of short- and long-term consequences. If the labour shortage persists, we can expect higher wages, inflation, and supply chain issues in the medium term. Furthermore, the competitive job market has increased worker power and given them bargaining power with employers. Businesses must respond to requests for better job quality, better working conditions, and higher pay in order to fill positions in a worker's economy. Although a pay increase is good for employees, a slow employment recovery could increase inflation and impede economic growth. Long-term labour shortages could slow GDP growth, trigger a recession, and stymie or hinder the expansion of businesses that primarily employ manual laborers and blue-collar workers. Demand has increased, but the willingness to return to work has not, at least not under the same conditions.

Matemani¹ and Ndunguru² (2019) discovered that the consequences of the construction industry's skills gap are: Due to a lack of experienced construction workers, there are fewer experienced workers available to pass on their knowledge to new hires, affecting the quality of work. When there is a labor shortage, new hires are also more likely to sustain workplace injuries. Employers should invest more money in educating new hires about safety practices and trade skills at a time when they are under pressure to meet increased demand. Previously, businesses would pair seasoned employees with newly hired employees to teach them specific workplace skills and best practices. When there aren't enough skilled workers, this type of mentoring becomes more difficult. The report added that another effect of the skills gap that may cause problems is the entry of some commercial contractors into the residential construction market. The subcontractor pool and skill set for commercial and residential construction are vastly different. Experts have expressed concern about commercial contractors accepting bids for work in which they lack expertise. For these and other reasons, the economic

pressure to meet the urgent housing demand during this labour crisis has exacerbated the safety risks for many construction workers.

Understaffing, according to Divincenzo (2022), is a major cause of workplace stress, which in turn is a major contributor to attrition. Employees in firms with a shortage of personnel may not feel they have any control over the rapidly expanding task. The organization may suffer from the low work performance of this frantic environment. In other words, overworked employees frequently experience high levels of stress. A recent study found that stress causes more than half of workers to lose interest in their jobs, lowering productivity. If your employees believe they are constantly facing deadlines or a never-ending list of chores, their stress levels will undoubtedly rise. Workplaces where employees feel a sense of belonging to a team that distributes tasks evenly, on the other hand, are typically far more productive and happier. Employee turnover is another drawback of a staffing shortage, claims Divincenzo (2022). The possibility of employee turnover may be reduced by making sure the company has the right number of employees. By doing this, your company will be able to keep its top personnel for a long time and avoid the costs associated with turnover. Finally, businesses with persistently low staffing levels may also experience an increase in workplace accidents. Employees who are exhausted and preoccupied are not only less productive but also more likely to sustain workplace injuries, which could increase the expense of workers' compensation (Divincenzo 2022).

Long (2015) asserted that the growing use of technology in conventional sectors is one important factor contributing to the skilled labour shortage. Modern machinery and equipment are much more technologically advanced, but the retraining of the aging workforce in the skilled trades has not kept up. Additionally, it is a constant struggle to draw new generations into the trades, which aren't traditionally viewed as desirable career paths. A company's growth may be slowed by a lack of skilled labor. In a previous survey, manufacturers listed the following as the top three effects of skills shortages: they are forced to hire unqualified candidates; production opportunities are lost, and less money is invested in the business and product development, all of which hurt manufacturers' ability to compete. Slow growth may then force a business to make corners elsewhere to save money and boost profitability. Less strict maintenance or quality-control procedures could result in losses as a result of this. For instance, failing to maintain equipment properly can lead to costly repairs and investment losses that may not be covered by insurance and that the business would have to pay for out of pocket. Inadequate quality control might also lead to pricey product liability lawsuits, which would raise insurance claims and consequent premiums. In extreme circumstances, it might even lead to a reduction in coverage. Lack of appropriate skills among employees may have an impact on the quality of the work. That could raise the price of having to fix subpar work or pay for damages caused to third parties because of negligence on the part of an under-qualified worker.

Holtmann (2022) maintained that the skilled labour shortage cannot be solved easily; it will require a mix of education, training, and a shift in the public's opinion of the trades. Businesses can increase their future talent pool by collaborating with regional colleges and universities. In addition to offering students a head start in their careers, co-ops and internships also allow employers the chance to identify and hire potential employees ahead of their rivals. The moment is now for businesses to act due to an aging workforce and a lack of new talent pools. Those who succeed will be able to hire and keep skilled workers who generate high-quality work, which will reduce risk and pave the way for further success.

Oke, Aigbavboa, and Khangale (2018) believe that a lack of workers has harmed the country's economy and international participation. The study discovered that a lack of skills has a significant impact on a country's socioeconomic growth and development. According to the report, the inadequate and lack of basic skills in the construction industry is threatening the industry's future and will continue to do so, especially as demand for construction products rises. As the demand for construction products and services grows, so does the problem of skill shortages, which is caused by many senior employees with adequate skills and a small number of younger employees taking their place. To be successful in the construction industry, artisans and professionals must have technical, business, managerial, and other skills. According to the authors, in order for construction firms and contractors to attract skilled artisans and professionals, there is a need to improve their welfare, raise their salaries and wages, and increase their total compensation. The lack of adequate construction skills has a negative impact on the growth and development of Small, Medium, and Micro Enterprises (SMMEs). However, due to a lack of skilled labour, many emerging construction firms have failed. The authors cautioned that a lack of skills leads to ineffective management strategies at the start or early stages of a project, which eventually leads to the failure of construction projects. According to the study, the construction industry's skills shortage has impacted the quality and productivity of construction projects over the years. The shortage of skills has put pressure on the construction industry, and as a result, the industry is struggling to meet the industry's rapidly increasing service demands. According to the study, the construction industry frequently experiences workforce shortages, which cost both contractors' and other stakeholders' resources in terms of time and money.

According to Bloom (2021), a global labour crisis is hindering the recovery of small and medium-sized firms from the epidemic. If small enterprises had enough staff to handle everything from production to customer service, they would increase production and move near to pre-pandemic levels. Small and medium-sized businesses (SMBs) are less robust and more vulnerable to problems because of their size. Productivity is impacted by a staffing shortage. Projects are done

more quickly the more skilled people are available. How many projects SMBs can take on is impacted by this. Reduced income and profit are the results of a lack of productivity. In some cases, this has affected small businesses to the extent that they are no longer operational. There are fewer options and fewer opportunities for innovation (Bloom 2021). The report also indicated that skill shortages have an impact on safety. Workers may try to do physically challenging work on their own and injure themselves. This can be a huge drain on the finances of a small business. Customer relations suffer as a result. When a company lacks sufficient manpower, it struggles to meet its production and delivery targets. Customer expectations are constantly rising, and businesses that fail to meet them will struggle to compete. Customer service is critical today because customers who do not receive the service they require will quickly move on to another provider. Meeting changing employee expectations has an impact as well. Employee expectations have shifted significantly because of the COVID-19 pandemic. Understanding what employees want and meeting those needs is critical to resolving the talent shortage. Many business owners are currently working on incorporating new types of flexibility into roles, such as a mix of in-person and remote work. Another step that businesses can take to address labour shortages is to invest more in training and development programs. They could assist current employees in transitioning into new roles that require new skills. They must also look outside of the business for talent that they cannot develop in-house, as well as cultivate talent communities on which they can rely.

According to Paul (2020), the following are two ways that understaffing can harm a business in the following ways:

- **Loss of sales and customers** - Understaffing can be one of the most serious problems for any business.
- **Revenue loss** -- right, that's if you don't have enough people to answer the phone or interact with new customers, how can you possibly give them the care and attention they need to buy from you? Even dividing your sales team to cover both new and existing customers will not work. You will continue to lose new sales and have customers leave you, the author added.
- **Brand damage** can result from poor customer service, which can be caused by the smallest of factors. Customers waiting on the phone for an extended period, for example, may not be able to find someone in the store to assist them, or there may be no one to assist them in a live chat on your website. Customers become frustrated because of these issues and leave a negative review. It can take years for a company to build a good reputation, but it only takes a few months for all that hard work to be undone.
- **Work quality** will inevitably suffer as there will be more projects to manage and less time to work on each project. With more workers to handle, the construction team will have less time to understand individual construction requirements; the marketing department, as well as all other departments rushing around to finish their projects, will have less time to thoroughly check their work. All with less care and more errors. It's possible that the increased workload isn't the cause of the poor work quality. Employees may simply dislike the workload; they are unconcerned about the outcome. They simply have too much work to do and have lost all motivation to do it well.
- **Employees who are stressed** - Increasing the workload not only reduces the quality of work but also puts employees under extreme stress. Many people may become stressed as a result of the additional work, as they struggle to complete it all on time. Stress can cause a variety of mental health problems, requiring employees to take several days off to recover. While these employees are away, you will be left with even fewer employees to cover your business, which means even more work for the few remaining employees, causing them to become stressed and take more time off.
- **High staff turnover rate** - Why would anyone want to work for a company where they are overworked and stressed, as well as customers who are constantly complaining and leaving negative reviews? The simple answer is that they wouldn't. Employees will quickly leave for companies that care about their employees and have enough staff to cover the workload. All of this necessitates the hiring of additional personnel, which incurs additional costs for recruiting, interviews, and training. This is after it has become extremely difficult to hire anyone due to the high turnover rate, causing your company to have a reputation as a bad employer.

Cushard (2022) discovered that absenteeism influences individual productivity. According to the author, if someone works less, they are more likely to be less productive. Employers should consider root causes like burnout and disengagement, as well as those that may necessitate accommodations like childcare or illness. These issues must be addressed immediately by organizations. If an employee is frequently checked out, it could indicate a lack of morale, engagement, and passion for their work. The study also looked at the effect of absenteeism on team performance. According to the report, as missed work time increases, employees in the office are left to make up for work not completed by absent employees. Spending more time per week dealing with absences and preparing for/adjusting workflow to keep things moving has an impact on supervisor productivity as well. According to the author, one of the most significant negative effects of absenteeism on the employee experience is the additional workload that colleagues must bear in order to cover absent employees.

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Absenteeism was also discovered to reduce profit margins in the sense that increased costs reduce profit margins unless revenues increase. For example, if organizations spend more money on overtime pay and contract workers, direct costs rise while profit margins shrink. According to the report, absenteeism can reduce revenue if employees with specific roles are not present. The author used the example of construction plant operators who are experts in plant operation. When such employees are absent, they will undoubtedly have less time to achieve their objectives, resulting in a decrease in revenue, Cushard (2022) says.

5. THE STRATEGIC MEASURES TO BE TAKEN TO COMPLETE THE PROJECTS AND RECOVER THE LOSS

Contractors must fully understand the provisions outlined in contracts, according to Lorenz (2018), to ensure they are not impacted by labour availability. The research revealed the key to avoiding the following pitfalls:

- **Common contract pitfalls** - While each construction contract is unique, every agreement will include provisions governing payment and project timing, both of which may be impacted by a labour shortage. Companies should address these issues when reviewing contracts to avoid potential liabilities for all parties down the road.
- **Labour provisions** - During a labour shortage, one of the most common ways projects get into legal trouble is by failing to meet labour requirements. Most contracts will hold the general contractor responsible for providing adequate labour to carry out the work outlined. Before entering into an agreement, it is critical to ensure that the companies can provide the necessary amount of labour for the project. In contrast, if an owner discovers that its general contractor (GC) is unable to meet the contract's proposed deadlines due to staffing issues, it may be time to rethink the project.
- **Project delays** - In addition to specific labour provisions, businesses should review contract language regarding project timing and delays, particularly as it relates to labour. These provisions can be difficult to identify because they are frequently not listed in the labour provisions mentioned above but have similar consequences if not followed. Failure to meet contract deadlines due to a labour shortage could be viewed as a direct breach of contract by the GC or as an uncontrollable market condition that all parties must endure, depending on the contract language. Regardless of the language, it is critical to understand the potential consequences of failing to meet deadlines due to a lack of sufficient labour.
- **Liquidated damages** - For projects that require a hard, specific completion date based on the owners' business (such as schools, restaurants, or retail establishments), owners will frequently include contract provisions outlining liquidated damages that could be enforced if project deadlines are not met. These are primarily included as financial safeguards for the owner, ensuring that it will be compensated if the project is not completed on time. When reviewing these provisions, owners and general contractors should make a game plan for dealing with potential labour issues that could disrupt the project schedule and jeopardize the timely completion of the work.
- **Payment structures based on contract milestones** - Contracts may include clauses that govern payment terms based on project milestone completion. For example, a project that begins in April may be scheduled to be completed in November. However, for the contractor to be compensated for 50% of the job, the owner may require that 50% of the work be completed by August. This means that contractors must plan their schedules accordingly, projecting labour requirements based on work status. Beyond the confines of a contract, there are numerous other ways for businesses to protect themselves during a labour shortage, particularly for ongoing projects.
- **Invest in training new employees** - Labour shortages in the industry frequently result in higher employee churn rates. Construction companies may become so desperate for more workers that they hire less-than-qualified workers for specific jobs. In these cases, it's critical to remember that quality trumps quantity — simply having more people on a job doesn't guarantee that it will be completed correctly or on time. Instead, consider establishing an apprentice program aimed at developing new talent. Showing a commitment to developing and retaining employees gives owners additional assurance that the work outlined in contract agreements will be completed accurately and on time. Furthermore, businesses will always have a pool of eager workers who are trained and prepared in the event of an unexpected project.
- **Be proactive about worker safety** - The construction industry is inherently dangerous, and in a tight labour market, every employee counts. To reduce the number of workplace accidents, construction companies should reconsider current safety protocols. This may include reviewing daily walk-around procedures, inspecting common risk zones such as scaffolding, holes in flooring, ladders, and so on, as well as hosting regular safety demonstrations.
- **Check that your insurance is adequate and up to date** - Most construction companies do not review their insurance policies on a regular basis, which exposes them to a slew of unnecessary liabilities. Is your professional liability insurance adequate to protect your business in the event of a labor shortage delay? Should you think about purchasing an additional policy or policies? Are our boundaries adequate? When reviewing current construction projects and projecting potential future construction needs, all these questions should be addressed. It is critical to consult with a qualified construction

practitioner who is familiar with the construction industry. Above all, owners and contractors should be aware of this economic shift and be open and honest with one another during the project and contract development phases. To avoid surprises once work begins, carefully scope all timelines, budgets, and staffing schedules. And, as always, taking the time to have contracts reviewed by a qualified legal team who is familiar with your industry is the best way to ensure that all risk mitigation options have been explored, according to Lorenz (2018).

Dozol (2022) discovered that companies are generally having difficulty hiring people for open positions, whether it's finding replacements or increasing staff. In fact, there is a shortage of qualified manpower, or talent, as many prefer to call it. The study identifies the following methods for dealing with labour shortages:

- **Handling manpower shortages** - When defining the skills required to fill a job, it is critical that they are based on the activities that will be performed. Leaving some of them out to increase the chances of finding candidates results in overburdened recruiters and suitable candidates being overlooked. However, "loading up" on requirements eliminates good potential candidates. They may have the necessary skills and experience to fill the position, but they are overlooked. This strategy also impedes the operation by allowing an open position to go unfilled for an extended period. That is why familiarity with the activities and routines that a worker will perform is critical. Having a well-written description of positions and roles with the necessary and desired requirements will make it easier to publicize it and look to leaders for assistance in completing these tasks.

- **In-house treasure hunting** - Filling a position with internal staff is one hypothesis that is sometimes overlooked. This concept may appear to be counterproductive at first. It will solve one problem while potentially creating another in the area or role that the professional is leaving. However, the position created by the reallocation may be easier to fill through external recruitment than the original position. It is critical for the success of this strategy to have the support of software that provides a map of organizational competencies. This will assist you in locating professionals who are compatible with openings and demonstrating the extent to which a reallocation could have an impact.

- **Anticipating needs and solutions** - It is preferable to anticipate needs rather than hoping for an improvement in labour shortages. Prepare your workforce to respond to strategic demands. Map the fundamental roles required to achieve your company's strategic goals using them as a starting point. With this information in hand, create a competency inventory to identify existing gaps. Based on this, invest in training activities to develop, and equip the team to meet the demands of the company's growth. The need to open external positions can be reduced while also contributing to lower turnover.

According to Volo and Beveridge (2022), report on What Can Employers Do to Overcome the Labour Shortage, companies that do nothing to address the labour crisis risk facing severe consequences. Productivity loss, setbacks in achieving organizational goals, and high work pressure all exacerbate worker burnout. Sign-on bonuses, referral bonuses, and retention bonuses are all common financial incentives. However, as predicted by wage drift theory, higher wages and other economic motives will spread to other companies and sectors, reducing their effectiveness. Instead, proactive employers should emphasize providing competitive working conditions and take a human-centered approach. As a result, we see many companies offering hybrid and remote working options, expanding wellness benefits, and creating a more appealing work environment overall. The study added that focusing on People, Brands, and Culture can help to alleviate labor shortages. The most common reason for employees leaving their jobs is a strained relationship with their boss. Profits are generated by successful organizations, but so are thriving employees. As a result, a positive work culture that provides meaning and empowers employees can attract and retain exceptional talent. This includes having a clearly defined larger purpose, high levels of trust, and genuine caring in an environment where people want to be a part of the company and believe they can contribute. Leaders must first recognize the importance of a positive company culture! This will help to attract and retain great people in the long run. It is necessary to improve employee benefits and working conditions. To attract workers in a highly competitive job market, the simplest and most straightforward solution is to create better jobs. The study discovered the following methods for overcoming labor shortages in the industries:

- a. Encourage flexible working:** Transitioning to a hybrid working structure has been extremely successful for us and is now widespread throughout the organization. The ability of those individuals to work in both our award-winning office environment and from home is a major selling point in our recruitment.

- b. Promote well-being:** The business culture is changing for the better, with organizations openly supporting their employees' well-being. Companies are putting more emphasis on mental health and promoting physical activity to make their employees happier - the end result is that they are fulfilling their responsibility as an employer, increasing staff retention, and becoming more appealing to prospective employees.

- c. Satisfaction:** You are already building a good reputation by keeping your current employees happy in their roles. If they are happy with their workload, personal growth, compensation, and environment, they will gladly tell others about

available opportunities. We have implemented a program in which employees are rewarded if they refer a vacancy to a candidate who is successfully hired.

d. Provide Opportunities for Development and Growth: To boost retention rates in blue-collar jobs, companies are lowering educational requirements, providing job training, career path guidance, or even funding education.

Jones (2022) reiterates that the global demand for new infrastructure means a greater demand for labor, but the skills shortage makes this increasingly difficult. While the world recovers from the effects of the Covid-19 pandemic, the construction industry is hard at work planning projects and designing new infrastructure for the coming year and decades. However, Jones (2022) advised that the industry will only be able to keep up with the growing demand for new construction and new home services if it attracts new workers—young people, women, immigrants, and military vets. It's also important to understand how to encourage older, skilled workers to stay on the job as long as possible. The study discovered the following labour shortage mitigation measures:

i. Implement in-house apprenticeship programs- Apprentices are in high demand for vocational careers and trades. Registered apprenticeship programs are supported by employers and labour management organizations. Apprenticeships enable aging workers to train young people in their trades, passing on their knowledge to the next generation. Because young workers take longer to train and are more likely to drop out, extra assistance should be made available if possible. You should also be aware that apprentices are typically paid from the start of training and that a permanent position is likely to be offered upon completion. This pay and job security are likely to make this work more appealing to young workers, helping to alleviate the labour shortage.

ii. Let women know why they are welcome - Apprenticeships are more popular with men than with women; in 2016, women accounted for only 3% of construction apprentices, with the majority working behind the desk, in design, management, or administrative roles. Nonetheless, despite a labour shortage, a lack of women in the industry, and age-old stereotypes, the construction industry outperforms others in terms of the gender pay gap. Showcase how your company is inclusive of women by offering equal pay and learn how women are treated differently on the job. Consider how you can improve the culture on your own site to make it more welcoming. Make sure women feel safe at work and are recognized for the high quality of their work.

iii. Retraining workers from other industries - Workers with important skills from other industries are a great resource. Veterans are a great example. Every year, approximately 250,000 people leave the military in the USA, eager to find work in another industry, such as construction is another way to address the labour shortage.

iv. Advanced onboarding to reclaim lost time - Orientation is the most tedious task on the job. Workers and managers waste valuable time completing site orientation and qualification. Allowing employees to complete orientations online from any location creates a more flexible work environment. By offering online orientations, you give construction workers hours back in their day, allowing them to spend more time with family and break ground faster.

v. Productivity Impact - The relationship between manpower and company projects is straightforward: manpower is proportional to productivity. The greater the number of people available to work, the faster projects can be completed or the more projects a company can take on. In contrast, a lack of sufficient manpower prevents businesses from completing tasks. A decrease in productivity results in a decrease in revenue and profit, which in some cases means the business, cannot continue to operate.

vi. Maintaining Safety Needs - When a company employs enough people, workers do not need to work a lot of overtime hours. Because there are more people to handle tasks, the assigned workload is more appropriate. As a result, employees are typically less stressed and more rested and alert. Similarly, when there are enough workers on the clock, there are more people to ensure that safety regulations and policies are followed, and workers can seek assistance for physically demanding work. A good level of manpower thus aids in the prevention of issues such as burnout and injury. As a result, lawsuits and workers' compensation claims may be reduced.

vii. More Options and Innovation - When a company's manpower is adequate, it has more options in how it operates. It has some leeway in terms of who covers shifts; it is easier to find people to fill in. Additionally, the company has a larger pool of workers from which to form strong teams and is more likely to have employees with the skills, knowledge, and abilities to address current company problems. Furthermore, the company has more employees who can contribute their own ideas and viewpoints. As a result, it may find it easier to remain innovative and competitive. For these reasons, Forbes magazine recommends interviewing from a diverse talent pool to ensure that you can hire the people you need in your various departments.

viii. Customer Relations and Finance - Adequate manpower enables businesses to keep production and delivery promises. Companies that do this can establish and maintain positive client relationships. This may result in additional productions. At the same time, keeping promises can keep businesses from having to pay fines and penalties, which keeps profits higher.

ix. Greater Employee Representation - Most businesses in the United States operate on the traditional master-servant model. This simply means that the employer makes the majority of the decisions, and the employee is expected to work for the benefit of the company. However, if not reined in, some employers abuse the power that this type of relationship provides. Employees are better able to band together and lobby for fair treatment when there is a large amount of manpower in a company. For example, if managers only receive one complaint, they may not give it high priority. However, if the company receives 1,000 complaints, managers will find it more difficult to ignore the problem. As a result, manpower is a critical tool for holding companies accountable.

According to Batra (2022), one of the industry's biggest challenges has been a labour shortage in construction for several years. Despite steady industry growth, companies are still struggling to fill key jobsite roles, putting them at risk of losing jobs or extending project timelines. Instead of resigning to accomplishing less with fewer workers than needed, the author advised construction company leaders to take steps to overcome the construction labour shortage. According to the study, the following strategies for increasing the labour pool should be considered:

a. Make recruiting a year-round activity - Do not put off finding and hiring skilled workers until your busy season. If you don't have time in your already hectic schedule to devote to recruiting, consider hiring a part-time human resource professional. This employee can assist in the creation and maintenance of a recruitment process, as well as keeping your company's name and interests in front of potential job candidates.

b. Provide financial incentives for employee loyalty - Because your current employees are likely to have other options for employment, it is critical to provide them with incentives to stay with your company. Consider rewarding skilled workers when a project is completed on time or under budget.

c. Provide adequate training for your employees - Today's workers want opportunities to continue learning and growing professionally, and you can keep them engaged by providing training. Giving training is a win-win situation. It results in more highly qualified employees for your company, as well as goodwill toward these employees, who will feel valued because of the time and money you invested in them.

d. Ensure that your company is in good working order - The best employees will gravitate toward companies that appear to value them. Make certain that you have everything in order, such as establishing a strong workers' compensation policy, providing training and using appropriate safety equipment. These efforts will ensure that you can meet the needs of your customers while continuing to perform at a high level.

e. Attract and retain workers by promoting safety - While construction companies frequently have programs in place to ensure on-site worker safety, there is still room to promote road safety. Reducing accidents on the way to job sites makes the company a safer place to work. By making your workplace safer, you demonstrate to your employees that you care about their health and well-being and that you value them as people, not just employees.

f. Reduce rising job costs by downsizing the fleet - With fewer workers, available projects are taking longer to complete, increasing construction companies' costs. You can compensate for these time-consuming costly jobs by maximizing fleet utilization. This begins with rightsizing, which ensures that you have the appropriate number of vehicles and assets to run your business successfully.

g. Increase productivity through preventative maintenance - Having assets and vehicles constantly in and out of shops reduces not only profits but also productivity. As job lengths increase due to fewer workers, every vehicle and piece of equipment plays an important role in completing more projects on time. By automating your current preventative maintenance schedules, you reduce machine downtime, which increases workforce productivity and helps reduce job length. In addition, when dealing with a labour shortage, increasing productivity can compensate for having fewer employees.

According to Holtmann (2022) research, the following are strategic ways to overcome labour shortages:

i. Engage in Social Activities - It's a digital world, and job seekers are more connected than ever. Job seekers are looking for leads everywhere, not just on industry job boards and job search websites like Monster, LinkedIn, and Indeed. Even for construction, social media advertisements on Face book, Twitter, and Instagram can be extremely effective at targeting the right people at the right time. Based on search habits, likes, interests, and organizations, advertisement algorithms can filter and pinpoint potential hires. Social media advertisements can significantly increase your reach.

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ii. Network - It is time to look outside the box. Use the resources available from your partners, suppliers, and vendors in addition to reaching out to friends and friends of friends. Other parts of the state or country may be experiencing a decline in local employment, and good workers may be willing to travel or relocate in search of good, solid dependable jobs.

iii. Increase Demand - With every construction company competing for the same skilled workers, reputation alone isn't enough. It's also an opportunity to discuss what makes your company so special. Construction workers are said to be among the most satisfied and happy workers. Current employee testimonials can help potential hires understand what it's like to work for your company.

iv. Hire Interns - The use of drones on construction sites is increasing. Mentorships and apprenticeships abound in the construction industry, helping workers advance their skills and positions. Some companies offer internships with the possibility of guaranteed hire upon graduation to secure workers before they even leave the halls of education. With job prospects for recent graduates bleak, this is a welcome sigh of relief for some.

v. It's Time to Talk Technology - Construction technology advancements are fantastic! Construction applications may be unfamiliar to potential employees. Virtual reality, 3D printing, and drones are becoming more common in the construction industry. It's also unusual to see a contractor open the truck door and have papers, documents, and receipts poured out. Viewpoint-integrated construction software streamlines and integrates all aspects of a project, large or small.

According to Waldschmidt (2022), it was suggested that recruiting and retaining the next generation could help to solve labour shortages. Companies that have solved this problem recognize that the workforce development crisis is not about millennials. According to the author, contractors who participate in mentorship have better hiring success because they already have name recognition with students. The study also recommended that the following be considered:

☐ **Work culture in construction** - Taking responsibility for the construction recruitment and retention problem necessitates a close examination of company culture. Every company, for better or worse, has a culture. How that culture has evolved is determined by how it is emulated and nurtured daily. Work culture has been identified as a major factor in the departure of many skilled-trade veterans from their employers or the industry entirely.

☐ **Alternative talent pipelines** - In addition to young people, there are numerous other viable talent pools and untapped markets that can help fill the skilled-worker pipeline. Among the options are prisons, foster care systems, and the military. If you can provide people with opportunities and jobs after they are released from prison, their chances of returning are very low. The trades must be viewed as a viable option. You can feed your family, and travel around the country - there are many options depending on where you want to take it. While continuing education retention is required in the construction industry, employers should also consider training that provides employees with a path toward a goal they value, such as moving from apprentice to superintendent. Currently, and in this economy, you must invest in workforce training. A loyal employee is one who stays with the company.

☐ **Changing the narrative** - While the narrative that construction is a dead-end job is a systemic issue, individual companies can begin to reframe the conversation and illuminate the opportunities today. People learned skills, created things, and built things to build a country. Nobody can claim that a country was founded because people went to college. That's what we need to keep pushing for, said Waldschmidt (2022).

According to another recent study by Hall (2019), subcontractors must be proactive in order to mitigate the risks associated with construction labour shortages. The following suggestions were made by the study:

a. Strategize and plan - Excessive competition is one of the leading causes of a shrinking labour pool. Consider what you can do differently or better to stand out to attract and build the best staff possible. When competing with more established companies, it may be worthwhile to conduct research into their preferred strategies in order to up your game.

b. Get assistance with your hiring process - We all know that hiring is time-consuming and difficult. Consider the following to make the hiring process go more smoothly:

i. Hiring an employment agency to handle all the heavy liftings in recruiting new employees - This gives you more time to focus on developing your current employees while potential candidates are appropriately screened, and your hiring process runs more smoothly.

ii. Make it known that you are hiring.- Try posting open positions on well-known job boards or social media business platforms like LinkedIn.

iii. Encourage word-of-mouth - Notify your staff that you're hiring and offer financial incentives to employees who refer qualified candidates.

iv. Provide competitive wages and benefits - Benefits packages are one of the most important factors employees consider when selecting a company to work for, and they also influence whether workers will stay. People will be more inclined to notice what embodies your business culture if you provide good health insurance, paid time off, competitive wages, and financial assistance for further education. Make these advantages stand out. Because of the high demand for workers, there are construction labor shortages in qualified skilled tradesmen in some areas. Offer additional incentives, such as flexible hours, in addition to higher benefits, to get people through the door.

v. Ensure that your subcontractors are "up to speed" - Some trade schools now offer construction technology classes. By providing training, these programs can assist new workers in gaining access to various jobs on larger projects (e.g., software design, power tools, and automated equipment). While these courses frequently necessitate a high level of commitment, the skills learned can boost productivity while also improving career and job satisfaction. It also implies that your workforce is highly specialized. Consider reaching out to the next generation of subcontractors by attending career fairs or contacting schools to give presentations to their students.

vi. Collaborate with other businesses - The business environment is becoming increasingly competitive. This means that collaborating with other businesses is sometimes a good strategy and sometimes a requirement. Subcontractors can band together and sign contracts with businesses, for example, if one contractor needs more workers and another has open slots in their schedule, thereby benefiting both parties. Consider paying a good wage to borrow workers with specific skills from other companies.

vii. Be the best place to work - There are a few things you can do to make your workplace more appealing:

- Implement sick leave and vacation policies.
- Provide employees and their families with discounts or complimentary services (e.g., restaurant vouchers, gas cards).
- Make your construction site a fun place to be. Organize company events that encourage collaboration, boost morale, and foster relationships.
- Provide flexible schedules. People are more motivated and productive when they have a say in a weekly routine where schedules and project timelines frequently change.

viii. Embrace construction technology - As the construction industry becomes more technologically focused, businesses are constantly developing new ways to improve processes and make life easier for their project teams. There are numerous types of technological tools available to help you improve your work management processes. These tools can assist you in keeping track of employees' time off requests, shift trades, availability changes, and other important information. These systems can also be integrated with payroll software to provide information about employees' hours worked per pay period, overtime requirements, and so on.

ix. Embrace Artificial Intelligence (AI) - Artificial Intelligence is the future of the construction industry. AI can be used to boost productivity, cut costs, and transform how you manage projects on the following ways:

- Increase safety: AI systems equipped with sensors can monitor many aspects of a construction project, including safety. This means that the software can analyze risks and alert users to potential dangers and hazards.
- Reduce waste and rework while avoiding cost overruns: AI assists subcontractors in intelligently forecasting supply and demand and providing more accurate estimates.
- Keep schedules: When it comes to managing tasks, scheduling, and deadlines, AI and automation do the heavy lifting.
- Stay within your budget and avoid cost overruns.

According to Medcalf (2022), there is no simple solution to the skilled labour shortage. However, as the problem becomes more prevalent, the author suggests four steps that businesses can take to begin addressing it:

a. Increase Salaries - Companies can mitigate the effects of the skilled labor shortage on their projects in the short term by posting job opportunities with industry-leading salaries. With the current job market becoming increasingly competitive, jobs with higher pay often win out. While this will help the company find the talent it requires, it may not be beneficial to the industry.

b. Expand Apprenticeship Programs and Incentivize Training - The next step for businesses is to upskill current employees and/or offer (more) apprenticeships. If you have good employees who are missing certain skills, it may be worthwhile for your company to pay for or incentivize their training. Similarly, if more companies offer apprenticeships, the industry will produce more trained professionals while also increasing enrolment in apprenticeship programs. However, both solutions are dependent on having either unskilled labour or students to draw from.

c. Inspire Young People - The third step that businesses or individuals can take is to advocate for the industry by writing or meeting with local schools, writing or meeting with local politicians, and joining or creating a trade training outreach program through an industry association.

d. Use Technology to Your Advantage - The final step in mitigating the impact of the skilled labour shortage on your company is to adopt specific equipment and technologies that reduce labour requirements. A small excavator and one operator could do the same job as a three-person crew equipped with hand tools. You can eliminate the need for a site surveyor by using a drone. By implementing project management software, you can reduce the time it takes to complete a variety of tasks, making your team more productive and reducing labour needs.

According to Long (2015), one potentially positive outcome of the construction labour shortage is that businesses must become more efficient. The study revealed some ways to use technology to reduce waste and save time and materials, allowing your company to accomplish more with fewer resources:

i. Save Time with Mobile Technology - You can save time on your construction site by accurately planning and adjusting schedules in real time. You don't want people standing around waiting for their tasks to begin because a previous job hasn't been completed or materials and equipment haven't arrived. Mobile technology will help you keep track of the work each day and will notify managers back in the office if schedules need to be adjusted. This way, you can ensure that when trades and workers arrive on-site, they can complete their tasks, reducing lost production time.

ii. Use Technology to Your Advantage - Technology can assist you in better managing your job site so that you are not impacted by the construction labour shortage. You can use geo-location on mobile devices to track exactly when workers are on-site by requiring them to include their location when clocking in and out. This will help you keep track of who is where. Don't overspend on overtime because workers are present but unable to complete a task. You can also save administrative time in the office by implementing a Cloud or mobile-based solution that eliminates the need to manually enter all of this data into a spreadsheet or other tool. Technology also reduces the time it takes for approvals to be processed between the job site and the office. Managers on-site and in the office can always have access to the most recent data and information, allowing them to get answers and make informed decisions more quickly.

iii. Keep Workers Safe - An accident on your construction site is bad for everyone, and it will have serious consequences for your timeline and business reputation. Workers' safety should always be a top priority. Conducting a job safety analysis and providing adequate worker training is critical, and they can be completed more quickly when the process is digitized and completed on a smartphone or tablet. You must also manage time and resources effectively so that employees are not working longer hours than necessary or rushing and taking shortcuts because you are understaffed and trying to meet a deadline.

A report by Hall (2019) indicated that today's construction industry is failing to attract and retain a workforce capable of meeting the complexity and demand of the current economic environment. There appears to be a significant shortage of human capital in the construction industry, ranging from field labour to management. As contractors attempt to hedge the additional risk they are assuming by committing to project delivery in an uncertain labour environment, the upfront cost of construction and schedule will soon be impacted. Long-term effects may even jeopardize the viability of an industry for future generations, and thus the way of life (e.g., a depressed construction industry means limited new structures). The author further added that the workforce shortage could be mitigated by:

a. Rebuild a Strong, Long - Term Construction Workforce - Construction is a resilient industry that has overcome numerous challenges over the years and will undoubtedly overcome the current labour shortage. The question is, how should it look when it bounces back? Let us reimagine construction as the appealing, challenging, one-of-a-kind, and rewarding industry that it is. Building a strong, sustainable pipeline of quality construction professionals capable of meeting the industry's diverse and imminent needs is critical and will pay dividends to the industry and the marketplace at large.

b. Collaboration - The efforts in vetting and cultivating strong relationships with trade contractors will pay off on the projects. Because there is so much work available, the carrot of "the next job" is no longer the primary motivator. Trade contractors, on the other hand, may be more likely to perform well if interest is shown in them as valued business partners. In fact, one top contractor recently changed their company nomenclature from "subcontractors" to "trade partners" to communicate their commitment to this level of partnership both internally and externally.

c. Communication - Early and frequent two-way communication with parties upstream and downstream will improve your ability to manage projects in uncertain labour conditions. Consider hiring project managers to oversee and support quality, safety, and other job site activities, particularly if new workers or subcontractors are involved. Watch for warning signs, especially at the end of the day, when key personnel are absent (to avoid the tendency for others to "fill in"), and when activities are near completion against a hard deadline. Be wary of brokered labour and keep an eye on subtler payments to ensure your valuable workforce remains viable. Considering the current "hot market," address schedule, manpower, escalation, and contingency concerns early in the prime contract with the owner.

d. Reboot Interest in the Construction Industry - Construction is the oldest industry in the world. That is an exciting and inspiring viewpoint that we should use to attract and retain talent, rekindle enthusiasm, and revitalize interest in construction. The authors stated the three important ways for us to do this and no better time to start than now.

According to the report by Pailwan¹ and Tatar² (2020), knowing the causes of absenteeism allows absenteeism to be dealt with much more effectively because the cause is treated directly. Absenteeism can be dealt with by implementing proper personnel policies, as laborers fall under the purview of Human Resources. The study discovered that health issues are the leading cause of workers' absenteeism. Seasonal and climatic changes are to blame for laborers' health problems. According to the authors, health issues can be reduced by holding regular medical check-up camps for laborers. According to the report, absenteeism can be reduced if the employer can provide at least one meal of the day which is a properly balanced meal. Along with the weekly off, a set number of holidays can be assigned to employees on a monthly or yearly basis. It was also discovered that semi-skilled and unskilled labour have higher absenteeism rates than skilled labour. However, the study insists that absenteeism is one of the causes of cost overruns that are rarely considered (loss of time and production), and that increasing productivity while decreasing time will result in higher profits. Workers' socioeconomic conditions will improve as their income increases, allowing them to live better lives. Furthermore, Pailwan¹ and Tatar² (2020) discovered some unique solutions to labour shortages in construction projects. The authors stated that incorporating a communication, motivation, and leadership plan is the best way to keep employees motivated at work and in good spirits. Regular staff meetings should be held to establish communication with employees, emphasizing positives and downplaying negatives, recognizing, and acknowledging their work, and clarifying expectations and job requirements. Finding out what motivates employees, showing appreciation, encouraging stress relievers, fresh air, and vacation days, and increasing compensation are all ways to motivate employees. Employees can be led by developing leadership skills, sending them to training, and delegating tasks. Surprisingly, in today's age of technological closeness, the constant intertwining of work and home life through technology has been a leading cause of employee stress and burnout. Some employers go out of their way to keep a safe distance between their personal and professional lives in order to keep employees engaged with the company's goals. The study identified several job stressors that may be linked to depression, including high job demands, limited job control, and a lack of social support at work. However, depression is a complex condition, and changes in the workplace environment will not necessarily result in significantly lower rates of depression throughout the workplace. Employers must be both proactive and reactive in order to ensure that employees receive all necessary care in relation to this phenomenon. Employers should take the lead in creating a work environment that reduces the risk of depression caused by stress, bullying or harassment, or other workplace issues. Employers should be proactive in responding to employees who are already depressed by providing assistance such as depression recognition screenings, employee assistance programs, supervisors who have been trained in depression recognition, and ensuring workers have access to needed psychiatric services.

Pailwan¹ and Tatar² (2020) also stated that an effective employee absence plan should be implemented to deal with attendance issues in order to prevent excessive and unnecessary absences for any reason. The plan should define expectations clearly and outline disciplinary actions for employees who do not behave appropriately, as well as incentives for those who do. Through recruiting and training, the company can take preventative measures to reduce absenteeism. Positive reinforcement of good attendance and the implementation of flexible scheduling are two other effective strategies that businesses can use to reduce absenteeism:

i. Create an Absence Policy - Creating an airtight absence policy is the first step in developing a system of controls to prevent absenteeism. Employees will have a clear understanding of what the company expects as a result. This will pave the way for the establishment of an organizational culture centred on exceptional attendance. When developing an absence policy, the company should ensure that clear expectations are established. They should inform employees of the amount of time they have before being considered late, as well as the point at which they will be considered absent. When establishing these expectations, the company must take the time to explain the distinction between paid and unpaid time off. They should clearly explain any deadlines or restrictions for requesting time off. Furthermore, the terms and

conditions for paid holidays, military, religious, jury duty, and family and medical leave should be defined. At this point in the control process, the company policy for disciplinary actions should be developed and documented so that all employees are fully aware of the rules. Furthermore, management should set a good example by arriving on time every day and only taking absences that are authorized by company policy (Pailwan¹ and Tatar² 2020).

ii. Proactive Recruitment - An absence policy is useless if employees are not competent or hardworking enough to follow company guidelines. Employees will be less likely to feel singled out and resent the attendance policy if it is applied consistently throughout the company. Employees should be hired on the basis of their competence and attendance, among other things. When looking for candidates who will take company guidelines seriously, using professional venues to attract employees is the best option. Once those employees are hired, the company should take the time to train them on company policies and ensure that they understand what is expected of them in terms of absences. Furthermore, communication should be maintained throughout the employee's tenure with the company to ensure that absences are used positively. Any absence issues should be addressed, and the company should be present to inquire whether increased absences could benefit employee morale while decreasing presenteeism.

iii. Reinforcement - After the initial hiring and training phase is completed, programs for positive reinforcement of attendance should be implemented to keep employees moving toward company goals. Financial incentive programs, recognition programs, lottery programs, and information feedback programs are the four major types of positive reinforcement plans:

- **Financial incentive schemes** - These programs financially compensate employees for excellent attendance. For example, at one company, employees who had no absences received a cash bonus at the end of the year. Employees who missed one or two days may be given a little cash bonus. Companies can also pay employees for every sick or personal day missed or offer extra days for the following year in exchange for perfect attendance.

- **Programs of recognition** - Some companies hold personal recognition events at the end of the year or quarter to recognize excellent service, whereas other companies award employees with few absences with congratulatory cards signed by the manager or with custom-designed, engraved jewelry commemorating the event and the company.

- **Lottery games** - Lottery programs allow employees who have few or no absences to enter a lottery and win a prize. Companies will be given lottery tickets based on the number of absences they have accumulated during the period, and if their name is drawn, they will be eligible to win a prize designated by the company.

- **Programs for information feedback** - There is no financial incentive in this type of program, but employees are notified with each pay-check of their absence situation and how their level of attendance compares to that of other employees. It appears that implementing some combination of the above types of programs to incentivize employees to do what is right before disciplinary actions must be carried out in accordance with rules is the most effective way of influencing employees.

iv. Flexible Scheduling - Many businesses have implemented some form of flexible scheduling to avoid some of the costs associated with absenteeism in the future. Flexible hours, compressed workweeks part-time work, or job sharing are all examples of flexible scheduling (a structured form of part-time work) that could reduce the rate of absence.

Utting (2010) investigated the risks of construction skill shortages, and many organizations are dealing with them by accepting the new reality that the market, not the company, will determine the movement of their employees. Managing retention entails controlling the flow's direction and speeds rather than trying to dam it. While an increase in skilled foreign nationals helps to alleviate pressure, obtaining work permits to bring in skilled foreign nationals is frequently a lengthy process fraught with unnecessary delays. Migrant workers on temporary work permits primarily perform manual labor. Visible management support is critical in convincing teams that they are serious about career programs and not just performance management. Graduate programs and mentoring are becoming more common, and many contractors offer construction skills training centres. However, some contractors are transferring all risks to project owners, who will eventually be forced to cancel projects that are no longer feasible based on a reassessment of risks and rewards. According to the study, the government is dealing with the shortage by implementing policies such as the Joint Initiative for Priority Skills Acquisition, South Africa's Accelerated and Shared Growth Initiative, and the Construction Transformation Charter Group. These are expected to keep the industry going and transform it.

6. RESULTS AND DISCUSSION

Findings from six vibrant construction contractors revealed the key damages to the construction projects due to the lack of workers on site. These damages are indicated as follows:

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CONTRACTOR - A

Contractor A indicated that a lack of workers on site could cause a delay in project delivery. The contractor also stated that the project's timeline would be jeopardized.

What exactly is a construction project delay? Construction project delays occur when project events occur later than expected due to causes related to the client, consultant, and contractor, among others. Construction delays in residential and light construction are frequently the result of miscommunication between contractors, subcontractors, and property owners. A project delay is an unplanned and unexpected postponement of a project due to an event or occurrence that prevents the project from starting or continuing. It is the length of time that causes the project duration to be extended and the delivery of project goals and objectives to be disrupted. Project delays are frequently caused by circumstances that create barriers to the start and continuation of project activities. A delay is rarely caused by a request from the customer, sponsor, or other stakeholders to have sufficient authority over their project. Unexpected project delays are uncontrollable and have a negative impact on project activities and results. An unanticipated delay lengthens the overall duration of project activities and raises project costs. It causes time-related cost effects, which increase resource consumption and require more time to complete the project.

CONTRACTOR - B

Contractor B was also concerned about the project's delays. The contractor insisted that it is the workers who can ensure successful delivery. The participant stated that when there are labour shortages on a project, the project is bound to run over its deadline. Contractor B shares the same viewpoint as Contractor A.

CONTRACTOR - C

Contractor C believed that a lack of workers leads to cost overruns and project delays. The participant also mentioned that materials and equipment would be wasted. It was also stated that a labour shortage would have an impact on the project's original timetable.

What, however, can we say about project cost overruns? - A cost overrun is an unexpected change in the project budget that raises the overall project cost. Inadequate cost management, inefficient project design, and underutilization of resources can also lead to project overruns or cancellations. Project overrun, also known as project cost overrun, is a situation in which the actual cost of the project exceeds the initial budget. This results in a shortfall in the project's financial requirements, which can slow or halt the project entirely.

What does it mean when materials and equipment are wasted? - Construction waste occurs when materials or equipment are not used as intended. Due to a lack of workers, fragile construction materials may sustain damage when not in use. If construction equipment is not used as planned, it can be a financial waste. This primarily affects rented equipment. To avoid the accumulation of additional costs, equipment and materials should be used when planned.

CONTRACTOR - D

Contractor D believed that a lack of workers for a project could result in project delays and damages. The report also stated that the project time schedule will be impacted due to a lack of workers to complete the work activities within the construction schedule. The participant also believed that the production rate would be reduced. In other words, construction productivity will be low.

What exactly do we mean by low construction productivity? - Given that productivity is the engine of economic growth, governments, and the private sector must work together to maximize levels within a workforce. The low productivity in the industry indicates waste and a country's failure to maximize the potential value of its workforce across a sector. This same ethos applies to businesses as well as countries. To help a business grow, a highly productive workforce is desired. Construction is an intriguing industry to examine through the lens of productivity because it has a well-deserved reputation for having a high number of inefficiencies.

CONTRACTOR - E

Contractor - E was motivated by the fact that a lack of workers or worker absenteeism has a significant impact on the project's timeline. The participant also believed that if a job was not completed or completed late, it could result in a breach of contract and financial loss. If this occurs, it may have an impact on the company's reputation in future projects. When a project exceeds the original project budget, money is lost.

But what exactly is a breach of contract? - When one of the agreed-upon terms and conditions of a binding contract is violated, this is referred to as a breach of contract. A breach can range from late payment to a more serious breach such as failure to deliver promised good. If it can be proven that a contract was broken, the remedy is usually to give the victim what they were promised in the first place. A breach of contract is not considered a crime or even a tort, and punitive damages for failing to perform promised obligations are rarely awarded.

What exactly is financial loss? - This generally refers to losses incurred by one or more parties to the construction contract, such as loss and expense, which refers to direct loss and/or expense as a result of the progress of the works being materially hampered by relevant matters for which the client is responsible. Any physical loss, damage or destruction, theft or misappropriation of any money, bank note, negotiable instrument, or other property belonging to the company is considered a loss of money. For any period, project loss refers to the amount, if any, by which all Project Outlays for that period exceed all Project Receipts for that period. Additional resources added to a project will have an impact on the project's planned financial aspect.

CONTRACTOR - F

Contractor - F revealed that if a project is not completed on time due to a labour shortage, it may result in the project being delivered late. The participant also stated that the issue may necessitate the involvement of additional resources, which will have an impact on the project's budgeted finances. When employees fail to show up on a consistent basis, it can lead to financial instability.

7. CONCLUSION

The construction industry is a people-oriented industry with various forms of skilled and unskilled workers. Although these people are interdisciplinary, their focus is on providing services to improve sustainable project performance for the satisfaction of clients and other stakeholders. As such, there is an increasing shortage of required skills in the industry, and this study explored the impact of this phenomenon on the sustainability of construction projects and the industry as a whole. A shortage of skilled workers in the construction industry leads to problems such as higher project costs, project delays, lower quality, more on-site accidents, rework, and lower workforce productivity. Other impacts include reduced competitiveness of organizations, the complete collapse of companies, higher wages for construction workers, and reduced number and size of construction and construction worker sectors. The availability of the necessary construction technology impacts project success in terms of sustainability, quality, cost, time, health and safety, and stakeholder satisfaction. To cope with this situation, the construction industry's more skilled workforce, i.e., craftsmen and professionals, needs to be absorbed and trained to improve the performance of construction projects. Given this, public and private sector construction companies and other affiliates should invest in training to develop employees across sectors. There is also a need for government agencies such as the Construction Education and Training Authority (CETA) to invest in technical schools to introduce young people to construction-related fields at an early stage of their education. The impact of absenteeism is felt directly by individuals, teams, and entire organizations, putting pressure on productivity and profitability. By discovering and addressing the root causes of absenteeism and taking steps to address these issues, construction leaders can directly impact company performance and employee morale.

8. RECOMMENDATION(S)

- Further studies are required to discover the root causes of the lack of workers on site.

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CONFLICT OF INTEREST

The author declares no conflict of interest in this study.

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Risk Factors Identification of Office Building Construction Project in BPJS Ketenagakerjaan to Improve Time Performance

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Abstract- Several office building constructions within BPJS Ketenagakerjaan during the last 5 (five) years have experienced delays in project completion. The delay is because the process of controlling the construction of office buildings has yet to be developed based on risk. The method uses gap and qualitative risk analysis to determine the dominant risks during the construction life cycle and develop them with risk management based on PMBOK 6th edition. By conducting assessments and analyses related to dominant risk factors at each stage of the office building construction project's life cycle in BPJS Ketenagakerjaan that impacts on-time performance and then formulates a risk response for each of these dominant risks. The results of this study are the dominant risk factors at each stage of the life cycle of the office building construction project in BPJS Ketenagakerjaan.

Index Terms- Project management, Time performance, Project delay, Risk Management

I. INTRODUCTION

With investment management funds and participation program management with significant value, BPJS Ketenagakerjaan continues to develop and innovate in setting standardization of office buildings and customer service areas to improve the brand image. As well as providing excellent service to participants by making changes to the appearance/facade of the building, space requirements and standardization under management policies or changes in organizational structure.

A. Background

The object of the research is a Public Legal Entity, as well as the development of guidelines for controlling the construction of Office Buildings within the BPJS Ketenagakerjaan (owner's perspective) as a social security organization for workers in Indonesia on a risk-based basis to improve time performance, with a risk-based approach. At each stage of the project life cycle, it is necessary to carry out risk management.

As one of the organizers of social security in Indonesia, stipulated by Law No. 24 of 2011 concerning Social Security Administering Bodies, PT Jamsostek (Persero) transformed into BPJS Ketenagakerjaan. BPJS Ketenagakerjaan organized the social security program for workers, including Accident Insurance Work, Death Benefits, and Old Age Benefits. Furthermore, in 2015 held a Pension Guarantee program (JP). BPJS Ketenagakerjaan's vision is to realize reliable, sustainable, and prosperous employment and social security for all Indonesian workers.

BPJS Ketenagakerjaan's missions are:

1. To protect, serve & prosper workers and their families.
2. To provide a sense of security, ease & comfort to increase participant productivity and competitiveness.
3. To contribute to the nation's development and economy with good governance.

The total of 337 offices throughout Indonesia consists of 1 head office unit, 11 regional office units, 123 branch office units, and 202 Pratama branch office units. BPJS Ketenagakerjaan also contributes to the nation's development and economy by implementing good governance.

There are several cases of office building construction delays and problems raised by the mass media which can impact the reputation risk of BPJS Ketenagakerjaan. The cause of project delays is the lack of good project management by the project's owner or contractor, causing construction delays and additional costs for both parties (Truman & King, 2018). A case study conducted in

Indonesia found that projects often experience delays caused by owners and contractors, architects, sub-contractors, and consultants (Zetta. R, 2017).

Based on the delay indications and the impact of the project delay for BPJS Ketenagakerjaan, it is necessary to develop risk-based project management. To determine the dominant risk in the BPJS Ketenagakerjaan office building project to reduce the possibility and impact of adverse risks and to optimize the chances of project success.

B. The objective of The Study

This research aims to provide input to BPJS Ketenagakerjaan as the project owner in developing the existing project management guidelines to improve time performance in project completion. By using risk management to (1) Identify the stages and activities in the life cycle of the BPJS Ketenagakerjaan office building projects; (2) Identify influencing risk factors based on data from office building construction projects within BPJS Ketenagakerjaan, and at each stage of the project life cycle that may affect time performance.

C. Limitations

The study is limited in the following respects (1) The object of research is the office buildings construction/renovation at BPJS Ketenagakerjaan (2) The risks analyzed are risks related to the office buildings construction/renovation. (3) The construction projects are from initiating the work plan until the physical Handover of the building. (4) This research's perspective is from the owner's side.

I. LITERATURE REVIEW

1. Office Buildings Projects

Office building projects are essential to the country's development (Yap, Chow, & Shavarebi, 2019). However, the construction of an office building has associated risks, and it is necessary to identify the dominant risks that may arise so that mitigation is necessary to minimize the risks that can occur in each phase of the project life cycle.

According to PMBOK Guide 6th edition, the project life cycle is the series of phases a project goes through from start to completion. It provides a basic framework for managing projects, regardless of the specific project work involved. Stages can be sequential, repeating, or overlapping, and all projects can be mapped to a typical life cycle shown in Figure 1 (PMI, 2017).

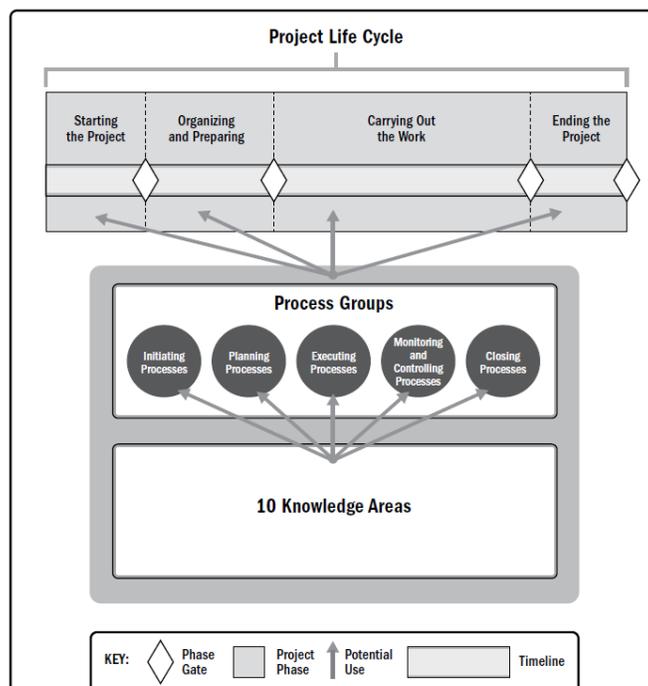


Figure 1. Project Life Cycle
Source: PMBOK Guide 6th edition (PMI, 2017)

2. Project Time Performance

Managing projects in time, cost, and performance is more accessible said than done. The project management environment is highly volatile and includes multiple meetings, reporting, conflict resolution, ongoing planning and re-planning, customer communications, and crisis management. Disciplined time management is one of the keys to effective project management. The project manager cannot control his own time and will not hold anything else on the project. (Kerzner, H, 2003).

Generally, a project delay is when the work is finished outside the estimated timeframe, and most construction projects experience time overrun. Delay is when a construction project slows down without stopping, while suppression is a project termination directed from the owner to the contractor. The time delay is based on two methods: a non-excusable delay (Non-Excusable Delay) and an excusable delay (Akhun, MA, 2017).

3. Risk Management

Risk Management at BPJS Ketenagakerjaan is stipulated by the Board of Directors Regulations and is a confidential document whose use is limited only to the internal BPJS Ketenagakerjaan. BPJS Ketenagakerjaan risk management policies are prepared based on applicable regulations and provisions and ISO 31000:2018 Risk Management Guidelines. According to ISO 31000:2018, risk management is part of governance and must be integrated into organizational processes. Risk management aims to create and protect value, which is realized by improving performance, encouraging innovation, and supporting target achievement.

According to PMBOK 2017, project risk management includes carrying out risk management planning, identification, analysis, response planning, response implementation, and risk monitoring on projects. Project risk management aims to increase the likelihood and impact of native risks and reduce the probability and impact of adverse risks, to optimize the chances of project success.

4. Risk Factors in Office Building Construction

Identify risks in office building construction projects within BPJS Ketenagakerjaan with risk categorization to identify risks using the Risk Breakdown Structure (RBS) as illustrated in Figure 2. RBS is a hierarchical representation of potential risk sources that can cause problems and affect project objectives. Risk factors play an essential role in determining the success of project implementation. This research will develop an office building project strategy by evaluating dominant risk events throughout the project life cycle using a risk management approach.

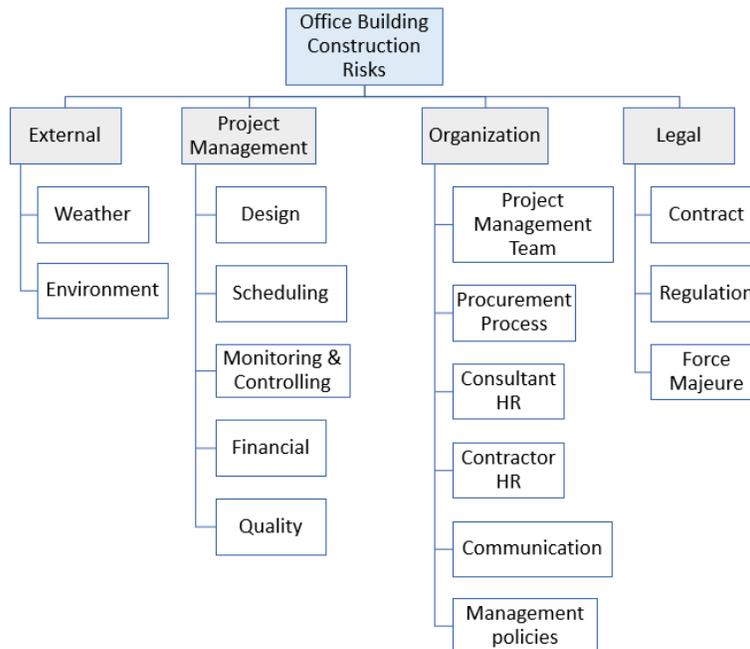


Figure 2 Project Risk Factors Categories RBS of Office Building Projects in BPJS Ketenagakerjaan

II. RESEARCH OBJECTIVES

This research was conducted by reviewing several journals from previous studies which mentioned the risk factors that often occur in construction projects. Furthermore, the risk factors of the prior research are categorized into risk breakdown structure (RBS) based on the life cycle of office building construction projects within BPJS Ketenagakerjaan. Table 1 summarizes the risk factors that can cause project delays, categorized based on RBS and validated by academics and experts in BPJS Ketenagakerjaan office construction projects.

Table 1. Summary of the risk factors that can cause project delays

Risk Categories	Risk Sub Categories	Project risk factors affecting time performance	Reference
External	Cuaca	X1 Bad weather	Cheng, 2021
	Environment	X2 Lack of environmental safety	Cheng, 2021
	Environment	X3 Strikes, revolutions, riots, demonstrations	Cheng, 2021, Aziz R, 2013
	Environment	X4 Project site conditions Unforeseen surface and subsurface conditions (soil, water table, etc.)	Sanjeet K, 2019, Aziz R, 2013
	Environment	X5 Global financial crisis	Aziz R, 2013
Legal	Force Majeure	X6 Natural disasters (force majeure)	Chatterjee, 2018
	Contract	X7 Variation/Change order	Cheng, 2021
	Contract	X8 Legal disputes between the parties	Aziz R, 2013
	Regulation	X9 Delays in obtaining permits from the city government	Aziz R, 2013
Organization	Management policies	X10 Estimated project duration is too short/unrealistic to complete	Nguyen P, 2021, Cheng, 2021
	Management policies	X11 Job Delays	Cheng, 2021, Aziz R, 2013
	Management policies	X12 Improper project feasibility study	Aziz R, 2013
	Management policies	X13 Slow decision making	Cheng, 2021, Aziz R, 2013
	Communication	X14 Disputes of the parties	Chatterjee, 2018, Nguyen P, 2021
	Procurement Process	X15 Negligence for not clarifying during the bidding stage	Tarihoran A, 2019
	Procurement Process	X16 Incorrect bid type and project value	Cheng, 2021
	Procurement Process	X17 Availability and budget allocation	Chatterjee, 2018, Cheng, 2021
	Procurement Process	X18 Choosing the wrong contractor	Aziz R, 2013
	Procurement Process	X19 Insufficient contractor experience	Aziz R, 2013, Cheng, 2021
	Procurement Process	X20 Bureaucracy in bidding/tendering methods	Aziz R, 2013
	Contractor HR	X21 Lack of proper management in identifying the needs of users / users	Safaeian M, 2022
	Contractor HR	X22 The consultant does not meet the requirements	Cheng, 2021
	Contractor HR	X23 Errors and delays in the creation of design documents	Aziz R, 2013
	Contractor HR	X24 Difficulty in obtaining a work permit	Cheng, 2021
	Contractor HR	X25 Poor project site management and supervision	Aziz R, 2013
	Contractor HR	X26 Contractors' internal disputes (strikes)	Chatterjee, 2018
	Contractor HR	X27 Lack of understanding and implementing project management	Cheng, 2021
	Contractor HR	X28 labor fluctuations	Nguyen P, 2021
	Contractor HR	X29 Poor productivity and skills of the workforce, lack of competency	Cheng, 2021, Sanjeet K, 2019, Aziz R, 2013
	Contractor HR	X30 Bad resource management	Cheng, 2021
	Contractor HR	X31 Difficulty in hiring suitable skilled workers	Chatterjee, 2018
	Project Management Team	X32 Project management member experience	Chatterjee, 2018
	Project Management Team	X33 Late payments to contractors	Chatterjee, 2018, Cheng, 2021, Aziz R, 2013
	Project Management Team	X34 Lack of staff reliability/competence	Chatterjee, 2018, Cheng, 2021, Aziz R, 2013
	Project Management Team	X35 Mistakes due to not carrying out a risk assessment	Tarihoran A, 2019
	Project Management Team	X36 Weak programming and team development	Safaeian M, 2022
	Project Management Team	X37 Lack of project management knowledge	Safaeian M, 2022
	Design	X38 Design changes by the owner	Nguyen P, 2021
	Design	X39 Weak analytical and design team	Safaeian M, 2022
	Design	X40 Faulty/incorrect design	Cheng, 2021
	Design	X41 Delays in approving the design document	Aziz R, 2013
	Monitoring & Controlling	X42 Additional work	Aziz R, 2013
	Monitoring & Controlling	X43 Overdue submission of engineering results by related disciplines	Tarihoran A, 2019
Monitoring & Controlling	X44 Long timeframe between design and bid/tender time	Aziz R, 2013	
Financial	X45 Insufficient cash flow/contractor financial difficulties	Chatterjee, 2018, Sanjeet K, 2019, Aziz R, 2013	
Monitoring & Controlling	X46 Lack of monitoring of construction activities	Chatterjee, 2018	
Monitoring & Controlling	X47 Poor plan implementation (poor performance)	Cheng, 2021	
Monitoring & Controlling	X48 Lack of materials	Cheng, 2021	
Project Management	Quality Control	X49 Lack/difficulty of utilities (electricity, water, work equipment)	Chatterjee, 2018, Safaeian M, 2022, Cheng, 2021, Sanjeet K, 2019, Aziz R, 2013
	Quality Control	X50 Low quality of materials	Nguyen P, 2021
	Quality Control	X51 Inaccurate measurement	Chatterjee, 2018
	Quality Control	X52 Mistakes and rework	Cheng, 2021, Aziz R, 2013
	Quality Control	X53 Changes in material types and specifications during construction	Aziz R, 2013
	Quality Control	X54 Construction work methods are not appropriate	Cheng, 2021, Aziz R, 2013
	Quality Control	X55 Poor/improper construction quality	Nguyen P, 2021, Chatterjee, 2018
	Scedulling	X56 Improper/effective planning and scheduling	Chatterjee, 2018, Cheng, 2021, Tarihoran A, 2019, Aziz R, 2013
	Scedulling	X57 Material Long Lead Items (need time) are not identified at the beginning of the project	Tarihoran A, 2019, Sanjeet K, 2019
	Scedulling	X58 Delays in material delivery	Cheng, 2021, Sanjeet K, 2019

III. RESEARCH METHODOLOGY

This research consists of four steps. First, do a literature study. Then step 1 data collection with a questionnaire instrument for expert validation of the life cycle of office building construction projects within BPJS Ketenagakerjaan. The validation results were then followed by step 2 data collection in the form of a questionnaire to experts to validate the variable risk factors at each stage of the project life cycle and whether these risk factors could affect time performance. Then, stage 3 collects pilot survey data to determine the understanding of prospective respondents. Finally, step 4 data collection in the form of a questionnaire to 27 respondents to find out the risk rating of risk factors at each stage of the project life cycle. To obtain the dominant risk factors at each stage of the project life cycle within the Employment BPJS, which impact on-time performance. After collecting all the survey questionnaires, analyze the data using SPSS software and risk probability and impact matrix.

The Likert scale used to measure probability and impact is a scale of 1 to 5, where scale 5 is the scale used for the measure with the highest likelihood and a substantial impact. The risk factor value is multiplied by the frequency with the impact value of each risk factor to obtain the risk rating. In this calculation, the probability and impact matrix guidelines are used by PMBOK 2017, as shown in Figure 3.

		Threats					Opportunities						
Probability	Very High 0.90	0.05	0.09	0.18	0.36	0.72	0.72	0.36	0.18	0.09	0.05	Very High 0.90	
	High 0.70	0.04	0.07	0.14	0.28	0.56	0.56	0.28	0.14	0.07	0.04	High 0.70	
	Medium 0.50	0.03	0.05	0.10	0.20	0.40	0.40	0.20	0.10	0.05	0.03	Medium 0.50	
	Low 0.30	0.02	0.03	0.06	0.12	0.24	0.24	0.12	0.06	0.03	0.02	Low 0.30	
	Very Low 0.10	0.01	0.01	0.02	0.04	0.08	0.08	0.04	0.02	0.01	0.01	Very Low 0.10	
		Very Low 0.05	Low 0.10	Moderate 0.20	High 0.40	Very High 0.80	Very High 0.80	High 0.40	Moderate 0.20	Low 0.10	Very Low 0.05		
		Negative Impact					Positive Impact						

Figure 3 Probability and Impact Matrix
 Source: PMBOK Guide 6th edition (PMI, 2017)

IV. FINDINGS DAN DISCUSSION

They are referring to the project life cycle in PMBOK 2017 and the results of the step 1 experts validation questionnaire to obtain the life cycle of office building construction projects within the BPJS Ketenagakerjaan, as shown in Figure 4. The experts in the step 1 questionnaire have experience in being involved in BPJS Ketenagakerjaan office building construction projects and have experience in building construction for 7 to 15 years.

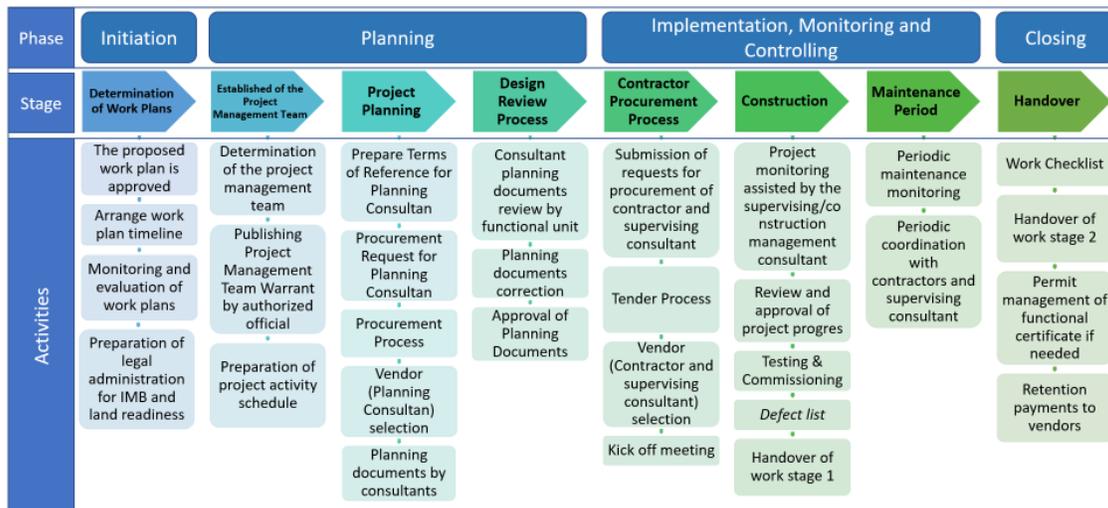


Figure 4 Project Life Cycle of BPJS Ketenagakerjaan Office Building Construction

Then in step 2 of the survey, respondents are experts with 9 to 23 years of experience in project management, both experts from BPJS Ketenagakerjaan employees and academics. The result of validation, as shown in Table 1, obtained risk factors that can cause project delays. The risk factor is named variable X.

Table 2. Respondent Characteristics

Experience	Frequency	Percent (%)
< 5 years	6	22%
5-10 years	8	30%
10-15 years	9	33%
> 15 years	4	15%
TOTAL	27	100%

In step 3 of the survey, respondents then carried out a risk assessment of the probability and impact values on a Likert scale of 1 to 5 for these variables. Then perform an analysis of homogeneity tests, validity and reliability tests, descriptive tests, and risk analysis. Table 3 shows the tabulation of the survey results. Then calculate the probability and impact average value for each risk variable at each stage of the Employment BPJS project life cycle.

Then the risk rating is calculated by multiplying the average probability and the average impact value to obtain the risk factor with a high-risk category. The dominant risk factor is 37 out of 58 variables Analysis of validated survey data.

The highest rank of risk factors at each stage of the project life cycle is as follows :

Stage Project Planning: Delays in obtaining permits from the city government (X9), Stage Design Review Process: Faulty/in correct design (X40), Stage Contractor Procurement Process: Insufficient contractor experience (X19), Stage Construction : (1) Choosing the wrong contractor (X18); (2) Insufficient cash flow/contractor financial difficulties; and (3) Negligence for not clarifying during the bidding stage (X15).

These findings are related to prior research about significant delay factors. According to Azis R., 2013 the owner-related group of delay factors was the third most important group. The significant factors were delay in progress payments (Funding problems), Selecting inappropriate contractors, and Inadequate planning.

Figure 5 shows that the stages of Determination of the Work Plans level, Established of the Project Management Team, Maintenance Period, and Handover have medium risk categories. Stages with dominant risk factors with high categories are Project Planning, Design Review Process, Contractor Procurement Process, and Construction. The risk that affects time performance has the highest value during construction. Moreover, the top 3 high-rank risks are at the Construction stage, i.e., (1) Choosing the wrong contractor; (2) Insufficient cash flow/contractor financial difficulties; and (3) Variation/Change order.

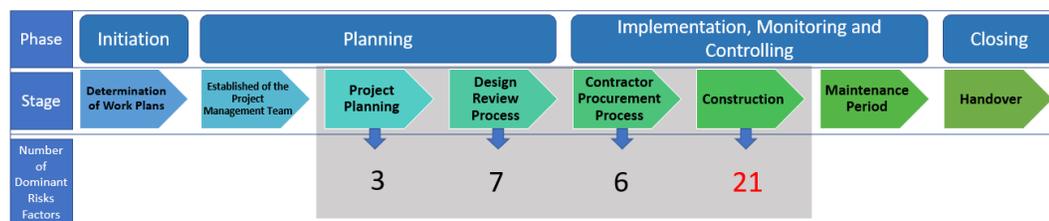


Figure 5 Numbers of Dominant Risk Factors at each Stage of Project Life Cycle

An equally important group of factors for the construction of office buildings was the group of environmental risks, and the group of factors construction risks assesses the degree of risk common in the construction site. The most influential factors were construction ground problems, material cutting leading to defective components, and design errors in the drawings compared with the construction reality (Nguyen P., 2021). These are also high categories of risks in this study, Bad weather (X1), Lack of environmental safety (X2), Project site conditions, unforeseen surface and subsurface conditions (X4), and Errors and delays in the creation of design documents (X4).

Table 3. Risk Rating of BPJS Ketenagakerjaan Office Building Projects

Stage	Variables	Risk Factors	Avg Probability	Avg Impact	Risk (FxD)	Category	Rank
Project Planning	X9	Delays in obtaining permits from the city government	0,56	0,40	0,224	High	14
	X38	Design changes by the owner	0,54	0,38	0,208	High	26
	X40	Faulty/incorrect design	0,57	0,36	0,206	High	28
Design Review Process	X13	Slow decision making	0,57	0,35	0,202	High	36
	X23	Errors and delays in the creation of design documents	0,60	0,34	0,205	High	29
	X35	Mistakes due to not carrying out a risk assessment	0,57	0,39	0,222	High	17
	X38	Design changes by the owner	0,58	0,37	0,215	High	19
	X40	Faulty/incorrect design	0,59	0,40	0,236	High	10
	X41	Delays in approving the design document	0,60	0,35	0,212	High	21
	X43	Overdue submission of engineering results by related disciplines	0,58	0,37	0,215	High	19
Contractor Procurement Process	X16	Incorrect bid type and project value	0,56	0,36	0,202	High	37
	X18	Choosing the wrong contractor	0,63	0,41	0,260	High	5
	X19	Insufficient contractor experience	0,62	0,42	0,262	High	4
	X22	The consultant does not meet the requirements	0,59	0,38	0,222	High	16
	X30	Bad resource management	0,57	0,36	0,203	High	35
	X56	Improper/effective planning and scheduling	0,60	0,34	0,203	High	34
Construction	X1	Bad weather	0,61	0,40	0,247	High	8
	X2	Lack of environmental safety	0,58	0,35	0,205	High	30
	X4	Project site conditions Unforeseen surface and subsurface conditions (soil, water table, etc.)	0,57	0,36	0,204	High	31
	X6	Natural disasters (force majeure)	0,53	0,42	0,224	High	15
	X7	Variation/Change order	0,66	0,40	0,264	High	3
	X15	Negligence for not clarifying during the bidding stage	0,57	0,37	0,210	High	22
	X18	Choosing the wrong contractor	0,61	0,45	0,275	High	1
	X19	Insufficient contractor experience	0,61	0,39	0,238	High	9
	X25	Poor project site management and supervision	0,59	0,37	0,218	High	18
	X27	Lack of understanding and implementing project management	0,57	0,36	0,204	High	32
	X29	Poor productivity and skills of the workforce, lack of competency	0,61	0,38	0,233	High	12
	X30	Bad resource management	0,59	0,36	0,210	High	23
	X31	Difficulty in hiring suitable skilled workers	0,58	0,35	0,204	High	33
	X35	Mistakes due to not carrying out a risk assessment	0,54	0,38	0,208	High	26
	X42	Additional work	0,61	0,38	0,234	High	11
	X45	Insufficient cash flow/contractor financial difficulties	0,63	0,43	0,271	High	2
	X46	Lack of monitoring of construction activities	0,58	0,40	0,232	High	13
	X47	Poor plan implementation (poor performance)	0,59	0,36	0,210	High	24
X48	Lack of materials	0,60	0,43	0,257	High	6	
X55	Poor/improper construction quality	0,56	0,37	0,208	High	25	
X58	Delays in material delivery	0,59	0,42	0,249	High	7	

I. CONCLUSION

The results of this study identify the life cycle and the dominant risk factors at each stage of the office building project at BPJS Ketenagakerjaan that affect time performance. By distributing questionnaires as a research instrument involving experts and respondents from stakeholders engaged in office-building projects at BPJS Ketenagakerjaan. The results showed that the life cycle stage of office building projects within BPJS Ketenagakerjaan consists of four phases and seven stages, starting from the Determination of Work Plans, Established of the Project Management Team, Project Planning, Design Review Process, Contractor Procurement Process, Construction, Maintenance Period, to Handover. To deepen the risk analysis, researchers conducted secondary data collection and qualitative risk analysis of the collected data to obtain the dominant risk factors.

Risk factors throughout the life cycle of office-building projects within BPJS Ketenagakerjaan affect time performance, and the risk that affects time performance has the highest value during construction. The dominant risk factors at each project's life cycle stage are as follows:

Stage Project Planning: Delays in obtaining permits from the city government (X9), Stage Design Review Process: Faulty/incorrect design (X40), Stage Contractor Procurement Process: Insufficient contractor experience (X19), Stage Construction : (1) Choosing the wrong contractor (X18); (2) Insufficient cash flow/contractor financial difficulties; and (3) Negligence for not clarifying during the bidding stage (X15).

Risk factors ranking shows the need for risk management to reduce losses that can result in project delays, thus requiring the attention of the project manager or project management team. For further research, each dominant risk requires a risk response. In an office construction project within the BPJS Ketenagakerjaan environment, these guidelines can be added to the project management team guidelines to improve time performance.

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Derivation Of Results Centered On Range Of Appearance Of Two Disparate Sequences

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Abstract- In this paper, the range of appearance of totality of two familiar sequences involving Icosagonal number and square pyramidal number so-called Icospyramidal result number and addition of the range of appearance of the above cited sequences separately are assessed. Furthermore, some results centered on range of appearance of those numbers are perceived and confirmed by separate python programs.

Index Terms- Polygonal number, divisibility, p – adic range, Range of appearance.

I. INTRODUCTION

“Polygonal number is a number denoted as dots or pebbles organized in the form of a systematic polygon. It is a two dimensional figurate number. An Icosagonal number is of the form $9i^2 - 8i$ and it is a twenty sided polygon. Pyramid number or square pyramidal number $\frac{j(j+1)(2j+1)}{6}$ shows three dimensional figurate number” [1, 4, 5]. In [2] deals the modulus condition used in Fibonacci number. In [3] author shows the order of Fibonacci and Lucas number.[6-10] display the order of appearance in different forms like a product, upper bound and Diophantine equation involving of Fibonacci number. In this communication, the range of appearance of sum of two peculiar sequences concerning Icosagonal number and square pyramidal number termed as Icospyramidal number and sum of the range of appearance of the already quoted sequences distinctly are evaluated. Also, few results based on range of appearance of those numbers are presented and verified by python programs.

II. RANGE OF APPEARANCE IN ICOSPYRAMIDAL NUMBER

The r^{th} term of sequence of Icosagonal number is taken as

$$s_r = 9r^2 - 8r.$$

The r^{th} term of sequence of Square pyramidal number is consider as

$$m_r = \frac{r(r+1)(2r+1)}{6}$$

The r^{th} term of the novel sequence named as Icospyramidal sequence received by adding like terms in both of the above mentioned sequences is denoted by

$$f_r = s_r + m_r = \frac{2r^3 + 57r^2 - 47r}{6}$$

Then, the sequence of Icospyramidal number is given by 2,25,71,142,240,367,525,716,942,1205,1507,

“The range of appearance of a positive integer f_r in the sequence of Icospyramidal number is denoted by $u(f_r)$ and is defined by the least positive integer c such that $f_r | c$ ”[10].

Few range of appearance of Icospyramidal number are enlisted in table 2.1

Table 2.1

\bar{f}_r	1	2	3	4	5	6	7	8	9	10	11	12
$I(\bar{f}_r)$	1	1	5	5	2	5	7	5	16	5	11	5
\bar{f}_r	13	14	15	16	17	18	19	20	21	22	23	24
$I(\bar{f}_r)$	13	21	5	5	15	16	19	5	7	33	23	5
\bar{f}_r	25	26	27	28	29	30	31	32	33	34	35	36
$I(\bar{f}_r)$	2	13	16	21	22	5	31	37	77	16	7	16
\bar{f}_r	37	38	39	40	41	42	43	44	45	46	47	48
$I(\bar{f}_r)$	12	57	52	5	41	77	13	77	27	69	42	5
\bar{f}_r	49	50	51	52	53	54	55	56	57	58	59	60
$I(\bar{f}_r)$	49	12	16	13	53	16	22	21	95	29	27	5
\bar{f}_r	61	62	63	64	65	66	67	68	69	70	71	72
$I(\bar{f}_r)$	61	93	70	101	52	77	67	16	23	77	3	16
\bar{f}_r	73	74	75	76	77	78	79	80	81	82	83	84
$I(\bar{f}_r)$	25	12	7	133	77	52	79	5	97	41	83	77
\bar{f}_r	85	86	87	88	89	90	91	92	93	94	95	96
$I(\bar{f}_r)$	15	13	167	165	89	77	91	69	124	89	57	293
\bar{f}_r	97	98	99	100								
$I(\bar{f}_r)$	57	49	77	32								

The range of appearance in Icospyramidal number can be estimated with the assistance of the following Python program 1

Program 1

```

i = int(input("Enter r value: "))
t = []
for k in range(1, i + 1) :
    a = (9 * (k ** 2) - 8 * k)
    b = (k * (k + 1) * ((2 * k) + 1))/6
    a = a + b
    t.append(int(a))
print(t)
r = int(input("Enter r value: "))
arr = list(range(1, r + 1))
print("fr: ", arr)
z = []
for j in range(r) :
    v = []
    for k in range(i):
        if (t[k]%arr[j]) == 0:
            v.append(k + 1)
    if not v:

```

```

        z.append(" * ")
    else:
        z.append(min(v))
print("i(fr):", z)

```

Result 2.1

Let r be a positive integer of the form $f_r = P^t$ where P is a prime number

- i. If $P = 2$ then $I(2^t) \leq \frac{5}{3}(2^t)$ for $t \geq 1$.
- ii. If $P = 3$ then $I(3^t) \leq \frac{5}{2}(3^t)$ for $t \geq 1$.
- iii. If $P = 5$ then $I(5^t) \leq (5^t)$ for $t \geq 1$.
- iv. If $P > 5$ then $I(P^t) \leq \left(3P - \frac{2}{P}\right)P^{t-1}$, for $t \geq 1$.

This result can be verified by the Python program 2.

Program 2

```

i = int(input("Enter r value: "))
m = []
for k in range(1, i + 1):
    a = (9 * (k ** 2) - 8 * k)
    b = (k * (k + 1) * ((2 * k) + 1))/6
    a = a + b
    m.append(int(a))
print(m)
t = int(input("Enter t value: "))
t_arr = []
for j in range(1, t + 1):
    t_arr.append(2 ** j)
print("fr: ", t_arr)
z = []
for j in range(t):
    v = []
    for l in range(i):
        if (m[l] % t_arr[j]) == 0:
            v.append(l + 1)
    if not v:
        z.append(" * ")
    else:
        z.append(min(v))
print("i(fr):", z)

```

Result 2.2

Let x be any integer and $d_p(x), \wedge(x)$ are p-adic and prime conjunction function where $\mathfrak{S}_x = \begin{cases} 0 & \text{if } x \nmid 5 \\ 1 & \text{if } x \mid 5 \end{cases}$

- i. If $d_p(x) = 1$, then $I(f_r) \leq \begin{cases} \frac{5}{2}x, & \text{if } \wedge(x) = 2 \text{ and } x \nmid 5 \\ 2x, & \text{if } \wedge(x) = 2 \text{ and } x \mid 5 \\ 4\left(\frac{2}{3}\right)^{\wedge(x)-\mathfrak{S}_x-2}x, & \text{if } \wedge(x) > 2 \end{cases}$
- ii. If $d_p(x) = 2$, then $I(f_r) \leq \begin{cases} \frac{7}{2}x, & \text{if } \wedge(x) = 2 \text{ and } x \nmid 5 \\ 2x, & \text{if } \wedge(x) = 2 \text{ and } x \mid 5 \\ 3\left(\frac{5}{2}\right)^{\wedge(x)-\mathfrak{S}_x-2}x, & \text{if } \wedge(x) > 2 \end{cases}$

$$\text{iii. If } d_p(x) = 3, \text{ then } I(f_r) \leq \begin{cases} \frac{5}{2}x, & \text{if } \wedge(x) = 2 \text{ and } x \nmid 5 \\ 3x, & \text{if } \wedge(x) = 2 \text{ and } x \mid 5 \\ 5\left(\frac{1}{2}\right)^{\wedge(x)-\ominus x-2}x, & \text{if } \wedge(x) > 2 \end{cases}$$

This result can be substantiated by the Python program 3.

Program 3

```
i = int(input("Enter r value: "))
m = []
for k in range(1, i + 1):
    a = (9 * (k ** 2) - 8 * k)
    b = (k * (k + 1) * ((2 * k) + 1))/6
    a = a + b
    m.append(int(a))
print(m)
p = int(input("Enter p value: "))
n = 2 * p
print("fr: ", n)
z = []
v = []
for j in range(i):
    if (m[j]%n) == 0:
        v.append(j + 1)
if not v:
    z.append(" * ")
else:
    z.append(min(v))
print("i(fr): ", z)
```

III. SUM OF RANGE OF APPEARANCE OF ICOSAGONAL AND SQUARE PYRAMIDAL NUMBERS

Let $u(s_r)$ and $u(m_r)$ be the range of appearance of Icosagonal and square pyramidal number respectively then $u(t_r) = u(s_r) + u(m_r)$ is the sum of range of appearance in Icosagonal and square pyramidal number. Some numerical values of range of appearance of Icosagonal numbers are listed in table 3.1.

Table 3.1

s_r	1	2	3	4	5	6	7	8	9	10	11	12
$I(s_r)$	1	2	3	2	2	6	4	4	9	2	7	6
s_r	13	14	15	16	17	18	19	20	21	22	23	24
$I(s_r)$	11	4	12	4	16	18	3	2	18	18	6	12
s_r	25	26	27	21	29	30	31	32	33	34	35	36
$I(s_r)$	12	24	27	4	17	12	25	8	18	16	7	18
s_r	37	38	39	40	41	42	43	44	45	46	47	48
$I(s_r)$	5	22	24	12	10	18	27	6	27	12	39	12
s_r	49	50	51	52	53	54	55	56	57	58	59	60
$I(s_r)$	39	12	33	24	48	54	7	4	3	46	14	12
s_r	61	62	63	64	65	66	67	68	69	70	71	72
$I(s_r)$	28	56	18	8	37	18	53	16	6	32	64	36

s_r	73	74	75	76	77	78	79	80	81	82	83	84
$I(s_r)$	9	42	12	22	7	24	36	12	81	10	47	18
s_r	85	86	87	88	89	90	91	92	93	94	95	96
$I(s_r)$	17	20	75	40	80	72	11	6	87	74	22	24
s_r	97	98	99	100								
$I(s_r)$	44	88	18	12								

Few range of appearance of square pyramidal numbers are scheduled in table 3.2.

Table 3.2

m_r	1	2	3	4	5	6	7	8	9	10	11	12
$I(m_r)$	1	3	4	7	2	4	3	15	12	4	5	8
m_r	13	14	15	16	17	18	19	20	21	22	23	24
$I(m_r)$	6	3	4	31	8	27	9	7	13	11	11	31
m_r	25	26	27	28	29	30	31	32	33	34	35	36
$I(m_r)$	12	12	40	7	14	4	15	63	22	8	7	40
m_r	37	38	39	40	41	42	43	44	45	46	47	48
$I(m_r)$	18	19	13	15	20	27	21	16	27	11	23	31
m_r	49	50	51	52	53	54	55	56	57	58	59	60
$I(m_r)$	24	12	8	32	26	40	5	31	9	28	29	40
m_r	61	62	63	64	65	66	67	68	69	70	71	72
$I(m_r)$	30	15	13	127	12	27	33	8	22	7	35	80
m_r	73	74	75	76	77	78	79	80	81	82	83	84
$I(m_r)$	36	36	49	47	10	71	39	32	121	20	41	31
m_r	85	86	87	88	89	90	91	92	93	94	95	96
$I(m_r)$	17	43	58	16	44	27	6	23	31	23	9	63
m_r	97	98	99	100								
$I(m_r)$	48	24	27	24								

The succeeding Python program 4 ensured the values of $u(s_r)$ and $u(m_r)$.

Program 4

```

i = int(input("Enter r value: "))
t = []
p = []
for k in range(1, i + 1):
    a = (9 * (k ** 2) - 8 * k)
    t.append(int(a))
print(t)
j = int(input("Enter r value: "))
for k in range(1, j + 1):
    b = (k * (k + 1) * ((2 * k) + 1))/6
    p.append(int(b))
    
```

```
print(p)
r = int(input("Enter sr value: "))
arr = list(range(1, r + 1))
print("sr: ", arr)
z = []
for y in range(r):
    v = []
    for k in range(i):
        if (t[k]%arr[y]) == 0:
            v.append(k + 1)
    if not v:
        z.append(" * ")
    else:
        z.append(min(v))
print("i(sr): ", z)
m = int(input("Enter mr value: "))
m_arr = list(range(1, m + 1))
print("mr: ", m_arr)
z = []
for y in range(m):
    v = []
    for k in range(i):
        if (p[k]%m_arr[y]) == 0:
            v.append(k + 1)
    if not v:
        z.append(" * ")
    else:
        z.append(min(v))
print("i(mr): ", z)
```

Result 3.1

Let x be a positive integer of the form $x = P^t$, where P is a prime number

- i. If $P = 2$ then $I(2^t) \leq \frac{5}{2}(2^t)$ for $t \geq 1$.
- ii. If $P = 3$ then $I(3^t) \leq \frac{7}{3}(3^t)$ for $t \geq 1$.
- iii. If $P = 5$ then $I(5^t) \leq \frac{5}{3}(5^t)$ for $t \geq 1$.
- iv. If $P > 5$ then $I(P^t) \leq 5 \left(P - \frac{6}{p}\right) P^{t-1}$, for $t \geq 1$.

This result can be verified by Python program 5

Program 5

```
i = int(input("Enter r value: "))
m = []
p = []
for k in range(1, i + 1):
    a = (9 * (k ** 2) - 8 * k)
    m.append(int(a))
print(m)
j = int(input("Enter r value: "))
for k in range(1, j + 1):
    b = (k * (k + 1) * ((2 * k) + 1))/6
    p.append(int(b))
```

```

print(p)
t = int(input("Enter t value: "))
t_arr = []
for u in range(1, t + 1):
    t_arr.append(2 ** u)
print("sr: ", t_arr)
z = []
for e in range(t):
    v = []
    for l in range(i):
        if (m[l]%t_arr[e]) == 0:
            v.append(l + 1)
    if not v:
        z.append(" * ")
    else:
        z.append(min(v))
print("i(sr): ", z)
print("mr: ", t_arr)
x = []
for e in range(t):
    v = []
    for l in range(j):
        if (p[l]%t_arr[e]) == 0:
            v.append(l + 1)
    if not v:
        x.append(" * ")
    else:
        x.append(min(v))
print("i(mr): ", x)
    
```

Result 3.2

Let x be any integer and $d_p(x), \wedge(x)$ are p-adic and omega function where $\mathfrak{S}_x = \begin{cases} 0 & \text{if } x \nmid 5 \\ 1 & \text{if } x|5 \end{cases}$

- i. If $d_p(x) = 1$, then $I(t_r) \leq \begin{cases} \frac{7}{2}x, & \text{if } \wedge(x) = 2 \text{ and } x \nmid 5 \\ 3x, & \text{if } \wedge(x) = 2 \text{ and } x|5 \\ 4\left(\frac{1}{2}\right)^{\wedge(x)-\mathfrak{S}_x-2}x, & \text{if } \wedge(x) > 2 \end{cases}$
- ii. If $d_p(x) = 2$, then $I(t_r) \leq \begin{cases} \frac{9}{2}x, & \text{if } \wedge(x) = 2 \text{ and } x \nmid 5 \\ 3x, & \text{if } \wedge(x) = 2 \text{ and } x|5 \\ 4\left(\frac{3}{2}\right)^{\wedge(x)-\mathfrak{S}_x-2}x, & \text{if } \wedge(x) > 2 \end{cases}$
- iii. If $d_p(x) = 3$, then $I(t_r) \leq \begin{cases} \frac{9}{2}x, & \text{if } \wedge(x) = 2 \text{ and } x \nmid 5 \\ 3x, & \text{if } \wedge(x) = 2 \text{ and } x|5 \\ 4\left(\frac{5}{2}\right)^{\wedge(x)-\mathfrak{S}_x-2}x, & \text{if } \wedge(x) > 2 \end{cases}$

This result can be confirmed by the Python program 6.

Program 6

```

i = int(input("Enter r value: "))
m = []
    
```

```
x = []
for k in range(1, i + 1):
    a = (9 * (k ** 2) - 8 * k)
    m.append(int(a))
print(m)
j = int(input("Enter r value: "))
for k in range(1, j + 1):
    b = (k * (k + 1) * ((2 * k) + 1))/6
    x.append(int(b))
print(x)
p = int(input("Enter p value: "))
n = 2 * p
print("sr: ", n)
z = []
v = []
for e in range(i):
    if (m[e]%n) == 0:
        v.append(e + 1)
if not v:
    z.append(" * ")
else:
    z.append(min(v))
print("i(sr): ", z)
print("mr: ", n)
q = []
y = []
for e in range(j):
    if (x[e]%n) == 0:
        y.append(e + 1)
if not y:
    q.append(" * ")
else:
    q.append(min(y))
print("i(mr): ", q)
```

IV. CONCLUSION

In this article, few results using the concept of range of appearance of number patterns are evaluated. All the derived results are verified by various python programs. In a similar way, one can scrutinize numerous results by modifying the definition of range of appearance of different kinds of numbers.

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Perspectives on the Dimensions Affecting the Quality of Online Learning Amidst Pandemic

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Abstract- This study ascertained the perspectives of the respondents on the dimensions affecting the quality of online learning amidst pandemic. The study further investigated the dimensions influencing the quality of online classes, such as administrative support, course content, course design, instructor characteristics, learner characteristics, social support, and technological support, which affects the quality of online classes for the 1st and 2nd Semester of A.Y. 2020-2021. The study instrument is a questionnaire adapted from the study of (Elumalai, K., Sankar, J. et al. 2020). The study aims to ascertain the quality of online classes in the College of Business, Entrepreneurship, and Accountancy from the perspectives of CBEA Administrators, CBEA Instructors, and Students. The method employed in the study was descriptive correlational. Findings show a positive relationship between the set of online learning profile variables and the dimensions affecting the quality of online learning as perceived by the three (3) groups of respondents.

Index Terms- Covid-19 Pandemic; Dimensions; Online Learning; Perspective

I. INTRODUCTION

The pandemic has a significant effect on the educational system of the university. Since Covid-19 can cause death, it prohibits people from staying outside; hence, it brought a new phase in education called “online classes.” This kind of learning is possible through electronic technology like portals to access lectures, activities, assignments, and the like, unlike face-to-face classes where the teacher teaches course contents and learning materials to students.

There are several drawbacks to online learning, and these must be addressed to ensure the legitimacy and longevity of the online learning industry, as explained in (<https://e-student.org/disadvantages-of-e-learning/>). The following are the disadvantages of E-learning: Online student feedback is limited, E-learning can cause social isolation, E-learning requires strong self-motivation and time management skills, lack of communication skill development in online students, cheating prevention during online assessments is complicated, online instructors tend to focus on theory on rather than practice, E-learning lacks face-to-face communication, E-learning is limited to specific disciplines, Online learning is inaccessible to the computer illiterate population and lack of accreditation and quality assurance in online education.

Schools and universities are now thinking of ways to improve students' online learning experiences, which will lead to better learning outcomes. Schools like Cagayan State University feel an urgent need to research this for the students to have a better online learning experience. The information gained from the respondents' perspectives is essential to think that their opinions are being valued. These can be used to answer research gaps along with the quality of online learning. In like manner, the researchers believed that the study results would provide helpful information in the "world of online learning" Hence, this study.

II. STATEMENT OF THE PROBLEM

This study attempted to ascertain the respondents' perspective on the dimension affecting the quality of online learning amidst pandemic.

Specifically, it answered the following questions:

1. What is the online learning profile of the respondents in terms of:
 - 1.1 Source of internet connection
 - 1.2 Primary gadget used for online learning
 - 1.3 Internet Connection Speed Used in Online Learning
 - 1.4 Location during Online Learning
2. What is the perception of the Students, Faculty, and College Administrators on the dimensions affecting the quality of online learning relative to:

- 2.1 Administrative Support
- 2.2 Course Content
- 2.3 Course Design
- 2.4 Social Support
- 2.5 Technical Support
- 2.6 Instructor Characteristics
- 2.7 Learner Characteristics

3. Is there a significant difference among the perception of Students, Faculty, and College Administrators on the dimensions affecting the quality of online learning relative to:

- 3.1 Administrative Support
- 3.2 Course Content
- 3.3 Course Design
- 3.4 Social Support
- 3.5 Technical Support
- 3.6 Instructor Characteristics
- 3.7 Learner Characteristics

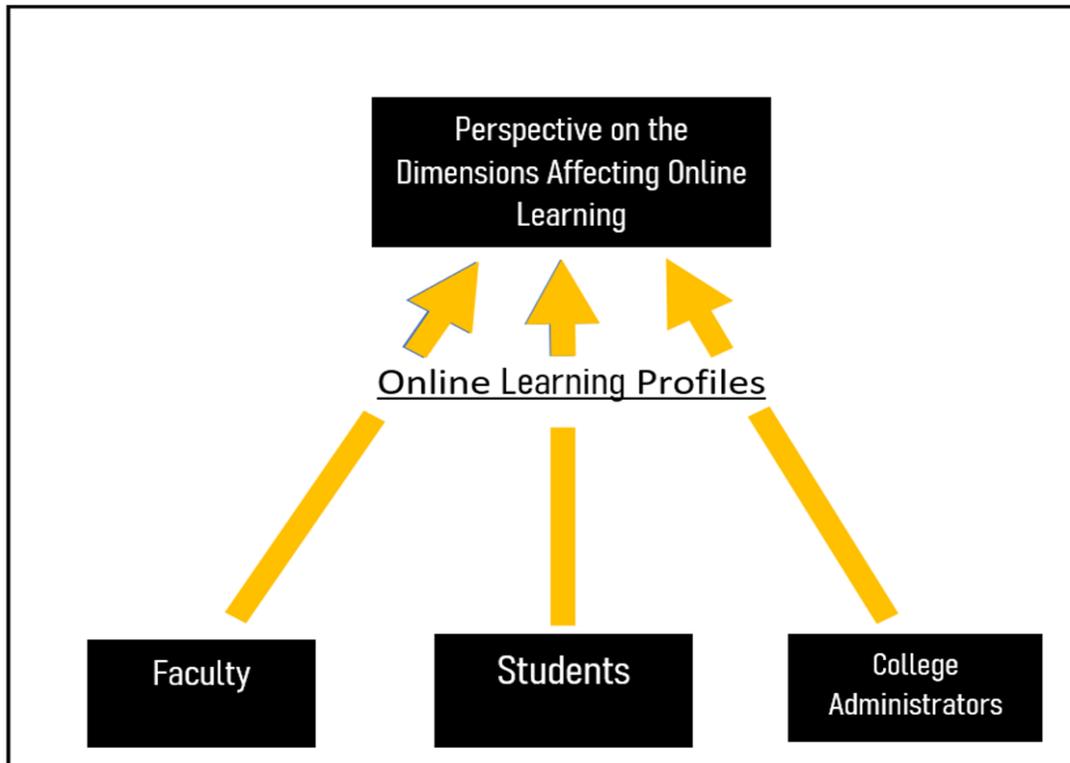
4. Is there a significant relationship in the respondents' perception of the dimensions affecting the quality of online learning when grouped according to online learning profile?

HYPOTHESES

The following hypotheses guided the study:

1. There is no significant difference among students, faculty, and college administrators' perception on the dimensions affecting the quality of online learning.
2. There is no significant relationship in students' perception of the dimension affecting the quality of online learning when grouped according to their online learning profile.

RESEARCH PARADIGM



The figure presents a triangular design, showing the perspective of the three distinct groups – Students, Faculty, and College Administrators on the dimensions affecting the quality of online learning. The participants were asked to respond to a survey questionnaire that includes online learning profile and 28 items measuring the seven (7) dimensions affecting the quality of online learning.

SIGNIFICANCE OF THE STUDY

The results of the study are helpful to the following individuals:

Internet Service Provider: The result allows the internet service providers to improve the service/s they provide. This will pave way to clientele satisfaction.

Parents: Parents be informed about the use of online learning modalities and how it affects the quality of online learning.

School Administrators: It serves as a benchmark for the school administrators to improve technical support in online education delivery to enhance the online learning experience.

Students: It provides concrete evidence from students' experiences concerning online learning, rather than mere claims by other people.

Teachers: The study data will be an influential tool in planning the teaching strategies to be applied, especially in online classes.

Future Researchers: It serves as a basis in identifying factors that can affect the quality of online learning. However, this is not the ending point. The data collected by this study alone recommends further researches to conduct new research raised by this research.

SCOPE AND LIMITATION

The study is limited in determining the relationship of the online learning profile variables to the seven dimensions affecting the quality of online learning amidst pandemic. Tests of relationships and differences among variables be conducted. A questionnaire via google form was administered to the 400 2nd year students across all college programs, 25 permanent CBEA Faculty, and nine (9) administrators of CBEA - CSU, Andrews Campus for 1st semester, A.Y. 2021-2022.

DEFINITION OF TERMS

The following terms are subsequently defined for easier understanding by the readers:

Connection Speed: Refers to the speed of internet

Gadgets: Pertains to the technology used by the respondents in online learning.

LENS: It is the online learning management system of the university

Mbps: Represents the speed an internet plan is offering.

Perception: The belief or opinion of the respondents on the dimensions affecting the quality of online learning.

Triangulation: How an alternate perspective is used to validate, challenge or extend existing findings.

RESEARCH METHODOLOGY

RESEARCH DESIGN

The method employed is the descriptive correlational method since the primary purpose of the study is to ascertain the respondents' perspective on the dimensions affecting the quality of online learning amidst pandemic. According to Sevilla, a descriptive study involves collecting data to test hypotheses or answer questions concerning the current status or subject of the study. Correlational studies are designed to help the researchers determine how different variables are related to each other in the population of interest.

RESPONDENTS OF THE STUDY

The respondents of the study are CBEA 2nd year students, instructors, and administrators.

Table 1
Frequency Distribution of Respondents

Distinct Groups	Frequency	Percentage
Students	400	92%
Faculty	25	6%
College Administrators	9	2%
TOTAL	434	100%

Table 1 presents the frequency and percentage distribution of the respondent. There are 400 or 92% of the 2nd year students across all programs, 25 or 6% CBEA faculty, and 9 or 2% CBEA administrators: the College Dean, Department Chairs, and Program Coordinators.

Table 3
Online Learning Profile of the Respondents in Terms of the Source of Internet Connection

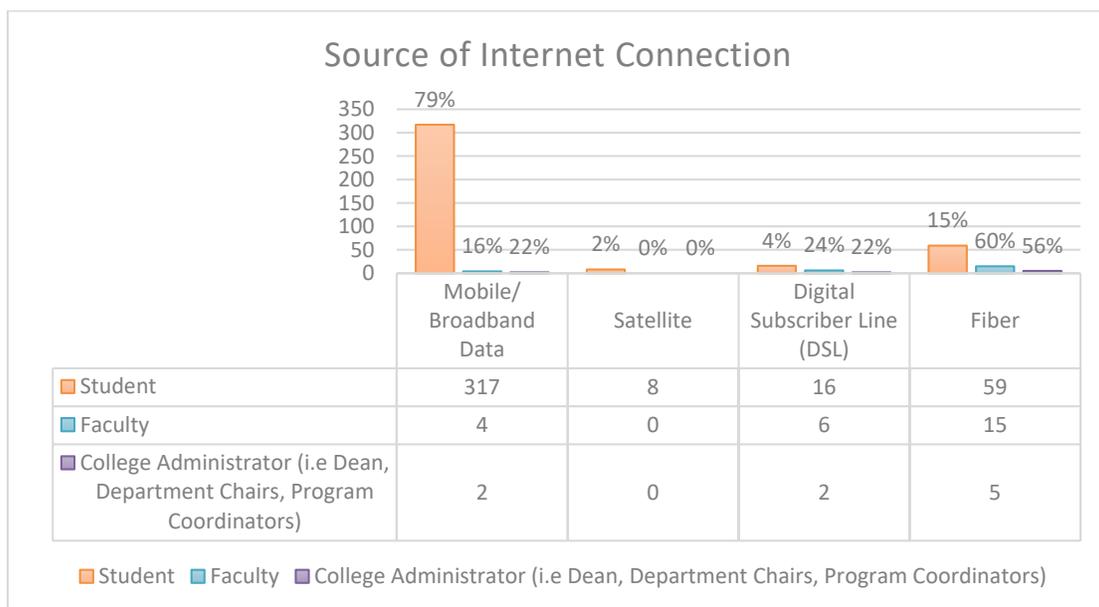


Table 3 shows the source of internet connection of the respondents. College administrators with 5 or 56% and faculty with 15 or 60% use fiber from the various internet connection. This implies that the most favorable internet service provider considering connection speed, reliability, and efficiency in online classes. In students' case, 317 or 79% of them favor using mobile/broadband data. Since telephone companies like PLDT and Globe provide the fastest option to access the internet, it also allows the students to save money. On the other hand, the use of satellite is the least preferred source of internet connection by the three groups of respondents. The results can be attributed to a satellite internet option being used in areas where a broadband connection is unavailable.

Table 4
Online Learning Profile of the Respondents in Terms of Primary Gadget Used for Online Learning

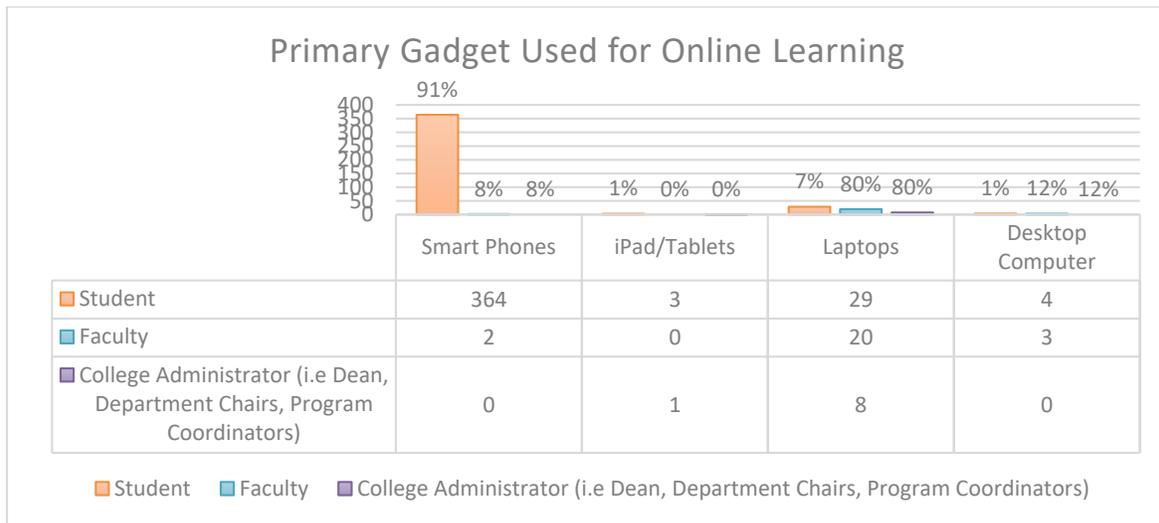


Table 4 shows the primary gadget used by the respondents for online learning. 8 or 80% of the college administrators and 20 or 80% of the faculty use laptops in online learning. This can be attributed to the unique and essential features of laptops suitable for online learning. Furthermore, it also allows the respondents to bring and use it anytime and anywhere. However, 364 or 91% of the students are using smartphones which can function like laptops. In contrast, smartphones and iPads/tablets are the gadgets that college administrators do not use because they prefer to use laptops and desktops over the said gadgets.

Table 5
Online Learning Profile of the Respondents in Terms of Internet Connection Speed Used in Online Learning

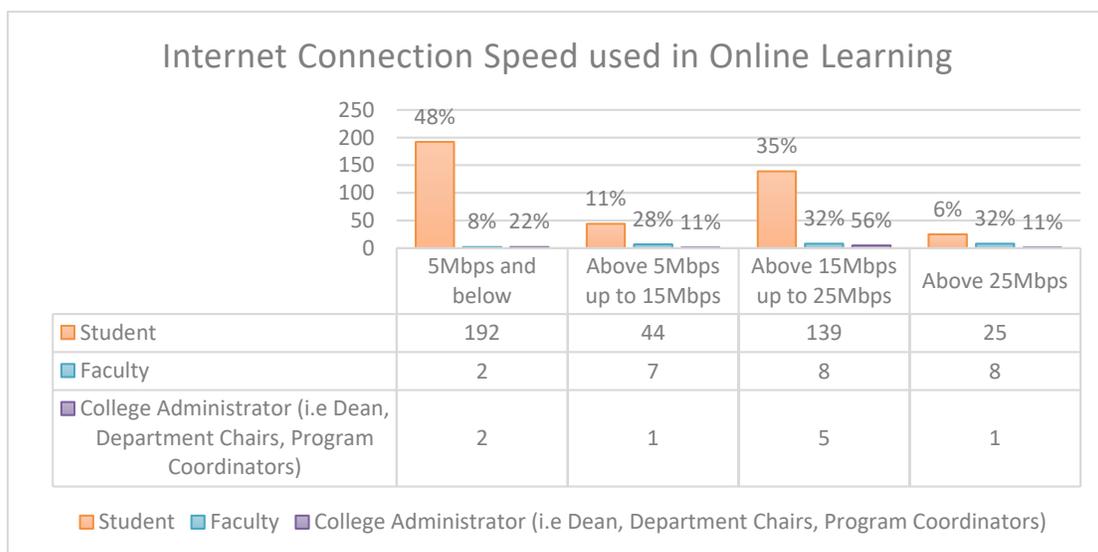


Table 5 shows the internet connection speed in online learning. It is revealed that 5 or 56% of the college administrators have above 15 Mbps up to 25 Mbps internet connection speed. Same with the 8 or 32% of the faculty respondents. According to (<https://www.fcc.gov/reports-research/guides/broadband-speed-guide?kbid=120594>) for browsing, email, and social media, the bare minimum download speed is only 1 Mbps, this explains that the respondents can enjoy a better online learning experience since the

Mbps is much higher than the required Mbps for online learning activities. Majority of the students, with 192 or 48% of them, have 5 Mbps and below. Considering the socio-economic status of the student respondents coming from a low-income family, they can afford is just 5Mbps and below.

Table 6
Online Learning Profile of the Respondents in Terms of Location during Online Learning

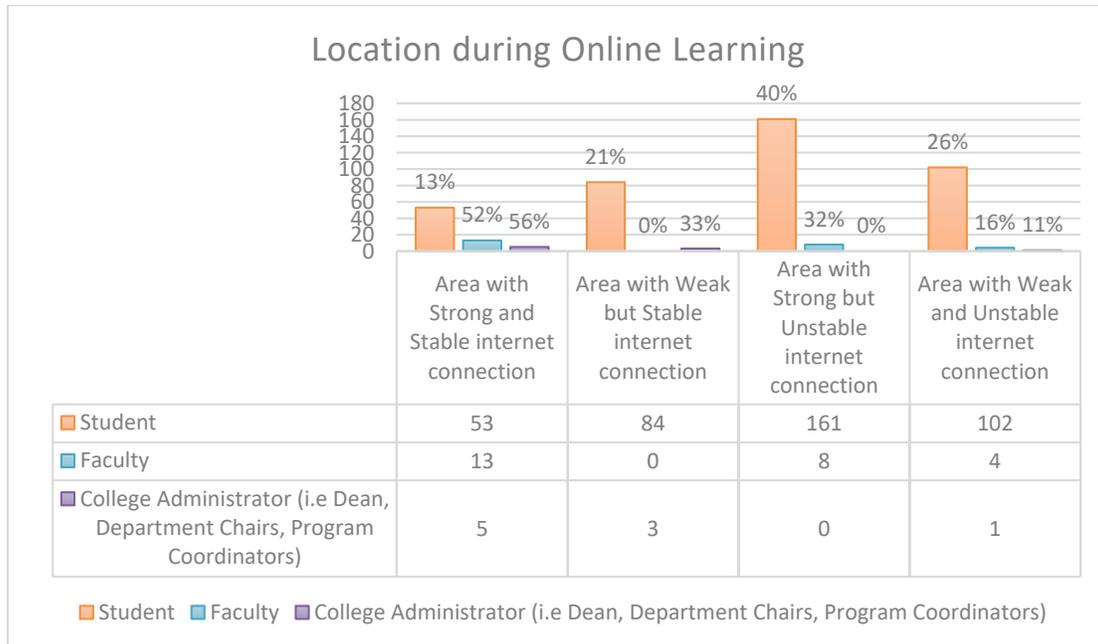


Table 6 shows the online learning profile of the respondents in terms of location during online learning. Data show that 5 or 56% of the college administrators stay in an area with strong and stable internet connections. As designated college administrators, a strong and stable internet connection is needed to perform their tasks. Likewise with the faculty; 13 or 52% stay in an area with a strong and stable internet connection. As they work on the web, strong and stable internet connection a must to respond to the demand for online learning. On the other hand, 161 or 40% of the students stay in an area with a strong but unstable internet connection. On the contrary, no one among the college administrators and faculty stay in an area with a strong but unstable internet connection. Lastly, only 53 or 13% of the students stay in areas with strong and stable internet connections. These are students living in near cellular sites.

Table 7
Perception of the Students, Faculty, and CBEA Administrators on the Dimensions Affecting the Quality of Online Learning Relative to Administrative Support

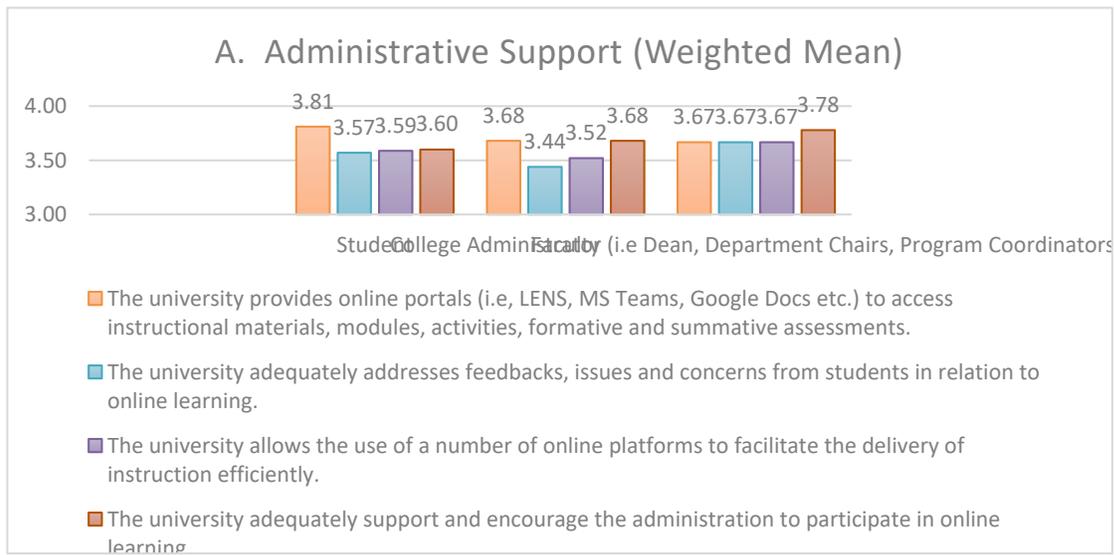


Table 7 shows the perception of respondents relative to administrative support. The item on "The university provides online portals to access institutional materials, modules, activities, formative and summative assessments" has the highest weighted mean of 3.81, very important for the students and 3.68 or very important for the faculty. This means that online portals, provided by the university, is essential for the students and faculty. LENS performs many functions, like allowing the students to access all the information they need in online learning provided by the faculty. In contrast, the item "The university adequately addresses feedbacks, issues, and concern from students about online learning" has the lowest weighted mean for the respondents but still has a descriptive scale of very important. 3.57 for students, 3.44 for faculty, and 3.67 for college administrators. This implies that the university has open communication channels with students, allowing them to share their issues and concerns about online learning.

Table 8
Perception of the Students, Faculty, and CBEA Administrators on the Dimensions Affecting the Quality of Online Learning Relative to Course Content

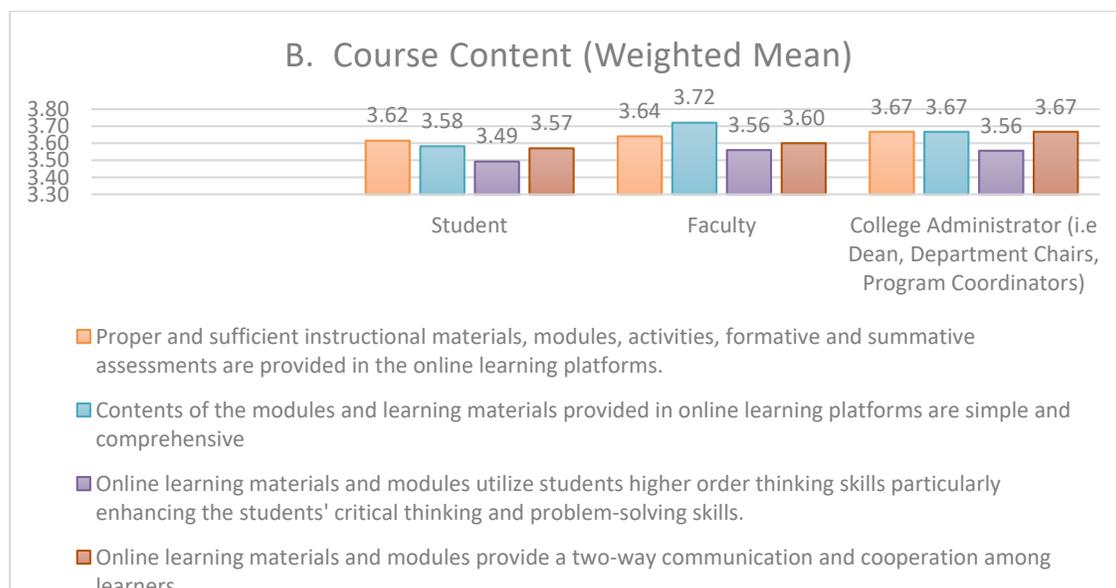


Table 8 shows the perception of the respondents relative to course content. For the students, the item on "Proper and sufficient instructional materials, modules, activities, formative and summative assessments are provided in the online learning platforms" has

the highest weighted mean of 3.62, very important. Since instructional materials are used to facilitate students' learning and monitor the assimilation of information through various assessments, the respondents find this item very important. For the faculty and college administrators, the item on "Contents of the modules and learning materials provided in online learning platforms are simple and comprehensive" has the highest weighted mean of 3.73, very important for faculty and 3.67 or very important for college administrators. This ensure the students better learning and understanding of the contents of the modules and learning materials. On the other hand, the item "Online learning materials and modules utilize students' higher-order thinking skills particularly enhancing the students' critical thinking and problem-solving skills" has the lowest weighted mean.

Table 9
Perception of the Students, Faculty, and CBEA Administrators on the Dimensions Affecting the Quality of Online Learning Relative to Course Design

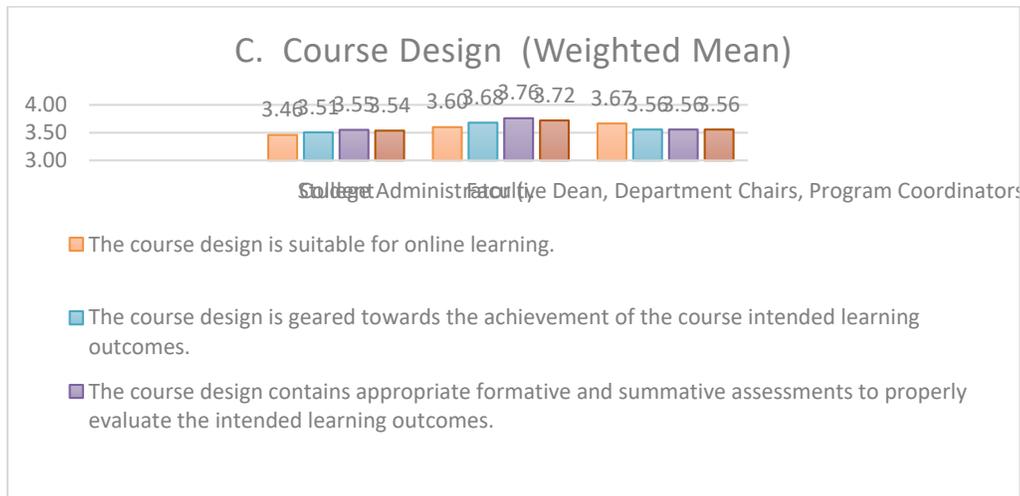


Table 9 shows the perception of the respondents relative to course design. As shown in the above table, the item "The course design contains appropriate formative and summative assessments to evaluate the intended learning outcomes properly" has the highest weighted mean for the two groups of respondents, students weighted mean is 3.55, very important and 3.76, very important for faculty. This indicates that faculty, as agreed by the students and college administrators, use assessments to evaluate students' learning. The item "The course design is suitable for online learning" has the lowest weighted mean of 3.46, very important for students and 3.60, very important for faculty. This shows that the course design is suitable for online learning.

Table 10
Perception of the Students, Faculty, and CBEA Administrators on the Dimensions Affecting the Quality of online Learning Relative to Social Support

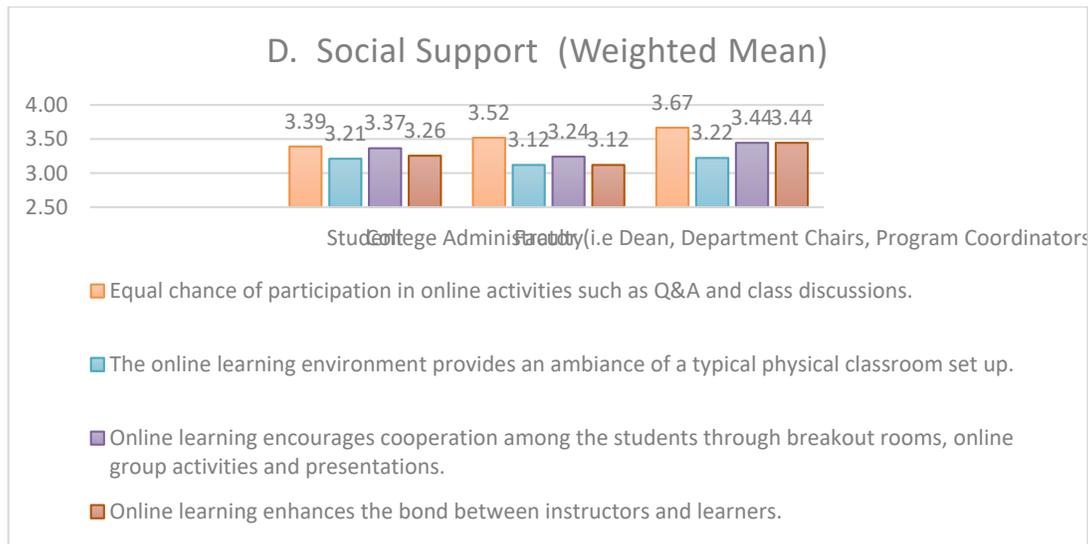


Table 10 shows the decision-making perception of the three groups of respondents relative to social support. The item “Equal chance of participation in online activities such as Q&A and class discussions” has the highest weighted mean for the three groups of respondents. 3.39 or very important for students, 3.52 or very important for faculty, and 3.67 or very important for college administrators. This explains the value of promoting an equitable classroom environment so all students can participate, and when every student has the recognition they need, the entire classroom thrives. On the contrary, the item "The online learning environment provides an ambiance of a typical physical classroom set up" has the lowest weighted mean for the three groups of respondents. 3.21 or important for students, 3.12 or important for faculty, and 3.22 or important for college administrators.

Table 11
Perception of the Students, Faculty, and CBEA Administrators on the Dimensions Affecting the Quality of Online Learning Relative to Technical Support

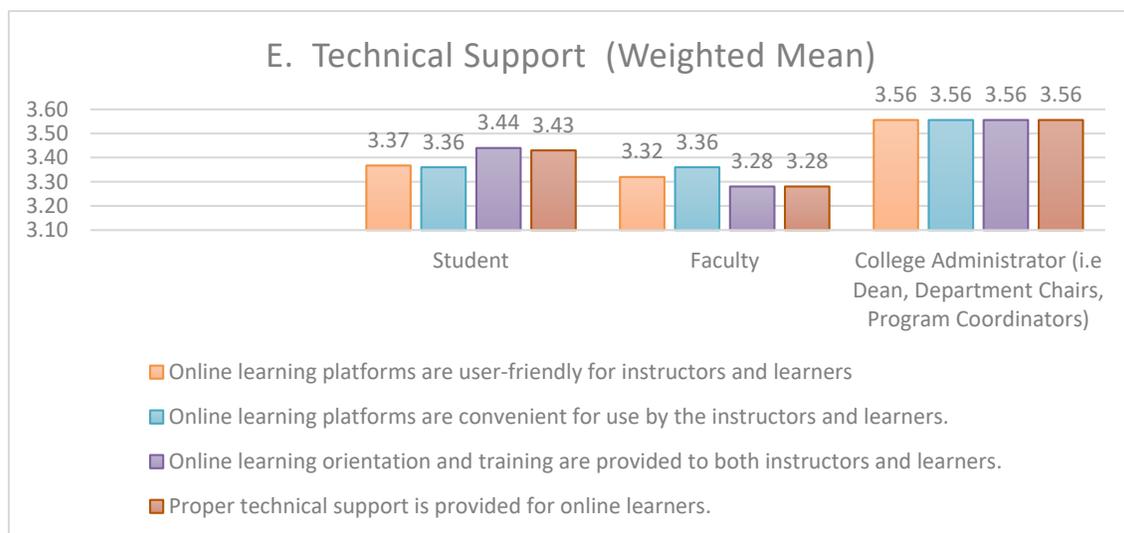


Table 11 shows the perception of the three groups of respondents relative to technical support. The item "online learning orientation and training are provided to both instructors and learners" has the highest weighted mean, 3.44, very important as perceived by the students. This explains that the university prepares both the instructors and students in the transition from face-to-face to online learning. Training workshops were conducted for them to understand how the online university platform (LENS) works. Concerning the use of LENS, the item "online learning platforms are convenient for use by the instructors and learners" has the highest weighted mean of 3.36 or very important as perceived by the faculty.

On the other hand, college administrators perceived that the following items are equally very important with a weighted mean of 3.56: "online learning platforms are user-friendly for instructors and learners", "online learning platforms are convenient for use by the instructors and learners", online learning orientation and training are provided to both instructors and learners" and "proper technical support is provided for online learners". The revolution of online education has changed the concept of traditional education or face-to-face classes radically. The Cagayan State University ensures that its people have access through its online platform (LENS) to a quality education whenever and wherever they want. Hence, the above data. Furthermore, The item "online learning platforms are convenient for the instructors and learners" has the lowest weighted mean of 3.36, very important as perceived by the students and faculty. Although it has the lowest weighted mean, this group of respondents still believe that online platform convenient for use may result in a better online learning experience is very important.

Table 12
Perception of the Students, Faculty, and CBEA Administrators on the Dimensions Affecting the Quality of Online Learning Relative to Instructor Characteristics

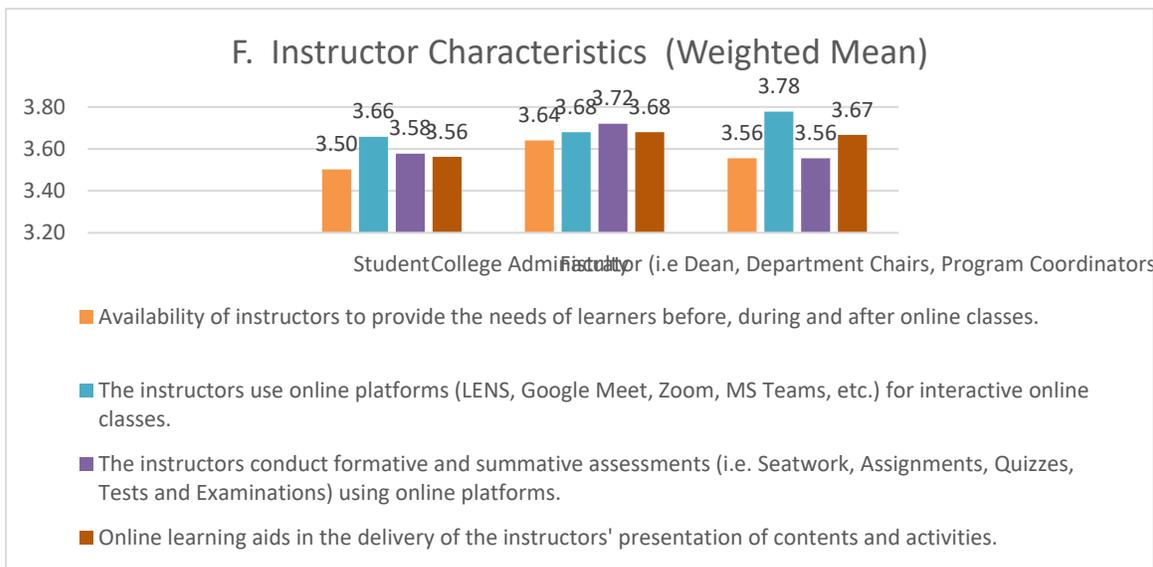


Table 12 shows the perception of the three groups of respondents relative to instructors' characteristics. The students perceived that "the instructors use online platforms for interactive online classes" is very important with 3.66. This manifests that students' needs are met by providing an online portal. In the case of faculty, the item "the instructors conduct formative and summative assessments using online platforms" has weighted mean of 3.72, very important because instructors adapt the demand of using online platforms in giving activities and assessments in their online classes. The college administrators and students, perceived the item "the instructors use online platforms for interactive online classes" very important with a weighted mean of 3.78. This is a manifestation that the college administrators support the students and faculty by embracing new challenges and using technological apps in online classes. The lowest weighted mean is the item on "availability of instructors to provide the needs of learners before, during and after online classes," with 3.50, very important for the students, 3.64 or very important for the faculty, and 3.56 or very important for the college administrators. Although learning is accessible through different online platforms, the respondents still do not find it engaging compared to the traditional face-to-face classroom set-up.

Table 13
Perception of the Students, Faculty, and CBEA Administrators on the Dimensions Affecting the Quality of Online Learning Relative to Learner Characteristics

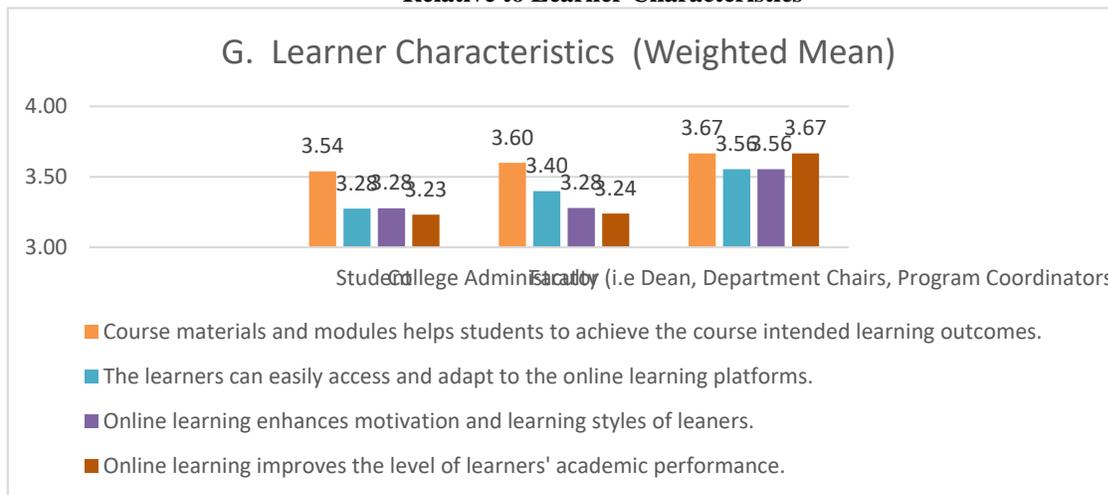


Table 13 shows the perception of the respondents relative to learner characteristics. The item on the "course materials and modules help students achieve the course intended learning outcomes" has the highest mean for the three groups of respondents. 3.54, very important for the students, 3.60, very important for the faculty, and 3.67, very important for the college administrators. This shows that instructional learning materials provided to the students are suited to facilitate learning and to attain the course learning goals. On the other hand, the item "online learning improves the level of learners' academic performance" has the lowest weighted mean of 3.23, important for students and 3.24 or very important for the faculty. Although online learning makes teaching-learning possible amidst pandemic, still a two-way interaction or traditional classroom setup is preferred. It allows instructors and students to connect and collaborate physically to improve students' academic performance. Lastly, the "the learners can easily access and adapt to the online learning platforms has the lowest weighted mean of 3.56. This is in connection to the location of respondents during online class for most of them reside in remote areas.

Table 14

Summary of the Test of Significant Difference of the Perception of Students, Faculty and College Administrators on the Dimensions Affecting the Quality of Online Learning

ANOVA and Tukey - Kramer Multiple Comparison test			
Dimension Affecting the Quality of Online Learning	F - ratio	P-Value	Decision @ (α=0.05)
A. Administrative Support	1.3802	0.30005	Accept Ho
B. Course Content	1.9492	0.19801	Accept Ho
C. Course Design	9.9491	0.00525	Reject Ho
D. Social Support	1.5247	0.26899	Accept Ho
E. Technical Support	61.4043	0.00001	Reject Ho
F. Instructor Characteristics	2.056	0.1839	Accept Ho
G. Learner Characteristics	5.5071	0.02742	Reject Ho,

Table 14 presents the summary of the test of difference on the perception of the respondents on the dimensions affecting the quality of online learning. As reflected, the four dimensions accepted the null hypothesis, administrative support, course content, social support and instructors' characteristics with the P-value of 0.3,0.19,0.26,0.18 respectively. The probability of these dimensions is greater than the alpha level of significance; thus, the null hypothesis is accepted. On the other hand, the three dimensions rejected the null hypothesis; course design, technical support and learner's characteristics with the P-value of 0.00525, 0.00001, and 0.02742 respectively. The probability is less than the alpha level of significance. Hence, the alternative hypothesis was accepted.

Table 15

Post-Hoc Analysis for the Course Content Dimension

Tukey-Kramer Multiple-Comparison Test

Response: Student, Faculty, College Administrator

Term A:

Alpha=0.050 Error Term=S(A) DF=9 MSE=0.003108333 Critical Value=3.9480

Different From

Group	Count	Mean	Groups
Student	4	3.515	Faculty
Faculty	4	3.69	Student
College Administrator	4	3.5875	

Table 15 presents the post-hoc analysis for the course content dimension. The students computed P-Value is 0.00416 when compared to the perception of the faculty respondents has a significant difference. Since the P-value is less than the alpha level of significance, it shows that the perceptions of the two groups of respondents are significantly different. However, for the college administrators, the computed P-Value is 0.21176 compared to students' perception and a P-Value of 0.06739 when compared to the perception of faculty respondents. Since both P-Values are greater than the alpha level of significance of 0.05, it implies that the college administrators' perception of the students and faculty is not significantly different. The various perceptions of the respondents can be attributed to the following reasons: The college administrator's function is to craft and implement the college and the university policies, a reason why this group of respondents' perception has no significant difference to the perception of the faculty and students. On the other hand, these policies will be the benchmark of the faculty in the delivery of the course content to be presented to the students. Furthermore, the learners have their understanding and appreciation when it comes to delivering the course content. Thus, the perceptions of the faculty and students are significantly different.

Table 16

Post-Hoc Analysis for the Technical Support Dimension

Tukey-Kramer Multiple-Comparison Test

Response: Student, Faculty, College Administrator

Term A:

Alpha=0.050 Error Term=S(A) DF=9 MSE=0.001044444 Critical Value=3.9480

Different From

Group	Count	Mean	Groups
Student	4	3.4	Faculty, College Administrator
Faculty	4	3.31	Student, College Administrator
College Administrator	4	3.56	Student, Faculty

Table 16 presents the post-hoc analysis for the technical support dimension. The students computed P-Value is 0.00861 when compared to the perception of the faculty respondents and a P-Value of 0.00016 when compared to the college administrators' perception. Furthermore, when the perception of the college administrators is compared to the perception of the faculty, it results in a P-Value of 0. Since the computed P-Values of the respondents are all less than the alpha level of significance of 0.05, the perceptions of the three groups of respondents are significantly different from each other. This explains that each respondent has different needs when it comes to technical support.

Table 17

Post-Hoc Analysis for the Learner Characteristics Dimension

Tukey-Kramer Multiple-Comparison Test

Response: Student, Faculty, College Administrator

Term A:

Alpha=0.050 Error Term=S(A) DF=9 MSE=0.01661944 Critical Value=3.9480

Group	Count	Mean	Different From Groups
Student	4	3.3325	College Administrator
Faculty	4	3.38	
College Administrator	4	3.615	Student

Table 17 presents the post-hoc analysis for the learner characteristics dimension. The students computed P-Value is 0.03097 is significantly different when compared to the perception of the college administrators. However, for the faculty, when compared to the students' perception, the computed P-Value is 0.85197. On the other hand, the P-Value of faculty is 0.06974 compared to the college administrators' perception. Since both P-Values are greater than the alpha level of significance of 0.05, it implies that the perception of the faculty compared to the perceptions of the students and college administrators has no significant difference. This can be attributed to the fact that as designated officials, college administrators have no direct supervision with the students since they need to perform administrative functions, unlike the faculty members wherein they meet their students regularly through online learning. Furthermore, the faculty reports the academic prowess of their students to the college administrators. Hence, the above data.

Table 18

Significant relationship in the perception of respondents on the dimensions affecting the quality of online learning when grouped according to administrative support

	Source of Internet Connection			Primary Gadget Used for Online Learning			Internet Connection Speed used in Online Learning			Location during Online Learning		
	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)
The university provides online portals (i.e. LENS, MS Teams, Google Docs etc.) to access instructional materials, modules, activities, formative and summative assessments.	0.5467	0.8469	0.1490	0.1866	0.5961	0.0433	0.2842	0.5360	0.6052	0.2635	0.1690	0.1207
The university adequately addresses feedbacks, issues and concerns from students in relation to online learning.	0.6727	0.2920	0.3389	0.1699	0.4725	0.0433	0.6759	0.2775	0.6052	0.3433	0.0897	0.1207
The university allows the use of a number of online platforms to facilitate the delivery of instruction efficiently.	0.1717	0.6131	0.6351	0.3381	0.9694	0.1168	0.5248	0.4151	0.5819	0.8658	0.1235	0.0941
The university adequately support and encourage the administration to participate in online learning.	0.7053	0.8518	0.2460	0.4460	0.5961	0.4635	0.1881	0.7475	0.4227	0.2596	0.6552	0.2460

Table 18 presents the significant relationship of the respondents' perception on the dimensions affecting the quality of online learning when grouped according to administrative support. It shows that this dimension has no significant relationship when the respondents are grouped according to "source of internet connection"; "internet connection speed used in online learning," and "location during online learning." Since the likelihood ratio computed is greater than the alpha level of significance, 0.05, the null hypothesis is accepted. However, for the online profile variable "primary gadget used in online learning," the students and faculty's computed likelihood ratio resulted in the acceptance of the null hypothesis with less than the alpha level of significance.

The items on "the university allows the use of several online platforms to facilitate the delivery of instruction efficiently" and "the university adequately supports and encourages the administration support to participate in online learning" have no significant relationship. For college administrators, the items on "the university provides online access to instructional materials, modules, activities, formative and summative assessments" and "the university adequately addresses feedbacks, issues and concerns from students in relation to online learning" have significant relationship. This can be attributed to the academic and administrative functions of the college administrators requiring them to have gadgets capable of performing multiple tasks simultaneously.

Table 19

Significant relationship in the perception of respondents on the dimensions affecting the quality of online learning when grouped according to course content

Pearson-Chi Square/Likelihood Ratio	Source of Internet Connection			Primary Gadget Used for Online Learning			Internet Connection Speed used in Online Learning			Location during Online Learning		
	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)
B. Course Content												
Proper and sufficient instructional materials, modules, activities, formative and summative assessments are provided in the online learning platforms.	0.1105	0.1248	0.6351	0.1105	0.2283	0.1168	0.1774	0.2928	0.5819	0.6377	0.1690	0.0941
Contents of the modules and learning materials provided in online learning platforms are simple and comprehensive	0.5488	0.4027	0.3389	0.5488	0.7548	0.0433	0.0616	0.6705	0.6052	0.4358	0.0897	0.1207
Online learning materials and modules utilize students higher order thinking skills particularly enhancing the students' critical thinking and problem-solving skills.	0.3883	0.8247	0.3165	0.3883	0.0600	0.0433	0.2183	0.5987	0.4490	0.6260	0.1235	0.0735
Online learning materials and modules provide a two-way communication and cooperation among learners.	0.0883	0.2984	0.6351	0.0883	0.5596	0.1168	0.6377	0.7459	0.5819	0.8409	0.6552	0.0941

Table 19 presents the significant relationship of respondents' perception on the dimension affecting the quality of online learning when grouped according to course content. The following online profile variables have no significant relationship; source of internet connection, internet connection speed, used in online learning, and location during online learning since the likelihood ratio computed is greater than 0.05 alpha level of significance. In like manner, the online profile variable on the primary gadget used for online learning, the students and faculty respondents show no significant relationship, also with the college administrators. The items "proper and sufficient instructional material, modules, activities, formative and summative assessments are provided in the online learning platforms" and "online learning materials and modules provide a two-way communication and cooperation among learners" have no significant relationship. In contrast, items on "contents of the modules and learning materials provided in online learning platforms are simple and comprehensive" and "online learning materials and modules utilize students higher-order thinking skills particularly enhancing the student's critical thinking and problem-solving skills" have a significant relationship. Since the college administrators are particular with the quality of instructional materials used by instructors in their online classes, they need to have a primary gadget that will allow them to provide prompt feedback related to learning materials, modules, and the content of the course syllabi. They need to ensure that these will enable the students to use their higher-order thinking skills as it is one of the 21st-century components students must develop.

Table 20

Significant relationship in the perception of respondents on the dimensions affecting the quality of online learning when grouped according to course design

Pearson-Chi Square/Likelihood Ratio	Source of Internet Connection			Primary Gadget Used for Online Learning			Internet Connection Speed used in Online Learning			Location during Online Learning		
	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)
C. Course Design												
The course design is suitable for online learning.	0.0175	0.7967	0.6351	0.0388	0.6416	0.1168	0.6093	0.1760	0.5819	0.0783	0.1203	0.0941
The course design is geared towards the achievement of the course intended learning outcomes.	0.1180	0.6829	0.9560	0.1687	0.8533	0.1821	0.3149	0.4942	0.1308	0.3313	0.0782	0.4033
The course design contains appropriate formative and summative assessments to properly evaluate the intended learning outcomes.	0.7797	0.8167	0.9560	0.1177	0.3185	0.1821	0.4489	0.7102	0.1308	0.9865	0.5200	0.4033
The course design enables the instructor to record the results of the various assessments.	0.1777	0.4027	0.9560	0.0831	0.2952	0.1821	0.3472	0.3242	0.1308	0.8958	0.5200	0.4033

Table 20 presents the significant relationship of respondents' perception on the dimension affecting the quality of online learning when grouped according to course design. As presented, the four online profile variables of the three groups of respondents have no significant relationship to the dimension of course design. However, for the student respondents, the online profile variables along "source of internet connection" and "primary gadget used for online learning" show a significant relationship for the item "the course design is suitable for online learning." The data explains that the students' internet connection and the gadget used can affect the quality of online learning. This is in relation to the sudden shift of traditional education to online learning.

Table 21

Significant relationship in the perception of respondents on the dimensions affecting the quality of online learning when grouped according to social support

Pearson-Chi Square/Likelihood Ratio	Source of Internet Connection			Primary Gadget Used for Online Learning			Internet Connection Speed used in Online Learning			Location during Online Learning		
	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)
D. Social Support												
Equal chance of participation in online activities such as Q&A and class discussions.	0.9725	0.4943	0.6351	0.3505	0.5148	0.1168	0.6515	0.1503	0.0915	0.1080	0.5750	0.2679
The online learning environment provides an ambiance of a typical physical classroom set up.	0.3064	0.0228	0.8656	0.6551	0.5125	0.4106	0.1200	0.1605	0.3378	0.5315	0.0984	0.5577
Online learning encourages cooperation among the students through breakout rooms, online group activities and presentations.	0.8772	0.2349	0.2390	0.6125	0.4956	0.2588	0.0663	0.3381	0.1308	0.5685	0.4150	0.4033
Online learning enhances the bond between instructors and learners.	0.3850	0.0772	0.2390	0.5167	0.6412	0.2588	0.6852	0.0095	0.1308	0.9997	0.4536	0.4033

Table 21 presents the significant relationship in respondents' perception of the dimension affecting the quality of online learning when grouped according to social support. As reflected in the above table, The three (3) groups of respondents do not have a significant relationship with the dimension of social support, except for the faculty respondents' source of internet connection and internet connection speed used in online learning. These two online profiles show a significant relationship to the dimension of social support, the source of internet connection of the faculty respondents has a significant relationship to "the online learning environment provides an ambiance of a typical classroom set up," this explains that the source of internet connection affects the online learning environment, it is believed that the physical classroom set up that the faculty intended to provide for the online class can be affected by the source of internet connection. In connection to this, the internet connection speed used in online learning has a significant relationship to the item "online learning enhances the bond between instructors and learners" this is because the online portals used by instructors and students meet not only the learning needs of the students but also it enhances their teacher-student relationship.

Table 22

Significant relationship in the perception of respondents on the dimensions affecting the quality of online learning when grouped according to technical support

Pearson-Chi Square/Likelihood Ratio	Source of Internet Connection			Primary Gadget Used for Online Learning			Internet Connection Speed used in Online Learning			Location during Online Learning		
	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)
E. Technical Support												
Online learning platforms are user-friendly for instructors and learners	0.2673	0.3783	0.9560	0.5238	0.8224	0.1821	0.8755	0.0435	0.1308	0.2125	0.8696	0.4033
Online learning platforms are convenient for use by the instructors and learners.	0.2247	0.1270	0.9560	0.4612	0.0639	0.1821	0.7700	0.5910	0.1308	0.9063	0.2899	0.4033
Online learning orientation and training are provided to both instructors and learners.	0.5615	0.2415	0.9560	0.2115	0.9076	0.1821	0.4885	0.5004	0.1308	0.9535	0.1247	0.4033
Proper technical support is provided for online learners.	0.8704	0.5095	0.9560	0.6056	0.9486	0.1821	0.2684	0.2997	0.1308	0.6699	0.5155	0.4033

Table 22 presents the significant relationship in respondents' perception of the dimension affecting the quality of online learning when grouped according to technical support. As shown in the above figure, only the internet connection speed used in online learning has a significant relationship to the item "online learning platforms are user-friendly for instructors and learners" for the faculty respondents. This implies that the internet connection speed used by the faculty respondents affects how they use online learning platforms. Since a number of faculty members have used traditional instructional materials for an extended period, such as ppt, visual aids, etc., the short time of using these platforms doesn't allow them to have the knowledge and technical skills to utilize them efficiently. On the other hand, the online learning profile of the three (3) respondents shows no significant relationship to the dimension of technical support since the likelihood ratio computed is above the alpha level of significance of 0.05.

Table 23

Significant relationship in the perception of respondents on the dimensions affecting the quality of online learning when grouped according to instructor's characteristics

Pearson-Chi Square/Likelihood Ratio	Source of Internet Connection			Primary Gadget Used for Online Learning			Internet Connection Speed used in Online Learning			Location during Online Learning		
	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)
F. Instructor Characteristics												
Availability of instructors to provide the needs of learners before, during and after online classes.	0.6589	0.6842	0.0597	0.0517	0.9133	0.1821	0.4055	0.8601	0.4133	0.9199	0.5964	0.4033
The instructors use online platforms (LENS, Google Meet, Zoom, MS Teams, etc.) for interactive online classes.	0.7239	0.9459	0.4152	0.2857	0.8533	0.0611	0.4885	0.8935	0.6241	0.1960	0.4255	0.1038
The instructors conduct formative and summative assessments (i.e. Seatwork, Assignments, Quizzes, Tests and Examinations) using online platforms.	0.2994	0.7237	0.9560	0.0119	0.4981	0.1821	0.3452	0.5147	0.4133	0.7863	0.2350	0.0597
Online learning aids in the delivery of the instructors' presentation of contents and activities.	0.2035	0.6829	0.6351	0.0594	0.8533	0.1168	0.7839	0.8935	0.5819	0.3384	0.4255	0.0941

Table 23 presents the significant relationship in respondents' perception on the dimension affecting the quality of online learning when grouped according to instructor characteristics. For the student, the primary gadget used for online learning has a significant relationship to the item "the instructors conduct formative and summative assessments using online platforms." In as much as the faculty wishes to conduct various assessments to measure the students' higher-order thinking skills. The gadgets features used by the students are not capable of performing some of the evaluations given by the faculty. Hence, assessment results are affected by it.

Table 24

Significant relationship in the perception of respondents on the dimensions affecting the quality of online learning when grouped according to learner characteristics

Pearson-Chi Square/Likelihood Ratio	Source of Internet Connection			Primary Gadget Used for Online Learning			Internet Connection Speed used in Online Learning			Location during Online Learning		
	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)	Student	Faculty	College Administrator (i.e. Dean, Department Chairs, Program Coordinators)
G. Learner Characteristics												
Course materials and modules helps students to achieve the course intended learning outcomes.	0.1346	0.7248	0.6351	0.1430	0.5596	0.1168	0.5918	0.8430	0.5819	0.3120	0.7327	0.0941
The learners can easily access and adapt to the online learning platforms.	0.1826	0.6648	0.3165	0.4142	0.7012	0.1732	0.7992	0.2521	0.8087	0.3120	0.8624	0.2167
Online learning enhances motivation and learning styles of learners.	0.6715	0.6278	0.3165	0.3412	0.8669	0.1732	0.5991	0.1593	0.8087	0.8535	0.6017	0.2167
Online learning improves the level of learners' academic performance.	0.6715	0.6334	0.6351	0.0745	0.9245	0.1168	0.0901	0.1311	0.5819	0.2874	0.2991	0.0941

Table 24 presents the significant relationship of respondents' perception on the dimension affecting the quality of online learning when grouped according to learner characteristics. As reflected, all online learning profiles of the respondents exhibit no significant relationship to the dimension "learner characteristics". This explains that the items along learner characteristics are independent of the online learning profile variables of the respondents.

III. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter presents the summary, conclusions, and recommendations based on the results of the study.

SUMMARY OF FINDINGS:

1. Online learning profile of the respondents.

- 1.1. *Source of Internet Connection* - 5 or 56% college administrators, 15 or 60% of faculty are using fiber, and 317 or 79% of students favor using mobile/broadband data. On the contrary, the use of satellite is the least preferred source of internet connection by the three groups of respondents.
- 1.2. *Primary Gadget Used for Online Learning* - 8 or 80% of the college administrators and 20 or 80% of the faculty use laptops in online learning. However, 364 or 91% of the students are using smartphones. No one uses an iPad/tablet as a primary gadget for online learning for the faculty and students.
- 1.3. *Internet Connection Speed Used in Online Learning* - 5 or 56% of the college administrators have above 15 Mbps up to 25 Mbps internet connection speed, same with the 8 or 32% of the faculty respondents and majority of the students, 192 or of them have 5 Mbps and below.
- 1.4. *Location during Online Learning* - 5 or 56% of the college administrators stays in an area with a strong and stable internet connection. The same is true in the case of the faculty, 13 or 52% also remain in a place with strong and stable internet connection. On the other hand, 161 or 40% students stay in an area with a strong but unstable internet connection.

2. Perception of the students, faculty, and college administrators on the dimensions affecting the quality of online learning

2.1 *Administrative Support* - The item on "The university provides online portals (i.e., LENS, MS Teams, Google Docs, etc.) to access institutional materials, modules, activities, formative and summative assessments" has the highest weighted mean of 3.81 with a descriptive scale of very important for the students and 3.68 or very important for the faculty. Moreover, 3.78 or very important is likewise given to the item "The university adequately support and encourage the administration to participate in online learning." In contrast, the item "The university adequately addresses feedbacks, issues, and concern from students in relation to online learning" has the lowest weighted mean for the three groups but still has a descriptive scale of very important.

2.2 *Course Content* - For the students, the item on "Proper and sufficient instructional materials, modules, activities, formative and summative assessments are provided in the online learning platforms," has the highest weighted mean of 3.62 or very important. For the faculty and college administrators, the item on "Contents of the modules and learning materials provided in online learning platforms are simple and comprehensive" has the highest weighted mean of 3.73 or very important for faculty and 3.67 or very important for college administrators. On the other hand, the item "Online learning materials and modules utilize students higher-order thinking skills particularly enhancing the students' critical thinking and problem-solving skills" has the lowest weighted mean.

2.3 *Course Design* - "The course design contains appropriate formative and summative assessments to evaluate the intended learning outcomes properly" has the highest weighted mean for the three (3) groups of respondents. In like manner, the item on "the course design suitable for online learning" has a weighted mean of 3.67 or very important as perceived by the college administrators. However, the item "The course design is suitable for online learning" has the lowest weighted mean of 3.46 or very important for students and 3.60 or very important for faculty. The item "The course design is geared towards achieving the course intended learning outcomes" has the lowest weighted mean of 3.56 or is very important.

2.4 *Social Support* - The item on "Equal chance of participation in online activities such as Q&A and class discussions" has the highest weighted mean for the three groups of respondents. 3.39 or very important for students, 3.52 or very important for faculty, and 3.67 or very important for college administrators. On the contrary, the item "The online learning environment provides an ambiance of a typical physical classroom set up" has the lowest weighted mean for the three groups of respondents.

2.5 *Technical Support* - The item on "online learning orientation and training are provided to both instructors and learners" has the highest weighted mean of 3.44, or very important as perceived by the students. The item on "online learning platforms are convenient for the instructors and learners" has the highest weighted mean of 3.36 or very important as perceived by the faculty. Furthermore, The item on "online learning platforms are convenient for use by the instructors and learners" has the lowest weighted mean of 3.36 or very important as perceived by the students and faculty.

2.6 *Instructor Characteristics* - The students perceived that "the instructors use online platforms (LENS, Google Meet, Zoom, MS Teams, etc.) for interactive online classes" is very important, with a weighted mean of 3.66. The same is true with the college administrators, with a weighted mean of 3.78 or very important. In the case of faculty, the item on "the instructors conduct formative and summative assessments (i.e. seat works, assignments, quizzes, tests and examinations) using online platforms" has a weighted mean of 3.72 or very important. The lowest weighted mean is the item on "availability of instructors to provide the needs of learners before, during and after online classes," with a weighted mean of 3.50 or very important for the students, 3.64 or very important for the faculty, and a weighted mean of 3.56 or very important for the college administrators.

2.7 *Learner Characteristics* - The item on the "course materials and modules help students to achieve the course intended learning outcomes" has the highest mean for the three groups of respondents. 3.54 for the students, 3.60, for the faculty, and 3.67 for the college administrators. On the other hand, the item "online learning improves the level of learners' academic performance" has the lowest weighted mean of 3.23 for students and 3.24 for faculty. Lastly, the item "the learners can easily access and adapt to the online learning platforms" has the lowest weighted mean of 3.56 or very important for college administrators.

3. Difference among the perception of students, faculty, and college administrators on the dimension affecting the quality of online learning.

The four (4) dimensions: *Administrative Support*, *Course Content*, *Social Support*, and *Instructor Characteristics*, accepted the null hypothesis that there is no significant difference among the perception of students, faculty, and college administrators because the probability is less than the alpha level of significance of 0.05. On the contrary, the three (3) dimensions: *Course Design*, *Technical Support*, and *Learner Characteristics*, rejected the null hypothesis since its probability is greater than the alpha level of significance of 0.05. Post-Hoc Analysis was used to determine the difference in the dimensions on *Course Design*, *Technical Support*, and *Learner Characteristics* since it rejected the null hypothesis.

4. Relationship in respondents' perception of the dimension affecting online learning quality when grouped according to their online learning profile.

The dimension on *administrative support* has no significant relationship when the respondents are grouped according to "source of internet connection"; "internet connection speed used in online learning," and "location during online learning." However, for the online profile variable "primary gadget used in online learning," the students and faculty's computed likelihood ratio resulted in the acceptance of the null hypothesis.

CONCLUSIONS:

Based on the results and findings of the study, the researchers conclude that:

1. Most of the college administrators and faculty favor fiber and mobile/broadband data for the students and laptops are used as primary gadgets for online learning
2. College administrators and faculty respondents have above 15 Mbps up to 25 Mbps to do their tasks better in online learning while students use internet connection speed of 5 Mbps and below because it is cheaper.
3. In order for college administrators and faculty to perform their tasks, they should stay in an area with a strong and stable internet connection.
4. Students and faculty respondents perceived online portals very important to access institutional materials, modules and assessments.
5. Faculty and college administrators, believe that the contents of the modules and learning materials offered in online learning platforms are comprehensive and straightforward as the students agree that sufficient instructional materials, activities and assessments are provided.
6. The course design contains appropriate assessments in evaluating the intended learning outcomes of the students.
7. Online learning environment provides an ambiance of a typical physical classroom.
8. Online learning orientation and training are important.
9. Students and college administrators perceived that using online platforms for interactive online classes is very important.
10. Course materials and modules help students achieve the course intended outcomes.

RECOMMENDATIONS:

Based on the above conclusions, the researchers highly recommend the following:

1. Since electronic technology is the portal used to access learning in online classes, internet service providers must improve the services they provide to their subscribers by making it more accessible and more cost-effective.
2. Students and parents should consider the importance of internet connection, a primary gadget used for online learning, the internet connection speed used in online learning, and location during online learning when it comes to the quality of online learning.
3. For the school administrators to improve technical support in the delivery of online learning and for the faculty to enhance their teaching strategies and come up with assessments that can adequately evaluate the online knowledge and experiences of the students.
4. The university must ensure that online portals like LENS meet the needs of the faculty and students in online learning. Faculty and students must adapt to changes promptly as the pandemic demands them to embrace new challenges and use various online platforms.
5. The *course content* dimension must facilitate learning through proper and sufficient instructional materials, modules, and the like to be provided by the CBEA faculty in the online learning platforms.
6. *Course design* must genuinely be suitable for online learning; it must consider the importance of achieving the course learning objectives.
7. Faculty members and college administrators are encouraged to devise ways to supplement these lapses to provide a suitable ambiance to facilitate learning.
8. The university needs to train the respondents in the use of technology and other online platforms.
9. Students must know and understand how to effectively adapt to online learning to improve their online learning experience. It is also suggested that students communicate with their instructors to clear doubts through online platforms, calls, or texts.

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The Effect of Dolomite and Chicken Manure on Cauliflower (*Brassica oleracea L. var. Botrytis*) Intercropping with Sweet Corn in Peatlands

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ABSTRACT

Cultivating cauliflower in Central Kalimantan's peatlands requires proper nutrient management. This is because cauliflower is very sensitive to soil and environmental variations, which can affect the growth and mass yield of flowers. Peat soil problems, both physical, chemical and biological, need specific handling, including high soil acidity, poor nutrients, high cation exchange capacity (CEC), with low base saturation, soil pH is generally below 4.5 while cauliflower is a plant that is sensitive to high acidity. The conditions for growing cauliflower plants are between pH 5.5 - 6.6. Low pH and high organic acids do not support plant development and the availability of soil nutrients, so it is necessary to improve peatlands so that they are close to the requirements for growing cauliflower, one of which is by applying ameliorants such as dolomite lime, ash and fertilization.

The purpose of this study was to determine the effect of the type and dose of amelioran on the intercropping pattern of cauliflower with sweet corn on changes in peat soil pH which is most suitable for increasing the growth and yield of cauliflower.

The experiment used a factorial randomized block design, the first factor was the dose of amelioran, which consisted of 3 levels: A₁ = 10 t ha⁻¹ burnt ash, A₂ = 3 t ha⁻¹ dolomitic lime, A₃ = 6 t ha⁻¹ dolomitic lime. The second factor was the dose of chicken manure, which consisted of 3 levels: P₁ = 10 t ha⁻¹ chicken manure, P₂ = 20 t ha⁻¹ chicken manure, P₃ = 30 t ha⁻¹ chicken manure.

Based on the results of this study it can be concluded that the application of dolomite lime amelioran of 3 t ha⁻¹ and chicken manure fertilizer of 30 t ha⁻¹ on peatlands can improve peat soil pH from 4.1 to 5.1 and increase growth in height, number of leaves and leaf area and flower weight yield of cauliflower plants were 4.59 t ha⁻¹ and 5.37 t ha⁻¹.

Keywords: Flower cauliflower, dolomite, chicken manure, intercropping, peat land

PRELIMINARY

The prospect of developing cauliflower plants in Central Kalimantan Province is quite good. In line with the increase in people's income and nutritional awareness, the demand for cauliflower in Central Kalimantan Province continues to increase. So far, to meet consumer needs, most traders bring cauliflower from other areas, especially from the island of Java. Long distances and long enough times resulted in a decrease in the freshness and quality of cauliflower and the price became expensive. Therefore there is a market opportunity to develop cauliflower plants in Central Kalimantan.

Utilization of peat land for cauliflower cultivation has chemical barriers. The main problems in peatlands are soil acidity, nutrient deficiency, especially Ca and high content of Al³⁺, Fe³⁺ and SO₄²⁻, cation exchange capacity in peatlands is high and Soil Base Saturation is very low (Tufaila *et al.*, 2014). In addition, the content of micro elements (Cu, Zn and Mo) is very low and is tightly

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bound by organic matter so that it is not available to the soil. While the soil pH suitable for growth and mass formation of flowers ranges from 5.5 to 6.5, fertile, sufficient water but not stagnant and rich in soil organic matter. Soil acidity below 5 causes the growth of cauliflower plants to be abnormal so that the mass of flowers produced is small due to a lack of Mg, Mo and B and even some plants are unable to form flowers.

RESEARCH METHODS

Time and Place

The research was conducted on Ombrogen peat soil in Kalampangan Village, Palangka Raya City, Central Kalimantan Province.

Ingredient

The materials used were flower cauliflower seeds of the PM 126 variety, sweet corn seeds of the Bonanza variety, chicken manure and inorganic fertilizers (Urea, SP-36 and KCl), dolomite and burnt ash.

Methodology

The study was conducted using a factorial randomized block design, where the first factor was the type and dose of ameliorant and the second factor was the dose of chicken manure.

The first factor is the dose of ameliorant, which consists of 3 levels:

A1 = Burnt ash 10 t ha⁻¹

A2 = Dolomite lime 3 t ha⁻¹

A3 = Dolomitic lime 6 t ha⁻¹

The second factor is the dose of chicken manure, which consists of 3 levels:

P1 = Chicken manure 10 t ha⁻¹

P2 = Chicken manure 20 t ha⁻¹

P3 = Chicken manure 30 t ha⁻¹

Research Implementation

Cauliflower Nursery

Cauliflower seedling is carried out in a prepared nursery. The nursery is given a mixture of chicken manure with a ratio of 1:1. Before sowing the nursery is watered until conditions are moist. Cauliflower seeds are sown evenly then sprinkled with soil thinly, then covered with plastic sacks. After ± 4 days the plastic bag was opened and the sprouts started to grow. The nursery was then given a paranet roof to protect it from heat and rain. Nursery is done until the plants are ready to be transplanted ± 21 Days After Planting (DAP).

Planting Sweet Corn and Cauliflower Seeds

The planting of the sweet corn seeds was carried out 2 weeks before planting the cauliflower, with the aim that the leaves of the sweet corn plant would become a shade for the cauliflower plants. The distance between the sweet corn plants used is 120 cm and the distance in the rows of sweet corn plants is 60 cm, while the spacing of cauliflower used is 60 x 60 cm. Cauliflower plants are transplanted at the age of ± 21 days or already have 4 to 5 leaves.

Provision of Ameliorant (Chicken Manure, Ash and Dolomite)

Ameliorant (chicken manure, burnt ash and dolomite lime) was applied 2 weeks before planting by spreading it evenly on the row then raking it until it was evenly distributed. The application of the type and dose of ameliorant and the dose of chicken manure were adjusted for each treatment.

Cauliflower plants were fertilized using inorganic fertilizers (Urea 200 kg ha⁻¹, SP-36 250 kg ha⁻¹ and KCl 150 kg ha⁻¹). SP-36 and KCl fertilizers were given simultaneously at 7 DAP, while Urea fertilizer application was given 2 times at 7 and 21 DAP each half of the dose.

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Sweet corn plants were fertilized with 200 kg ha⁻¹ Urea, 100 kg ha⁻¹ SP-36 and 100 kg ha⁻¹ KCl. SP-36 and KCl fertilizers were applied simultaneously at 7 DAP, while Urea fertilizer applications were given at 7, 28 and 49 DAP respectively 1/3 of the dose. The hole where the fertilizer is drilled is ± 5 cm deep with a distance of ± 15 cm from the plant stem, then the fertilizer hole is covered with soil.

Observation

Observation of the growth of cauliflower plants

Observation of growth is done destructively and non-destructively. The observed variables include:

1. Plant height (cm), measured from the soil surface to the top growing point.
2. The number of leaves (strands) per plant, counted all the leaves that have opened perfectly.
3. Leaf area (dm²), measured using a leaf area meter (LAM).
4. Flower mass yield components of cauliflower plants per plant, per plot and per hectare

RESULTS AND DISCUSSION

Research Result

The results showed that there was no significant interaction between the ameliorant treatment and the dose of chicken manure on the height of cauliflower plants. Administration of ameliorant at various doses had no significant effect on the height of cauliflower plants at 10 Days After Planting (DAP), while a significant effect began to occur at 20 to 40 Days After Planting (DAP). The application of chicken manure at various doses did not significantly affect plant height at 10 to 20 Days After Planting (DAP), but had a significant effect at 30 and 40 DAP.

Table 1. Cauliflower Plant Height Due to The Application of Ameliorant and Chicken Manure at Various Ages of Observation.

Perlakuan	Plant Height (cm plant ⁻¹) (DAP)			
	10	20	30	40
Ameliorant (A)				
Ash 10 t ha ⁻¹ (A ₁)	14,60	22,33 a	33,15 a	40,36 a
Dolomite 3 t ha ⁻¹ (A ₂)	15,59	23,21 ab	35,53 ab	41,99 ab
Dolomite 6 t ha ⁻¹ (A ₃)	15,91	24,28 b	36,84 b	44,24 b
BNT 5%	ns	1,51	2,42	3,03
Chicken Manure (P)				
10 t ha ⁻¹ (P ₁)	15,17	22,78	33,47 a	39,64 a
20 t ha ⁻¹ (P ₂)	15,43	23,25	35,21 ab	42,15 ab
30 t ha ⁻¹ (P ₃)	15,50	23,80	36,84 b	44,80 b
BNT 5%	ns	ns	2,42	3,03

Note: Numbers in the same column accompanied by the same letter also show no significant difference in the 5% BNT test

ns = not significantly different DAP = Days After Planting

In Table 1 it is known that the administration of various doses of ameliorant had no significant effect on the height of cauliflower plants at 10 DAP. The application of dolomite (A₂ and A₃) resulted in a higher height of cauliflower compared to the application of ash (A₁) at 20 to 40 DAP, although the application of dolomite 3 t ha⁻¹ (A₂) produced a cauliflower plant height which was not significantly different from the application of ash as much as 10 t ha⁻¹ (A₁). Increasing the dolomite dose to 6 t ha⁻¹ (A₃) increased the height of cauliflower plants compared to 10 t ha⁻¹ (A₁) ash, but not significantly different from the dolomite dose of 3 t ha⁻¹ (A₂).

The application of chicken manure at various doses did not significantly affect the height of cauliflower plants at 10 to 20 DAP, but had a significant effect at 30 and 40 DAP. Application of chicken manure as much as 10 t ha⁻¹ (P₁) resulted in a lower flower cauliflower plant height compared to other doses of chicken manure at 30 and 40 DAP. Increasing the dose of chicken manure from 10 t ha⁻¹ (P₁) to 20 and 30 t ha⁻¹ (P₂ and P₃) further increased the height of cauliflower plants. An increase in plant height was

obtained through the application of chicken manure as much as 30 t ha⁻¹ (P₃), although it was not significantly different from the dose of 20 t ha⁻¹ (P₂).

Based on the analysis of variance, it was found that there was no significant interaction between the administration of ameliorant and chicken manure on the number of leaves of cauliflower plants. Administration of various doses of ameliorant had no significant effect on the number of leaves of cauliflower plants at 10 DAP, while at 20 to 40 DAP it had a significant effect. The application of chicken manure at various doses had no significant effect on the number of leaves of cauliflower plants at 10 and 20 DAP, and had a significant effect at 30 to 40 DAP.

Table 2. shows that the application of ameliorants at various doses had no significant effect on the number of leaves of cauliflower plants at 10 DAP. On observation 20 to 40 HST, the application of ash as much as 10 t ha⁻¹ (A₁) produced a number of leaves that were not significantly different from the application of dolomite as much as 3 t ha⁻¹ (A₂). Increasing the dose of dolomite to 6 t ha⁻¹ (A₃) increased the number of leaves of cauliflower compared to the application of ash, although it was not significantly different from the administration of dolomite lime at a dose of 3 t ha⁻¹ (A₂) at 30 and 40 DAP.

Table 2. The Number of Leaves of Cauliflower Plants Due to Application of Ameliorants and Chicken Manure at Various Ages Observations

Perlakuan	The Number of Leaves (DAP)			
	10	20	30	40
Ameliorant (A)				
Ash 10 t ha ⁻¹ (A ₁)	7,22	11,00 a	15,39 a	19,72 a
Dolomite 3 t ha ⁻¹ (A ₂)	7,53	11,81 ab	16,39 ab	21,00 ab
Dolomite 6 t ha ⁻¹ (A ₃)	7,80	12,67 b	17,17 b	21,59 b
BNT 5%	ns	1,06	1,12	1,49
Chicken Manure (P)				
10 t ha ⁻¹ (P ₁)	7,20	11,48	15,56 a	19,50 a
20 t ha ⁻¹ (P ₂)	7,44	11,83	16,28 ab	20,92 ab
30 t ha ⁻¹ (P ₃)	7,91	12,17	17,11 b	21,89 b
BNT 5%	ns	ns	1,12	1,49

Note: Numbers in the same column accompanied by the same letter also show no significant difference in the 5% BNT test

ns = not significantly different DAP = Days after planting

Based on the results of the study it was found that there was no significant interaction between the administration of amelioran and the dose of chicken manure on the leaf area of cauliflower plants. At 10 DAP, the application of amelioran and doses of chicken manure had no significant effect on the leaf area of cauliflower plants, whereas at 20 to 40 DAP it had a significant effect.

Table 3. Leaf Area of Cauliflower Plants Due to Application of Ameliorants and Chicken Manure at Various Ages Observations

Perlakuan	Leaf Area (dm ²) (DAP)			
	10	20	30	40
Ameliorant (A)				
Ash 10 t ha ⁻¹ (A ₁)	1,12	5,48 a	34,59 a	61,54 a
Dolomite 3 t ha ⁻¹ (A ₂)	1,14	5,73 ab	37,74 b	69,07 b
Dolomite 6 t ha ⁻¹ (A ₃)	1,17	5,95 b	38,81 b	72,14 b
BNT 5%	ns	0,34	2,77	4,66
Chicken Manure (P)				
10 t ha ⁻¹ (P ₁)	1,09	5,53 a	34,42 a	61,55 a
20 t ha ⁻¹ (P ₂)	1,16	5,66 ab	37,59 b	67,32 b
30 t ha ⁻¹ (P ₃)	1,18	5,97 b	39,13 b	73,89 c
BNT 5%	ns	0,34	2,58	4,66

Note: Numbers in the same column accompanied by the same letter also show no significant difference in the 5% BNT test

ns = not significantly different DAP = Days after planting

In Table 3 it is known that the application of ameliorants at various doses had no significant effect on the leaf area of cauliflower plants at 10 DAP. At 20 DAP, cauliflower plants fed 10 t ha⁻¹ ash (A₁) and 3 t ha⁻¹ dolomite (A₂) produced lower leaf area than dolomite lime 6 t ha⁻¹ (A₃). Dolomite treatment of 3 and 6 t ha⁻¹ (A₂ and A₃) resulted in higher plant leaf area at 30 and 40 DAP, while the application of ash at 10 t ha⁻¹ (A₁) resulted in the lowest leaf area.

At 10 DAP, the application of chicken manure doses of 10, 20 and 30 t ha⁻¹ (P₁, P₂ and P₃) had no significant effect on the leaf area of cauliflower plants. Whereas at 20 and 30 DAP, the application of chicken manure 20 and 30 t ha⁻¹ (P₂ and P₃) resulted in wider leaf area, although at a dose of 20 t ha⁻¹ (P₂) it was not significantly different from a dose of 10 t ha⁻¹ (P₁). At 40 DAP, cauliflower plants that were given 10 t ha⁻¹ (P₁) chicken manure produced the lowest leaf area, on the other hand the increased dose of chicken manure from 10 t ha⁻¹ (P₁) to 30 t ha⁻¹ (P₃), produced the highest leaf area.

The results showed that there was no interaction between the administration of ameliorant and chicken manure on the yield components of cauliflower (Table 4). A single application, treatment of ameliorant and chicken manure had a significant effect on the yield components of the cauliflower plant (yield per plot, per hectare and per flower mass). Application of ash as much as 10 t ha⁻¹ (A₁) resulted in the lowest weight per mass of flowers and per hectare, namely 186.28 g per mass of flowers or 3.62 t ha⁻¹. The application of ameliorant in the form of dolomite as much as 3 t ha⁻¹ and 6 t ha⁻¹ (A₂ and A₃) resulted in higher weight per flower mass, per plot and per hectare than the application of ash 10 t ha⁻¹ (A₁). Cauliflower plants treated with dolomite 3 and 6 t ha⁻¹ (A₂ and A₃) yielded weight per flower mass of 236.18 g and 259.55 g or 4.59 t ha⁻¹ and 5.05 t ha⁻¹ respectively.

Table 4. Components of Cauliflower Mass Yield Due to Application of Ameliorants and Chicken Manure at Various Ages Observations

Perlakuan	Flower Mass Yield		
	Per harvest plot (kg 2,16 m ⁻²)	Per hectare (t ha ⁻¹)	Per mass of flower (g plant ⁻¹)
Ameliorant (A)			
Ash 10 t ha ⁻¹ (A ₁)	1,12 a	3,62 a	186,28 a
Dolomite 3 t ha ⁻¹ (A ₂)	1,42 b	4,59 b	236,18 b
Dolomite 6 t ha ⁻¹ (A ₃)	1,56 b	5,05 b	259,55 b
BNT 5%	0,14	0,51	24,07
Chicken Manure (P)			
10 t ha ⁻¹ (P ₁)	1,05 a	3,41 a	175,24 a
20 t ha ⁻¹ (P ₂)	1,38 b	4,48 b	230,40 b
30 t ha ⁻¹ (P ₃)	1,66 c	5,37 c	276,37 c
BNT 5%	0,14	0,51	24,07

Note: Numbers in the same column accompanied by the same letter also show no significant difference in the 5% BNT test

The application of chicken manure in cauliflower plantations had a significant effect on the yield components of cauliflower plants (Table 4). The lowest yield of cauliflower was obtained when the application of chicken manure was 10 t ha⁻¹ (P₁) with yield per flower mass of 175.14 g or 3.71 t ha⁻¹. Increasing the dose of chicken manure from 10 t ha⁻¹ (P₁) to 20 and 30 t ha⁻¹ (P₂ and P₃) further increased the yield of cauliflower. The highest cauliflower yield was obtained by increasing the dose of chicken manure 30 t ha⁻¹ (P₃) with a yield per flower mass of 276.37 g or 5.37 t ha⁻¹, although the results were not significantly different from the dose of 20 t ha⁻¹ (P₂). Application of chicken manure at 10 t ha⁻¹ (P₁) resulted in the smallest flower mass size.

Discussion

The Effect of Ameliorant and Chicken Manure on the Growth of Cauliflower Plants

Based on the results of the study it was known that the treatment of giving ameliorant with chicken manure did not show a significant interaction with all growth parameters of cauliflower at all ages of observation. The absence of interaction is suspected

because the two ameliorants do not synergize with each other to support growth or it is also caused by one factor playing a more dominant role than the other. If one factor has a stronger influence than the other factors, then the other factors will be covered and each factor is not synergized or does not support each other in carrying out its functions.

Giving ameliorants and chicken manure can improve the properties of peat soil in increasing the availability of plant nutrients thereby increasing the growth of cauliflower plants. The results of soil analysis prior to the study showed that the soil in the study area had low soil pH (very acid), very high organic C/N, high cation exchange capacity (CEC) and very low base saturation. According to Marlina *et al.* (2017), peat soils with very high CEC characteristics and very low Soil Base Saturation percentages will inhibit the supply of nutrients, especially K, Ca and Mg and make it difficult for plants to absorb nutrients. Therefore, to be able to produce good growth and yield of cauliflower plants, it is necessary to apply ameliorant to improve the acidic nature of the soil. The results of the soil analysis after the research showed that the application of ash, dolomite and chicken manure at various doses on peatlands resulted in different changes in soil properties. Abbot *et al.* (2001) explains, the effect of soil change is influenced by the type and dose of ameliorant used.

Changes in soil properties for the better were obtained through the application of dolomite as much as 3 and 6 t ha⁻¹ (A₂ and A₃), namely an increase in pH and better base saturation. The application of dolomite as much as 3 and 6 t ha⁻¹ (A₂ and A₃) also causes the availability of nutrients such as K, Na, Ca and Mg to increase compared to ash 10 t ha⁻¹ (A₁). This is because dolomite contains Ca and Mg higher than ash. Dolomite (CaMg (CO₃)₂) is a type of lime that contains the nutrients calcium carbonate (CaCO₃) and magnesium carbonate (MgCO₃). Dolomite contains CaO (30.4%), CO₂ (47.7%), MgO (21.9%) and a small amount of iron, manganese, silica and other compounds (0.05%) (Trubus, 2002 in Nopiyanto and Sulhaswardi, 2014). While the ash used in the study had low Ca and Mg contents of 2.52% and 0.34%, and a low C/N ratio so that its effect on changing the properties of peat soils was still less than that of dolomite. Better changes in soil properties through the provision of ameliorants in the form of dolomite will result in better growth of cauliflower plants. The increase in pH due to administration of lime is due to the decarboxylation of organic acid anions such as oxalic acid, citric acid and malic acid which are produced in the breakdown of organic matter.

Application of various ameliorants to peat soils had no significant effect on various plant growth parameters at 10 DAP. Ameliorant treatment at various doses began to have a significant effect on the parameters of plant height, number of leaves and leaf area of plants from 20 DAP to 40 DAP (Tables 1, 2 and 3). There was no effect of ameliorant administration on plant growth at 10 DAP, presumably because changes in soil properties began to occur at 20 DAP. In addition, at 10 DAP, the plants were still in the process of adapting to the environment after the transplanting process, so there was not much formation of new plant organs.

Giving amelioran in the form of dolomite resulted in better growth of cauliflower plants compared to ash. In Table 3 it can be seen that the application of dolomite as much as 3 and 6 t ha⁻¹ (A₂ and A₃) resulted in a wider leaf area than the application of ash 10 t ha⁻¹ (A₁) at 30 and 40 DAP. Dolomitic lime contains Ca and Mg elements which are higher, where these two types of elements affect the increase in soil pH. An increase in pH can stimulate the activity of soil microorganisms which play a role in the decomposition of soil organic matter, resulting in an increase in plant vegetative growth (Nyakpa *et al.*, 1988).

Application of amelioran in the form of ash 10 t ha⁻¹ (A₁) resulted in poor growth of cauliflower plants compared to treatments of dolomitic lime 3 and 6 t ha⁻¹ (A₂ and A₃). In Tables 1 and 2 it is known that cauliflower plants grown on peat soil treated with ash 10 t ha⁻¹ (A₁) produced lower plant height and number of leaves, although not significantly different from dolomite as much as 3 t ha⁻¹ (A₂) at 20 to 40 DAP. Meanwhile, Table 3 shows that the application of 10 t ha⁻¹ (A₁) ash resulted in a lower leaf area of cauliflower than the application of dolomite 3 and 6 t ha⁻¹ (A₂ and A₃) at 20 to 40 DAP. This is due to the fact that adding ash to peat soils is less effective in increasing soil pH and base saturation compared to dolomite due to the low content of Ca and Mg. Low Ca content inhibits the absorption of plant nutrients because Ca is needed to reduce the reactivity of organic acids found in peat soils through the mechanism of forming cation complex compounds and is a macro nutrient needed by plants (Tisdale *et al.*,

1985 in Hartatik and Nugroho, 2003). The C/N ratio of ash is also low, namely 6, so that much of the decomposed N has been lost before being used by cauliflower plants. The availability of N in small amounts causes the photosynthesis process to take place slowly and the photosynthate produced is low.

Better plant growth due to the application of dolomite to peatlands is thought to be because dolomite contains higher Ca and Mg than ash. The Mg nutrient in dolomite plays a role in increasing leaf growth so that it will increase the process of plant photosynthesis and produce more photosynthates (Nopiyanto and Sulhaswardi, 2014). The resulting dry matter will be used to enlarge or increase plant organs such as plant height and number of leaves. Therefore, to produce better growth, efforts are needed to widen the leaf area. Wider leaf area will increase the capture of sunlight resulting in more photosynthesis. The photosynthate results are used to form plant organs.

Giving chicken manure can improve soil properties and increase the availability of nutrients for plants so that plant growth increases. The soil at the study site has a very acidic pH, high CEC but low base saturation. Besides that, the C-organic content is high, as well as the total N and C/N are very high. According to Marlina *et al.* (2017), if the total N content, C-organic is high, then N is a constituent of peat organic matter and is not available to plants. In addition, very acidic soil pH, high CEC and very low base saturation result in inhibition of nutrient absorption by plants. Applying chicken manure to peat soil will increase soil pH and base saturation thereby increasing the availability of plant nutrients. Chicken manure can also provide macro and micro nutrients for plants. The results of the soil analysis after the research showed that the application of chicken manure at various doses increased soil pH from pH 4.1 to 5 – 5.5, and increased base saturation from very low (14%) to moderate (30 – 49%), and increase the availability of bases such as K, Ca, Na and Mg. The addition of chicken manure can increase soil pH, total nitrogen, available phosphorus, exchangeable cations and organic matter. Chicken manure fertilizers increase plant growth and yield through improving soil properties and through releasing nutrients into the soil (Adeleye *et al.*, 2010).

Tables 1 and 2 show that the application of chicken manure at various doses had no significant effect on the height and number of leaves of plants at 10 and 20 DAP. While on the parameters of leaf area and dry weight of plants, the application of chicken manure had no significant effect at 10 DAP. The effect of chicken manure on the initial growth of plants has not yet been due to the slow release process of decomposition and mineralization of organic fertilizer so that it only starts to have a significant effect after 20 DAP. According to Louisa and Taguiling (2013), the main problem with the use of organic fertilizers is their slow release nature and low nutrient content, so that in order to meet sufficient nutrient requirements for plants, large amounts of organic fertilizers are needed. The degree of N mineralization of organic matter depends on the application dose, C/N ratio, soil characteristics and temperature (Fernandez – Luqueno *et al.*, 2010).

The dose of chicken manure had a significant effect on increasing the growth of cauliflower plants. The results showed that the application of chicken manure at a dose of 10 t ha⁻¹ resulted in lower plant height, number of leaves, leaf area and plant dry weight. Increasing the dose of chicken manure from 10 t ha⁻¹ (P₁) to 20 and 30 t ha⁻¹ (P₂ and P₃) further increased the growth of cauliflower plants. Gushan *et al.* (2013) explained that in applying chicken manure, one must pay attention to the dosage. Application of chicken manure at doses that are too low can cause nutrient deficiencies and yields to be low. While the application of chicken manure at doses that are too high can lead to nitrate leaching, phosphorus run off and excessive plant growth. Application of chicken manure at a dose of 30 t ha⁻¹ (P₃) resulted in better growth of cauliflower plants. This is because the chicken manure used has a low C/N ratio of 9, so that it can improve soil properties and increase the availability of plant nutrients in large quantities. The low C/N ratio results in during the decomposition process of organic matter, much of the nitrogen produced is lost through evaporation before it can be utilized by plants (Amalia and Widiyaningrum, 2016).

Application of chicken manure at a dose of 10 t ha⁻¹ (P₁) resulted in a lower rate of leaf area formation than at higher doses. With increasing doses of chicken manure will increase the leaf area of cauliflower plants. At 40 DAP, the application of chicken manure 10 t ha⁻¹ (P₁) produced the lowest leaf area of cauliflower plants, while a dose of 30 t ha⁻¹ (P₃) produced the highest leaf area (Table 3). Increasing the dose of chicken manure applied to peat soil can increase soil pH and Soil Base Saturation, as well as

Ca and Mg. Increasing soil pH and base saturation will increase the availability of nutrients for plants. According to Suge *et al.* (2011), the increase in soil pH varies depending on the amount and organic fertilizer used. Increasing the dose of chicken manure further increases the availability of macro nutrients, especially N, which is much needed in early vegetative growth because it is very important for cell division. Nitrogen is a constituent of a large number of important compounds found in living cells such as amino acids, enzymes and nucleic acids (RNA and DNA) (Rop *et al.*, 2012).

The ability per leaf area to produce plant dry weight is different for each dose of chicken manure applied. The ability per leaf area to produce dry weight in chicken manure treatment 10 t ha⁻¹ (P₁) was lower than other doses of chicken manure. On the other hand, at doses of 20 t ha⁻¹ (P₂) and 30 t ha⁻¹ (P₃) chicken manure, each increase in leaf area will result in an increase in plant dry weight.

The results of the soil analysis after the study also showed that increasing the dose of chicken manure increased soil pH, saturation and available bases such as K, Na, Ca and Mg. Improving soil properties and increasing the availability of nutrients will increase the rate of plant growth. Organic fertilizers not only provide nutrients for plants but also improve soil properties. Chicken manure fertilizers increase the availability of phosphate in the soil, improve the efficiency of fertilizer use and soil microbial populations, reduce nitrogen loss due to the slow release of nutrients. The slow release of nutrients and the ability to chelate nutrients will fulfill the availability of nutrients for plants for a long time.

The Effect of Amelioran and Chicken Manure on Cauliflower Yields

Amelioran significantly affected the yield of cauliflower plants. In Table 4 it is known that the ash treatment of 10 t ha⁻¹ (A₁) and dolomite doses of 3 t ha⁻¹ and 6 t ha⁻¹ (A₂ and A₃) had a significant effect on weight per plot, per hectare and per flower mass and mass diameter flower. The highest yields were obtained by using dolomite at 3 and 6 t ha⁻¹ (A₂ and A₃). Giving dolomite to peat soil can improve soil properties for the better so that it can increase the availability of soil nutrients. The results of soil analysis after the study showed that the application of dolomite was able to increase peat soil pH and base saturation better than the application of 10 t ha⁻¹ ash. Dolomite contains higher Ca and Mg, where Ca is effective in increasing soil pH. In addition, the elements Ca and Mg play a role in accelerating flowering (Marlina *et al.*, 2017). Increasing the soil pH makes the availability of nutrients better. In the treatment of 10 t ha⁻¹ (A₁) ash, although they both increased soil pH and base saturation, the increase was lower than the dolomite treatment because the ash contained Ca and Mg which were lower than dolomite, and C/N ratio is low so that a lot of N is released which cannot be utilized by plants because it evaporates during the decomposition process of organic matter. This resulted in a lower mass weight of the flowers produced by adding ash compared to dolomite.

Applying dolomite to peatlands produces a higher flower mass weight than adding ash. Table 4 shows that the application of dolomite as much as 3 and 6 t ha⁻¹ (A₂ and A₃) resulted in a higher weight per flower mass of 236.18 g and 259.55 g respectively compared to the application of ash which produced a flower mass of only 186.28 g ie increased 27 - 39%. The ability of cauliflower plants to produce flower masses is influenced by the leaf area of the plant. From Table 3 it is known that dolomite administration at doses of 3 and 6 t ha⁻¹ (A₂ and A₃) resulted in higher leaf area at all ages of observation. Wider leaf area and supported by improved soil properties will be able to increase the availability of nutrients so that the rate of photosynthesis increases and the photosynthate allocated for the formation of flower mass becomes optimal.

An increase in soil pH will accelerate the process of decomposition of organic matter to produce organic phosphate compounds, which can be converted into inorganic phosphate through more complete decomposition. Element P is very influential on growth and increases crop production and improves yield quality (Nyakpa *et al.*, 1988). Application of dolomitic lime 3 and 6 t ha⁻¹ (A₂ and A₃) on peat soils increased the mass of flowers produced, respectively 4.59 t ha⁻¹ and 5.05 t ha⁻¹. The availability of adequate amounts of phosphate can stimulate root development and improve flower formation.

Giving amelioran ash as much as 10 t ha⁻¹ produced the lowest flower mass. Table 4 shows that applying 10 t ha⁻¹ (A₁) of ash to peatlands resulted in lower weights per flower mass and per hectare than dolomite, namely 186.28 g and 3.62 t ha⁻¹ respectively. The lower ash treatment compared to dolomite was thought to be because the ash resulted in changes in soil properties and a

lower increase in nutrients compared to dolomite. This is because the ash used has a low C/N ratio of 6, so that its effect on improving peat soil properties and nutrient availability is lower. The C/N ratio determines the rate of decomposition and mineralization of organic matter. If the C/N ratio is too low, the released nutrients, especially N, are easily lost during the decomposition process before they can be used by plants. Low N availability results in sub-optimal plant growth.

Table 3 shows that cauliflower plants grown on peat lands which were given as much as 10 t ha⁻¹ (A₁) of ash enhancer had a narrower leaf area, this resulted in a narrower area of photosynthesis so that the photosynthetic results that could be used to increase the size and the weight of the flower mass becomes less. Aryanti *et al.* (2016), explained that the increase in available N was influenced by pH, Fe and Al ions, as well as the degree of decomposition of organic matter. In addition, the ash used has a low Ca and Mg content of 2.52% and 0.34%. The low availability of Ca causes flower production to be hampered because Ca has a direct effect on the growing point. Meanwhile, the low availability of Mg makes less chlorophyll formation. Less chlorophyll causes the process of photosynthesis to run slower which has an impact on plant metabolism and protein synthesis.

Applying chicken manure at various doses to peatlands can increase the mass weight of flowers. Based on the analysis of variance, it is known that chicken manure has a significant effect on the mass weight of flowers produced by cauliflower plants. The higher the dose of chicken manure applied to the peat land, the more the weight of the flower mass will increase. The highest flower weight of cauliflower was obtained through the application of chicken manure as much as 20-30 t ha⁻¹ (P₂ and P₃), while the lowest yield was obtained through the application of chicken manure as much as 10 t ha⁻¹ (P₁) with a weight per flower mass of 175.24 g or 3.41 t ha⁻¹. This shows that each increase in the dose of chicken manure will increase the weight per mass of flowers, and vice versa (Table 4). This is because the higher the amount of chicken manure applied to peatlands, the better the peat soil properties will improve and increase the availability of macro and micro nutrients. Chicken manure contains microorganisms that can break down organic matter so that it can increase the availability of nutrients for plants. The process of overhauling soil organic matter will increase soil pH and base saturation which will have an impact on increasing the availability of nutrients for plants. Increasing the dose of chicken manure also increases the available N, P, K and other microelements. The availability of phosphorus in sufficient quantity is not only important for vegetative growth but also for the formation of flower mass. Increasing the available P elements will further increase the mass weight of the flowers produced. Increasing the available K will improve the quality of the flower mass produced. Lack of K in cauliflower plants will produce a mass of flowers that are small and not dense/compact. In addition, element K is needed to maintain the balance between nitrogen and phosphate fertilizers. The availability of K, Ca and Mg elements is the main limiting factor for plant growth and production on peatlands (Alwi and Hairani, 2007). Therefore, increasing the dose of chicken manure from 10 t ha⁻¹ to 30 t ha⁻¹ increased the mass yield of flowers from 3.41 t ha⁻¹ to 5.37 t ha⁻¹, which was an increase of 57%.

Application of chicken manure at low doses on peat soils produces a low mass weight of cauliflower. This is because cauliflower plants get the availability of nutrients in low amounts compared to applications with higher doses. The results of the soil analysis after the research showed that the available K, Na, Ca and Mg nutrients were lower than the higher doses. Lower nutrient availability results in lower formation of plant organs such as leaves. Narrower leaf area and less availability of nutrients will result in a slower process of photosynthesis.

Efforts to increase the yield of cauliflower in the lowlands on peatlands, it is necessary to improve the growing environment, not only the micro-environment on the ground but also in the soil. As we know that the nature of peat soil is fragile so that it can experience land degradation/decreased function, if it is mismanaged. In order to increase the productivity of peat soil, the application of ameliorants in the form of dolomite and chicken manure in the right composition and dosage can increase fertility and improve the properties of peat soil and overcome the problem of peat soil acidity. According to Koesrini and William (2009), land amelioration is an effective way to improve soil fertility. The pH of peat soil which was originally only 4.1 increased to 5 – 5.5 after being applied with dolomite 3 - 6 t ha⁻¹ and chicken manure 30 t ha⁻¹.

CONCLUSIONS

Conclusion

- a. Applying 3 t ha⁻¹ of dolomite lime ameliorant and 30 t ha⁻¹ of chicken manure on peatlands can increase the pH of peat soil from 4.1 to 5.1 and increase growth in height, number of leaves and leaf area of cauliflower plants.
- b. The lowest yield was found in the application of 10 t ha⁻¹ ash and 10 t ha⁻¹ chicken manure, which produced flower mass weights of 3.62 t ha⁻¹ and 3.41 t ha⁻¹, while the highest yield of cauliflower was 4.59 t ha⁻¹ and 5.37 t ha⁻¹ were found in the treatment of 3 t ha⁻¹ dolomite lime and 30 t ha⁻¹ chicken manure.

Suggestion

Based on the research results, it can be suggested that in developing the cultivation of cauliflower in peatlands of Central Kalimantan, it is better to add 3 t ha⁻¹ dolomite lime and 30 t ha⁻¹ chicken manure, in order to increase the mass production of flowers.

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Diabetes Mellitus and Covid-19 Review Article

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ABSTRACT

I look out that Diabetes mellitus is considered a common coexisting (multiple chronic conditions) of covid-19; observational studies investigating blood glucose ,or glycated hemoglobinA1c (HbA1c) according to severity of covid-19 were considered. The severe acute respiratory syndrome(SARS-CoV) and recently emerged middle east respiratory syndrome(MERS-CoV) epidemics have proven the ability of coronaviruses to cross species barrier and emerge rapidly in humans. Other Coronaviruses such as porcine epidemic diarrhea virus (PEDV) are also known to cause major disease epidemics in animals with huge economic loss. The virology journals aims to highlight the advances and key discoveries in the animal origin, viral evolution, epidemiology, diagnostic and pathogenesis of the emerging and re-emerging coronavirus in both humans and animals. The ongoing pandemic of covid-19 is now the major issue in global health. Studies and evidence implies that patients with diabetes are at a high risk of severe disease or death due to covid-19 than individuals without diabetes. I understand from other articles that the preexisting pathological pathways in patients with poorly controlled diabetes increases the risk of infectivity and are responsible for higher levels of tissue injury and death in patients with diabetes.

KEYWORDS

DM, COVID -19, Management, Pathophysiology, Risk Factor, Type 1, Type 2

INTRODUCTION

Corona viruses are a family of viruses with a genome size of around 26 to 32 kilo bases and a size of 80 to 220nm in diameter, making them the largest among RNA viruses. Corona viruses are enveloped viruses with a single-stranded, positive –sense RNA genome known to cause respiratory infections in humans. Two highly pathogenic CoV have resulted in outbreak of severe acute respiratory syndrome (SARS) in 2003 in Guangdong province, china and Middle East respiratory syndrome (MERS). In Dec 2019, a novel coronavirus, SARS-CoV-2, was identified as the pathogen causing corona virus diseases (COVID-19) in Wuhan, China. On March 11, 2020, COVID-19 was declared a pandemic by the WHO. Globally 27,324 deaths have been reported among 595,800 confirmed cases.

Individuals with diabetes mellitus, hypertension and severe obesity are more likely to be infected and are at a higher risk for complications and death from COVID-19. Considering the high risk prevalent of cardiovascular disease, Obesity and Hypertension in patients with DM, it is unknown whether DM independently contributes to this increased risk.

Corona viruses are surrounded and enveloped by a fatty layer and commonly have spherical shapes with crown or “corona” of club-shaped spikes on their surfaces. These spikes are responsible for the virus-receptor binding in cell surface. As stated earlier, DM increases the complications of COVID-19 and the risk of COVID-19 related mortality. Current evidence demonstrates that patients with DM are more likely to experience severe symptoms and complications than patients without DM due to COVID 19. One hypothesis is that hyperglycaemia facilitates the virus entry into the cells and viruses both need glucose for their function. It plays an essential role in pathophysiology of various complications of DM as well as viral respiratory disorders. In addition to damaging various biological molecules in the respiratory tract.

Diabetes mellitus is a well known risk factor for worse clinical outcomes in patients with corona virus disease 2019 (COVID 19). As a direct effect the covid 19 infection has resulted in striking changes in patients' metabolism with significant elevation in blood glucose. This led to increase insulin resistance and the associated hyperglycaemia. In addition, it has been suggested that covid 19 might be involved in developing DM in certain patients by targeting pancreatic islets of cells resulting in pancreatic injury.

OBJECTIVES OF THE STUDY

The aim of this study is to analyse how the impact of diabetes mellitus in patients with COVID 19 varies according to altitudinal gradient.

RESEARCH METHODOLOGY

Retrospective cohort study was conducted using deidentified claims and electronic health record data from the opium labs data between January 2017 and November 2020. Research has found that corticosteroids can cause insulin resistance and increase the risk of diabetes, the researchers excluded patients who already had diabetes. Follow up both the control group and covid 19 patients, and their results shows COVID 19 were more likely to develop type 2 diabetes compared to those in the control groups. Specifically, for every 1000 COVID 19 patients, about 15.8% developed diabetes.

LITERATURE REVIEW

Infection with SARS-CoV-2 in the setting of Diabetes mellitus (DM) initiates a flywheel of cascading effects that result in increased mortality. Some finding suggests that there were no significant differences in symptoms between patients who suffered from both diabetes and COVID-19 and those who only suffered COVID-19. In the subsequent meta-analysis 14.5% of the subjects were diabetic patients. In addition, it is suggested the diabetic patients will be treated with antibiotic, antiviral, and HCQ. Diabetes mellitus is associated with the proinflammatory state and the attenuation of the innate immune response. Patients with diabetes usually have concurrent disease such as hypertension, ischemic heart disease (IHD).It is known that diabetes is associated with microvascular and macrovascular complications. COVID-19 is a newly emerged respiratory infectious disease; there are no effective antiviral agents for treatment. It is known that glucocorticoids treatment is associated with a variety of common metabolic side effects including diabetes, hypertension, and osteoporosis. A high dose of glucocorticoids may result in impairment of multiple pathways including beta-cell dysfunction, manifested as impaired sensitivity to glucose and ability to release insulin, and insulin resistance in other tissues. Diabetes mellitus describes a group of metabolic disorders characterized by hyperglycaemia and defects in insulin secretion and insulin action. Several studies have described the indirect effects of the COVID-19 pandemic on diverse populations during the lockdown. Some studies indicated that there is an improvement in glycemic control, while others state there is no significant change or that the glycemic control in this population has worsened.

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Systemic Review Of Yoga Nidra

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Abstract- In this modern scientific era, every human wants to move forward, he is trying in every way to live his life well and he is working day and night to fulfil his dreams and he is working hard. To fulfil his every desire, he is doing extra work to get everything, due to which work pressure is on him and his physical and mental condition is getting affected, due to which his practical, social, occupational and family relations are getting spoiled. And he is also likely to have mental illnesses in the future. One should practice *Yoga Nidra* to remain mentally and physically healthy. *Yoga Nidra* has been of great importance since ancient times. *Yoga Nidra* is literally *Yogic* sleep or deep relaxation or meditative state. It is an ancient technique where the practitioner enters the deep state of conscious relaxation. *Yoga Nidra* is a meditative state by which we try to keep the restless mind stable, which increases concentration. We get a better grip on the physical and mental state caused by too much stress. Which has a good effect on senses, intellect and mind relax as well improvements in mood, quality of life, and well-being and diseases caused by mental stress can be avoided. The goal of *Yoga Nidra* is to promote a profound state of relaxation.

Index Terms- Mental Health, Physical Health, *Yoga Nidra*

I. INTRODUCTION

Yoga Nidra is a *Yogic* practice or *Yogic* sleep, but further than that, it's both a pensive fashion and a pensive state. *Yoga Nidra* is methodical system of converting complete physical, internal, and emotional relaxation. During the practice of *Yoga Nidra*, one appears to be asleep, but the knowledge is performing at a deeper position of mindfulness. For this reason, *Yoga Nidra* is frequently ascertained to as psychic sleep or deep relaxation with inner mindfulness. In this threshold state between sleep and insomnia, contact with the subconscious and unconscious confines occurs spontaneously. *Yoga Nidra* is a practice intended to allow the mind and body to reach the deepest state of relaxation possible, whilst maintaining knowledge. [i]

According to the training of *Yoga* and the other great philosophical traditions of India, we're Pure knowledge passing life through a body and mind. Blockages, called *nadi*, live in the subtle channels of our body. There are, 72000 *nadi*. While utmost of those *nadi* are related to the functions of the body and mind, there are specific channels related to knowledge. To one degree or another, we all witness a certain quantum of blockage within these

channels. This blockage causes us to forget our true nature as Spirit and the wholeness essential in all of actuality. As a result, we witness separation and suffering. The practice of *Yoga Nidra* is an active practice of purifying these channels bringing about a return of lesser mindfulness. While advanced mindfulness is clearly the most important thing of this practice, the benefits are felt not only in the channels of mindfulness but in all, 72000 *nadi*. In other words, prana flows further freely in the body and mind supporting the mending process. The practice of *Yoga Nidra* is one of the most salutary practices for tone- mending. [iii]

Various studies:

- *Yoga Nidra*, reducing anxiety level and increasing both mental and physical relaxation level. In a follow-up study, these same researchers demonstrated that *Yoga Nidra* results help release of dopamine in the striatum, increased physical relaxation and constant with decreased motor planning. [iii]
- According to research, the *Yoga Nidra* technique appears to mimic the neural structure's integrated associate response, resulting in decreased sympathetic (excitation) nervous activity and increased parasympathetic (relaxation) nervous activity. [iv] Results show that there was a big improvement in positive well-being, general health, and vitality within the *Yoga Nidra* cluster. The association of *Yoga Nidra* with a shift toward parasympathetic dominance is additionally associated with high internal organ and cranial nerve management, which, in turn, is said to reduce anxiety and improve subjective and objective sleep quality. [v] In a study on the effects of *Yoga Nidra* over sleep, the morning practice has been found to increase parasympathetic drive at night causing sleep to be more restorative, which may explain significant improvement in sleep-quality ratings. [vi]
- Regular practice helps reach these heightened parts, stimulates and controls activity. Let's relook at the results from a Study that found - during practice of *Yoga Nidra* incorporated PET scans observed an increase in dopamine levels in the ventral striatum of contestants, Dopamine being a neurotransmitter that is commonly associated with pleasure, reward, motivational prominence and social anxiety. This is a clear indication of how the brain stimulation has an impact on mood, and

thus, our state of relaxation is, psychologists and physiologists, all recognize the existence of these three distinct states of the individual human consciousness - waking, dream and deep sleep states. Each of these states of consciousness, as well as the borderline state of *yoga nidra*, has been correlated with distinct patterns of electrical activity in the brain.

THE ORIGINS OF *YOGA NIDRA* ^[vii]

The term *yoga nidra* is derived from two *Sanskrit* words, *Yoga* meaning union or one-pointed awareness, and *Nidra* which means sleep. ^[viii]

The term is relatively ancient. The term first appears in the *Bhagavata Geeta* and latterly in *Puranas*. These references to the term *Yoga Nidra* don't depict a fashion. rather, they're describing a particular god's transcendental sleep and the goddess's incarnation as sleep. latterly medieval *Hatha Yoga Pradipika* textbooks use *Yoga Nidra* as a reverse for *Samadhi* (A state of deep contemplation). still, in none of these references is there instruction or great explanation of the generalities.

THE ORIGIN OF MODERN *YOGA NIDRA* ^[ix]

- One of the foremost "ultramodern" preceptors was said to be *Paramyogeshwar Sri Devpuriji*, He was said by his addicts to be a manifestation of *Lord Vishnu*.
- One of his votaries was *Bhagwana Sri Deep Narayan Mahaprabhuji*. He was deified by his addicts as an icon (a godly manifestation). Some of his jottings about *Yoga Nidra* are saved and they're relatively beautiful and lyrical. *Bhagwana* had two main votaries to whom he's said to have passed on this knowledge.
- *Swami Satyananda Saraswati*, the author of the Bihar School of *Yoga*, created the ultramodern relaxation fashion *Yoga Nidra* in the early sixties. It's said that he'd a vision of *Swami Sivananda* who blessed him as *Swamiji* left his body in Rishikesh. Through that vision, *Swami Sivananda* is said to have passed on the knowledge of *Yoga Nidra* to *Swami Satyananda*. It's extensively believed that *Swami Satyananda* developed his own approach or his style of *Yoga Nidra*, which some believe was told by the Tantric practice of *Nyasa* or fastening mantras on body corridor and organs. One of *Swami Satyananda's* votaries is *Swami Janakananda* who went on to set up the *Scandinavian* academy of *Yoga* in 1970.

HOW TO ATTAIN THE STATE OF *YOGA NIDRA* ^[x]

Yoga Nidra is most commonly achieved through guided meditation or following instruction from instructor. *Yoga Nidra* is carry out in corpse pose (*shavasana*), which minimizes touch sensations by eliminant contact between the limbs of the body. The room should be neither hot nor cold, sight stimuli are eliminated by simply closing the eyes. Then recline in corpse pose and listen to the instructions. Go on following the instructions mentally. The prime thing in *yoga nidra* is to abstain from sleep. The mind is then focused on external sounds. After some time, the mind loses interest in the outsidel world and automatically

becomes quiet. This process of calming the mind is called *antara mouna*. It prepares the consciousness for practising *yoga nidra*.

STAGES OF *YOGA NIDRA* ^[xi]

Stage 1- Initial relaxation: This the preparatory stage for the body to begin to feel comfortable, release tensions, increase awareness of itself and the environment and become aware of your breathing just be conscious that you are breathing, do not concentrate. Awareness of breath and awareness of body.

Stage 2- Resolve or *Sankalpa*: A *Sankalpa* is a short statement that may be very general or very specific. Something we greatly desire to achieve. Repeat your resolve inwardly with full consciousness and feeling three times.

Stage 3- Rotation of consciousness: Now we move into rotation of consciousness. Awareness of different parts of body by taking a trip through the body. As promptly as possible the consciousness is to go from one body part to another body part. Repeat the name of each body part in your mind concurrently, become aware of that part of the body. The practice always begins with the right hand.

Stage 4- Breathing: Now bring all your attention to the natural breath. Become conscious of your breathing nothing else. Concentrate now on the flow of the breath between the navel and the throat feel the breath moving along this passage. On inhalation it rises from the navel to the throat, on exhalation it descends from the throat to the navel become aware of this. Now become aware of the breath through the nostrils, the natural breath flowing through both nostrils and meeting at the top to form a triangle. Think of the breath as starting separately from a distance, drawing near and uniting in the eyebrow centre. Now commence to practise mental *nadi shodhan*, mental awareness of breathing through alternate nostrils.

Stage 5- Awareness of sensations: Bring awareness to opposite body sensations such as heaviness/ lightness; heat/cold; pain/pleasure; joy/sorrow; love/hate. The pairing of feelings in *yoga nidra* regulates the opposite hemispheres of the brain and helps in balancing our fundamental drives and direct functions that are usually unconscious. This practice also develops willpower on the emotional plane and brings about emotional relaxation by means of catharsis, as memories of profound feelings are relived.

Stage 6 -Visualization. Many different things will be named you and must try to develop a vision of them on all levels feeling, consciousness, imagination, emotion. Since the images that are used often have universal significance and powerful associations, they bring the hidden contents of the deep unconscious into the conscious mind. The practice of visualization develops self-awareness and relaxes the mind, by purging it of disturbing or painful material. It leads the mind to concentration or *dharana*. In advanced stages, visualization develops into *dhyana* or pure meditation. Then there is the conscious experience of the visualized object in the unconscious, the distinction between conscious and unconscious dissolves and distracting images cease to arise.

Stage 7- Resolve or *Sankalp*: Now is the time to repeat the stage no. 2 as it and repeat this three times with full conscious and feeling.

Stage 8- Externalization: Relax all efforts, connect your mind to the outside world, focus on the process of inhaling and exhaling, your body lying on the floor in a relaxed state., breathing slowly and silently, focusing on your body from head to toe. Give,

imagine that you are in a room, be aware of the surrounding, move and stretch the body, when you feel that you are awake then open your eyes, now yoga *nidra* practice completed.

THE MECHANISMS THROUGH WHICH YOGA NIDRA WORKS ^[xii]

Hypothalamus: At some point of a *yoga nidra* practice, we heighten the consciousness of the parts of the body to stimulate the brain. There is an homogenous feedback by the hypothalamus, the region acting as the control centre for the whole autonomic nervous system. The hypothalamus receives input from the outside environment through the sensory/motor areas of the cerebral cortex. The hypothalamus additionally forms a component of the ascending reticular activating system (RAS), the component of the brain stem accountable for patterns of sleep, arousal and wakefulness.

Pituitary gland: The pituitary gland also shows behaviour and secretion patterns which are directly altered by levels of mental and emotional activity regulated in the hypothalamus. Pituitary hormones are entailed in every aspect of life in the physical body. In *yoga*, there is a lot of emphasis positioned upon the psychophysiology of this gland. The role of the pituitary gland is recognized to be that of the eyebrow centre (the *ajya chakra*). *Yoga nidra* is one of the most powerful ways devised to revive this psychic centre.

Yoga Nidra balances the brain hemispheres: *yoga nidra* is an appropriate state in which to learn something new because it employs both hemispheres of the brain in the task: the logical, conscious left and the non-logical, subconscious right. Though, in *Yoga Nidra*, the signals which are being received by the subconscious are reorganized in such a manner that the whole mind is receptive to them. Consequently, far more of the entire brain is concentrated effortlessly on learning.

α & β Waves: Within the awake state of consciousness, the conscious mind is actively engaged with the outside environment via the sensory channels of experience. At this point of time, fast rhythm beta waves predominate. Before the dreaming state, is the state of *Yoga Nidra*, the borderline state. Right here the subconscious mind is active within the alpha brainwave patterns, inducing deep relaxation and a conscious dreaming state. Throughout the dreaming state, while the subconscious mind will become foremost, the suppressed dreams, fears, inhibitions, and deep-seated impressions (*samskaras*) are actively expressed. This is characterized by theta waves. In the deep sleep state, the unconscious mind, source of instincts, drives deeply immersed experiences of initial evolutionary stages.

As this happens, the consciousness passes from being conscious to dreaming and then to being asleep. In *Yoga Nidra*, Though, the method of descent is unique. Here beta waves are succeeding by alpha waves, and the duration of alpha predominance is substantially extended. Since accelerated alpha activity is feature of relaxation, this finding inferred that *yoga nidra* stimulates a much more relaxed state of sleep than is otherwise obtained.

THERAPEUTIC APPLICATIONS OF YOGA NIDRA ^[xiii]

- Psychological disorders.
- PTSD

- Depression
- Anxiety
- Insomnia
- Drug addiction and alcoholism
- Chronic degenerative diseases
- Chronic pain
- Psychosomatic disorders such as asthma, colitis and peptic ulcer, IBS
- Cancer therapy
- Cardiovascular diseases such as hypertension, coronary vasospasm.
- Influence upon cholesterol and lipid levels.
- Pregnancy, childbirth and menstrual disorders.

II. DISCUSSION

The closing goal of *yoga nidra* is to produce a relaxation response that is incongruous with anxiety and depression and which consequently counters their disruptive internal processes. *Yoga nidra* plays an important palliative role in the fields of rehabilitation and geriatrics, where intractable pain, loss of motivation and psychological depression pose major barriers in conventional treatment. In addition, *yoga nidra* has its most widespread application as a preventive measure, to be practised by healthy, active as a means of relieving accumulated tensions, increasing stress resistance and overall efficiency, and preventing the development of psychosomatic diseases.^[xiv] *Yoga nidra* is an effective adjunct to traditional forms of psychiatric treatment, especially in cases which are unresponsive to routine psychotherapy.^[xv] Attacks of asthma, growth of cancers, exacerbation of ulcer symptoms or colonic irritation frequently arise as complex psychophysiological reactions to emotional insecurity, interpersonal stress, intrapsychic conflict, hypersensitivity, rejection, frustration and suppression, personal isolation and other deep seated emotional crises.

Yoga nidra therapy leads to conscious and subconscious recognition and analysis of these underlying psychological factors, and initiates the release of suppressed conflicts. It is therefore an important part of *yogic* and medical management of all psychosomatic conditions. These blockages create tension. As the practitioner succeeds in letting move of the tension, prana flows freely and higher cognizance develops. One of the early realizations is that the body is not a firm structure however alternatively a densely packed field of energy. At this moment the practitioner realizes that he or she is neither their body nor their thoughts. The practitioner then asks him or herself the most fundamental and prime question: "Who am I?" The answer is not found through the mind but realized through the knowledge. We are that which lies above the body and the intellect. We are nothing greater than the realization of awareness. The consequence of this state of consciousness is virtuous bliss.^[xvi]

III. CONCLUSION

In *yoga nidra* we revel in a rustic of harmony between body and thoughts. Then the unconscious barriers and blockages in the individual, which exist due to our negativity, are eliminated and the healing power of the mind commence offevolved to occur.

particularly, *yoga nidra* not only brings bodily and mental relaxation but additionally prepares the thoughts for non-secular evolution. It is far specifically associating with *pratyahara* and *dharana*. The practice of *yoga nidra* invites each a deep, holistic relaxation and an expansive meditative state of cognizance. Consequently, it might constitute a therapeutic approach with preventive, promotive, and curative value.

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National Education Policy 2020 With Reference To School Education, Higher Education, Vocational and Technical Education

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Abstract- Education is the living process through a continuous reconstruction of experiences. It is the improvement of all those capacities in the individual which will enable one to control the environment and fulfil one's possibilities. A well-furnished and futuristic education policy is an indispensable movement for development of the country's economic and social progress, incorporated with cultural diversity, local and the global needs. In the present study, researcher has adopted descriptive research and analysed the National Educational Policy 2020 based on the available data such as research papers, journals, websites and mainly NEP 2020 through analytical method and conceptual discussion. The National Education Policy 2020 (NEP 2020), which was approved by the Union Cabinet of India on 29 July 2020, outlines the vision of India's new education system. This paper demonstrates this policy as a comprehensive sustainable framework for elementary education to higher education as well as technical and vocational training in both rural and urban India. This Paper also discusses the fundamental principles of the NEP 2020 in India. In the perspective of school education-new academic structure, curriculum and pedagogy has been highlighted in this paper. This paper has also focused on the implications of New Education Policy 2020 on higher education, technical and vocational education in India. The National Education Policy 2020 is based on the pillars of access, quality, equity, affordability, accountability and will transfigure our country into a "Vibrant Knowledge hub".

Index Terms- National Education Policy 2020, School Education, Higher Education, Technical Education, Vocational Education.

I. INTRODUCTION

National Education Policy 2020 was approved by Union Cabinet chaired by Prime Minister Narendra Modi in July 2020. This policy is drafted by the chairperson of the National Education Policy Drafting Panel and the former chairman of Indian Space Research organisation (ISRO) Mr. Krishnaswamy Kasturirangan. It aims to bring forth a comprehensive approach focusing on the entire array of education from pre-school education to doctoral degrees in both rural and urban India. The

National Education Policy- 2020 works against the challenges of quality, equity, affordability, accountability and access that persist in the current education system, intending to improve the quality of education system in India. The NEP 2020 focuses to uplift and upgrading the education system in India and lying out a radical change in the education system. And that is why, It aims to increase the state expenditure on education from around 4% to 6% of the GDP as soon as possible.

The NEP 2020 has replaced the 34 years old National Education Policy-1986. The first NEP was promulgated by the Government of India by the then Prime Minister Indira Gandhi in 1968 under the recommendation of the Kothari commission and the second NEP under the Prime Ministership of Rajiv Gandhi in 1986. In a momentous shift from the 1986 policy, which scrapped the 10+2+3 structure of education, the new NEP-2020 pitches for a "5+3+3+4" pattern according to which the students' education must be completed in 4 different stages, corresponding to the age sets 3-8 years (foundational phase), 8-11 years (preparatory phase), 11-14 years (middle phase) and 14-18 years (secondary phase). The policy focusses on the inclusive, justifiable and quality education. It will enable our education system to keep pace with the ongoing developments around the world as well as to cater the future demand of the job market so that the vast demography can be accommodated with proper employment.

Shifting to the New Education Policy to be framed in such a fashion, that the learning outcomes to convey the utmost quality, integrity as well as inclusiveness and equity throughout the structure of the education system right from elementary till the higher education level. The policy aims to instill among the citizens a pride of being Indian in letter and spirit. It holistically put forth the wisdom of rationality in its thought, action, intellect and deeds as well as to develop proper skillful knowledge to make India a global knowledge hub, values and morality in a sustainable manner to well utilise the resources keeping in view of the future generations to come.

The curriculum and pedagogy of our educational institutions has been designed that must develop among the students a deep sense of respect towards

the Fundamental Duties enshrined in the Article 51(A) in the constitution of India and the responsibilities towards the nation as well as the world. The pedagogy also envisioned in accordance to secure the Fundamental Rights of citizens of every classes of India as enshrined in the Article 12-35 of our constitution in the line of Right to Education Act-2009 that provides free and compulsory education to the children in the age group of 6 to 14 years as provided in the Article 21(A) of Indian constitution, but with a greater role.

This policy reckons on the teachers' recruitment and re-establish a new system to make teachers the most respected and essential member of the society.

The policy also describes the SDG goal 4 of the agenda 2030 for sustainable development adopted by India in 2015 seeks 'to ensure inclusive and equitable quality education and to promote lifelong learning opportunities for all' by 2030.

The flagship scheme "Mid-Day Meal Programme" under the National Food Security Act-2013 will be extended upto pre-school children in this policy. The policy describes the fundamental principles like identifying, recognizing, and developing the unique capabilities of every student, achieving basic foundation level in literature and numerals by grade 3. The NEP-2020 also affirms that the students upto Class-5 to be taught in mother tongues or in vernacular languages.

In higher educational level, the NEP recommends for all universities and colleges to provide a holistic education by offering multi-disciplinary degrees to students. It also gives equal importance to curriculum activities, emphasizing practical understanding, creativity, critical thinking and analysis, conceptual up-gradation, developing ethics and human values righteously through constitutional preaching.

According to the policy, by 2025, at least 50% of learners through the school and higher education system shall have exposure to vocational education. And gradually, every child will learn at least one vocation and is exposed to several more. That would lead to emphasizing the dignity of labour and importance of various vocations involving Indian arts and artisanship.

The Policy has also emphasized on various professional education viz; Agriculture education, Legal education, Health care education and Technical education as well. In technical arena, this policy reckons on preparing professionals in cutting-edge areas that are fast gaining prominence such as; Artificial Intelligence (AI), 3-D machining, big data analysis and machine learning, in addition to digital literacy, coding, and computational thinking etc.

II. REVIEW OF LITERATURE:

KPMG(2020) in the paper "Impact of National Education Policy 2020 and opportunities for stakeholders" has observed that the NEP 2020 has outlined an ambitious task of nearly doubling the GER in higher education from 26.3%(2018) to 50% by 2035 while improving quality of Higher Education Institutions and positioning India as a global education hub. It is also found that the focus of the policy is on providing a flexible curriculum through an interdisciplinary approach, creating multiple exit points in what would be a four-year undergraduate programme,

catalysing research, improving faculty support and encouraging internationalisation.

Raman(2020) in his paper "Vocational Education in the NEP2020: Opportunities and challenges" has emphasised on vocational Education to develop a skilled workforce in India's educational policy disclosure. The author has found that it is high time for the government for mapping out the linkages between the demands of industries and supply of vocational courses so that skills can align according to the jobs available. So in order to effectively implement the recommendations in the NEP 2020, the government needs to learn from the existing inefficiencies in its skilling programmes.

Singh(2020) in his paper "NEP 2020: An Interplay of Education and Technology" have stated that while the policy is a novel and progressive document, acknowledging the invaluable role of technology in facilitating learning and teaching, it is essential to develop a coherent plan of action for fostering technological proficiencies to aid successful engagement with technology while providing effective safeguards for data protection and data privacy. He has also observed that the policy also presents a significant opportunities for cooperation between the various industry stakeholders and regulatory authorities/educational institutions. The author has recommended that the overall success of the policy will be contingent on the means and mode of its implementation, as well as the ability to effectively integrate the objectives of the policy, within existing initiatives and engaging the relevant stakeholders in the effective delivery of the policy.

Sarkar & Sarkar(2021) in their paper "Visions of National Education Policy 2020 In School Education" have discussed the National Education Policy 2020 and specially focused on school education system by adopting descriptive research method. The authors have found that National Education Policy being based on the pillars of success, quality, equity, affordability, accountability will transfigure our country in to a vibrant knowledge hub. And based on this policy, the Indian education system is moving from teacher centric to learner centric, particular to all-round development, marks centric to skills centric, information centric to knowledge, examination centric to experimental centric. NEP 2020 is expected to fulfil their objectives within 2030, by encouraging active participation of society's all members and students, faculties of the various educational sectors, using innovative ideas and creating joyful educational atmosphere.

Ahmad(2022) in his paper "Vocational Education in the light of NEP 2020" found that the NEP2020 can potentially lead to explosive growth of vocational education in the country, since it requires all educational institutions to integrate vocational education in to their offerings. This will bring in a very large number of schools, colleges and universities in to the fold of potential vocational Education and Training providers during the coming decade and make vocational education available to millions of students.

III. OBJECTIVES OF THE STUDY:

1. To highlight the fundamental principles of the National Education Policy 2020 in India.
2. To highlight the new academic structure, school curriculum and pedagogy in school education introduced by NEP 2020 in India.
3. To highlight the implications of NEP 2020 on higher education, Technical education and Vocational education in India.

IV. DATABASE AND METHODOLOGY:

The present study is purely based on secondary data. Informations are collected from different national and international journals, research papers, newspapers, magazines, authentic website and e-contents relating to NEP 2020. In the present study researcher has adopted descriptive research and analysed the National Educational Policy 2020 based on the available data and mainly NEP 2020 through analytical method and conceptual discussion.

V. DATA ANALYSIS & FINDINGS:

5.1 Fundamental Principles of the National Educational Policy 2020 in India:

The purpose of the education system is to develop good human beings capable of rational thought and action, possessing compassion and empathy, courage and resilience, scientific temper and creative imagination, with sound ethical moorings and values. It aims at producing engaged, productive, contributing citizens for building an equitable, inclusive and plural society as envisaged by our Constitution.

The fundamental principles that will guide both the education system at large, as well as the individual institutions within it are:

- Recognizing, identifying, fostering and nurturing the unique capabilities of each student, by sensitizing educational faculties as well as parents to ameliorate each student's holistic development both in academic and non-academic spheres.
- To achieving the foundational literacy and numeracy is highest priority by all students in grade-3.
- Imparting flexibility to the learners, so that the learners can choose their learning programmes and own paths in life according to their needs, interests, talents and capabilities.
- There will not be hard separations and harmful hierarchies among the different areas of learning (arts and sciences, curricular and extra-curricular activities, vocational and academic streams etc.).
- To create a multidisciplinary and holistic educational world with arts, sciences, social sciences, sports and humanities in order to ensure the unity and integrity of all knowledge.
- Emphasis on conceptual understanding of the learning rather than rote learning. To encourage students towards

logical decision-making, problem solving, innovation and critical thinking.

- Being a human, to promote the ethical and constitutional values like empathy, responsibility, liberty, courtesy, respect for others, cleanliness, democratic spirit, spirit of service, scientific temper, pluralism, equality, and justice.
- Promoting the power of multilingualism in teaching-learning atmosphere and life skills such as communication, teamwork, cooperation and resilience.
- Creative a today's "coaching culture" based on the focus of regular formative assessment for learning.
- Wide use of information and communication Technologies in the field of teaching-learning system, educational planning and management. Improve the assistive and adaptive technologies for Divyang learners.
- In keeping mind that education is a concurrent subject, all curriculum, pedagogy and policy should be made to show the respect of diversity and the local context.
- To ensure the full equity and inclusion in educational spheres that all learners are able to access and afford the education according to their needs.
- The continuity exists in all levels of curriculum from early childhood care and education to school education to higher education.
- A major preclusive taken by NEP2020 that, the teachers and faculty is the heart of learning process.
- The ensure the transparency, integrity and resource efficiency, "light but tight" a regulatory framework should be made in educational system.
- The aim is the equitable access to the highst-quality education for all learners regardless their social and economic background.
- Outstanding research as a corequisite for outstanding education and development.
- Continuous review of progressive research regularly assesses by the educational experts.
- Education is public service and a rottenness pride in India. It creates an awareness of one's roles and responsibilities in dynamic World.
- Education must be developed a deep sense of respect towards the Fundamental duties and constitutional values among the students bonding with one's country.

5.2 To highlight the new academic structure, school curriculum and pedagogy in school education introduced by NEP 2020 in India:

The New Academic Structure in School Education Introduced by NEP 2020

The National Education Policy 2020 take into considerations that 10+2 structure in school education will be modified with a new curricular and pedagogical restructuring of 5+3+3+4 covering the age 3-18 as shown in the following figure and elaborate in details.

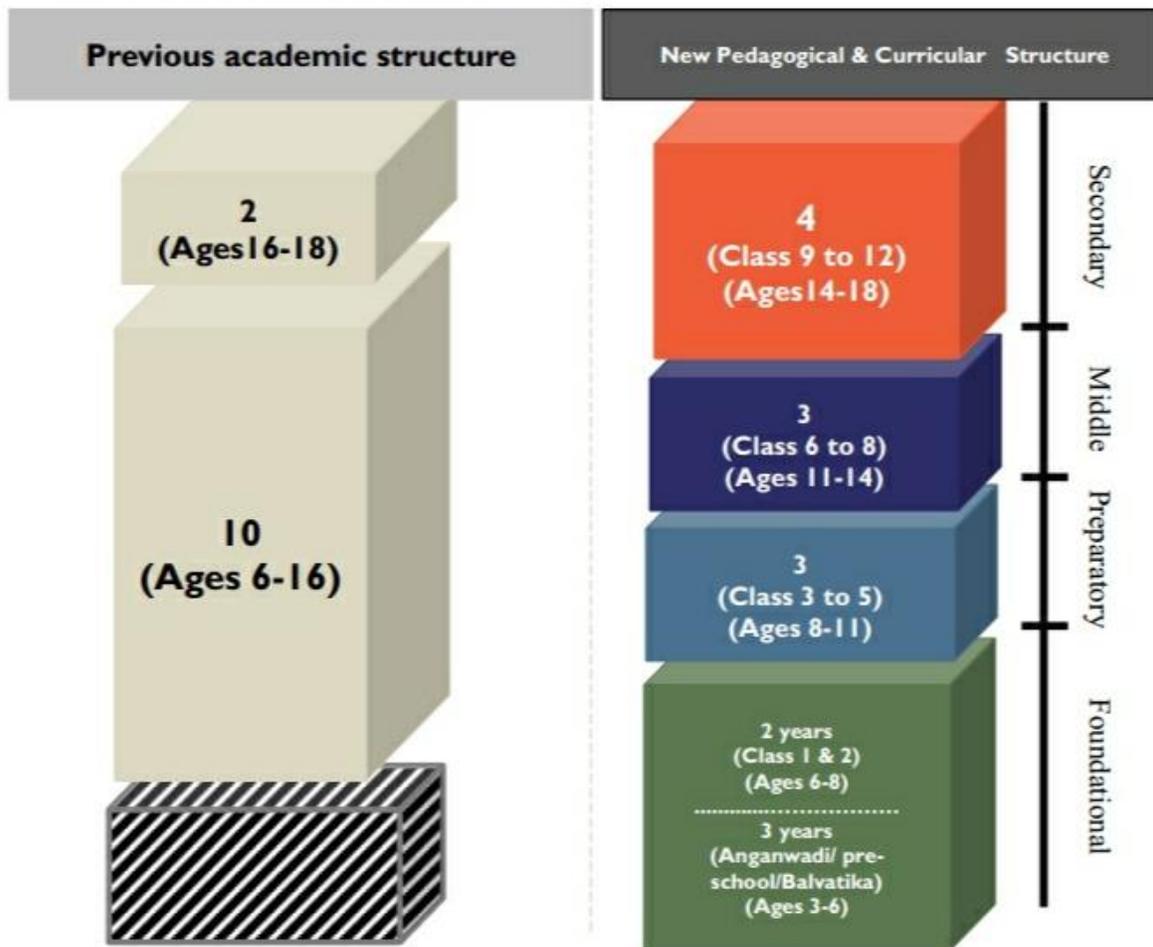


Figure-1: Previous and New academic structure of school education

Foundation stage(3 years Anganwadi+ class i-ii)

- ❖ According to the National Education Policy 2020 the foundation stage will start from the age of three and continue up to the age eight. In the first 3 years of the foundational stage the child learner receives the education from Anganwadi/pre-school/Balavatikacentre of education and next 2 year they are in class I & II, total foundational stage is governed by early childhood care and education(ECCE).Five years foundational stage provides the basic education which is flexible, multi-level, activity-based, inquiry-based, play-based learning. ECCE’S ultimate aim is to attain optimal outcomes in the domains of:physical and motor development, cognitive, socio-emotional-ethical, cultural and the communication(NCPFFCCE) will be developed by NCERT.

❖ **Preparatory stage(class: iii-v)**

Preparatory stage continues up to the age of 11 which start from 8 years.These three years preparatory stage gradually introduces

to the learners in formal schooling system with classroom learning and textbooks.The nutrition and health care will be addressed to the learners at this stage.The focus is to expose the different subjects to the students, building on the activity-based learning and prepare the learners to develop deeper insights.

Middle stage(class: VI-VIII):

Three years of middle stage of school education focus on more clarification and abstract concept in each subjects like arts, sciences, social sciences, mathematics, humanities. The specified subject teachers’ experiential method to be adopted, explorations of relations among different subjects and character-building programmes also be done at this stage.Students are to be introduced to semester system.

Secondary stage(Class: ix-xii)

This is the stage of the National Education Policy 2020.This is the last stage of the National Education Policy 2020.Four years of secondary school education stage is designed to provides the multidisciplinary liberal education. This stage will develop the learners subject-oriented pedagogical knowledges, curricular style with greater depth, greater critical and creative thinking and greater flexibility. Students are to be more attentive towards life aspirations and vital education.10th and 12th standards board examination will conduct, students will be able to go beyond the

school education, they will take step towards the higher education.

School curriculum and pedagogy in school education introduced by NEP 2020 in India:

Curriculum refers to an interactive system of instruction and learning with specific contents, goals, strategies, resources and measurement. The new policy of education has introduced the

learner centric education, students can choose their subject with flexibility according to their needs. The curriculum should be less content and high understanding base, focused on the holistic development of the child. The restructuring curriculum and pedagogy as shown in the following figure and discussed in details below:

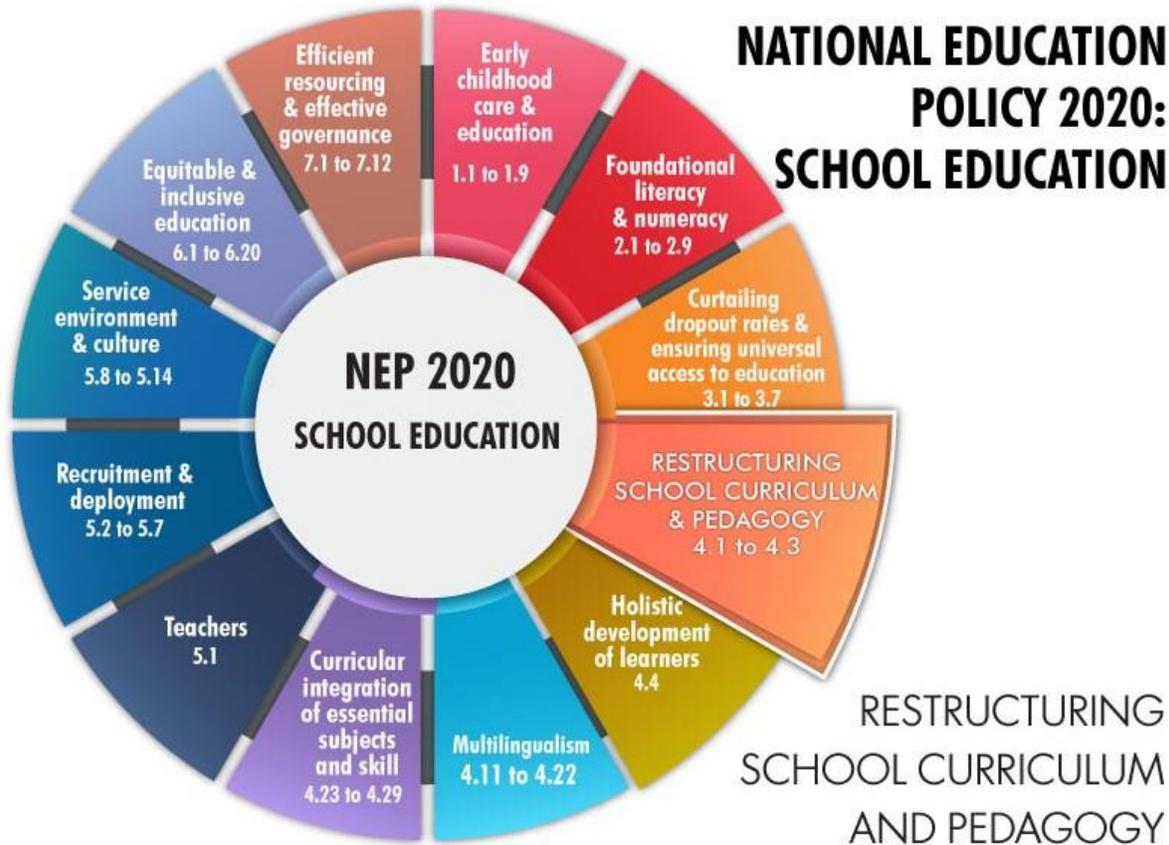


Figure-2: Restructuring School Curriculum and Pedagogy

❖ **Holistic development of learners:**

The curriculum and pedagogy reforms across the all stages of education will be moved towards the real understanding and learning how learn away from the rote learning that is largely present right now. The aim of education is not only to the cognitive development but also building our character, creating holistic and well-rounded individual prepared with the key 21st century skills. All aspects of curriculum and pedagogy will be reformed and revamped to attain these critical goals.

❖ **Reduce curriculum content and enhance the essential learning and critical thinking**

The curriculum in all stages will be reduced and make space for critical thinking, discovery based, inquiry based, analysis based, and more holistic. The content will focus on more practical applications, key concepts, ideas and problem solving. Classroom sessions will comprise more creative, collaborative, fun and exploratory to the students for creating deeper and experiential learning.

❖ **Experiential learning**

All stages of education, experiential learning including hand-on learning, sports-integrated education with relations among different subjects will be adopted. Different pedagogical practices will help to develop many skills, such as self-direction, self-discipline, responsibility, self-initiative, collaboration, teamwork and citizenship, etc. Sports-integrated learning will be commenced in class transactions to help students to adopt fitness as a lifelong attitude and as envisaged in the “Fit India Movement”.

❖ **Flexibility in course choices to the students**

Particularly in secondary school education, students will be given more empowerment to choose the subjects for study including the arts, physical education, crafts and vocational education. So, the learners can create their own paths of the study in lifelong process. There will be no hard separation among the curricular, co-curricular, or extracurricular and different academic streams.

❖ **Multilingualism and the power of language:**

To show the respect of all languages, it will be taught in an interactive and enjoyable conversation style in school level. The medium of instruction at grade 5-8 level based on the mother tongue/home language/local and regional language. To promote

national unity and multilingualism, the three-language formula will be continued to implement in keeping mind of the regions, aspirations of the people and constitutional provisions.

❖ **National Textbooks with local content and flavour**

The curriculum content will be reduced, to give the greater opportunities of the students to select the subjects and pedagogy according to their dynamic needs. The curriculum must be renewed emphasis on the constructivist approach rather than rote learning must be accompanied by parallel changes in school textbooks that contain the requisite national and local material so that they may teach by their own pedagogical styles based on the community needs and local context. States will prepare their own curricula and textbooks incorporated with NCERT as per the local context and needs. Also recommended to reduce the weight of school bags and text books. Availability of such textbooks will be in all regional local languages is the highest priority that, all learners can access the high-quality learning.

5.3 Implications of NEP 2020 on higher education, Technical education and Vocational education in India:

Implications of NEP 2020 on Higher Education in India:

NEP 2020 has focused a major thrust on Higher Education to improve quality of Higher Education Institutions and positioning India as a global education hub. Some of the major implications of NEP 2020 on Higher Education in India are as follows.

➤ **Only quality role-models have the opportunity to elevate to the top to decision making role:**

Higher Education policy-making decisions and implementations of such policies may go out of bureaucrats and fake educationists who are enjoying top decision making positions like chairman's of UGC, AICTE, MCI, DCI, and vice chancellors of various universities. For example, in present HE system in India a person without a single scholarly publication can become Vice-Chancellor of public Sector universities and can elevate to various higher positions and even become the chairman of UGC.

➤ **Cleaning of Higher Education Bureaucratic system:**

Merit-based appointments of institutional leaders in Research & Innovations. Unlike the present system, professors without at least five first author scholarly publications or patents during the last five years will not become institutional leaders like directors, Vice-Chancellors, etc.

➤ **Transformation of single discipline colleges into a multi-disciplinary autonomous degree-awarding colleges:**

This will again help to decrease corruption and lobbies in colleges. Many colleges are unable to chart own courses, controlled as they are rigid bureaucratic norms of the affiliating University. All this deeply undermines the principle of local governance and the local pursuit of innovation and excellence. This must be addressed with urgency. This also develop more responsible leaders to work in HE administrations along with research so that they can make better innovations in imparting higher educational services.

➤ **Focus on Research & Innovation at UG & PG levels:**

This allows students and faculty members to think creatively with confidence to propose and do new things leading to novelty.

➤ **Highly educated Board of Governors (BOG) to avoid misuse of power by individuals:**

Every autonomous institution is expected to for a BOG having highly qualified, competent, and dedicated individuals who have proven capabilities and a strong sense of commitment to the institution.

➤ **The responsibility of maintaining quality lies with the Board of Governors:**

The BOG shall be responsible and accountable for the outcomes of the HEI to the stakeholders through transparent disclosures of relevant records. BOG has to meet all regulatory guidelines mandated by the National Higher Education Regulatory Authority (NHERA).

➤ **Single Regulator for entire HEIs:**

National Higher Education Regulatory Authority (NHERA) a single HEIs regulator setup leads to effective regulations of financial probity of HEIs, governance, open disclosure of financials, faculty/staff, courses, and educational qualities.

➤ **Elimination of Commercialization of Education:**

HEIs both public and private should ensure that they are not for profit and if there is any surplus, it should be re-invested in the institutional development under the supervision of BOG members to eliminate the commercialization of education.

Responsibility of Private HEIs towards Educational Philanthropy:

Though private HEIs can set their fees independently, by offering at least 20% free-ship and 30% scholarships. This model allows to recover reasonably their cost while discharging their social obligations.

➤ **Private Universities will overtake Public Universities due to offered 20% free-ship:**

Bright and intelligent students irrespective of their economic status, religion, gender, will get the opportunity to study in private HEIs free of cost due to 20% free-ship and 30% scholarship leading to mobilizations of intelligent and self-motivated students to private institutions leading to overcrowding of meritorious students in private Universities.

Implications of NEP2020 on Vocational Education:

The NEP2020 has given due importance to vocational education, and capacity development of teachers to boost the employability skills and vocational skills of the learners at all levels. Some of the major implications of NEP2020 on vocational Education are as follows.

- By 2025 at least 50% of learners going through school and higher education system shall have exposure to vocational education.
- All educational institutions to integrate vocational education programs into mainstream education in a phased manner.
- Vocational courses to be available for students enrolled in all bachelor's degree programmes including 4-year holistic bachelor's programmes.
- Higher education institutions will also allow to conduct short-term certificate courses in various skills including soft skills.
- Incubation centres will be set up in higher education institutes in partnership with industries.

- Focus areas to be chosen based on skills gap analysis and mapping of local opportunities and technical and vocational will be part of larger version of holistic education.
- “Lokvidya” knowledge develops in India will be made accessible to students through integration into vocational education courses.
- The Ministry of Education will constitute a National Committee for The integration of vocational education(NCIVE), along industry participation, to oversee this effort and should also embark budget for promotion this integration.
- A General Education Programme(GEP) shall be set up to frame expected learning outcomes for higher education programmes also refer to as graduates attributes.

Implications of NEP 2020 on Technical Education

NEP 2020 has also put emphasis on Technical Education which are as follows.

- The NEP weaves the digital thread across the very fabric of the education system giving “digital” the attention it needs.
- Technology adoption resonates across all facets of education in the new policy be it for online learning, e-program delivery, teacher training or e-assessments.
- At the same time, there is conscious effort not to overdo the digital agenda and the policy does talk about the challenges of managing screen-time and the effects of the digital medium on the social and psycho-motor dimensions of learning.
- With school education being organised in the new pedagogical and curricular structure of foundational, preparational, middle and secondary phases, there will be a need to rethink and recalibrate the e-content development strategy.
- Technology for improving learning outcomes with focus on disadvantaged sections: One of the primary areas the NEP2020 seems to address is leveraging technology for improving learning outcomes and providing access to quality education at scale.
- The policy focuses on providing quality education to disadvantaged sections as well as improving digital access and technology assisted learning access for Divyang students.
- Improving access and equity through online courses and ODL:

The NEP aims at providing for and improving access to quality education through the online medium.

- On the higher education side, it opens new opportunities for developing custom courses that may be offered in online or distance-learning mode.
- Enhanced digital infrastructure: The NEP2020 focuses on developing and enhancing an existing national-level repository of digital learning resources as well as e-learning public platforms like DIKSHA and SWAYAM.
- It talks about development of better online assessment or examination platforms leading to a host of new areas such as development of digital question banks.
- Innovative Virtual Labs will be utilised to improve access to digital learning for socially and economically disadvantaged groups.
- NETF and adoption of disruptive technologies: A new autonomous body, NETF, will be created for overseeing and facilitating decision-making in the technology-based learning space. It will provide a strategic thrust as well as set standards for e-learning in times to come.
- Data-driven systems for evidence-based policymaking: Performance Assessment Review and Analysis of Knowledge for Holistic Development(PARAKH) is expected to monitor the achievement of learning outcomes and guide the boards of education to make learning more contemporary and suited to future needs.
- This will provide opportunities for setting up National/State level data centres for collation of learning data and analyse them for effective policy design and implementation.

VI. SUMMARY AND CONCLUSIONS:

The National Education Policy 2020 is the great initiative in our educational system from the foundation level to higher level with special focus on vocational & technical education and lifelong education, focuses on every field of life. NEP 2020 is marching towards achieving such goals by creating various innovative policies to improve the quality, affordability, attractiveness and enhancing the supply by opening of the schools and higher education for the Government and private sectors. Based on this policy, the Indian education system is moving from teacher centric to learner centric, particular to all round development, mark centric to skill centric, information centric to knowledge centric, examination centric to experiment centric. NEP 2020 is expected to fulfil their objectives within 2030, by encouraging active participation of the society's all members and students, faculties of the various educational sector using innovative ideas and creating joyful educational atmosphere.

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FIGURE:

- [1] Figure-1: Previous and New academic structure of school education
- [2] Figure-2: Restructuring School Curriculum and Pedagogy

APPENDICES:

- [1] NEP:- National Education Policy
- [2] PARAKH:- Performance Assessment Review and Analysis of Knowledge for Holistic Development.
- [3] ODL:- Online Distance Learning
- [4] (GEP):- General Education Programme
- [5] (NCIVE):- National Committee for The integration of vocational education
- [6] HEI:- Higher Education Institution
- [7] NHERA:- National Higher Education Regulatory Authority
- [8] BOG:- Board Of Governors

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Fair Price From The Islamic Economic Perspective At The Market Of Pontianak City, West Kalimantan, Indonesia

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Abstract- This research article aims to show the importance of fair price determination at the market for the public. Determining fair price serves as “intermediary” between sellers and buyers by making price regulations that are fair and mutually beneficial for sellers and buyers.

This research, in the context of writing the results of the study, was carried out using a qualitative research paradigm. The research was conducted at the Pontianak Flamboyan Market. This is based on the fact that Flamboyan Market is a wholesale market located in the capital city of West Kalimantan Province. In this study, we collected two types of data, namely: primary and secondary data.

Fair price in Pontianak City is volatile. Prices increase ahead of Eid al-Fitr (Islamic festival that marks the end of Ramadan) because demands increase and the stock of some staple commodities is short. Fair price in Pontianak has yet to be achieved due to prices being exploited by sellers by taking advantage of the increase in demand before Eid al-Fitr. Buyers, especially people with lower-middle income, find it difficult to meet their needs ahead of Eid al-Fitr.

Index Terms- Fair Price, Seller and Buyer.

I. INTRODUCTION

The law of supply and demand applies to transactions of goods and services. Therefore, the role of the Government through relevant agencies must be able to mediate between sellers and buyers by making price regulations that are fair and mutually beneficial for both producers and consumers. (Faris Ihsan. 2014: 9).

In Indonesia, the goods that often experience price volatility are goods that people use for basic needs or more commonly referred to as *sembako* (nine staple commodities). The term *sembako* refers to nine staple food items as stated in the Decree of the Minister of Industry and Trade No. 115/mpp/kep/2/1998 dated 27 February 1998 consisting of rice, sago, corn, sugar, vegetables, fruits, beef, chicken, fish, cooking oil, margarine, milk, eggs, kerosene or LPG, iodized salt. *Sembako* consists of various kinds of food and beverage commodities that are generally needed by the Indonesian people, because they are basic daily necessities that must be sold freely in the market. The categorization of these essential products is important because the

government must ensure the availability of these products and be responsible for not allowing the stock of these basic needs and their prices to go wild following market mechanisms. This price volatility is affected by several factors, such as natural disasters, rising fuel prices, government policies regarding quotas for importing goods from abroad, exploitation by sellers by hoarding goods at certain times, such as ahead of Eid al-Fitr, Christmas and New Year.

The theory of prices according to Ibn Khaldun is that prices are determined by the law of supply and demand. If an item is rare and in demand, the price increases, and if an item is abundant, the price decreases (Ibn Khaldun. 2001: 648). Meanwhile, the theory of fair price according to Ibn Taimiyah is that if the price rises due to a lack of goods (supply) or because there are many people need them (demand), then this is justified, but forcing sell at a certain price is not justified. (Ibn Taimiyah. 2004:28).

Such justification includes increase in prices due to a lack of availability of goods (supply) and an increase in demand, and selling goods in a way that is fair and without injustice (Ibn Taimiyah, 2004: 28). Honesty in transactions is a form of fair pricing which, according to Ibn Taimiyah, can be achieved without any party, both sellers and buyers, being harmed as a result of the price increase (Ibn Taimiyah, 2004: 28).

Fair pricing a manifestation of transaction ethics that will lead business economic actors to act mutually pleased, compete fairly, honestly and not commit fraud in their transactions (Solihuddin, 2011:14). A fair price is a normal price that is acceptable to both sellers and buyers, and according to Ibn Taimiyah, a fair price has the goal of fulfilling justice for the whole community, so that both the buyer and the seller feel the existence of justice (Ibn Taimiyah. 2004:28-29) According to Ibn Khaldun, a fair price is the desired price balance, namely, the profit earned are socially acceptable to sellers and consumers.

Ibn Taimiyah (2004: 30) explains that if the price increase is caused by lack of supply or increase in demand and sellers sell their goods in an acceptable manner, then such price increase is natural and should not force sellers to sell goods at a certain price which may inflict loss on the part of the sellers. However, if the price increase is caused by sellers trying to cheat to get high profits or gain more profits than usual, then such price increase will be unreasonable for the buyer or the public. A fair price is a price that provides fairness for both sellers and buyers so that no one is

harmful, or in other words, the market mechanism runs normally without cheating or price exploitation in the market.

The government's role here is to maintain market prices so as to prevent sharp declines and increases as this will be fatal in the country's economy. When prices continue to decline, there will be a lot of people out of business and unemployment will rise because non-state-owned businesses such as the private sector and small and micro-enterprises (SMEs) will find it difficult to make a profit. Private businesses and SMEs only get even or possibly suffer losses. Meanwhile, if prices continue to increase, inflation will occur, so it is very important to stabilize prices so that the businesses run by SMEs or sellers can continue.

Stable prices will have an impact on people's welfare, where previously people were able to meet all their needs but the increase in prices will lower their purchasing power and thus limiting the fulfilment of their basic needs. According to the law of supply and demand, if the price increases, the purchasing power of the people will also decrease. On the other hand, if the price goes down, the people's purchasing power will increase.

Therefore, the government must maintain price stabilization towards fair price. With stable prices, people's purchasing power will be stable, and traders will not suffer losses that may affect economic growth which will also have an impact on state income. In accordance with the role of local governments concerning trade as stipulated in the Law of the Republic of Indonesia no. 7 of 2014 concerning Trade Article 95 Point c, that the local government is in charge of controlling the availability, price stabilization, and distribution of basic needs and/or important goods.

Pontianak City as the capital of West Kalimantan has several markets, including Flamboyan market, Mawar market, and Teratai Market. Flamboyan Market is the main wet market in Pontianak.

II. THEORY

According to Qardawi (1997: 241) if traders hold a commodity, while buyers need it with the intention that buyers

will buy it at a price twice as much as the previous price, then traders voluntarily accept the price determined by the government which is done so that traders sell the commodity at an appropriate price for the sake of fairness.

The government has an important role in stabilizing prices by ensuring the availability of goods in the market, monitoring the circulating prices, so that prices can be controlled and price stabilization can be achieved (Veithzal et al. 2018: 53).

According to Qusthoinah (2014: 79), a balance in supply and demand is required to maintain economic stability. Surplus supply can harm producers because their goods are not absorbed by the market. On the other hand, excess demand without sufficient production will push prices up, and if it continues, it will reduce the welfare of the people as consumers.

Faris Ihsan (2014: 1) reveals that in stabilizing prices, it is necessary to regulate the distribution of goods, maintain stock of goods based on people's needs, maintain people's psychological state in meeting their basic needs so as to achieve the stability of prices of goods.

According to Lucy Ngare, Franklin Simtowe, Jaqueline Massingue (2014: 160) in their research, *Analysis of Price Volatility and Implications for Price Stabilization Policies in Mozambique*, price stability can be maintained through the use of markets and non-market price stabilization interventions that encourage investment on market infrastructure such as roads, warehouses and market information systems, institutions such as warehouse receipt systems, credit and insurance, maintaining strategic reserves and reducing tariffs and food-for-work programs.

According to Benton F Massell (2014: 297) in his journal article, *Price Stabilization and Welfare*, price stabilization caused by buffer stocks provides a net benefit for producers and consumers simultaneously, and that buffer stocks are a definite policy standard.

Based on the theories above, it can be concluded that the indicators of price stabilization are fair price, demand, supply and market balance.

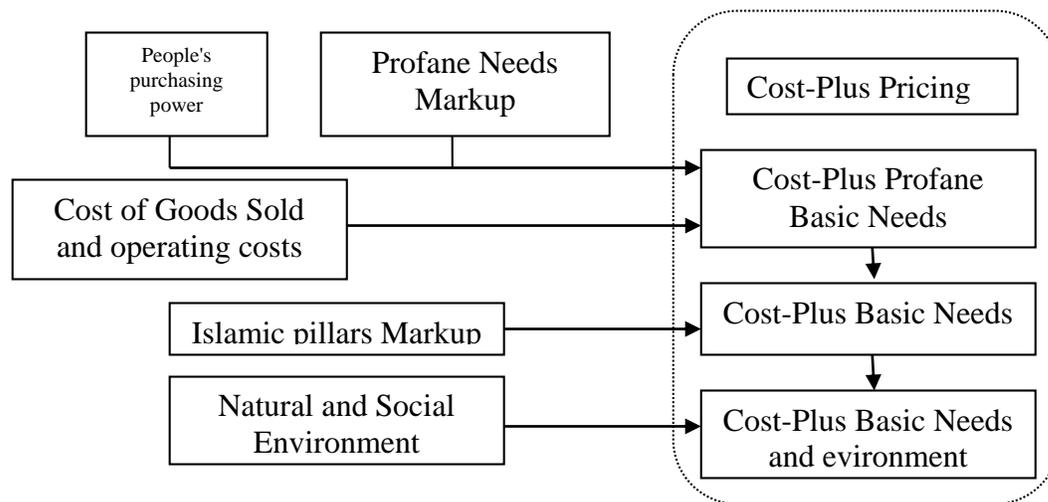
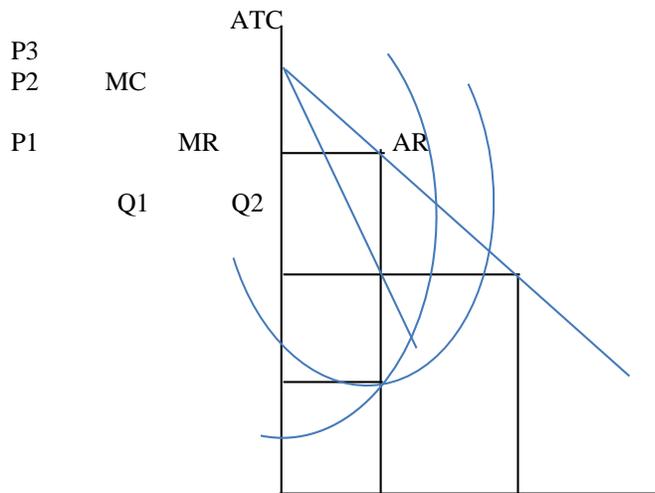


Figure 2.1
Fair Value-Based Pricing Concept
 (Alimuddin. 2011: 540)

Based on the above analysis according to Alimuddin (2011: 541), the concept of selling price based on the Islamic value of fairness is cost-plus pricing which is a selling price concept that takes into account all costs incurred to produce the product until it reaches the buyer in addition to the basic needs of traders and for environmental conservation. At first glance, the concept of selling price is the same as that of cost-plus pricing in conventional terms, namely costs plus the expected profit. The difference lies in the significance of profit and the determination of the amount of profit.

According to Masudul Alam Choudhury (1986: 159-160) in his book, *Contributions to Islamic Economic Theory*, that the price is equal to the average income equal to the average total cost, which is stated in the formula $P = AR = ATC$. In the principles of Islamic Economics, a company is not allowed to gain excessive profits through monopolistic competition, persist with excessive production and use of excessive consumption capital. The principles of Islamic Economics recommend the right economic criteria, namely minimizing costs to get profits within the limits as the curve below shows:

Figure 2.2
 The Curve of the Price Mechanism of an Islamic Economic Company



The figure above illustrates that the price of the product (Q1,P1) shows the result of monopoly competition, by overriding the perfect market mechanism, and also setting aside the determination of the quantity price in perfect competition, while (Q2,P2) shows that in the case of Islamic companies operating in under competitive cooperative conditions, it is possible to produce products at higher quantity levels and still sell at a lower price level, p2 as opposed to the case of monopolistic competition which is appropriate for other companies, whose sales volume is limited to that level, q1 and the selling price is at the level of p3. According to Qardawi, one of the characteristics of fairness is not forcing people to buy goods at a certain price if the market mechanism runs normally. There should be no monopoly in the market, no price exploitation, and no strong grip on the weak and poor. If some goods increase in price because they are limited in number or because of the high demand, then according to the law of supply and demand, at that time the market is left to a fair and reasonable decision (Qardawi. 1997:171).

Ibn Khaldun in his book, *Mukadimah*, specifically wrote a chapter entitled "Prices in the City". According to him, if a city develops and the population increases, the people become more prosperous, then the demand (supply) for goods increases, as a result the price increases, which in this case Ibn Khaldun argued that "if the city is abundant, the development is achieved and there are a lot of needs for luxury, it will be perfect at that time for the motivating factors to fulfill and multiply those needs of each

person according to his circumstances, and as a result the supply becomes very limited. Many people will make an offer even though the number of goods itself is small, people who have the desire to get it fight over it. People who are affluent and live in luxury pay extravagantly, no matter the price, because their needs are greater than those of others. Then at that time the price will be expensive as you can see (Ibn Khaldun. 2001: 648).

According to Ibn Taimiyah, there are two kinds of prices, namely the price that is unfair and unlawful and the price that is fair and lawful, namely when the price contains unfairness against the community, such as containing unjustified coercion in buying and selling at a price that is not agreed upon by the people, or the price hinders the people of what is permitted by Allah, then this is the price that is unfair and unlawful. If that price contains fairness among fellow human beings as it "forces" them to fulfill the requirement to exchange at standard prices and prohibits taking additional profit from standard exchanges, then such prices is possible or even mandatory (Ibnu Taimiyah. 2004:27).

An example of unfair price is what was narrated by Anas Ibn Malik. He recounted that at the time of Prophet Muhammad there was an increase in the price of goods. People then complained about this to the Messenger of Allah: "You should set the price, O Messenger of Allah". The Messenger of Allah replied: "Indeed, Allah is Omnipotent, who makes it easy, who gives sustenance, and who sets the price. I really hope to be able to meet Him in a state without anyone suing me because of the injustice that I have done to them in matters of blood and property"

(narrated by Abu Dawud and Al-Tarmidhi). If people have sold their goods in an acceptable way, while prices continue to rise, whether it is due to a lack of goods (supply) or because many people have the need (demand), then this is up to Allah: forcing people to sell at a certain price cannot be justified (Ibnu Taimiyah. 2004:28).

A. METHODOLOGY

This research uses the qualitative approach. According to John W. Creswell, "Qualitative research begins with assumptions and the use of an interpretive / theoretic framework that forms or influences the examination of research problems related to the meanings imposed by individuals or groups on social or human problems (John W Creswell. 2015:59). The paradigm used in this research is post positivism.

Each scientific research requires data in solving the research problems. The source of the data is the place or person where the data are obtained. The sources of data in this research consist of:

1. Primary Data

Primary data come from sources that directly provide data to data collectors (Sugiyono, 2015: 225) The primary data in this study were the results of interviews regarding fair price with sellers/traders, buyers/consumers at the Flamboyan Market, Head of Cooperatives Office, Secretary and Head of Market Division of the Cooperatives, Micro Enterprises, and Trade Office of Pontianak City.

2. Secondary Data

Secondary data come from sources that do not directly provide data to data collectors (Sugiyono, 2015: 225) Secondary data can be divided into several categories including publications of government or non-government institutions, previous studies, reports or personal notes, mass media.

The approach used this research is the qualitative approach using purposeful sampling, which is used to select individuals and places to be examined because it can specifically provide an understanding of the research problems and phenomena in the study (John. W. Creswell. 2015: 217), and the purposeful samples in this research were traders who sell in the market, buyers who shop at the market, Head of Cooperatives Office, Secretary and Head of Market Division of the Cooperatives, Micro Enterprises, and Trade Office of Pontianak City.

B. DISCUSSION

Development and supervision of trade includes supervision of goods circulating within the city, warehouse data collection, information on prices of staple commodities and other important goods, information on stock availability of staple commodities and other important goods.

Fair price in Pontianak

1. Prices at the Flamboyan market, according to the sellers, increase ahead of Eid al-Fitr due to increased demand.

The increase in prices ahead of Eid al-Fitr at the Flamboyan market, according to the sellers, is due to an increase in demand, which leads to the increase in the prices of staple commodities because demand is higher than usual, while the available stock of goods does not keep up with the increase in the demand. Therefore, it is natural for the prices to increase. The findings

showed that the price of broiler chicken at the Flamboyan market also increased despite the stable stock of the commodity.

The theory of fair price which is relevant to the findings in this study is used as a tool to prove whether or not the findings are relevant.

The relevance of the fair price theory with the findings in this discussion can be seen from the increase in prices caused by an increase in demand and a shortage of supply. This relevance is proven by the fact that as Eid al-Fitr draws near, the public or buyers in Pontianak City increased their purchases of staple commodities to celebrate Eid al-Fitr or Eid al-Adha, and the stock of goods available was not sufficient, resulting in an increase in the price of the basic food items. However, the stock of broiler chicken in Pontianak was stable and had been prepared for an increase in demand ahead of Eid al-Fitr, but the broiler chicken commodity had also increased in price. This finding is irrelevant to the fair price theory because the increase in demand for chicken was in line with an increase in supply. The price of chicken in fact should not have increased, and this had resulted in the absence of a fair price for buyers at the Flamboyan market.

According to the fair price theory, it is justified but the price increase that occurred in broiler chicken commodity at the Flamboyan market was caused by price exploitation by sellers because there was a high demand for beef and chicken ahead of Eid al-Fitr. Sellers usually say that the stock of broiler chicken is empty or there is little available even though the opposite is true. The increase in the price of broiler chicken at the Flamboyan market is not relevant to the theory of fair price.

2. Flamboyan Market sellers took advantage of the lack of information among buyers by raising prices.

The buyers accepted the price offered by the sellers at the Flamboyan Market even though the price had increased and the buyers did not know exactly the cause of the price increase as the information was provided only by Flamboyan Market sellers. The buyers' lack of information was used by the Flamboyan market sellers to exploit the price with the excuse of shortage of stock despite the fact that the stock was available because the government had anticipated an increase in demand ahead of Eid al-Fitr.

The irrelevance of the fair price theory with the findings on the subject of this discussion can be seen from the actions of Flamboyan market sellers who took advantage of the buyer's lack of information regarding prices to gain higher profits as in the case of broiler chicken commodity at the Flamboyan Market. This is clearly against to transaction ethics or Islamic economic behavior, namely honesty in transactions. Islamic law holds fast to the values of honesty in commercial transaction.

Broiler chicken sellers at the Flamboyan Market also exceeded the maximum profit limit, where in the context of fair price, the sellers make a reasonable profit.

Based on the above analysis that according to Islamic economics, broiler chicken sellers at the Flamboyan Market should not increase the price by ignoring market mechanisms, and override the determination of the price in perfect competition, and should be in accordance with the above formula that P (price) = AR (average income) = ATC (average total cost), i.e. price is equal to average income equal to average total costs incurred. If the income and total costs incurred by the broiler chicken sellers are

equal then the price of broiler chicken does not increase or it remains the same, although the demand for broiler chicken increases but the quantity of broiler chicken is also large, then the price of broiler chicken should remain stable, because the income and costs incurred by broiler chicken sellers remain the same.

Broiler chicken sellers who raised the price at the Flamboyan market by taking advantage of lack of information about the stock of the commodity among the buyers or the public and providing incorrect information to the buyers about the stock of the commodity, whereas in fair price theory neither party should be harmed by the price both on the part of the buyer and the seller.

Information given by the Flamboyan market sellers to the buyers by saying there was no broiler chicken stock which resulted in an increase in price had made the price unreasonable or in other words it did not reflect a fair price, and indicated an act of *ikhhtikar* or holding back the commodity that people need with the aim of increasing the price, which is an act prohibited by Islam, because it causes harm to society, as the Messenger of Allah said, "Whoever commits *ikhhtikar* with the aim of increasing the commodity price towards the Muslims, then that person is a sinner, and has been out of the *dzimah* (dependent) of Allah and His Messenger".

Ibnu Taimiyah explained that hoarding is an act of holding back commodities that are needed or in demand by the public with the aim of increasing prices. Such practice is strictly prohibited because it can cause inflation and harm to people's lives (Said Sa'ad Marthon. 2007:89-93). Regarding the information given by the Flamboyan Market sellers to the buyers saying there is no broiler chicken stock which results in an increase in prices when people need the commodity or are in demand of it, make this an act of withholding goods or *ikhhtikar* which is prohibited by Islam.

3. The price set by Flamboyan market sellers ahead of Eid al-Fitr was burdensome for some buyers or those with lower-middle income.

The increase in prices ahead of Eid al-Fitr was burdensome for the lower-middle income people in Pontianak City, forcing them to reduce the amount of food purchased to celebrate Eid al-Fitr or Eid al-Adha.

The theory of fair price which is used as a tool to examine the problem with regard to the findings of this study proves that these findings are contrary to the theory of fair price. The irrelevance between the fair price theory and the findings on this subject can be seen from the statement "the prices given by the sellers are burdensome for the buyers or the people in Pontianak City ahead of Eid al-Fitr".

The increase in prices of commodities in Pontianak city ahead of Eid al-Fitr, especially for broiler chicken based on the findings in section b, was caused by price exploitation by broiler chicken sellers at the Flamboyan Market. It can be concluded that the price received by buyers was an unfair price since sellers make profit by committing fraud, namely providing incorrect information about the lack of stock of broiler chicken at that time, i.e. ahead of Eid al-Fitr.

The fair price theory explains that reasonable profits will encourage trade growth, low profits will make trade sluggish, but if sellers obtain too much profit, it will cause trade sluggishness because demand will decrease (Ibn Khaldun. 2001:720). The relevance of this finding is that the sellers at the Flamboyan

Market made too much profit that the public or buyers objected and this had resulted in a decrease in the people's purchasing power or demand and finally a sluggish trade occurred.

4. The increase in the price of broiler chicken at the Flamboyan market ahead of Eid al-Fitr was still considered reasonable by the government.

The increase in the price of broiler chicken at the Flamboyan market was a burden to the lower-middle income people and thus it reduced the number of purchases made by the buyers, because the normal price which is between IDR 23,000 to IDR 25,000 increased to between IDR 32,000 to IDR 35,000. Such increase in the price was quite significant because the public or buyers were likely to buy broiler chicken for celebration of Eid al-Fitr and Eid al-Adha.

The fair price theory explains that a fair price is a reasonable price that can be accepted by both the buyer and the seller, and a reasonable profit can be obtained without adding burden to the public or the buyers, and there is no fraud committed by the sellers. However, this is not relevant to the findings of this research. The sellers at the Flamboyan Market obtained more profit than usual by providing false information about the lack of stock to the buyers ahead of Eid al-Fitr. In addition, the government explained that there was no shortage of broiler chicken stock. With false information given by these sellers, the increase in the price of broiler chicken reached around IDR 10,000 which is the result of a lie made by the sellers, thereby harming the public/buyers at the Flamboyan Market. This finding is completely irrelevant to the fair price theory.

Profits that are too high or unreasonable for broiler chicken commodity will result in unreasonable or unfair price and harm the public or consumers. The move taken by Flamboyan Market sellers in gaining higher profits was not monitored by the government because the public did not really complain about it, so the government assumed that people could still afford to pay for the price.

The high increase in the price of broiler chicken at the Flamboyan market should be analyzed by the Pontianak City's Office of Cooperatives, Micro Enterprises and Trade, so that the cause of the increase can be identified and strict measures can be taken against the sellers who exploit the price of the commodity because the government plays an important role in monitoring and controlling prices and availability of commodities so that people will not be harmed.

III. CONCLUSION

Based on the research conducted at the market regarding fair price in Pontianak City, it can be concluded that: Fair price in Pontianak City is volatile, while the causes of price increase are due to the increase in demand and decrease in stock of some staple commodities. Fair price in Pontianak has not been achieved due to price exploitation by the sellers by taking advantage of the increase in demand ahead of Eid al-Fitr which causes difficulties to the public/buyers with lower-middle income in meeting their needs. The government, in this case, the Office of Cooperatives, Micro Enterprises, and Trade plays an important role to ensure price stability by checking prices, monitoring sellers or agents who hoard staple commodities and anticipating price increase ahead of

Eid al-Fitr through increasing the stock of commodities so as to suppress price increase. However, the Office has not been able to overcome the increase in prices ahead of Eid al-Fitr. Therefore, it can be concluded that fair price in Pontianak City has not been achieved.

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Agricultural Crop Monitoring Using Online 3D Visualization Technique

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Abstract- Technologies have greatly shaped the activities in farming. In this context, agricultural information technology has brought about significant change in agriculture development, especially the adoption of technological tools in agriculture farming, including the 3D visualization technique in agricultural crop monitoring applications. Hence, a farmer must make timely decisions to make most from scarce resources, and thus, timely and appropriate information to allocate use of scarce resources efficiently and economically for production is essentially important towards high productivity and maximum profitability. In other words, monitoring crop or plantation can help farmers assess the real nature of the problems and analyze various alternatives in the deciding-making processes like what to produce and how to produce as well as providing a strong structure for decision-making when issues arise. Although farm management are known to be important, key issues related to good management practices which can enhance production efficiency still need to be addressed. Therefore, good crop or plantation monitoring is vital for the development of agrarian technology. Good agricultural crop monitoring also rests upon the ability to make right decisions. But there is no study has explored such monitoring decision system especially for monitoring plantation. This also is a motivated significance behind the present study.

Keywords— Online, 3D visualization, Agriculture, Crop, Monitoring

I. INTRODUCTION

In modern agriculture, farmers are also the managers of their businesses. For farmers to optimize agricultural production they must be highly competitive; as the manager of the enterprise, they are expected to bring about maximum profit. For that reason, farmers usually perform many management functions to achieve maximum production such as: giving clear instructions, deciding on the best possible action at the right time, and implementing the chosen solution.

Hence, a farmer must make timely decisions to make most from scarce resources, and thus, timely and appropriate information to

allocate use of scarce resources efficiently and economically for production is essentially important towards high productivity and maximum profitability. In other words, monitoring crop or plantation can help farmers assess the real nature of the problems and analyze various alternatives in the deciding-making processes like what to produce and how to produce as well as providing a strong structure for decision-making when issues arise. Although farm management are known to be important, key issues related to good management practices which can enhance production efficiency still need to be addressed. Hence, research on how to improve plantation monitoring practices is still ongoing [3]. Therefore, good crop or plantation monitoring is vital for the development of agrarian technology. Good agricultural crop monitoring also rests upon the ability to make right decisions.

Moreover, literature on smart agriculture found that the combination of internet technologies and the adaptation of technological-based monitoring practices will play a vital role towards reframing strategies to boost the cultivation of increasing farm productivity while providing remunerative returns for farm families. But there is no study has explored such monitoring decision system especially for monitoring plantation. This also is a motivated significance behind the present study.

Henceforth, the motivation behind this study is to demonstrate that the adoption of smart technologies such as data-driven decision-making system is the best solution to a better, more efficient and timely decisions [4]. Therefore, another significant motivation for this study is to develop a more rigorous approach to solving growers' problems through a technology dependent system particularly for the monitoring of plantations. Hence, the critical need to focus on an efficient and productive monitoring system such as online 3D visualization system.

Furthermore, new technology is revolutionizing modern farming. In these light, smart farming technologies such as the 3D visualization system is widely used in the operations of most agriculture fields today [6]. In this context, the visualization of existing and future agricultural plantation is becoming more important for monitoring crops as well as for decision-making, as

it considerably helps to influences the production. The concept of best monitoring plantation is an important stage of agricultural technology development; for instance, utilizing online 3D visualization system to support monitoring processes [5]. Along these lines, [8] had explored the implementation of online 3D terrain visualization technique. Unfortunately, the system concentrated on 2D visualization and was not implemented in 3D visualization.

Naturally, the vast plantation information i.e. the tree and its associated spatial information from plantation is 3D, and, in this way, the online 3D visualization system is an essential prerequisite set for this research. Moreover, this study aims to investigate the issues related to the monitoring of agricultural plantation crop (dragon) and to determine solutions to address facts concerning designing a system namely online 3D visualization technique in monitoring plantation. On that account, the present study is designed to show that the adoption of online 3D visualization system is important to ensure effective plantation crop monitoring.

II. KEY ISSUES IN ONLINE 3D VISUALIZATION

Graphs are found in various applications, for example, web surfing, state–transition outlines, and information structures. Generally, graph consists of objects (images) or entities (Beck et al., 2017). In the context of this study, graphs mean 3D graph of visual plant. Plant visualization is based on virtual organ and 3D graph of visual plant is rendered by 3D engine which read the attributes of virtual organs to control the rendering process [7]. [1] described any data that has picture view can be modeled as a graph such as, animal, species, trees, computer file systems, and so on. Unfortunately, there are size limitations and multi-sided quality of structures in 2D visualization. On the contrary, multidimensional graphs can be easily visualized in 3D and the possibility of movements in 3D space.

This study examines the basic visualization of farm in 3D form. The outcome of this research will enable farmers or plantation managers to view their plantation estate in virtual online 3D condition. Each of the virtual tree is visualized in 3D space so that they can be seen as natural plants. That means the 3D visualization of plantation generates 3D objects for each of the dragon trees. The total size of the graph will be large when the number of trees in the plantation increases. Unfortunately, memory is limited in storing capacity and cannot hold an infinite amount of data. For this reason, many visualization systems do not support the large data sets [3]. In a first step, terrain data is loaded from the terrain setup, and temporary storage is created to hold the server data. This part stored the retrieved data into temporary storage, which is the window registry (limited to 1Mb of data). The created memory holds a tree position and tree information. Large size or large-scale graphs can affect on limited memory size that should be addressed. The relative visibility will drop with ever-growing size of graphs visualization.

III. RESEARCH METHODS

This section contains about the step by step process that are conducted the research. Design research methodology is chosen; due to the main goal of this study is artifact, which is framework. It includes the framework of the study and other contributing factors in this research study. In summary, it consists of five parts (1) awareness of problem, (2) suggestion, (3) development, (4) evaluation and (5) conclusion. Each of phases has its own activities with outcomes and achieved the research objectives.

1) Plan of action:

The implementation of the project will be started from July, 2020. Figure 1 showing the flowchart of research activities as below:

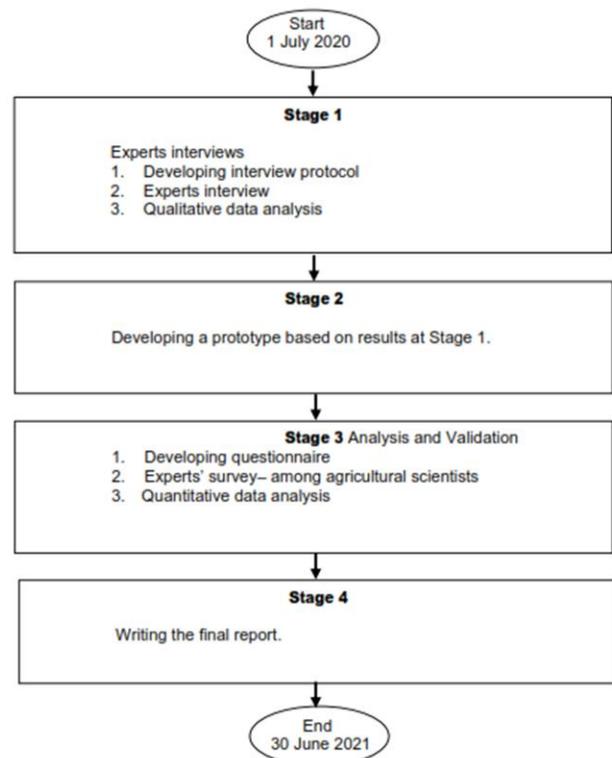


Figure 1: Flowchart of research Activities

This research study can be divided into three distinctive stages:-

Stage 1 :

In this stage, expert's interviews being conducted. It involves the experts in online 3D visualization from academia, practitioners and private company representatives. On the other hand, experts in dragon plantation management also being interviewed. It was targeted experts involved between 6 to 12 people. This method

was employed to identify the potential factors of online 3D visualization techniques for dragon plantation.



Figure-2. The field visit results from the study area

Stage 2:

In this stage a prototype of online 3D visualization technique for dragon plantation based on the results from Stage 1 have been developed. This section covers the methodological steps that is used for design and developing a new conceptual framework of online 3D visualization technique for agriculture crop monitoring. At the end of the previous stage (suggestions phase), chapter 3 explains the methodological approaches, process, and techniques used to achieve the objective 2. The previous literature helped identify and recognize the methodology used to develop online 3D visualization framework in this section. Based on the literature review, expert' consultation, interview, observations and the empirical case studies are examined to demonstrate and development of the proposed framework. The results of the preliminary study also used to develop the proposed framework. This chapter encompasses the implementation phase from the design science research to validate the new framework through prototype development to formulate objective 3. This prototype of the application is a proof of the concept that demonstrated in this section that is much more effective process of requirements validation.

In this regard, [5] stated in their research built a web-based farm information system using 3D visualization technology. Their research, entitled "a web-based 3D farm information system for enhanced information dissemination" examined how to

disseminate information to farmers through 3D visualization technology. Their research focused on three

layers and showed plant information through 3D visualization to empower farmers to make better decisions for crop yields. Their research focused on 3-layers architecture and showed plant information through 3D visualization aimed to improve the way information disseminates to farmers. They showed that their area of the plantation will be view virtually. That means the 3D visualization of plantation will generates 3D virtual objects for each of the trees. The total size for the 3D virtual objects or 3D graphs will be large when the number of trees in the plantation increases. Unfortunately, there is no directions for managing such large size graphs as memory is limited in storing capacity and cannot hold an infinite amount of data. Even though, when the scale of volume increases, the visibility, usability, and discernibility of graph visualization relatively will drop. For this reason, many visualization systems do not support the large data sets. That is very important to take in considerations to view their plantation estate in virtual online 3D condition. Hence, this study proposes to enhanced this existing 3-layer architecture to 4-layer architecture thereby allowing online 3D visualization problem. [12] posited that the web could show land data in rich structures and offered easy to use interfaces. One of the promising patterns in current GIS is the utilization of Web 3D innovation. Figure 3. Shows the architecture of this framework.

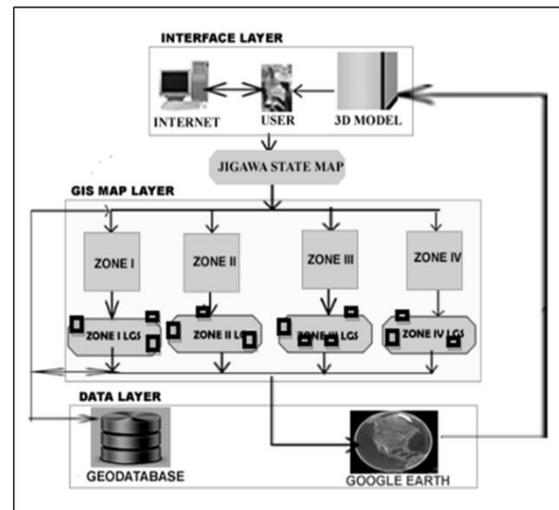


Figure 3. Architecture of Web-based Farm Information (Source: Obiniyi & Abubakar, 2015)

Tree Modeling

In this function, the tree is modeled by using 3D modeling software. Besides this, the tree is colored as green to make the tree presence more viewable inside the prototype. The dragon plantation is modeled where the tree is entirely modeled with the textured image using the polygon. This tree modeling is also virtually incorporated into the visualization process layer.



Figure-4: 3D model of Dragon tree

Stage 3:

This stage involved survey among dragon cultivars to analyse and validate the prototype to be developed. Questionnaires containing dimensions related to the prototype will be asked to the selected dragon plantation scientists around Gazipur district. The number of respondents was 20. Collected data being analyzed with the help of IBM SPSS version 23 computer package program. This study employs a questionnaire as the main evaluation instrument to investigate whether the prototype is effective and workable in terms of usability. Generally, Oppenheim (2000) has described the questionnaire as a widely used research instrument that is reliable in terms of data collection. Throughout the review process, two mediums of communication were used email review and face to face review. Hence, to design the evaluation instrument, a systematic approach was adopted in which the rigor process of instrument development.

IV. RESULTS, DISCUSSION AND CONCLUSIONS

The final chapter in this thesis draws together the results in the previous chapters, discussed these findings, highlights the future directions that online 3D visualization research for plantation monitoring has taken in and provided the conclusions on the research performed. In summary, the discussion on how to develop, implement, analyses and validate a new framework of online applications of 3D visualization has been presented. and finally, concludes the research.

Finally, this section deliberates on the findings of this study by answering all the research questions and research objectives. Besides, it discusses the contributions of the study to the body of knowledge, as well as highlighting recommendations for future directions of the study.

The final results is reported based upon the results of analyses and the expected study findings in narrative form. The findings of the study can be represented in a graphical or non-graphical form where research objectives are additionally clarified. A summary

of the study, conclusions are drawn from the findings and an evaluation discussion of the developed



Figure-5. Interview with farmer

Several interviews and expanded discussions with farmers and experts have been carried out.

At the end of this part four (development phase of DSRM), here the final online 3D visualization prototype based on the framework was evaluated by plant cultivars and 3D visualization experts. Besides this, an empirical field study evaluation method named Trial-run is used to evaluate the prototype of this study. This chapter used questionnaires containing dimensions related to the prototype functionality. Here, a number of interviews, observations, and expanded discussions with experts have been carried out to review the developed system framework and prototype. Therefore, this chapter is to evaluate the prototype results and the results of the evaluation indicate that the system achieved their satisfaction or efficient in ease of use by allowing growers to solve crop monitoring problem. The results of the usability evaluation indicated that the system achieved its satisfaction or efficient in ease of use.

prototype especially as for the original purposes and hypothesis of the study was exhibited. The final report section also includes validation reports related to the research questions being answered. Inside this last report segment, the researcher attempts to translate findings and conclusions and relate these to both the motivation behind the investigation. Final reports reflect clear, brief, and composed for a broad scientific audience. Finally, a

detailed description of recommendations for the future study based on the significance of findings is drawn.

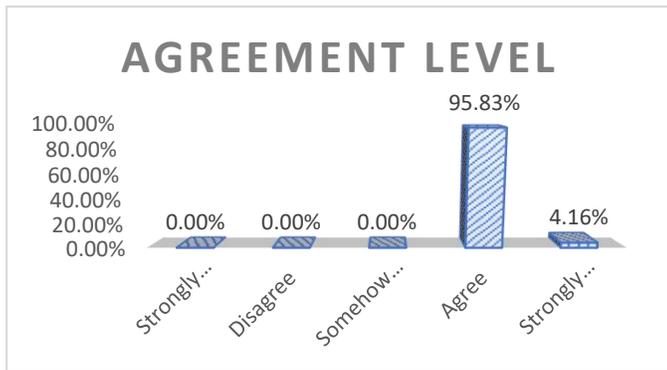


Figure-6. Level of users' agreement

Overall, results from the usability testing demonstrated that it can comfortably support or handle monitoring information of the plantation, and thus formulating the research issue; it is also proven that the results of enhanced architecture achieved its satisfaction through solving visualization problem.

APPENDIX

Appendixes, if needed, appear before the acknowledgment.

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Effect of the Covid-19 Pandemic on Customer Service by Small And Medium Enterprises in Garissa Township Ward, Kenya

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Abstract: Operating under the restrictions imposed by the Covid-19 was difficult for most firms. Challenges for SMEs were more severe than for other enterprises due to a considerable decline in demand for goods and services. Thus, the study examined the effect of the Covid 19 Pandemic on customer service by small and medium enterprises in Garissa Township Ward, Kenya. The study employed a descriptive research design with a sample size of 387 locals from Garissa County. Data was collected using questionnaires targeting locals owning SMEs in and key informant interviews from the County Government of Garissa. The findings indicated that customer service was one of the measures of performance affected by the pandemic. From the researchers, because of how contagious the virus was, the Kenyan government and other world governments instituted a social distancing policy that restricted customers from participating in in-person purchases. The study recommends that future researchers to conduct further research on the performance of SMEs years after COVID-19 to show their health as the economy stabilizes.

Key Words: Covid-19 Pandemic, Customer service, Performance, SMEs, Enterprises

Introduction

The small and medium enterprises are critical in the social economic development of a country. The Small and Medium Enterprises (SMEs) are a multidimensional concept that varies across the globe due to diverse economic development levels. However, two components are often used in the conceptualization and definition of the SMEs that is number of employees and the sales turnover aspects. In this context, (Hazimah & Mat, 2022) views the SMEs within Malaysia to refer to enterprises with less than 75 employees and with an sales turnover of not more than 20 million Malaysian Ringgits (approximately 500 million Kenya shillings). (Omar et al., 2020) also commented on the conceptualization of SMEs in Malaysian context. In this regard, (Omar et al., 2020) noted that the SMEs are defined by the number of the employees and the sales turnover aspects.

In Malaysian context, (Pek et al., 2019) had also viewed the SMEs to refer to the business enterprises with sales turnovers of between MYR 250,000 and 25 million or with full time employees between 5 and 150. In Pakistan, (Hassan et al., 2018) viewed the SMEs are viewed as enterprises with up to 250 employees with an annual turnover of up to PKR 250 million (Approximately 150 Million Kenya shillings). On the other hand, (Awan et al., 2019) commenting on the Pakistan context also noted that the SMEs have between 20-250 employees. Within the context of United States of America, (Aun, 2022) viewed the small and medium enterprises as enterprises with less than 500 employees On the other hand, within the European Union the SMEs are taken to be enterprises with between 10 and 250 employees (Okoye & Igbokwe-Ibeto, 2020). The SMEs in African context are also been viewed differently across the African countries. Within Nigerian context, (Departmet, 2021) noted that the SMEs refers to the enterprises with less than 300 employees and an operational costs not exceeding 200,000 Nairas (Approximately Ksh 55,000) excluding costs

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of land. (EMERAH, 2018) further noted that in the Nigerian context that SMEs are enterprises with less than 300 employees. In Ghanaian context (Biney, 2018) viewed the SMEs to be the firms with a maximum of 300 employees.

In Kenya, MSMEs are classed under the MSEA Act based on their annual revenue, personnel count, or total financial investment. According to (CBK, 2020), the 2020 Survey differs from the 2017 Survey in that it permitted respondent institutions to complete the survey using their own internal MSMEs classification criteria. The Micro and Small Enterprises Act (2012) [MSEA Act 2012], as well as the Public Finance Management (Amendment) Act (No. 2) of 2020, were used to define MSMEs for the 2020 Survey (CBK, 2020). The SMEs in Kenya are important in the provision of essential goods and services, creation of employment opportunities, women and youth empowerment, fighting unemployment challenges, and helping in the achievement of Kenya's social economic development (Abdifatah, 2019; Shurie & Olando, 2020a).

The performance of the SMEs is critical in the social economic development of a country. The SMEs have been associated with women empowerment aspects (Khamurduddin & Sripathi, 2011)(Mishra, 2020). In this context, the women who are often financially disempowered in diverse contexts due to aspects such as illiteracy and negative cultural practices, are able to engage in SMEs leading to their financial empowerment. The women are able to financially support their own financial needs and those of their dependents through engagement in SMEs activities (Kanwal, 2018).

The SMEs have also been noted for the youth empowerment aspects (Chapter, 2019). The SMEs in this context provide a source of livelihood to the youths. Engagement of the youths in the SMEs activities have been noted to eliminate the youth unemployment challenges across diverse countries. In this context, SMEs initiatives have been used as strategic initiatives to address youth employment in diverse countries such as Nigeria (Ojetunde & Mafikuyomi, 2018), and Ghana (Amero, 2018) amongst other countries. The SMEs has also been linked with economic growth and Gross Domestic Growth (GDP) through facilitation of movement of goods and services within the country (Esther et al., 2018; Ruslaini, 2021). The SMEs in this context are associated with the provision of the provision of critical goods and services within the country hence leading to the social economic development (Ngota et al., 2018).

The performance of the SMEs is thus important due to its impact on the social economic development. According to (Baariu et al., 2020), performance of the SMEs relates to the ability of the SMEs to achieve its entrepreneurial objectives. The performance has also been thought as the extent in which the business objectives of the SMEs are achieved (Baariu & Gathungu, 2020).

The performance of the SMEs has also been viewed in terms of meeting stakeholder expectations and the comparison between the realized output against the desired output (HANGGRAENI & SINAMO, 2021). There are diverse indicators of performance aspects amongst the SMEs. The organizational performance of the SMEs has multiple indicators including employee retention (Agweya, 2020), employee performance (Sumiati et al., 2019), market performance (Amaglo, 2020), operations performance (Yawson, 2020), market penetration (Pramodanie et al., 2019), and product development (Bukki et al., 2019) amongst others.

The covid 19 pandemic was one of the major events of the last two years that impacted on the performance of the Small and Medium Enterprises (SMEs). According to (Nor Edi Azhar Mohamad, 2021) covid 19 pandemic was first discovered in Wuhan China in December of 2019. The disease posted major challenges to the working environment for the entrepreneurs due to the various restrictions posted placed by the diverse stakeholders including lockdowns, restrictions of public gathering, restrictions of the number of people interacting, working from home restriction and other measures that undermined entrepreneurial activities (Nawaz, 2021). The covid 19 impacted on the performance of the SMEs in diverse ways. These ways included loss of market share, financial constraints, failure to pay outstanding business debts, loss of customers, loss of revenue, closure of businesses, reduction of sales revenues, poor financial performance, and employee performance constraints (Behera et al., 2021; Goel & Donaldson, 2021; Imkotta et al., 2021).

Garissa Township Small and Medium Enterprises infrastructure relates to the small-scale trading in diverse items. Professional services, agribusiness, and retail companies are among the winners in Garissa Township. Doctors, attorneys, and hospitality services are examples of professional services. The public transportation provided by Boda Boda may be considered among other small and medium-sized enterprises. While farming is primarily carried out in rural areas, small and medium-sized enterprises are primarily found in urban areas. In Garissa County, small and medium-sized businesses (SMEs) are active in every sector and region. Young men, old women, educated individuals, and uneducated people are all involved in SMEs. The majority of businesses in the county are family-owned or inherited, and two to three of the employees come from close family or friends (Noor & Simiyu, 2020).

A survey conducted by CBK (2020) concluded that, Micro, small, and medium-sized businesses (MSMEs) play an important role in the economy, both in terms of job creation and economic growth. Covid 19 pandemic was associated with challenging business performance for the SMEs due to covid 19 restrictions such as lockdowns, restrictions of public gathering, restrictions of the number of people interacting, working from home restriction and other measures that undermined entrepreneurial activities (Nawaz, 2021).

Operating under the restrictions imposed by the Covid-19 was difficult for most firms. Challenges for SMEs were more severe than for other enterprises due to a considerable decline in demand for goods and services. In fact, due to their limited capacity to mitigate the associated risks and cover the costs associated with delayed firm activities, some SMEs were faced with the issues of a shortage of cash and liquidity, employees, clients, and technology. Due to their inability to service their clients, pay their employees' salaries, and honor their agreements with suppliers, SMEs suffered (Syriopoulos, 2020).

In fact, the implications of COVID-19 on SMEs have already been covered in a number of studies. In Kenya, Kaberia & Muathe (2021) examined the "Effect of Covid 19 Pandemic on Performance of Women Owned Micro, Small and Medium Enterprises" and discovered that a number of women-owned SMEs that had previously encountered severe difficulties are now in danger of going out of business. However, the study's emphasis on women-owned SMEs created an empirical gap. In their study "Effect of COVID-19 Pandemic on the Performance of Small and Medium Business Enterprises in Abuja-FCT, Nigeria," Enesi and Ibrahim (2021) discovered a number of effects, including the loss of qualified workers as a result of staff salary reductions and low revenue or income generation. However, this study had a focus on financial performance; thereby presenting an empirical gap and geographical gap. This study aimed at examining the effect of the Covid 19 Pandemic on customer service by small and medium enterprises in Garissa Township Ward, Kenya. In the context of customer service, product innovation, service innovation and marketing operations, this research filled the gap in empirical literature.

1.3 Purpose of the Study

The purpose of the study was to examine the effects of covid 19 pandemic on the performance of Small and Medium Enterprises in Garissa Township Ward, Kenya.

1.4 Specific Objectives

The specific objectives of the study are as follows;

- i. To

Literature Review

Most businesses had no concept how to conduct customer service when the Covid-19 pandemic first struck the United States. As they looked for new methods to help their clients, they had no idea that many of the temporary changes they had made would end up becoming long-term fixes. The loss of jobs led to the implementation of consumer protections by the federal, state, and local governments, including restrictions on property repossession (Kannan, 2021). Businesses had to change and put in more effort to understand the challenges and sufferings that their customers were facing, and many of them responded to a national catastrophe with empathy.

Accenture (2020) argues that COVID-19's abrupt emergence necessitated brands moving at breakneck speed to provide exceptional service to their customers while also caring for their staff with compassion. Consumers' and enterprises' emotional states exacerbate the problem. However, the combination of fear, uncertainty, and irritation poses new dangers and opportunities for companies. After a crisis, providing compassionate customer care is likely to result in a significant rise in good brand reputation and customer loyalty. Inaccessible, ineffective, or indifferent responses, on the other hand, are likely to elicit an equally strong negative reaction. Contact centers are critical in times of distress. When customers require immediate and sophisticated solutions, they choose live interaction (Accenture, 2022).

Customer service is occasionally one of the divisions that is most negatively impacted during times of crisis, according to Dixon et al. (2020). Tethr, an AI and machine learning firm, conducted research of more than 1 million customer service contacts involving more than 20 organizations from diverse industries in order to better illustrate the degree of influence of a crisis on customer service departments. The calls were placed between March 11 and March 26, when Covid-19 was declared a pandemic by the World Health

Organization (WHO). A 250-variable proprietary approach used in their study gave them the ability to rank client interactions on a scale from "difficult" to "easy," as well as the influencing variables that went into each score.

In just two weeks, Dixon et al., (2020) study found that the average company saw a more than doubling of its percentage of "difficult" calls, from a typical level of 10% to more than 20%. Due to unanticipated travel cancellations, bill payment delays, and insurance coverage disputes, customer stress and anxiety in service calls surged as a result of the pandemic, making a task that was already challenging for reps on a typical day considerably more challenging. Only 50% of the rationale for the high effort level of these Covid-related calls was customer anxiety. Another significant finding was the lack of infrastructure (such as a dependable phone connection) and support (peers and supervisors available to help) that most reps working from home for the first time previously had in the contact center. They therefore experienced greater difficulty than normal in helping clients. Customers and salespeople were both making more "I can't understand you" claims, for instance, and some of the firms in the survey had an increase in hold times of up to 34% and an increase in escalations (calls forwarded up the chain of command) of more than 68 percent.

Kannan (2021) notes that most businesses had no concept how to conduct customer service when the Covid-19 pandemic first struck the United States. As they looked for new methods to help their clients, they had no idea that many of the temporary changes they had made would end up becoming long-term fixes. The loss of jobs led to the implementation of consumer protections by the federal, state, and local governments, including restrictions on property repossession. Businesses had to change and put in more effort to understand the challenges and sufferings that their customers were facing, and many of them responded to a national catastrophe with empathy.

Kannan (2021) opines that customer service will be a significant distinction in this new market, when travel companies will face even more competition. Airlines should consider whether they want to rely on business travel as much as they do now and adjust their customer service accordingly. He observes that "One of my company's clients showed empathy in the face of the catastrophe. The bank contacted customers to offer delayed collections and deferred payments because its customers' income levels are self-reported. Even a one-time reprieve on a single payment might make a significant difference in customers' lives. If a customer defaults on a payment one month, assisting them will benefit your business in the long run. So, if your consumers require support, encourage them to contact you."

Calkins, (2021) argues that with so much of life moving online and set to remain so for the foreseeable future, it's time to make sure the online consumer experience is as well-designed as the in-person one. Before COVID-19, for instance, the majority of supermarket customers chose their products based on what they saw, felt, and compared when browsing the aisles. As a result, companies made investments in point-of-sale merchandising, in-store promotions, and shelf placement techniques to boost visibility and sales (Calkins, 2021).

Methods

Using Resilience Theory by Norman Garmezy and Contingency Theory by Fred Fiedler (1967) the researcher underpinned the study in theoretical framework. The study employed a descriptive research design gathering both qualitative and quantitative data from a sample size of 387 out of which 382 are locals from Garissa County owning and operating both licensed and unlicensed MSMEs and 5 key informant interviewees. Data was collected using questionnaires targeting locals owning SMEs in and key informant interviews from the County Government Ministry of Trade. Quantitative data was analysed statistically using the Social Science Statistics Package (SPSS) v21, content analysis was used to analyse qualitative, and information from the Likert scale was organized into relevant groupings using content analysis. Using simple descriptive statistics and inference statistical analysis, the research analysed and interpreted the results.

Results

The study used different elements of customer service interruptions to analyze the study problem. The results are presented in subsections as follows.

In-person customer service (Before)

Figure 1 below shows that in-person customer service before covid-19 was very high and high, representing 42% and 30%, respectively. Other results showed that 5% of the responses were moderate on the level of in-person customer service, while the rest were low and very low, representing 13% and 10%, respectively. These results implied that before covid-19, the rate of in-

person customer service was high since customers could interact with businesses without any restrictions. This is presented in Figure 1.

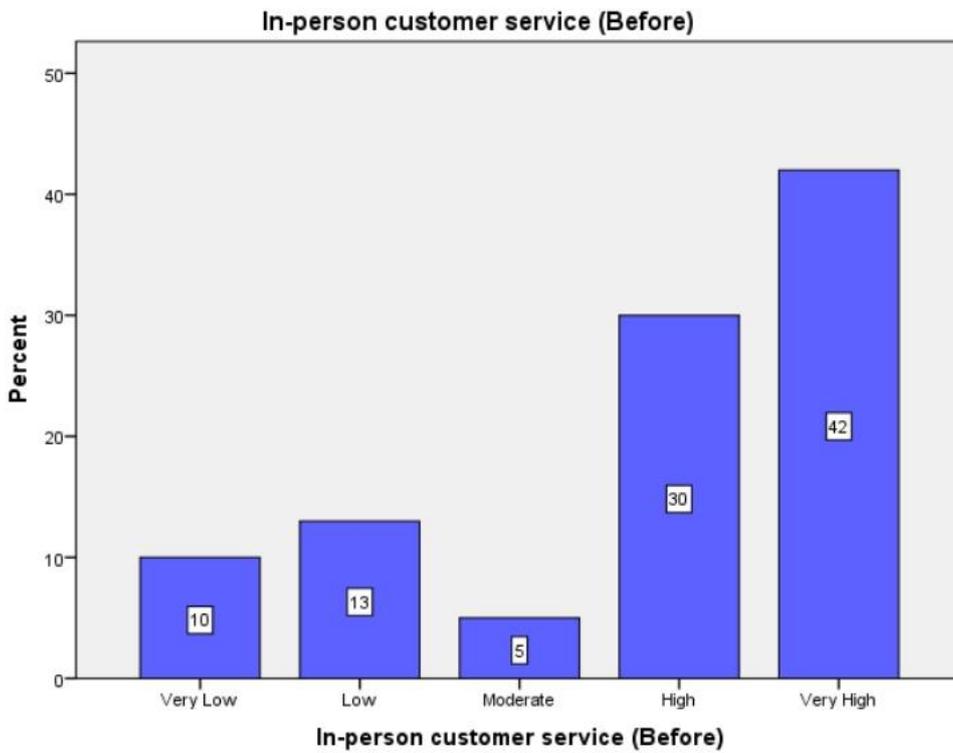


Figure 1 in-person customer service before covid-19

Use calls for customer service (Before)

The results in figure 2 depicted that calls were not mostly used for customer service since most of the responses showed that there was low and very low usage of calls for customer service, representing 40% and 33%, respectively. On the other hand, 10% of the responses were moderate on calls being used for customer service. In comparison, the rest of the responses were 11% and 6%, representing very high and high usage of calls for customer service, respectively. These results implied that before covid-19, most customer service was done in person rather than through calls.

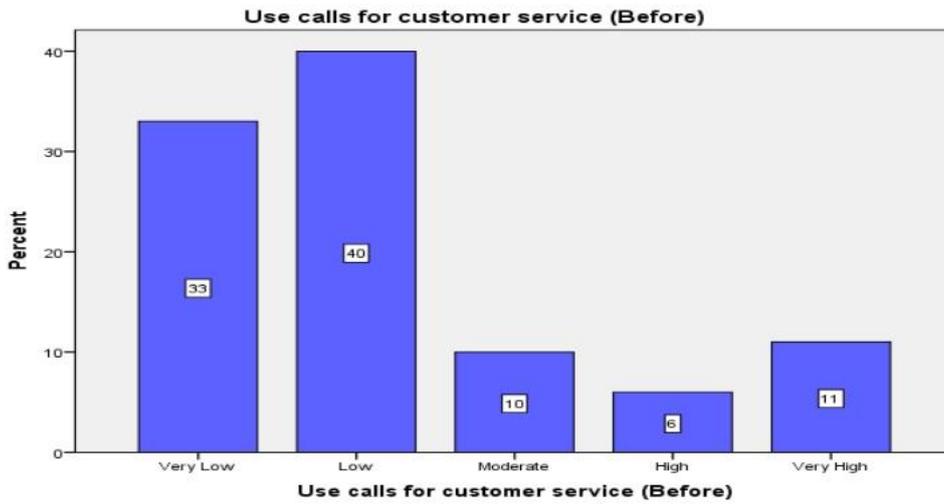


Figure 2 Use calls for customer service before COVID-19

Purchase of masks and sanitation equipment (Before)

Figure 3 showed that most responses on purchasing masks and sanitation equipment before covid-19 were very low and low. Since most of the responses indicated this, with each represented by 56% and 18%, respectively. The other responses were moderate, high, and very high, where each was represented by 8%, 13%, and 5%, respectively. These results implied that the majority of the people did not purchase masks and sanitation equipment since they were not necessary to them at that point in time.

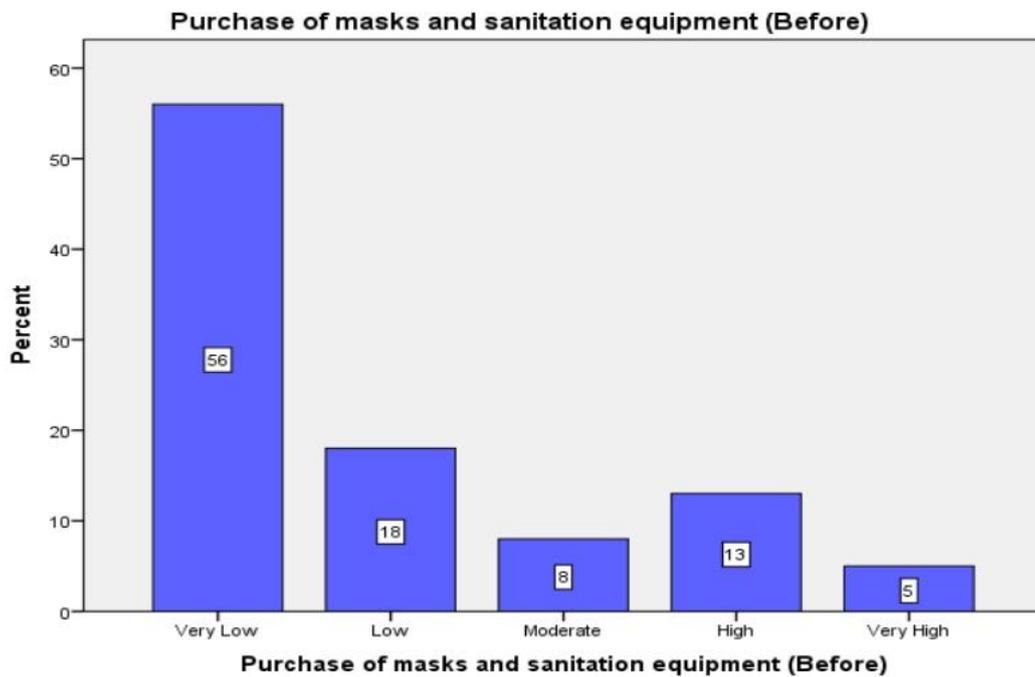


Figure 3 Purchase of Masks and Other equipment

Observing social distancing (Before)

The results in figure 4 showed that most of the responses on observing social distance before covid-19 were very low and low since most of the responses indicated this, representing 53% and 22%, respectively. The other responses were moderate, high, and very high, where each was represented by 12%, 11%, and 2%, respectively. These results implied that most people did not observe social

distancing before covid-19 since there were no regulations to follow or an infectious virus. Thus, that was not necessary for them during that period.

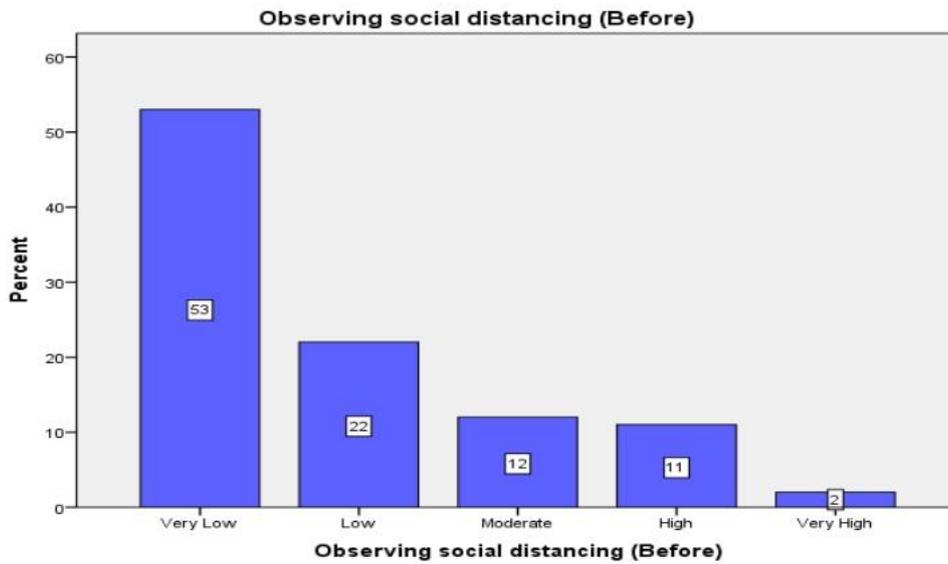


Figure 4 Observing Social Distance

In-person customer service (During)

The results showed that in-person customer service during the covid-19 era decreased by a very large percentage. Most of the responses indicated very low and low in-person customer service, representing 55% and 25%, respectively. The rest of the responses were moderate, which was 9%, followed by high, which was 7, % and finally, very high, which represented 4%. Since most of the responses indicated very low in-person customer service, this was evident that covid-19 negatively affected the physical interaction between businesses and customers. This is presented in Figure 5.

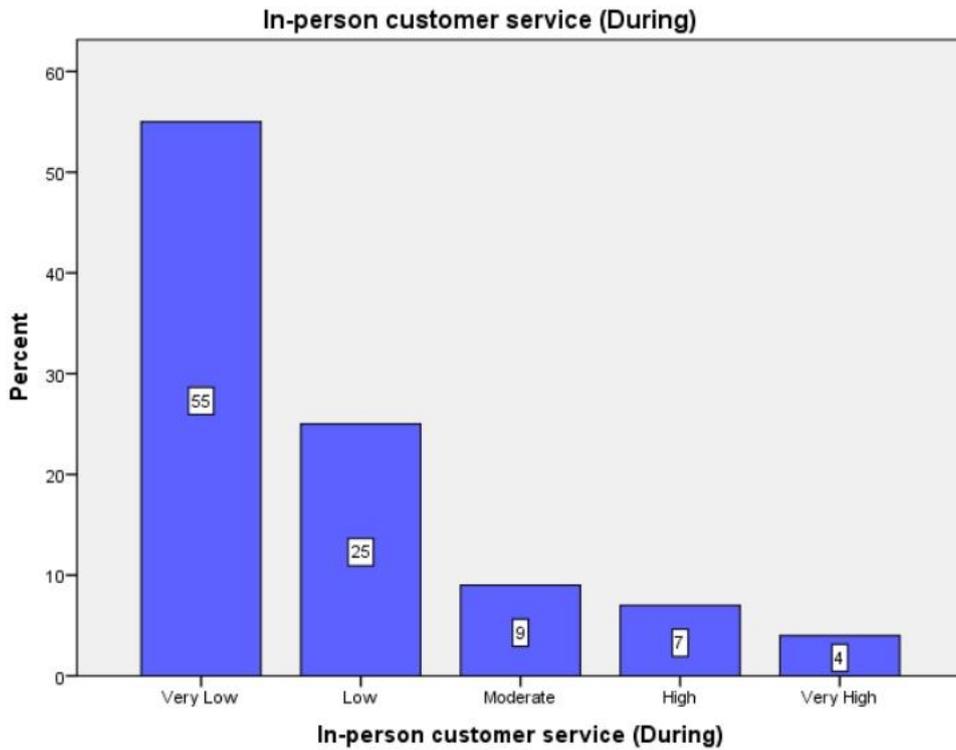
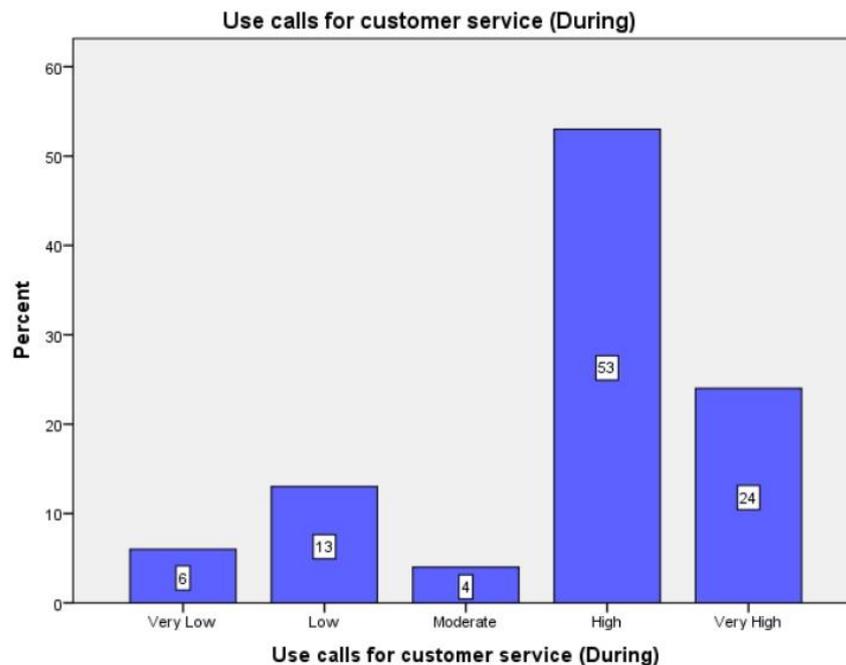


Figure 5 In-person Customers during Covid-19 Pandemic

Use calls for customer service (During)

The results in Figure 6 below showed that use of calls for customer service after covid-19 was very high, with each represented by 24% and 53%, respectively. Other results showed that 4% of the responses were moderate on the usage of calls for customer service, while the rest were low and very low, represented by 13% and 6%, respectively. These results implied that after covid-19, the usage of calls for customer service increased by a very high percentage since customers could not interact with businesses due to the



restrictions brought by the virus.

Figure 6 Use calls for customer service

Use emails for customer service (During)

The results showed that emails for customer service were almost the same for all the responses since there was a very small percentage of differentiating them. Most of the responses indicated that there was low usage of emails for customer service, which represented 24%, followed by responses that showed that there was very high usage of emails for customer service. The other responses were very low, high, and moderate, representing 21%, 18%, and 15%, respectively. This is presented in figure 7.

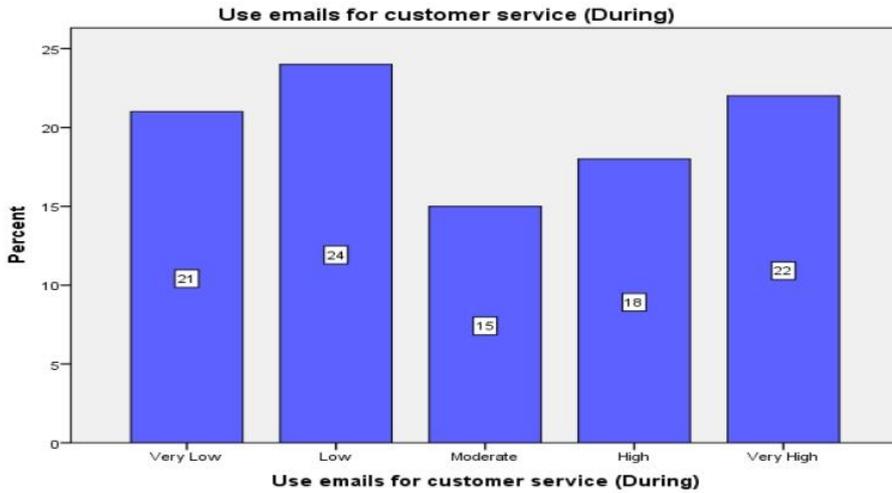


Figure 7 Use emails for customer service (During)

Purchase of masks and sanitation equipment (During)

The restrictions set aside by the ministry of health relating to the mandatory wearing of masks and sanitation led to an increase in the purchase of these items. Most of the responses showed a very high purchase of the items, represented by 24%, followed by high, represented by 21% and then moderate purchases, represented by 21%. Some responses indicated that the purchases of these items were low and very low, representing 19% and 15%, respectively. These results implied that due to the covid-19 impact, the business that sold masks and sanitation equipment increased their sales due to the high demand for the items. This presented in Figure 8.

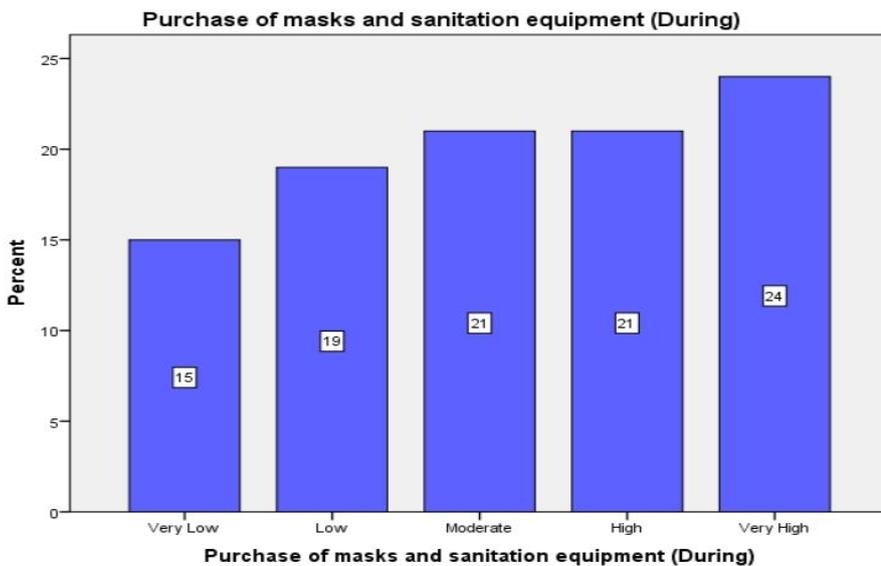


Figure 8 Purchase of Masks and Sanitation equipment (During)

Observing social distancing (During)

Due to the restrictions set aside by the ministry of health relating to observing social distance, many respondents indicated that observing social distance was very high and high, representing 25% and 23%, respectively. Some responses indicated that the observation of social distance was very low, low, and moderate, and these responses were represented by 21%, 16%, and 15%, respectively. These results implied that due to the covid-19 impact, most people were observing social distancing to avoid getting the virus. This is presented in Figure 9.

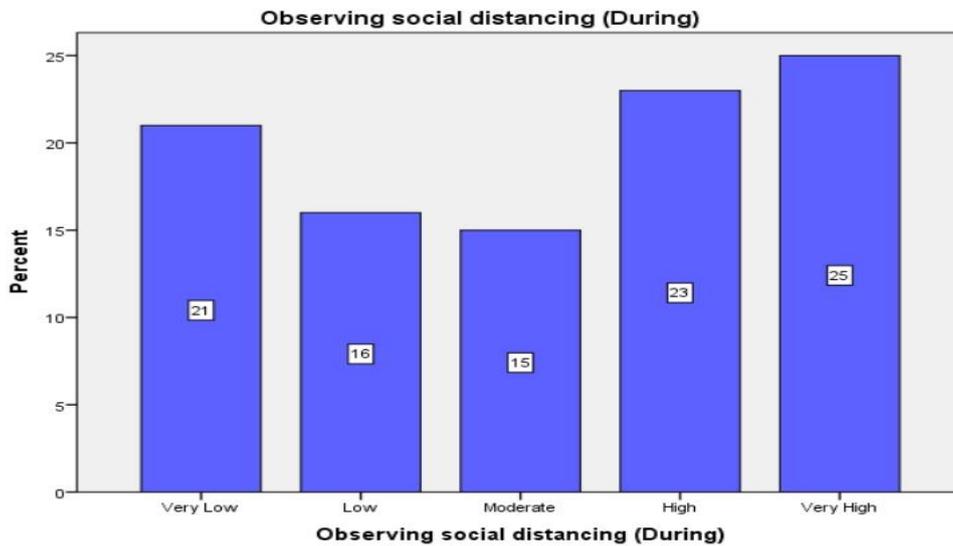


Figure 9 Observing social distancing (During)

Discussions

The study showed that before the outbreak, businesses in Garissa relied heavily on in-person customer service. The responses indicated that most businesses reported high and very high in-person customer service. Since there was no pandemic at the time, there were no restrictions put in place, thus, the customers and the businesses could interact. According to Calkins (2021), before the outbreak, most consumers made purchasing decisions based on what they saw, handled, and compared on supermarket shelves. Most businesses invest in point-of-sale merchandising, in-store promotions, and shelf-placing strategies to increase visibility and sales. However, the outbreak of COVID-19 resulted in restrictions such as social distancing, which meant the consumers could no longer visit the SMEs due to the fear of contracting the virus. The study showed respondent accounts of in-person consumer services in the county during the outbreak. From the accounts, in-person customer services dropped significantly, negatively affecting the SMEs. According to Kannan (2021), the world was unprepared when COVID-19 first hit. Therefore, most businesses did not know how to handle customer service. The pandemic was expected to last a short term before everything returned to normal. However, the pandemic persisted, which meant that the interim modifications put in place to mitigate the implications of COVID-19 became permanent, resulting in negative issues such as increased employment losses, and barring home repossession (Kannan, 2021).

Nevertheless, the outbreak had relatively positive impacts on SMEs that could find a way to cope with the pandemic. For instance, the presentations indicate that businesses that sold masks and sanitation equipment increased their sales significantly due to the high demand for the items. The availability of these items provided a buffer to the SMEs against the negative impacts brought by the drop in in-person customer services. According to Terlep (2021), hand sanitizer prices jumped 600 % during the outbreak, with companies such as Gojo industries adding a second factory as they expected the demand for hand sanitizer to persist well after the COVID-19 crisis faded. Similarly, the study showed a completely different perception of using calls for consumer services compared to the account, as SMEs in the county opted to introduce the use of calls as an alternative to in-person customer services. According to Kumar and Ayedee (2021), adopting technology, such as social media and ecommerce would help the SMEs adhere to the social distancing protocols during the outbreak while simultaneously maintaining consumer interaction which inadvertently increases sales and turnover. Therefore, the new approaches would serve as tools to increase business during the pandemic and maintain consumer interaction despite the restriction put forth by the government on social distancing.

Conclusion and Recommendations

The findings indicated that customer service was one of the measures of performance affected by the pandemic. From the researchers, because of how contagious the virus was, the Kenyan government and other world governments instituted a social distancing policy that restricted customers from participating in in-person purchases. Therefore, in-person customer services declined significantly, which inadvertently caused a decline in the performance of the SMEs. To combat the decline in performance, the SMEs had to shift to using phone calls instead of in-person customer services, which increased the frequency with which the phone calls were used. Similarly, SMEs that dealt with face masks and sanitation equipment increased their sale to improve performance. Based on these findings, the research urges future researchers to conduct further research on the performance of SMEs years after COVID-19 to show their health as the economy stabilizes. The research can help investors and other SMEs to learn the various approaches that can be taken in the aftermath of a devastating event such as the COVID-19 outbreak.

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