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s/n	Contents	Pages
1	Knowledge Management Tools Applications and Organizational Performance of Manufacturing Firms in Rivers State, Nigeria Evwierhurhoma, Daniel Ejiroghene and Prof. B. Chima Onouha	1-16
2	Information and Communication Technology: A Veritable Instrument for Distance Education Owuamanam Catherine Nkechinyere (Ph.D)	17-33
3	Effects of Entrepreneurship in the Management of Economic Recession in Nigeria Azojiri Emmanuel .N. and Jonathan Chibiko Nzube	34-56
4	Effects Introduction of New Method for Servicing and Maintenance of Automobile Engines in Nigeria Government Agencies, Case Study: Maritime Academy of Nigeria, Oron, Akwa Ibom State, Nigeria Eng. Uwaoma Blessing and Chibiko Jonathan	57-62
5	Appraisal of the Management of Internally Displaced Persons (IDPs) in Nigeria Dr. Dominic Shimawua	63-75
6	Studies on Some Diseases Associated with Mitochondrial Disorder Aliyu Isa; Abulazeez Ibrahim Mohammad; Bintu Imam & Amina B. Majama	76-83
7	Knowledge Management and Supply Chain Performance of Public Universities in Rivers State Harcourt Horsfall (PhD), Ikegwuru Mac-Kingsley (PhD) and Adiele, KenethC. (PhD)	84-96
8	Development and Characterizations of Mechanical Properties of Sisal Fiber Reinforced Recycled Polypropylene Composites (SFRRPPC) Usman, I., Hammajam. A.A. and Ahmed M.B.	97-108



Knowledge Management Tools Applications and Organizational Performance of Manufacturing Firms in Rivers State, Nigeria

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Abstract: *The purpose of this study is to determine the relationship between knowledge management tools applications and organizational performance of manufacturing firms in Rivers State, Nigeria. Social media and collaborative tools were used as the dimensions of knowledge management tools applications while profitability and customer satisfaction were used as the measures organizational performance. The study adopted the cross-sectional research survey design with accessible population of 144 managers as the respondents. The study adopted questionnaire as the research instrument and spearman's rank order correlation coefficient statistical was used to test stated hypotheses with the aid of SPSS. The findings show a positive and significant relationship between the dimensions of knowledge management tools applications and the measures of organizational performance. Thus, we recommended that for managers of manufacturing firms to enhance their organizational performance in terms of profitability and customers' satisfaction, they should manage their organization's knowledge effectively and efficiently through the applications of social media and collaborative tools.*

Key words: Knowledge; Social Media Tools; Collaborative Tools; Profitability; Customer Satisfaction

1. INTRODUCTION

The manufacturing sector is a major driving force of any economy in the world. The sector is in charge of manufacturing of products vis-à-vis goods and services as well a major source of employment; thus an important means for accelerating both the development and growth of any economy. As important as the manufacturing sector to the development of any economy in the world, the case is different in Nigeria. The history of manufacturing and industrial development in Nigeria reflects how a country has overtime neglected this essential sector due to irregularities in policies and the discovery of oil in commercial quantity in the 1970s (Adeola, 2005). No nations in the world can attain remarkable development without high performing manufacturing sector and for the sector to contribute to the development of Nigeria as a nation; their performance has to be enhanced. This is because the manufacturing firms have

great capability to provide a lot of employment to the increasing population of Nigeria as well provides the necessary environment for other sectors' growth. However, most of these firms in Nigeria have suffered immense setbacks in terms of their performance.

Organizational performance lies at the heart of a firm's survival and it is the one of the most important goal of every enterprise whether small or large, profit or non-profit, public or private enterprises (Ismael, Yusof and Davoud, 2010). Lebars and Euske (2006) expressed that organizational performance has to do with financial and non-financial indicators showing how well an organization has achieve its set goals. These indicators include market share, profitability, the satisfaction of customers, quality of product among others indicators which offers information about the success of the organization. Furthermore, today's business environment the manufacturing firms found themselves is full of frequent changes, increase in globalization as well a knowledge oriented environment that affects their success. Therefore, the survival and performance of these manufacturing firms is dependent upon their capabilities in the development of knowledge oriented competencies that can meet up with today's business environmental changes. In this present information (knowledge) era, knowledge has become an important resource to improving the performance of the organization which needs to be appropriately managed with the application of the right tools.

Knowledge is power as they anonymously say, however it is the knowledge that is rightly applied through the right knowledge management tools that is actually power. This is because many organizations have knowledge but the problem lies in the right tools to apply the possessed knowledge that will bring about an enhanced organizational performance. The effective and efficient management of knowledge is extremely crucial to enhancing organizational success. Thus, Lee and Sukoco (2007) expressed that for any organizations to achieve enhanced performance is not only by successfully deploying of tangible assets and natural resources but also the proper knowledge management, through appropriate tools. This is because the always increasing competitive worldwide business environment has created a hyper-competitive environment for organizations that only through their knowledge assets base will they be able to survive and improve performance.

Knowledge management according to Wong, Tan, Lee and Wong (2015) means the process of managing knowledge through a systematically and organizationally specified process. Organizations will not be able to benefit from knowledge without the applications of some necessary tools. These knowledge management tools according to Uriarte (2008) are hi-tech infrastructure consisting of computers, database, network applications which helps the organization to facilitate effective knowledge management. The importance of knowledge management tools cannot be taken for granted because business firms needs knowledge to improving its performance in today's dynamic environment we are in which must be carried out through some appropriate tools.

Knowledge has become a necessity and a means to gaining advantage competitively for every organization that will brings an enhanced organizational performance. In today's business environment full of frequent changes and uncertainty, Nonaka, Toyama, and Konno (2000) expressed that flourishing organizations are the ones that can continuously generate new knowledge, share and store it using appropriate tools. As such, successful application of

knowledge through the right tools can enable the organization gain competitive advantage and enhanced their performance (Heisig, Suraj, Kianto and Faith, 2016). However, there is disagreement on the influence of knowledge management vis-à-vis its tools on organizational performance (Sabherwal and Becerra-Fernandez, 2003; Barney, 1995; Vera and Crossan, 2003). These inconsistent observations indicate that knowledge management vis-à-vis tools application influence on organization's performance is still open for examination. More so, this study does not only focus on knowledge management and organizational performance but knowledge management tools applications and organizational performance of manufacturing firms which has not received much attention as most studies (Darroch, 2005; Leonard, 1992; Mills and Smith, 2011) has over the years focused on knowledge management and organizational performance.

Statement of the Problem

In Nigeria, the manufacturing firms have performed below expectation due to a combination of problems which ranges from factors such as poor infrastructure, low-sales, double taxation, infrastructural decay, erratic power supply and frequent government policy inconsistencies among others which has led to the failure of the manufacturing organizations to achieve stated goals and objectives.

Knowledge is an essential resource of any firms, manufacturing firms inclusive, however, only some organizations have been able to exploit this resource in a way that will enhance the performance of the firm. As today's economy becomes more knowledge oriented, so does the need to effectively and efficiently apply the right knowledge management tools in all organizations to improve performance. However, one of the major factors that have affected organizational performance of today is the inability to apply the right tool and behaviour that promotes knowledge acquisitions, sharing, as well as storing. Also, having knowledgeable employee does not guarantee for continuous success and performance, the reason been that the success and performance of the organization lies in the application of knowledge with the right tools.

Aim and Objectives of the Study

The aim of the study is to examine the relationship between knowledge management tool application and organizational performance of manufacturing firms in Rivers State, Nigeria. More so, the specific objectives of this study are to:

- i. Determine the relationship between social medial tools and profitability of manufacturing firms in Rivers State, Nigeria.
- ii. Determine the relationship between social medial tools and customer satisfaction of manufacturing firms in Rivers State, Nigeria.
- iii. Determine the relationship between collaborative tools and profitability of manufacturing firms in Rivers State, Nigeria.
- iv. Determine the relationship between collaborative tools and customer satisfaction of manufacturing firms in Rivers State, Nigeria.

Research Questions

Below are the research questions formulated to achieve the aim and objectives of this research:

- i. What is the relationship between social medial tools and profitability of manufacturing firms in Rivers State, Nigeria?
- ii. What is the relationship between social medial tools and customer satisfaction of manufacturing firms in Rivers State, Nigeria?
- iii. What is the relationship between collaborative tools and profitability of manufacturing firms in Rivers State, Nigeria?
- iv. What is the relationship between collaborative tools and customer satisfaction of manufacturing firms in Rivers State, Nigeria?

Research Hypotheses

The research hypotheses for this work are stated in the null form and they are as follows:

H0₁: There is no significant relationship between social medial tools and profitability of manufacturing firms in Rivers State, Nigeria.

H0₂: There is no significant relationship between social medial tools and customer satisfaction of manufacturing firms in Rivers State, Nigeria.

H0₃: There is no significant relationship between collaborative tools and profitability of manufacturing firms in Rivers State, Nigeria.

H0₄: There is no significant relationship between collaborative tools and customer satisfaction of manufacturing firms in Rivers State, Nigeria.

2. LITERATURE REVIEW

Theoretical Framework

The theory covering this work is resource based theory which holds that business enterprises must have required resources at their disposal so as to gain advantage competitively and enhance organizational performance (Wernerfelt, 1984). Resource based theory has to do with organization's resources used as input in the operation of the organization and sometimes these resources such as knowledge is scarce and inadequate. Overall, the resource-based theory holds that organizations should exploit and maximize the differences in their resource endowments, capabilities and competencies as bases to design strategies to gain competitive advantage in the market (Raduan, Jegak, Haslinda and Alimin, 2009). Thus, organizations should be able to manage any given knowledge effectively that will yield organizational success. Business enterprise can improve on their performance if they have the appropriate resources (that is knowledge) which are well managed with the right tools. In other words, organizations can attain performance through effective and efficient management of knowledge as organizational resource using appropriate tools.

Conceptual Framework

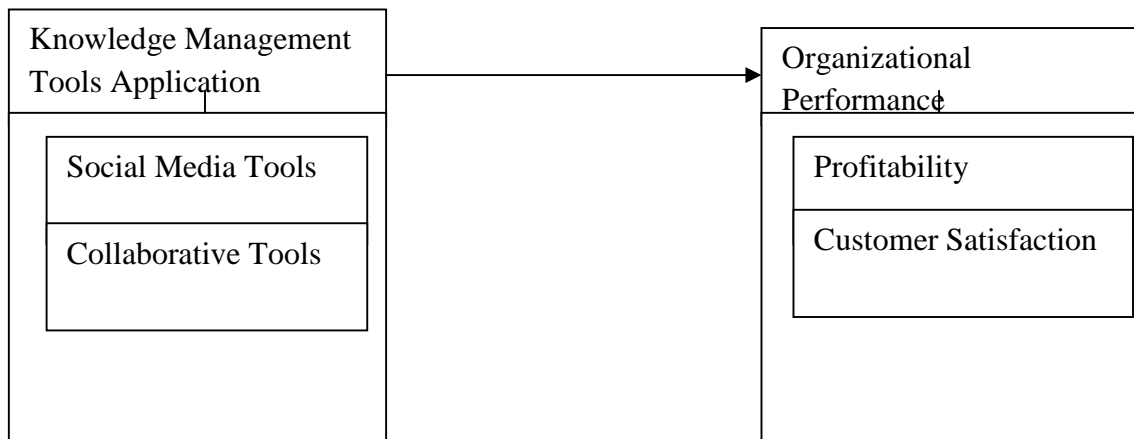


Figure 2.1: Conceptual framework of knowledge management tools application and organizational performance.

Source: Desk Research, 2019.

Knowledge Management Tools Application

Nowadays business enterprises are basically different when compare to older business enterprises that was in existence say fifty years ago due to frequent changes in the environment which has also resulted in changes in the way today's enterprise are been managed. Thus, according to Yu (2003) today's business enterprise put more focus on how to understand, adapt and manage changes in the environment as well compete on the basis of acquiring and using knowledge so as to effectively meet customer' needs. Knowledge according to Davernport, De Long and Beers (1998) is the information that is combined with experience, context, interpretation and reflection. Knowledge is crucial resource, whose efficient usage assists firms to offer innovative products that can affect their performance.

More so, Alan (2012) defined knowledge management as a process of managing firm's knowledge assets so as to create value and meet tactical and strategic requirements through the creation, sharing, and storage of knowledge. It has to do with the systematic process by which the firm gets value from its knowledge based assets. Thus, it can be seen as the management of behaviour which can raise the efficient use of knowledge and thereby the performance ability of the organization. Further, Uriarte (2008) expressed that knowledge management tools are hi-tech infrastructure consisting of computers, database, network applications which helps the organization to facilitate effective knowledge management. The tools for knowledge management are focused on assimilation, comprehension, and learning of the information by individuals who will then transform data and information into knowledge to enhance organizational performance (Stankosky, 2008). Knowledge management tools are used in the creation, organization and sharing knowledge in the organization from one employee to another. It therefore, facilitates knowledge capturing, development, storage, transfer and application in the organization.

Social Media Tools

Social media tools are tools that facilitate the communication between individuals whereby they create and exchange knowledge in a virtual community (Mueller, 2014). Kaplan and Haenlein (2010) expressed that social media tools consist of a collection of internet-based tools that assist users to create knowledge and share it with other users. There has been an increase use of social media tool in business enterprise at a global level among organizations and it has become more than just a tool for external communication to that of knowledge management. Social media tools are bringing swift changes to organization's communication process as well helping business organizations to becoming more socially engaged. Social media tools according to Boyd and Ellison (2007) allows organizations to create a stronger relationship with the community of reference, in order to exploit the network effect and harness collective intelligence and knowledge. It includes various methods such as social networking, blogs, forum, wiki etc. (Kietzmann and Hermkens, 2011).

Collaborative Tools

Collaboration tools are very significant tools used in managing knowledge in the organization especially if workers are dispersed. This is because it provides a kind of large forum in which employees work together over long distances and at different times of the day. Collaborative tools enables employees to work in a secure online workspace by using e-mail, internet web browser and computer or laptop applications so as to share or disseminate knowledge, build closer organizational relationships and streamline work processes (Chakravarthy, Vajre and Deshmukh, 2015). Such an environment also encourage employees in sharing information thereby providing access to knowledge and offer better user interface for internal and external users, thus providing the link between the organization and its partners as well as customers. Collaborative tools include audio conference, chat, and community of practice.

Organizational Performance

Organizational performance is the degree to which a particular business enterprise achieves its stated goals and objectives (Lee and Choi, 2003). Richard, Devinney, George and Johnson (2009) express that it has to do with the establishment of organization's objectives and monitoring improvement towards achieving the stated objectives as well make modification in attaining those goals in an effective and efficient way. In other words it is the outcome of the organization. Furthermore, Organizational performance is a way of measuring the efficiency and effectiveness of organization's action which has to do with the assessment of advancement made towards the attainment of the set objectives. In business it is recognized as a central outcome variable of interest, ranging from human resources and marketing to operations management. According to Pierre, Timothy, George and Gerry (2011) it covers three distinct areas which include performance financially (which include profitability, return on investment); market performance (which include customer satisfaction, market share); and shareholder return, however, this study focused on only profitability and customer satisfaction.

Profits are pointers of organization's good performance from the organization's activities. Profit refers to the ability of the organization to generate income (Griffith and Carroll,

2001). Lipsey, Kenneth, Carlaw and Richard (2003) define profitability as the ability of an organization to maximize revenues and minimize cost. It thus means how well the organization is performing measured in terms of net profit margin. Profitability is very significant to ensuring the continuity of the organization and organization that is not making profit won't be able to survive.

Furthermore, Homburg (2005) defined customer satisfaction as an assessment of previously held expectations with perceived product or service performance. The success of the organization is dependent on the customers' satisfaction; this is because the ability to produce a given product depends on the customers who will consume the produced products; hence without customers no organization will exist. Nowadays organizations have come to realized that the satisfactions of customers play major roles in expanding the market share as well improving the performance of the organization. This is as a result that satisfied customers habitually return to buy more and work as a network to luring other prospective customers in purchasing the organization's product by sharing their experiences. If organizations are able to satisfy their customers, then it is certain that customers will be loyal to the organization (Hague and Hague, 2016).

3. METHODOLOGY

This study adopted quasi-experimental design in the form of a cross sectional survey that studies the relationship between knowledge management tools application and organizational performance. The above research design was adopted because the variables were not under our control. The analysis unit was on the organizational level that is manufacturing firms operating in Rivers State. The target population of the study consists of 48 manufacturing firms operating within Rivers State gotten from Manufacturers' Association of Nigeria, Rivers State Chapter. However, since the study is at the organizational level with 48 firms as the population, we used all the 48 firms as our sample size. Moreover, for the sake of data analysis the questionnaire which was used as the research instrument was distributed to 3 managers in human resources, marketing and production department in each of the firms bringing the number of respondents to 144 respondents.

The research instrument consist of three respond choices with point scales ranging from 1 to 5 indicating strongly disagree, disagree, indifference, agree and strongly disagree respectively. The predictor variable is knowledge management tools application with dimensions of social media tools and video tools and the criterion variable is organizational performance measured with profitability and customer satisfaction. We used face and content validity to make sure the instrument measured what it intended to measure while the reliability of the instrument was done through Cronbach Alpha and the result reveals 0.826, 0.843, 0.849 and 0.817 for social media tools, collaborative tools, profitability and customer satisfaction respectively.

Furthermore, out of the 144 questionnaires that were distributed to respondents, 124 of the retrieved questionnaire were useful and it was therefore used for our analysis. The collected data was analyzed using the spearman's rank order correlation coefficient statistical

in analyzing the stated hypotheses with the aid of SPSS, Windows version 25 within a significance level of 0.05.

4. DATA ANALYSIS AND RESULT

The 0.05 significance level was used as criterion for either accepting the alternate hypotheses at PV less than 0.05 or rejecting the null hypotheses at PV greater than 0.05 as well using multiple regression analysis.

The Strength of the Relationship between Knowledge Management Tools Application and Organizational Performance

Table 1: Strength of Association between Knowledge Management Tools Application and Organizational Performance

Correlations			Knowledge Management Tools Application	Organizational Performance
Spearman's rho	Knowledge Management Tools Application	Correlation Coefficient	1.000	.951**
		Sig. (2-tailed)	.	.000
		N	124	124
	Organizational Performance	Correlation Coefficient	.951**	1.000
		Sig. (2-tailed)	.000	.
		N	124	124

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

Source: SPSS Result, version 25.0

Table 1 shows that a very strong and positive significant relationship exist between knowledge management tools application and organizational performance with a ($\rho = 0.951$) and a P-value at 0.000 which is less than 0.05. This means that knowledge management tools application influences organizational performance significantly.

The Strength of the Relationship between Social Medial Tools and Organizational Performance (Profitability and Customer Satisfaction)

Table 2 Correlation Matrix on the Strength of Association between Social Medial Tools and Organizational Performance (Profitability and Customer Satisfaction)

Correlations			Social Media Tools	Profitability	Customer Satisfaction
Spearman's rho	Social Media Tools	Correlation Coefficient	1.000	.923**	.926**
		Sig. (2-tailed)	.	.000	.000
		N	124	124	124
	Profitability	Correlation Coefficient	.923**	1.000	.939**
		Sig. (2-tailed)	.000	.	.000
		N	124	124	124
	Customer Satisfaction	Correlation Coefficient	.926**	.939**	1.000
		Sig. (2-tailed)	.000	.000	.
		N	124	124	124

	Sig. (2-tailed)	.000	.000	.
	N	124	124	124

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

Source: SPSS Result, version 25.0

Table 2 above shows a very strong and positive significant relationship between social medial tools and profitability with a ($\rho = 0.923$) and a P-value at 0.000 less than 0.05; similarly from the same Table 2 above a very strong and positive relationship exist between social medial tools and customer satisfaction with a ($\rho = 0.926$) and a P-value at 0.000 less than 0.05. This means that social medial tools influences profitability and customer satisfaction respectively.

The Strength of the Relationship between Collaboration Tools and Organizational Performance (Profitability and Customer Satisfaction)

Table 3: Correlation Matrix on the Strength of Association between Collaboration Tools and Organizational Performance (Profitability and Customer Satisfaction)

Correlations			Collaborative Tools	Profitability	Customer Satisfaction
Spearman's rho	Collaborative Tools	Correlation Coefficient	1.000	.919**	.936**
		Sig. (2-tailed)	.	.000	.000
		N	124	124	124
	Profitability	Correlation Coefficient	.919**	1.000	.939**
		Sig. (2-tailed)	.000	.	.000
		N	124	124	124
	Customer Satisfaction	Correlation Coefficient	.936**	.939**	1.000
		Sig. (2-tailed)	.000	.000	.
		N	124	124	124

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

Source: SPSS Result, version 25.0

Table 3 above shows a very strong and positive significant relationship between collaborative tools and profitability with a ($\rho = 0.919$) and a PV of 0.000 less than 0.05; similarly from the same Table 3 above a very strong and positive relationship also exist between collaborative tools and customer satisfaction with a ($\rho = 0.939$) and a PV of 0.000 less than 0.05. This means that collaborative tools influences profitability and customer satisfaction respectively.

Table 4: Effect of Knowledge Management Tools Application (Social Media Tools and Collaborative Tools) on Profitability

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.922 ^a	.850	.847	.84279

a. Predictors: (Constant), Collaborative Tools, Social Media Tools

Source: SPSS Result, version 25.0

Table 4 above showed an R^2 of 0.850 which means that social media tools and collaborative tools accounts for 85.0% of the outcome of profitability while the other 15% is unaccounted for. More so, R of 0.922 showed a very strong and positive significant influence of social media tools and collaborative tools on profitability.

Table 5: Multiple Regression Result on Knowledge Management Tools Application (Social Media Tools and Collaboration Tools) and Profitability

Coefficients ^a					
Model		Unstandardized Coefficients		Standardized Coefficients	Sig.
		B	Std. Error	Beta	
1	(Constant)	4.408	.718		6.140
	Social Media Tools	.512	.217	.339	2.359
	Collaborative Tools	.797	.195	.589	4.093

a. Dependent Variable: Profitability

Source: SPSS Result, version 25.0

Model 6: Effect of Knowledge Management Tools Application (Social Media Tools and Collaborative Tools) on Customer Satisfaction

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.926 ^a	.858	.856	.57461

a. Predictors: (Constant), Collaborative Tools, Social Media Tools

Source: SPSS Result, version 25.0

Table 6 above showed an R^2 of 0.858 which means that social media tools and collaborative tools accounts for 85.8% of the outcome of customer satisfaction while the other 14.2% is unaccounted for. More so, R of 0.926 showed a very strong and positive significant influence of social media tools and collaborative tools on market share.

Table 7: Multiple Regression Result on Knowledge Management Tools Application (Social Media Tools and Collaboration Tools) and Customer Satisfaction

Coefficients ^a					
Model		Unstandardized Coefficients		Standardized Coefficients	Sig.
		B	Std. Error	Beta	
1	(Constant)	.359	.490		8.733
	Social Media Tools	.640	.148	.982	7.026
	Collaborative Tools	.305	.133	.357	2.411

a. Dependent Variable: Customer Satisfaction

Source: SPSS Result, version 25.0

Testing of Hypotheses

Hypothesis 1

Table 2 shows a PV = 0.000 less than 0.05 and Table 5 shows $\beta = 0.512$; $t\text{-cal.} = 2.359 > t\text{-crit.} = 1.96$ at 0.05% which means that the relationship between social media tools and profitability is statistically significant. We therefore accept the alternate hypothesis, thus there is significant relationship between social media tools and profitability of Manufacturing Firms in Rivers State, Nigeria.

Hypothesis 2

Table 3 shows a PV = 0.000 less than 0.05 and Table 5 shows $\beta = 0.797$; $t\text{-cal.} = 4.093 > t\text{-crit.} = 1.96$ at 0.05% which means that the relationship between collaborative tools and profitability is statistically significant. We therefore accept the alternate hypothesis, thus there is significant relationship between collaborative tools and profitability of Manufacturing Firms in Rivers State, Nigeria.

Hypothesis 3

Table 2 shows a PV = 0.000 less than 0.05 and Table 7 shows $\beta = 0.640$; $t\text{-cal.} = 7.026 > t\text{-crit.} = 1.96$ at 0.05% which means that the relationship between social media tools and customer satisfaction is statistically significant. We therefore accept the alternate hypothesis, thus there is significant relationship between social media tools and customer satisfaction of Manufacturing Firms in Rivers State, Nigeria.

Hypothesis 4

Table 3 shows a PV = 0.000 less than 0.05 and Table 7 shows $\beta = 0.305$; $t\text{-cal.} = 2.411 > t\text{-crit.} = 1.96$ at 0.05% which means that the relationship between collaborative tools and customer satisfaction is statistically significant. We therefore accept the alternate hypothesis, thus there is significant relationship between collaborative tools and customer satisfaction of Manufacturing Firms in Rivers State, Nigeria.

Discussion of Findings

The result of the analysis revealed that knowledge management tools application significantly and positively affect organizational performance. Hence, applying the right knowledge management tools is one fundamental factor, which influences performance of organizations. This is because a worker who can access the required as well relevant information will be able to carry out his or her given task in a better way that will improve their performance (Han and Anantatmula, 2007), thus organizational knowledge must be managed with the appropriate tools that facilitates sharing and storing of information. The adoption and application of knowledge management tools brings about quicker access to significant information needed for better decisions making processes that brings about improved processes and performance in the organization. The process brings substantial savings both financially and time wise leading to better performance of the organization.

Furthermore, Uriarte (2008) expressly observed that through knowledge management tools, the organization can turn knowledge into a strategic asset and create an ever learning

organization and by making them readily available throughout the organization, the entire organization can learn and respond quickly to needs of customers whereby their performance can be enhanced. Knowledge management is very important because knowledge (experience and expertise) been an important assets in the organization which play a major roles in organizational success most of the times lies in the heads of the employees and managers; thus, in order to get optimum gain from this asset, method must be adopted to capture, share and store for easy access by employees through tools such as collaborative and social media tools and by sharing and storing such knowledge where the right person will have access to it for on time decision making increases the performance of the organization.

More so, the relationship between social medial tool and profitability showed a positive and significant relationship which is consistent with the findings of Rodriguez, Peterson and Ajjan (2015); Paniagua and Sapena (2014). They found that the application of social media significantly influences customers' purchase decisions and purchasing activities and therefore increase sales and organizational profitability. By applying social media tool in organizational marketing, organizations will be able to obtain additional information and manage the acquired information more effectively about customers, competitors as well the general market needs which will improve the information accessibility of the organizations to take better decisions that will result in higher profitability for the organization.

Also, the analysis of collected data revealed that social media tools significantly affect customer satisfaction. Thus, Cherotich (2016) observed that the adoption and application of social media tools to communicate organizational brands boost customer awareness and satisfaction. Hoyer and MacInnis (2010) expressed that social media tools has radically improves the relationship between the organization and the customers through a two way communication pattern and providing mediums of interaction with both present and prospect customers which boost relationship between customers and the organization. Using social media tools help the organization to access or gain knowledge on what the needs of customers are so as to produce products to meets those needs which improved customer relations, thereby enhancing their satisfaction.

It was also found that collaborative tools significantly affect the profitability of the manufacturing firms in Rivers State, Nigeria. The application of collaborative tools in managing knowledge according to Kim and Ko (2012) allows organizations to carry out included marketing activities with a reduced amount of effort, better efficiencies and less cost which invariably leads to enhanced profitability for the organization. This is because the applications of collaborative tools to communicate with customers have a significant influence in their purchasing decisions and thereby increasing the profit of the organization. Collaborative tools such as audio conferences helps to reduce cost associated with travelling in the organization as well allowing employees to be more industrious by not having to leave the office for meetings, especially when they are working in a far sites or location resulting in higher profit for the organization in terms cost of logistics.

Furthermore, collaborative tools also affect customer satisfaction of manufacturing firms in Rivers State, Nigeria significantly according to our data analysis. Gordhamer (2009) expressed that consumers nowadays are very knowledgeable and are becoming more difficult

to manage; therefore, organizations must be accessible and available at any time by applying collaborative tools like community of practice. This will help the organization get rich information about customers' needs and the way to serve them better and build up good relationship environment with them. Also, such environment will promote the sharing of information by employees in so doing provides access to knowledge and offer better user interface for internal and external users, thus promoting relationship between the organization and its stakeholders in such a way to satisfying them better. In improving the relationship with customers, knowledge management tools like that of collaborative tools helps in knowing customers better such as records of customers' demographics as well as address which help in serving the customers better.

5. CONCLUSION

This study provides a positive and significant relationship between knowledge management tools application and organizational performance of manufacturing firms in Rivers State, Nigeria. From the findings of our study it is obvious to conclude that knowledge management is an important aspect of the organization and applying it using the right tools such as social medial and collaborative tools organization will be able to increase their performance especially that of profitability and customer satisfaction. Knowledge management is a significant facet of organizational management as it enables better decisions process and help in the provisions of solutions to organizational problem effectively and efficiently; thus, using the right tools to manage the knowledge of the organization result in enhanced organizational performance.

6. RECOMMENDATIONS

The following are the recommendation from our findings

1. We recommend that for managers of manufacturing firms to enhance their organizational performance in terms of profitability and customers' satisfaction, they should manage their organization's knowledge effectively and efficiently through the applications of social media and collaborative tools.
2. Manufacturing firms' managers should encourage the sharing of knowledge between employees and other stakeholders especially customers with application of social media tools.
3. Employees should be trained on how to use effectively social media and collaborative tools that will bring about enhanced performance to the organization.

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Information and Communication Technology: A Veritable Instrument for Distance Education

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Abstract: *The problem of demand for education versus actual supply of educational services contributed to the acceptance, growth and implementation of distance education programmes as it bridges the gap between demand and supply. In view of the above, this paper examines the role of Information and Communication Technologies (ICTs) in Distance education. It examines the concepts of Distance education, Information and Communication Technology, Technology-based media for Distance education and factors that need to be put into consideration before utilizing ICTs for instruction.*

Key words: Distance education, Information and Communication Technology, Technological-based media

Introduction

Education is very relevant for the development of an individual and as a weapon against ignorance, conflict, disease and poverty. It demands organized information processing systems which will help to coordinate and transform vital ideas, emotions and feelings into life supporting operations (FME, 2007). Education is the basic need of every human being and today's technology has a big part in every sphere of life (Bates, 1995).

Distance education is a set of practices to plan and implement educational activities when there is a separation between teaching and learning. That separation may result from distance, time or other barriers (Mujibul, 2008). According to Barron (1999a), distance education is "a form of education in which students are remote from the distance education institution. The instructors and the students are not in the time or space for a significant portion of their learning".

Similarly, Garrison (as cited in Timothy, 2018) proposed three criteria that would define the field: First, distance education implies that the majority of educational communication between teachers and students occurs non-contiguously. Secondly, distance education involve two way communications between teachers and students for the purpose of facilitating and supporting the educational process and thirdly, distance education uses technology to mediate the necessary two- way communication.

Distance education offers a way to overcome this separation, chiefly through its learning materials and the use of ICTs to provide tutoring, linking learners to the system and each other, use of feedback and student support systems (Mujibul, 2008). ICTs are the acquisition,

processing, storage and dissemination of vocal, practical, textual and numeric information by a micro-electronic based combination of computing and telecommunication. In the words of Iwu (2006), ICTs is:

an umbrella term that includes any communication devices or application, encompassing radio, televisions, cellular phones, computer networks, hard ware, soft ware, electronic mail, facsimile, satellite system as well as the various services and applications associated with them. This includes but not limited to videoconferencing, internet technologies, audio conferencing and multimedia utilization.

The application of new technologies in the distance education context provides appropriate starting point for delineating the knowledge base required of expert teachers in today's global society. Teaching the distance learners requires different skills to prepare relevant learning materials to facilitate the construction of knowledge and learning. Technology –mediated instruction uses ICTs to mediate the learning experience and interactions without requiring that learners and instructors to be located together (Graham and Dziuban, 2006).

Distance education may utilize any/or a combination of the following four technologies: Printed materials, Audio/voice technologies, Video technologies and Computer technologies. This also fall into four instructional uses such as tools for retrieving information, tools for communication, tools for electronic/multimedia production and presentation, integrated mixture of tools that support text and so on (Mujibul, 2008). ICTs however, have provided avenue for enriching the quality and quantity of instructional content offered through distance education. It has also provided avenue for facilitating interaction between the teachers and group of students or among students.

In utilizing ICTs for instructional delivery and other purposes, a number of factors need to be put into consideration. These factors include: affordability, availability, access and the unique pedagogical characteristics of the particular technological application, instructional objectives, financial resources available at the institution and student personal resources (Victoria, 2002). In view of the above facts, this paper examines the role of ICTs in distance education.

Distance Education

Education is the process of developing knowledge ability in learners in such a way that knowledge is utilized to improve themselves and their society (FME, 2007). Education familiarizes individual members with the physical features of the society together with its cultural patterns and practices as well as the effect of these on the individual's behaviour and competence. While enabling him to constantly bear in mind the social realities, education also constantly makes him have a mental picture of a hoped for physical and social arrangements that would produce the congenial environment for development (Onwuka, 1996).

The word "distance" in itself denotes separation or isolation. Distance education

therefore, is defined as a form of education and training delivered in which students are remote from the distance education institution. The instructors and the students are not in the same location. Learners are separated from instructional base or teachers either in time or space for a significant portion of their learning (Barron, 1999a). According to Mujibul (2008, p. 1), distance education “is any type of education that occurs, while location, time or both separate the participants”. In distance learning, the teacher, through the use of technology, delivers instruction to a student at a separate location. The teacher then receives feedback, either immediately or delayed from the student.

Distance education is a method of education in which the learner is physically separated from the teacher and the institution sponsoring the instruction (Mielke, 2003). According to him, in any distance education process, there must be a teacher, one or more students and a course of curriculum that the teacher is capable of teaching and the student is trying to learn. The contact between teacher and learner requires that the student be taught, assessed, given guidance and where appropriate prepared for examination that may or may not be conducted by the institution. This must be accomplished by two-way communication. Where distance teaching materials are provided to learners, they are structured in ways that facilitate learning at a distance.

According to United States Distance Learning Association (as cited in Andrianes, 2013), “distance education is any mediated instruction that occurs at a distance-regardless of the technology involved”. So, although you probably imagine online degrees that involve using websites, e-mail and video casts, corresponding through regular mail or taking over the phone are methods that also technically qualify. Butressing, they state that in practical terms, most of what constitutes distance learning today is done by using electronic means. Teaching programmes utilize not only computer but satellites, video phones, interactive graphics, response terminals and more. It is also something that occurs in a wide variety of field and locations reaching well beyond k-12 and college campuses to include corporate, government and military training, telemedicine and anyone interested in lifelong learning.

Distance learning is especially important for those who lived in rural or otherwise underserved communities as well as individuals whose own physical and mental limitations impair their ability to attend traditional educational settings. Key players in distance education typically include students, faculty, facilitators, support staff and administration, each of whom have very different roles. The success of any distance education effort depends primarily on its faculty (Andrianes, 2013).

Distance education is planned learning that normally occurs in a different place from teaching necessitating special techniques of course design, instruction, special method of communication by electronic, other media, special organization and administrative arrangements. In the same vein, Keegan (1995) says that distance education and training result from the technological separation of teacher and learner which frees the student from necessity of traveling to a fixed place at a fixed time to meet a fixed person in order to be trained.

Similarly, Moore (1989) defines distance education as “the separation between learner and teacher such that the communication between the two necessary in the educational

transition is transmitted through print, broadcasting, telecommunications, mail, audio and video recording, computers, various combinations and variation of these". Filipezak (as cited in Timothy, 2018) also defines distance education as:

an event or a process that involves direct two-way communication between people; it does not include traditional correspondence courses or the Computer-Based Technology (CBT) software you get in the mail. It does include audio-conferencing, video-conferencing and docu-conferencing a relative new comer to the distance learning arena that allows many people to collaborate on a shared document via computers separated by a few feet or several time zones.

Distance education must involve a teacher, students, materials and a contract that defines roles between teacher, students and the institution. Distance education can involve face- to-face (video in real time) or independent instruction; the student is given guidance and access to instruction in a two way communication; learner are separated from the sponsoring institution; materials can take several forms-not necessarily designed exclusively for distance education-the requirement is that they be suitable for the learning event (Rumble, 1989).

Furthermore, Keegan (1996, p. 50) gives a more precise definition characterized by the following:

- The quasi-permanent separation of teacher and learner throughout the length of the learning process (this distinguishes it from conventional face to –face education;
- The influence of an educational organization both in the planning and preparation of learning materials and in the provision of student support services (this distinguishes it from private study and teach-yourself programmes);
- The use of technical media-print, audio, video or computer to unite teacher and learner and carry the content of the course;
- The provision of two-way communication so that the student may benefit from or even initiate dialogue (this distinguishes it from other uses of technology in education);
- The quasi-permanent absence of the learning groups throughout the length of the learning process so that people are usually taught as individuals rather than in groups with the possibility of occasional meetings, either face-to-face or by electronic means for both didactic and socialization purposes.

Implicit in this definition is the assumption of teacher-learner separation but not permanent; the assumption of individual learning and autonomy but not exclusively and the use of technology but not exclusively with increasing variety and more often than not, interactive. Distance education may include contact, no contact and part time learning (FRN, 2004).

Distance education offers unique opportunities for: life-long learning to working adults; out of school programme for children and youth who are unable to attend ordinary school as a result of disability, illness or remote location, educational opportunities for nomadic and itinerant groups and pre-service teachers' preparation and in-service development, among others (UNESCO, 2002). Models of distance education include: distance learning, open studies, remote instruction, correspondence study, home study, extension education, independent study, teaching at a distance, off-campus study, open learning, flexible learning, continuous education and distributed learning (Timothy, 2018).

Common characteristics of distance education variously defined are:

- The majority of communication is noncontiguous,
- There is two-way communication between teachers and students,
- Education is usually technologically mediated,
- The patterns of institutional control over the learner are changed,
- Reflection is at the heart of the process,
- Self-assessment of personal or professional development is expected,
- Learners, in varying degrees, have a stake in the planning of their programmes and the nature of the learning experiences undertaken (Barron, 1999a, Butcher, 2003 and Keegan, 1996).

Distance education has several benefits which include:

- It is convenient for both students and instructors,
- Flexible and thus provided students option to participate in education on an individual bases,
- It is as effective as traditional instruction when appropriate methods and technologies are used,
- It is a cheaper form of education,
- The use of multisensory media provides for optimal combination of media and interaction,
- It offers increased opportunities for increase interaction with students,
- It ensures equity in educational opportunity,
- It fosters the development of higher order thinking, and
- It encourages the development of skills for lifelong learning (Barron, 1999a, Keegan, 1996 and Timothy, 2018).

Information and Communication Technologies (ICTs)

Technology has remained the most outstanding human invention. The impact of technology in all aspects of human endeavour has been widespread and felt. Thus, technological breakthrough in communication, education, information technology and other human endeavours, to mention have been observed. The term “information and communication technologies” will be better understood if the words are explained fully.

According to Wendy (1992, p. 18), information “is knowledge derived from data. Data in turn is recorded as facts or figures”. Buttressing Wendy (1992), identifies four qualities of good information thus:

- Information must be pertinent: The information statements must relate to the business at hand and to the matters that are important to the person who has requested the information. Information should help the person deal in some way, with the issues in his or her world.
- Information must be timely: It must be available when needed.
- Information must be accurate.
- Information must reduce uncertainty: In short, good information involves differences that make a difference.

Technology on the other hand is man’s answer to a great deal of his cosmic and environmental limitations. According to Okafor (1988, p. 2), technology connote “the practical arts ranging from hunting to animal husbandry, from agriculture, transportation and communication mechanism to production of military hardware”. Technology, he continues, has brought the use of aspirin, penicillin, automobiles, airplanes, telephones, radio, television, printing machines, computers and calculators, while science has uncovered the regularities of magnetism and electricity, valence and quantum theory.

When information and technology are combined together we have “information technology”. Information technology is a set of tools for working with information and the process of improving knowledge by acquiring information (Stephen, Maeve & Donald cited in Adiele, 2005). Supporting the above idea Adiele (2005) states that information technology is the acquisition, processing, storing and dissemination of vocal, pictorial, textual and numeric information by a micro-electronic based combination of computers and telecommunication. UNESCO (as cited in Osuagwu, 2004) sees information technology “as the scientific technological and engineering uses in information handling, processing and their application; computers and their interaction with man and machines; associated socio-economic and cultural matters”.

Communication as a concept has its origin from a Latin word “Communicare” which means to share or to establish commonness. According to Daramola (2005, p. 157), communication can be seen as “the transfer of a message to another party so that it can be understood and acted upon”. Murphy (as cited in Daramola, 2005) captures the importance of communication when in an introductory note to students in his book he writes:

Communication is the essence of humanity. Through communication individuals bridge their island of loneliness and through communication societies are formed. The ability to communicate is essential both to individual success and to group activity. Communication is such a basic and crucial feature of human life, it is important that we understand precisely what it is. This term has been defined in a variety of ways over the years, but

implicit in every definition has been a recognition that communication rests upon the ability of the source to encode a message and pass it through a channel (air, sound or intermediate transmitter) to a receiver or a given destination.

When information technology is combined with communication the result is an integrated package of data gathered, organized, processed, stored, retrieved and made available to users. The fusion of information technology and communication gave rise to "Information Communication Technology" (ICT). According to Adamu (2006, p. 8), ICTs are "a diverse set of technological tools and resources used to communicate, to create, disseminate, store and manage information". Explaining further, he states that ICTs are generally relate to those technologies that are used for accessing, gathering, manipulating and presenting or communicating information. The technologies could include hard ware (e.g. computers and other devices), soft ware applications and connectivity (e.g. access to the internet, local networking infrastructure and video conferencing). What is most significant about ICTs is the increasing convergence of computer-based, multi-media and communications technologies and the rapid rate of change that characterizes both the technologies and their use.

Similarly, ICTs are the acquisition, processing, storage and dissemination of vocal, practical, textual and numeric information by a micro-electronic based combination of computer and telecommunication. ICTs are the use of computer-based information systems and communication systems to process, store and transmit data. It is also a way to describe exciting and innovative ways to provide lifelong learners with global access to information, learning and support. It is an umbrella term that includes any communication devices or application, encompassing radio, televisions, cellular phones, computer networks, hard ware, soft ware, electronic mail, facsimile, satellite system as well as the various services and applications associated with them. This includes but not limited to video conferencing, internet technologies, audio conferencing and multimedia utilization (Iwu, 2006).

Furthermore, ICTs are the combination of the potentials of computer, telecommunication and electronic media using the digital technology. ICTs have the potential for not only introducing new teaching and learning practices but also for acting as a catalyst to revolutionize the education system. It can empower teachers, learners and promote the growth of skills necessary for the 21st century workplace (UNESCO, 2005a). In line with the above, ICTs are often spoken of in particular context, such as ICTs in education, healthcare, military or in management.

Hence in education, recent advances in ICTs allow for the delivery of individually customized information and instruction to mass audiences simultaneously. This mass individualization has been increasingly popular and important in education and training communities (Van-Merrienboer, 2005). For example, the development of computer technology has provided a powerful tool for developing and implementing sophisticated instructional systems generating individual tailored instructional proscription (Debra, Santic and Brusilovsky, 2003).

Examples of ICTs in Distance Education

Distance education is a set of practice to plan and implement educational activities when there is a separation between teaching and learning. This separation may result from distance, time or other barriers. Distance education offers a way to overcome this separation, chiefly through its learning materials, the use of ICTs to provide tutoring, linking learners to the system and each other and the use of feedback and student support systems (Mujibul, 2008).

The ICTs used in distance education systems include mail, telephone, face-to-face sessions, radio, television, audio and video cassettes, compact disks, e-mail, other computer connections and tele-conferencing systems (Mujibul, 2008). This can be grouped into the following four technologies:

- Print materials,
- Audio technologies,
- Video technologies,
- Internet technologies.

Distance learning may utilized any/or a combination of the above four technologies.

Print Materials

Print is the foundation of all education and dominates in distance education. In distance education print serves as the primary source of instruction or may be supplemental. It can be in form of textbooks, posters, letter, circular workbook and so on (Owuamanam, 2011). Print is a viable distance tool for study guides, course syllabi, case studies, support text and so on (Mujibul, 2008)

Advantages of Print

Print has the following advantages:

- Spontaneous: Print materials can be used in any setting without the need for sophisticated presentation equipment,
- Instructionally transparent: The medium of delivery should enhance, not compete with the content for the learner's attention. If the student reads well, the print medium is the most transparent instructional medium of all,
- Non-threatening: Reading is second nature to most students. As a result, they are easily able to focus on the content, without becoming mesmerized or trusted by the process of reading itself,
- Easy to use: Given adequate light, print materials can be used anytime and anyplace without the aid of supplemental resources such as electricity, viewing screen and specially designed electronic classrooms. The portability of print is especially important for rural learners with limited access to advanced technology,
- Easily reviewed and referenced: Print materials are typically learner-controlled. As a result, the student rapidly moves through redundant sections, while focusing on areas demanding additional attention (Andrianes, 2013).

Limitations of Print

Print has the following limitations:

- ◆ Limited view of reality: Print, by its reliance on the written word, offers a vicarious view of reality. Despite the use of excellent sequential illustrations or photos. For example, it is impossible to adequately recreate motion in print.
- ◆ Passive and self-directed: Numerous studies have shown that higher learner motivation is required to successfully complete print-based courses. To a certain extent, the passive nature of print can be offset by systematic instructional design that seeks to stimulate the passive learner. Still, it takes more motivation to read a book or work through a written exercise than it does to watch a television programme or participate in an audio-conference with an instructor encouraging student participation and response.
- ◆ Feedback and interaction: Without feedback and interaction, instruction suffers regardless of the delivery system in use. By nature, print materials are passive and self-directed. Even with print materials incorporating feedback mechanisms and interactive exercise, it is easy for learners to skip to the answer section.
- ◆ Dependent on reading skills: Thanks to television, most students have developed fairly good viewing skills by age four. These same children, however, often fail to develop adequate reading skills by age 12. Reading skills must often be improved. Lack of ability in this area cripples the effectiveness of even the most instructionally sound print material and must be overcome if print is to be used effectively (Andrianes, 2013).

Audio Technologies

Audio technologies include the following: two-way audio transmission. Example is audio/phone conference and one-way audio transmission which includes radio broadcast and prerecorded audiotapes provided to students. Audio technologies use various means which include radio, audio cassette, telephone, voice mail and audio conferences (Mujibul, 2008). Radio is a major form of audio media. It is used all over the world as a medium of instruction in schools and colleges by integrating it into school programmes. When instruction is broadcasted through the use of radio medium, it is called Radio broadcast. Cassette tape as an audio media is a self-contained reel-to-reel system with the two reels permanently installed in a rugged plastic case.

Teleconferencing is an improvement of the conventional one to one telephone conversation. The use of teleconferencing becomes more reasonable and likely if the participants are few. The technique may be found useful in tutorials, discussions, seminars, providing information, lectures, advising, training and meetings. Okwo (1996) identifies three types of teleconferencing, namely: Operator-connected conference calls, Loudspeaker unit and Orator. Under the Operator-connected conference calls, up to 18 persons can be connected using their own telephones.

However, the Loudspeaker units enable small groups of persons to participate at each telephone through the amplification of the sound. Some modern telephone sets have built-in loudspeakers. The Orator enables two or more small groups of persons at different locations to be connected by direct dialing. It involves audio conferencing which is audio conference that

uses standard telephone lines to transmit voices to and from the parties involved in the conference (Iwu, 2006).

Advantages of Audio technologies

Audio technologies have the following advantages:

- Radio is portable and cheap and comes in various sizes. It can use batteries and this makes people to use it anywhere with or without electricity,
- A radio lesson reaches a wide audience than a class. A teacher can teach several classes at the same time. It can be used in teaching several subjects,
- Cassette tapes are durable, virtually immune to shock and abrasion (Chimezie, 2006),
- Teleconferencing, is useful in tutorial, discussions, seminars, proving information lectures, advising, training, and meeting,
- Tele conferencing is more efficient in task achievement (Okwo, 1996).

Limitations of Audio technologies

Audio technologies have the following limitations:

- Physical and practical skill oriented lesson cannot be conducted by audio because visual and physical demonstrations cannot be experienced directly by the students,
- Because radio is a one-way medium of instruction, there is no interaction between the presenter and the audience. The latter has no means of given the former feedback on the effectiveness of his programme,
- Longer cassette tapes, especially C-120s sometimes become stuck or tangled in the recorder due to the thickness of the tape (Chimezie, 2006).
- Inadequate telephone service. Most homes and places do not have telephone and where it is available; the services rendered are not reliable.
- Ignorance on the part of Users. Many potential users of this technique are not aware of its importance in distance education.

Video Technologies

These include: Two-way video with two-way audio (also referred to as two-way interactive video), one-way video with two-way audio, one-way live video and one-way prerecorded video (including prerecorded videotapes provided to students and television broadcast and cable transmission using prerecorded video) (Mujibul, 2008). Video media include video tape, satellite delivery, microwave, broadcast video, desktop video and also integrated multi-media (Butcher, 2003).

Educational television broadcasting is broadcasting of educational or instructional programmes through the use of television medium. Instructional television refers to those telecast (either broad cast or closed-circuit) designed and scheduled specifically for use with special classes or groups for particular learning situations. Such programmes emanate from a studio or classroom with a teacher or from pre-recorded video tapes or films (Chimezie, 2006).

Video conferencing is a system of using video to conduct distance learning. Video conferencing is of different types, namely:

- Small room video conferencing: This system is designed primarily for small groups (1-12 participants) at all sites seated around a conference table.
- Class room video conferencing: This type of system usually uses high quality AV components, codec and an interface that allows all participants to be seen on the monitors.
- Desktop videoconferencing: This system utilizes a personal computer and videoconferencing software (Andrianes, 2013).

Advantages of Video Technologies

Video technologies have the following advantages:

- In instructional television, motion and visuals can be combined in a single format so that complex or abstract concepts can be illustrated through visual simulation.
- Instructional television is an effective way to take students to new environments (the moon, a foreign country or through the lens of a microscope).
- Interactive video allows real time visual contact between students and the instructor or among students at different sites.
- Interactive video supports the use of diverse media; blackboards, handwritten documents and videos may be incorporated at all sites.
- Interactive video enables connection with experts in other geographical locations (Andrianes, 2013).

Limitations of Video Technologies

As with other technologies, video technologies have its limitations:

- Video production is time consuming and can be technically demanding, often requiring relatively sophisticated production facilities and equipment.
- Most prepackaged Instruction television video courses use a mass media approach to instruction aimed at the average student. As a result, they can be ineffective in serving students with special needs.
- In interactive video, unless a strong effort is made by the instructor, students not located with the instructor may remain uninvolved in the course.
- In interactive video, if visuals, like handwritten or copied materials are not properly prepared, students may have a difficult time reading them.
- In interactive video, if the system is not properly configured, class members may observe an audio echo effect. The result is audio interference that detracts from the learning environment (Andrianes, 2013).

Internet-based Technologies

These include: Internet courses using synchronous (i.e. simultaneous or “real time”) computer-

based instruction (e.g. Interactive computer conferencing or Interactive relay chat) and Internet courses using asynchronous (i.e. not simultaneous) computer-based instruction (e.g. e-mail, listserves and most World Wide Web-based courses) (Mujibul, 2008). Computer is equipment designed to facilitate storage, processing and retrieval of information (Onyejemezi, 1990). Owolabi (2001, p.1) sees computer as “a set of electronic equipment that accepts data as input, processes them with the aid of predefined instructions called programme and produces useful output for management or any other people’ use”.

The word “internet” is derived from two words: - interconnection and network. Internet is the “network of computers that are connected to one another, thus enabling the sharing of data, information, communication and other type of subject matter among its users via file-sharing protocols”. It is a world of wild network system of computer networks through which sharing of information is not only possible but also easy (Orji, 1999).

In line with the above, Johnson and Johnson (2006) state that Local-Area Networks (LANs), Wide-Area Networks (WANs) and the global version of the latter (the internet) provide a variety of media. Examples are: tools for cooperation such as e-mail and text messaging, chat rooms, bulletin boards, conferencing systems, web pages, blogs and specialized group ware. Huge amount of resources and services are available in the internet. These include electronic mail (e-mail), newsgroups, file sharing and topic searching, the World Wide Web (WWW), surfing the net, chatting, electronic and internet addresses. The WWW is an important knowledge-management tool while electronic mail (e-mail) is a transfer of information in electronic form from one computer user to another usually over a network (Iwu, 2006)

Advantages of Internet-based Technologies

Internet-based technologies have the following advantages:

- ★ Computers are a multi-media tool, with integrated graphic, print, audio and video capabilities. Computers can effectively link various technologies. Interactive video and CD-ROM technologies can be incorporated into computer-based instructional units, lessons and learning environments.
- ★ Computer increases access. Local, regional and national networks link resources and individuals wherever they might be.
- ★ Electronic mails (e-mail) can be used to send and receive messages to and from friends, organizations and families around the world.
- ★ It helps students to participate on-line especially practicum oriented courses like medicine and teaching (Andrianes, 2013).

Limitations of Internet-based Technologies

Internet-based technologies have the following limitations:

- Computer networks are costly to develop. Although individual computers are relatively inexpensive and the computer hard ware and soft ware market is very competitive, it is still costly to develop instructional networks and purchase the system soft ware to run them.

- The technology is changing rapidly. Computer technology evolves so quickly that the distant educator focused solely on innovation. Not meeting tangible needs will constantly change equipment in an effort to keep pace with the latest technical advancements.
- Students must be highly motivated and proficient in computer operation before they can successfully function in a computer-based distance learning environment.
- Some students might hesitate to contribute to computer conferences or to send e-mail because of lack of familiarity with the proper protocols (Andrianes, 2013).

ICT as an inevitable Instrument for Distance Education

Distance education is a set of practice to plan and implement educational activities when there is a separation between teaching and learning. This separation may result from distance, time, or other barriers. Distance education offers a way to overcome this separation, chiefly through its learning materials and the use of information and communication technologies.

In a typical distance education programme, a variety of ICTs is commonly used. It might include a print component in the form of course text, readings, schedules or syllabi accessed through the internet. Two-way interactive audio and / or video can provide real-time face-to-face and voice-to-voice interaction. Live audio / video media can incorporate guest speakers, mentors and content experts who would otherwise not have the opportunity to be in class.

Communication among teachers, mentors and peers can be accomplished through computer conferencing, electronic mail and online forums. Pre-recorded videotapes can be used for class presentations. Distribution of assignments and announcement can also be transmitted via Fax. Collaborative problem solving among global partners that culminates a mutually developed project can be conducted using current information telecommunications media (Mujibul, 2008).

The purpose of good education is to help each person become more effective in life. Accessing information is a highlight of the new technologies. ICTs through the internet, videos, CD-ROMs and so on can generate knowledge which changes a person's mental models and perspective of how one views things. With relatively little space and low costs, ICTs can provide access to a wealth of information resources that cannot be matched by local libraries and resource rooms. Videotapes and video-conferencing may be used for networking, study groups, interactive courses, access to educational resources and research. These technologies can be used to automate, expedite and organize the extensive informational resources available.

Web-based modules can be designed to operate as independent segments or they can be combined into a whole course. A web-based course can include links to the class syllabus and to online readings and database, with an explanation of appropriate uses of the information and uses that would infringe on copyright. Web pages also link to bulletin boards, to interactive multimedia texts and other materials that are helpful to students with different learning styles and to real-time conversation sessions. With increased availability of the appropriate hardware, future course participants will even be able to see each other in small, real-time TV-like windows right on their computer screens (Mujibul, 2008).

In addition to synchronous-group discussions through online virtual meeting places or

desk top video-conferencing connections, many distance courses include asynchronous group communications. For example, through e-mail and posted comments on limited list serves. Indeed, with the increased availability of e-mail, distance students are finding that they are engaging in more frequent communication and getting to know their lectures and fellow students better than in the typical situation where they are trying to coordinate almost impossibly busy schedules (Mujibul, 2008).

Similarly, computer application has made distance education effective. Computer application for distance education falls into four broad categories namely:

- Computer Assisted Information (CAI). This uses computer as a self-contained teaching machine to present discrete lessons to achieve specific but limited educational objectives. There are several CAI modes including: drill and practice, tutorial, simulations, games and problems solving.
- Computer Managed Instruction (CMI). This uses the computer's branching, storage and retrieval capabilities to organize instruction and track student records and progress. The instruction need not be delivered via computer, although often CAI (the instructional component) is combined with CMI.
- Computer Mediated Communication (CMC). This describes computer applications that facilitate communication. Examples include electronic mail, computer conferencing and electronic bulletin boards.
- Computer-Based Multimedia (CBM). HyperCard, hyper media and a still-developing generation of powerful, sophisticated and flexible computing tools have gained the attention of distance educators in recent years. The goal of computer-based multimedia is to integrate various voice, video and computer technologies into a single and easily accessible delivery system (Andrianes, 2013).

ICTs serve as a tool to support, enhance and extend learning through challenging real-life tasks. The following indicators below reflect characteristics of technologies that support meaningful learning experiences:

- All members of the learning community are able to access rich resources within and beyond the school and to use, interact and exchange data in different formats and programmes.
- The technological design applies standards of interoperability and user-friendliness to promote engaged learning.
- The instructional design allows students engage in collaborative projects and create products that present new knowledge or tools (Mujibul, 2008).

Yusuf and Yusuf (2009) posit that distance learning enhanced through ICTs provide flexible learning opportunities with collaborative aspects and rapid communication among learners and between the learners and academic mentors. ICTs remove age, distance and time constraints from any learning process and provide effective library service, make for interactive learning using a learner-centered and activity oriented teaching approach and energize the students.

Encourage deeper understanding about data collection, save time on measuring and recording and help in analysis (Adamu, 2006). The appropriate use of ICTs has provided information access to all students in remote, rural and urban areas as well as across nations.

The geographical, social-economical, political and cultural background of distance learners can influence their ability to learn using ICTs. A number of factors need to be taken into consideration when deciding upon the use of any one or combination of available technologies for course delivery and other purposes. These factors include:

- ◆ Affordability of the technologies,
- ◆ Availability of the technologies,
- ◆ Accessibility of the technologies,
- ◆ The unique pedagogical characteristics of the particular technological application,
- ◆ Instructional objectives,
- ◆ Financial resources available at the institution, and
- ◆ Student personal resources (Victoria, 2002).

Conclusion

Education is the basic need of every human being and today's technology has a big part in every sphere of life. The problem of unsatisfied demand for education versus actual supply of educational services contributed to the acceptance, growth and implementation of distance education programmes as a means to bridge the gap between demand and supply. Distance education offers a way to overcome this separation chiefly through the use of ICTs to provide tutoring, linking learners to the system and each other, the use of feedback and student support systems.

ICTs are the acquisition, processing, storage and dissemination of vocal, practical, textual and numeric information by a micro-electronic based combination of computing and telecommunication. Distance education may utilize any / or a combination of the following four technologies: Printed materials, Audio / voice technologies, Computer technologies and Video technologies. ICTs however, have provided avenue for enriching the quality and quantity of instructional content offered through distance education. It has also provided avenue for facilitating interaction between the teachers and group.

Finally, in utilizing ICTs for instructional delivery and other purposes, a number of factors need to be put into consideration. These factors include; affordability, availability, access and the unique pedagogical characteristics of the particular technological application, instructional objectives, financial resources available at the institution and student personal resources.

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Effects of Entrepreneurship in the Management of Economic Recession in Nigeria

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Abstract:

Since 2015, the Nigeria economy has been faced with economic recession influenced by both internal and external factors. Various attempts and policies have been formulated to steer the economy away with little success. This study has therefore provided an alternative approach towards recovering the economy from the clutches of recession. Entrepreneurship was suggested as a means solving the problem of recession. Entrepreneurship entails identifying, utilizing and maximizing profitable business opportunities in a sustainable manner that can foster the economic growth and development of a community or nation. Business entrepreneurship usually results in flourishing micro, small and medium enterprises (MSMEs) which generates gainful employment, creates wealth and consequently grows the economy. The present economic situation which has seen exchange rate value doubled in the last two years, oil price fallen, militancy and terrorist activities affected revenue and government expenditure, low economic output, high cost of living, high inflation rate, persistent budget deficit, etc have called for the need to pay attention to entrepreneurship as a panacea for sustainable development and speedy economic recovery. The government, higher institutions, private led sectors, and individuals all have great role to play at ensuring entrepreneurship development in Nigeria. Government must first provide an enabling environment for entrepreneurship to display their skill and contribute to business growth and development. Several authors have recommended infrastructural development and other policy framework for the government, however, it is imperative that government evaluates most recommends, assess the feasible ones and implement them.

Key words: Entrepreneurship, recession, Nigeria.

1. Introduction

The economic recession that befell most parts of the world finally came knocking at the Nigeria's door unexpectedly. The factors that contributed to the recession has been disputed from severally quarters. The present government had accused the past government as the cause pointing to poor investment infrastructural development, failure to save for the future

during the oil windfall period, corruption and wastage of resources, insensitivity and long years of misrule. On the other hand, the past government accused the present President and its ruling party of failed promises, inability to steer the wheel of the economy, failure of the president to organize his economic team when he came to power, delay in putting in place strategies to consolidate the gains of the past administration, his high-handedness in serving as the President and minister of the various sectors of economy for almost six months after he came to power without portfolio cabinet, lack of manifesto and understanding of the economy by the ruling party and the sitting present. Moreover, the sitting President was accused of trying to stop policies that has brought peace between the oil-rich Niger Delta and the government that has made oil exploration and oil production rise above the projected estimate. His attempt to stop the amnesty policies resulted in the restiveness of the region and subsequent destruction of oil pipelines which are the backbone of the Nigeria economy and major source of government revenue.

Moving away from the causes, various opinions have attempted to provide way out of the current recession problem which has not only affected the economy but government's funding of its obligations bringing untold hardship to its citizens. On the strength of this, it is the opinion of this article that while various recommendations have been made from different quarters, the significant role of the small and medium scale sector cannot be swept under the carpet. Entrepreneurship which is the footstool of any business sector can provide the much needed solution to economic recession in Nigeria.

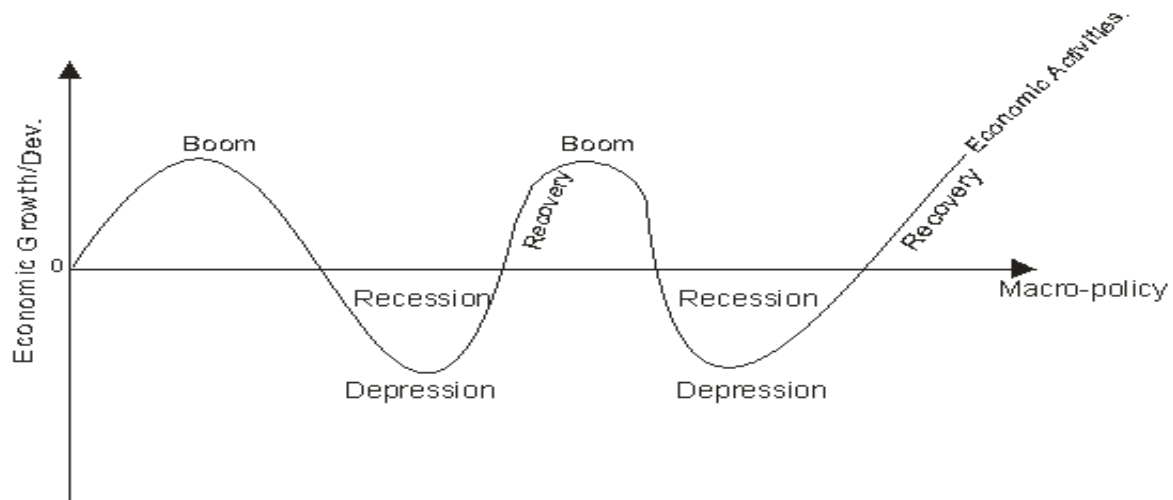
According to Oteh (2009), entrepreneurship can be regarded as the cornerstone of development strategies for emerging economies which has garnered support among a broad spectrum of scholars, policymakers and governments. Oteh noted further that many emerging economies such as El Salvador, Israel, Latvia, Uganda, Vietnam, China and India are making strides in realizing their entrepreneurship potential. Thus, the economic growth of any nation cannot be achieved without the growth of entrepreneurship. The entrepreneurship is the engine of growth for sustainable development of a nation especially in terms of job and wealth creation. The impact of entrepreneurship on the economy is felt in the following ways: Greater utilisation of local raw materials, employment generation, encouragement of rural development, mobilisation of local savings, linkages with bigger industries, provision of regional balance by spreading investments more evenly, provision of avenue for self-employment and provision of opportunity for training managers and semi-skilled workers. Muritala, Awolaja and Bako (2012) opined that most developed and developing countries rely on dynamism, resourcefulness and risk tasking of entrepreneurship to trigger and sustain process of economic growth. In order to ensure an orderly transition from the present economic recession, entrepreneurship deserve support as Ekpenyong and Nyong (1992) rightly observed that one way to alleviate poverty could be to increase the productivity of those engaged in entrepreneurship.

2. Literature Review

2.1 Economic Recession

Recession is also defined as a general slowdown in economic activity for two consecutive quarters and usually implies a business cycle contraction. According to the CBN (2012), recession period usually infers a decline in certain macroeconomic indicators such as GDP, employment, investment spending, capacity utilization, household income, business income, as well as inflation, with the attendant increase in the rate of unemployment. Technically, when an economy recorded two consecutive quarters of negative growth in real GDP, it can be said to be in recession (Olatunji, 2017). According to Chinguwo and Blewit, (2012), economic recession, financial crisis and climate change problems combined to make life difficult for working people and their families while Mailafia (2016) opined that economic recession stagnates wage growth and increases the proportion of people on low pay, as well as swelling unemployment and underemployment. This was earlier corroborated by Bauer, (2009) that economic recession and the global financial crisis have inter-linkages with poverty incidence in developing countries.

Table 1: Graphical Example of Business Cycle



Baumol (2014) posit that recession is no blessing for humanity, but since it does recur at regrettably frequent intervals, it is surely appropriate for society to make the best of these bad situations by deriving whatever benefits can be extracted from them. The author stressed further that there are potential gains offered by these periods of economic failure, pointing that markets automatically do provide inducements for the realization of these benefits, and that such gains have proved to be substantial. As Olatunji (2017) contributed, recession, even depression, encourages the entry of small enterprising firms and from among these ranks, a substantial proportion of the companies go on to become “giants of industry” emerge. It has been noted that some of the largest and most prosperous

firms in the American economy were born during periods of economic failure with authors such as Stangler (2009) reporting that at least 51 percent of the 2009 Fortune 500 firms included in his analysis were founded during a recession or a bear market or both. Earlier revelation made by Fano (1987), showed that during the Great Depression in the United States, when the overall unemployment rate hovered between 15 and 25 percent for nearly a decade, the employment of scientists and technicians grew markedly. Such employment growth, according to Fano is just one of the indication of the dramatic research and development growth that took place during the Depression era in the United States. Field, (2003) in his work titled, "The Most Technologically Progressive Decade of the Century", where he was referring to the decade of the Great Depression" also supported the findings of Fano. Salazar-Xirinachs (2009) also contribute that the economic recession affects developing countries astonishingly, quickly and strappingly through manifold channels while Onwuchekwa (2013) highlighted the channels to include reduced trade flows, decline in commodity prices, reduced liquidity and tightening of credit markets among others.

2.2 Recession in Nigeria

Agri, Mailafia and Umejiaku (2017) attributed the economic recession in Nigeria to both endogenous and exogenous factors. According to the authors, there have been symptoms of a recession in the Nigerian economy which became fully blown under the President Mohammadu Buhari's civilian regime due to certain drastic actions taken to solve perennial domestic economic problems. Other associated factors were the geopolitical tension around the world causing global crisis and commodity prices dropping, fall in the crude oil prices, Britain exit, American election in 2016, South China Sea issues, Russia-Syria crisis, ISIS, illegal migration and refugee crisis which were though remote but considered as important causes of the recession is Nigeria since it is an integral part of the global economy (Agri, Mailafia, and Umejiaku, 2017; Adelman, 2011). Authors such as Agri, Mailafia, and Umejiaku (2017), Diji (2017), Solomon (2017) identified the immediate causes to include monoprodukt structure of the economic, lack of economy diversification and over-reliance on imports, militancy, war against Boko Haram, high level of windfall revenue mismanagement by state government and federal government officials, global oil price shocks and volatility, worsened by oil pipeline vandalism and depletion of foreign reserves by the previous governments, sharp drop in government revenues, drop in global oil prices(which Nigeria cannot control). Diji (2017) was more expository in his assertion that poor economic planning with no concrete implementation of economic planning policies, budget delays, poor exchange rate policy, high interest rate coupled with high tax rate alongside tight monetary policy measures and budget deficit contributed to the present Nigeria recession.

Table 1: Booms and Recessions Periods in Nigeria (1970 to 2016)

Period	Boom or Recession	Causes
1970-1976	High Boom	Post-war period, high earnings from crude oil. Spring up of many investments.
1977-1979	Low Boom	Drop in crude oil earnings; Austerity measures by the Government.
1980-1983	High Boom	High oil earnings, Government engaged in expansionary

		economy through unsustainable trade debt build-up.
1984-1987	Recession	Low crude oil earnings, Government engaged in economic restructuring.
1987-1993	Low Boom	Deregulation of the economy, and Government expansionary policy.
1994-1999	Recession	Internal and political crisis; international isolation, low oil earnings.
2000-2007	Low Boom/Recession	Fairly steady policy of Government, tight fiscal management despite high oil earnings.
2008-2014	High Boom	High oil earnings, Government engaged in expansionary economy, debt relief package, war against terrorism, low build up of economic savings, amnesty implementation
2015-2017	Recession	Low crude oil earnings, war against terrorism, exchange rate devaluation, poor policy implementation

Source: Durowoju, Stella Toyosi (2014). Roles of entrepreneurship in small and medium enterprises development in Nigeria. *Review of Public Administration and Management*, 3 (5), 11-21.

Author's assessment.

The table 1 shows the various booms and recessions experienced in Nigeria since 1970, a decade after its independence. The discovery of oil and increase in oil price led to high boom and increase in oil revenue between 1970-1976. Another boom was experienced between 1980-1983 and 2008-2014. However, the country experienced three serious recessions between this period. The first recession was witnessed between 1984-1987 caused by fall in oil price. Another recession was witnessed between 1994-1997 also caused fall in oil price and international isolation. The present recession that started in 2015 also witnessed fall in oil production coupled with fall in oil price. From the foregoing, it is safe to state that recessions in Nigeria could be attributed to lack of foresight and plan towards fall in oil production and oil price. This is a confirmation that Nigeria is a mono-economy.

Lasisi and Shodiya (2017) analyzed the Nigeria economy between 2010 and 2014 period with the discovery that Nigeria was not doing too bad but noted that since June 2014: oil prices fell 66.8% from \$114/barrel recorded in June 2014, to \$38.0 by December 2015. Prices have fallen even further in 2016, to \$31.4 as at 22nd February, 2016 as the world sees a global glut in oil supply and slowing demand especially in emerging countries. While the price level itself is a problem, a bigger challenge lies with oil price volatility. The authors pointed to the imbalances and strains that were beginning to appear in the economy stemming from the gradual decline in the price of our country's main foreign exchange earner, while observing that very few could have anticipated the extent and severity of the economic and financial storm that has subsequently enveloped markets. Despite the unprecedented number and scale of the policy intervention measures introduced, systemic pressures have yet to fully abate. Confidence in the economy and the financial markets in particular is yet to return fully. It would appear that we are entering into a period of uncertainty in the context of changing economic and financial

market paradigms. Economic growth rates have slowed from a position where Nigeria was one of the fastest growing economies in the world.

Table 2: Growth in selected macroeconomic variables (2010-2016)

	2010	2011	2012	2013	2014	2015	2016
Oil revenue	5396091	8878970	8025953	6809231	6793820	3830096	2693907
% growth	69.05%	64.54%	-9.61%	-15.16%	-0.23%	43.62%	29.66%
Nonoil revenue	1907580	2237880	2628780	2950560	3275030	3082410	2985126
% growth	15.43%	17.32%	17.47%	12.24%	11.00%	-5.88%	-3.16%
Expenditure	4194577	4712062	4605320	5185318	4587385	4988864	5160736
% growth	21.34%	12.34%	-2.27%	12.59%	-11.53%	8.75%	3.45%
GDP	54204795	63258579	71186535	80222128	89043615	94144960	101489492.20
%	118.62%	16.70%	12.53%	12.69%	11.00%	5.73%	7.80%
Exchange rate	150.2980	153.8616	157.4994	157.3112	158.5526	193.2792	253.4923
% growth	0.95%	2.37%	2.36%	-0.12%	0.79%	21.90%	31.15%
Inflation	13.720	10.800	12.200	7.960	7.980	9.550	18.550
% growth	9.38%	-21.28%	12.96%	-34.75%	0.25%	19.67%	94.24%

Source: Central Bank of Nigeria Statistical Bulletin 2016

This is corroborated by table 2 which showed the fall in oil revenue from 43.62% in 2015 to 29.66% an almost 60% fall. Table 2 shows that the government expenditure contracted by from 8.75% to 3.45%, an approximate 150% fall which is enough to set a recession into motion. Economic recession leads to contractionary effects on aggregate demand and supply which results in volatile shocks in economic activities. The outcome further leads to scarcity of foreign exchange, few money supply, reduced income, decreased finances available to households and businesses, weak purchasing power, reduced consumer spending and decrease in sales of goods and services. The purchase of goods and services by individuals, households and firms has drastically reduced as a result of the economic recession. There was also high rate of inflation (see table 2) attributable to hike in pump price of petroleum, low domestic production capacity, dependence on imports, a weak Naira, scarcity of foreign exchange and high cost of doing business in Nigeria, high interest rates, poor electricity supply, lack of portable water, high cost of transportation and poor state of aggregate infrastructure. Statistical overview of growth rates in major sectors of the Nigerian economy show that they are either slow or negative sectoral growth rates.

Business activities was at low ebb resulting in high rate of jobs losses and increase in unemployment rate. The reduced employment was mainly due to decreased sales of goods and services by business owners, companies, street vendors, farmers, shop owners, retailers and wholesalers. The aggregate spending power also sharply declined following loss of income as a result of the loss of jobs. Moreover,

the cost of living also increased astronomically with food stuffs at high prices, high cost of transportation, high rents thus leading to sharp decline in savings and investment. The financial market also witnessed a decline as the stock market activities fell since investors pull out their funds from the stock market due to high risks and uncertainties. There is also increase in the crime rates as life gets harder for a greater number of the population (the poor), living conditions are getting worse, crime rates have escalated; increase in robberies, petty stealing, street hawking, kidnapping, child trafficking, fraudulent schemes and other financial crimes. The aggregate poverty incidence continues to increase. There is budget deficit in government spending. The national and state budgets are experiencing spending difficulties due to shortfalls in government revenues. The governments are borrowing as an option to cover for the fall in revenues. This has geometrically increased the debt burden of the federal and state governments.

2.3 Entrepreneurship

There is no generally acceptable definition of entrepreneurship as various groups and authors have varying opinions and views on the context of entrepreneurship. Afolabi (2015) elaborates the meaning of entrepreneurship as not synonymous with small business, however, see small firms as an outstanding vehicle for individuals to channel their entrepreneurial ambitions. Lumpkin and Dess (1996) succinctly see the small firm as an extension of the individual in charge. Entrepreneurship is thus not restricted to persons starting or operating an (innovative) small firm, rather it also involves enterprising individuals in large firms, the so-called 'intrapreneurs' or 'corporate entrepreneurs', undertake entrepreneurial actions as well. From the economist's view entrepreneurship is the combination of resources, labor, materials, and other assets such that their value is greater together than individually while from a management perspective, entrepreneurship entails the introduction of a change, an innovation, or a new order. However, as documented by Oteh (2009), entrepreneurship could involve process innovation, market innovation, product innovation, factor innovation, and even organizational innovation while both innovators and entrepreneurs can be engines of growth in a society since they invest in risky ventures, bring new products to the market, and adopt new production processes or improve existing processes. Entrepreneurship also involves the creation of new enterprises with the entrepreneur as the founder.

Earlier study by Kilby (1971) define entrepreneurship as the willingness and ability of an individual to seek out investment opportunities, establish and run an enterprise successfully. Hornby (1975) on his part defined entrepreneurship as the ability to organize a business undertaking and assume the risks for the sake of profit. It is also defined as the ability and willingness of a person to initiate, control and direct the processes of production of goods and services and bear the attendant risks thereof.

Tudor and Bisa (2016) see an entrepreneur as taking action towards initiating change, whether it is the initial decision to become an entrepreneur or one of many decisions following, change is a part of an entrepreneur's life. Entrepreneurs are also considered as social actors, influenced by the social, economic and political context, who tend to undertake concrete

actions in terms of initiating and performing activities related to new venture creation (Bayon, Vaillant and Lafuente, 2015; Uzunidis, Boutillier and Laperche, 2014). From the various definitions, it is safe to define entrepreneurship as the individual who takes up the responsibility of providing goods or services through a skilled effort to users of such goods and services. The entrepreneur must be able to understand what the society needs, use his/her skill to provide what the society needs in return for profit.

Okpara (2007) described entrepreneurs as the driving force of any nation as they are value adders and represent the wealth of a nation and its potentials to generate employment. He stressed that the entrepreneur may be a highly educated, trained, and skilled person or he/she may be an illiterate person possessing high business acumen, which others might be lacking. Okpara highlights the qualities of entrepreneur as follows:

- I. He/She is energetic, resourceful, and alert to new opportunities, able to adjust to changing conditions and willing to assume the risks in change and expansion.
- II. He/She introduces technological changes and improves the quality of his/her product;
- III. He/She expands the scale of operations and undertakes allied pursuits, and reinvests his/her profits.

2.4 Importance of Entrepreneurship

Tudor and Bisa (2016) observed that an entrepreneur usually starts as SMEs and thus confronted with issues such as lack of managerial and technical skills, organizational and cultural issues regarding venturing, customer involvement, external networking, research and development (R&D) outsourcing, and external participations, lower productivity, growth capacity and employment rate by their seventh year, more difficulties in accessing finance, less innovating capabilities comparative to larger enterprises, frequent lack of management and technical skills, unawareness of existing opportunities, discouraging public authorities' procedures etc. The authors stressed further that the ability of the entrepreneur to adapt helps them to decide to be self-employed in the first place, in spite of the risks, and helps them to overcome the challenges of their enterprise growth, as well as to transform the failure into an asset, through accumulated experience. Entrepreneurship can be an effective tool for combating unemployment, poverty and under-development in the developing nations and as a strategy for rapid economic development in both developed and developing nations. Entrepreneurs are driven by the desire to be their own bosses, do what they want to do, and turn passions into profit-making businesses and also initiates a new business in the face of risks and uncertainty for the purpose of satisfying human needs and making a profit (Durowoju, 2014). Durowoju (2014) stressed further that entrepreneurship by scanning the environment, identifying opportunities and threats, carves out a niche for himself by combining and utilising the necessary resources to capitalize on opportunities that has been identified.

Entrepreneurship is therefore a basic key for business growth as most business today grew out of the effort of one man with passion, the effort of one man who wants to make profit and who wants to innovate or create a new product. According to Schumpeter, capital and output growth in an economy depends significantly on the entrepreneur. The quality of performance of the entrepreneur determines whether capital would grow rapidly or slowly and whether the growth involves innovation where new products and production techniques are developed. The difference in economic growth rates of countries of the world is largely due to the quality of entrepreneurs in those countries. Ebiringa (2012) argued that production factors of land, labour and capital become dormant or indolent without the entrepreneur who organizes them for productive ventures. Entrepreneurial activities have been found to be capable of making positive impacts on the economy of a nation and the quality of life of the people (Adejumo, 2000). Agbonifoh, Ehiametalor, Inegbenebor and Iyayi (1999) explains that entrepreneurship is an essential variable in any nation's economic growth and development. It is therefore true that the growth of a nation (country) depends on whether it has entrepreneurs and encourage entrepreneur and entrepreneurship successes depends largely on whether the human capital is being deliberately harnessed and nurtured to become entrepreneurially successful because entrepreneurs are born as well as made. Entrepreneurial activity and new firm formation are unquestionably considered engines of economic growth and innovation. As such, they are among the ultimate determinants of the large regional differences in economic performance. The factor of production that will make this possible is the entrepreneur who is regarded by the economist as a factor of production responsible for the creation of the enterprise that run the risky business for the purpose of profit making while labour receive wages, land receive rent and capital attract rent as the return for their usage however, the entrepreneur receive profit as their return, this the economist view of who an entrepreneur is. Economic growth rates are often attributed to the role of the duo of government and entrepreneurs which is complementary and not mutually exclusive. In Nigeria, like some other economies, the government helps to encourage entrepreneurship development (Ebiringa, 2012). The entrepreneur is therefore an important agent of innovation growth and technical progress. The development and utilization of their technical and commercial skills create growth potential in micro, small and medium business enterprises. The present day global economy is knowledge-driven operating on the pragmatic and innovative thoughts of the entrepreneur. Business set ups have become informal and oriented towards survival and self employment.

2.5 Entrepreneurship as Panacea for Economic Recession in Nigeria

The present data on Nigeria's GDP value shows an increase in the past three years, however, the actual experience states otherwise just as the rates of unemployment and inflation have been far greater. This means economic development has not actually been achieved as it were. Owing to lack of data, Afolabi (2015) points out that it was impossible to carry out empirical investigation to measure the level of entrepreneurship development in Nigeria. He however stressed that narrative textual was made possible to determine the role of entrepreneurship in solving the economic recession in Nigeria.

Although not all market sectors are experiencing change to the same extent, change management is a useful tool for all entrepreneurs in this complex dynamic of economic systems, where chaos and order are coexisting (Abraham, Rempel and Rogers, 2006). While “automotive, IT, telecom and utilities report above-average susceptibility to change” and use more frequently change management instruments, other market sectors are less open to organizational change management. Resistance to change management is reducing over time. Also, studies prove that change management is saving money, constitutes an important competitive advantage and that there is a high correlation between project’s success and change management effectiveness (Prosci, 2014).

Entrepreneurship plays an important role in its economic growth, contributing substantially to income, output and employment and even getting involved in solving social problems. In Nigeria, over 92% of existing companies are small and medium size enterprises (SMEs) and provide jobs for over 85% of the working population. This is happening even though entrepreneurs find themselves in a tough environment in Nigeria. Moreover, education does not offer the right foundation for an entrepreneurial career in Nigeria while difficult access to credits and markets, difficulty in transferring business, the fear of punitive sanctions in case of failure, and burdensome administrative procedures have also been on offer. Considering the accelerating rate of change, the present volatile environment determined by economic recession and SMEs important contribution to economic growth, in spite of the specific obstacles they are facing, entrepreneurship proves itself as being a critical skill for Nigeria's recovery.

There are so many factors as reasons why people go into business for themselves with the desire to create a new business as a major factor. Durowoju (2014) highlighted other factors to include independence, the desire to determine one’s own destiny, and the willingness to find and accept a challenge that, certainly play a part even though family background may also exert an influence as well. However, there must be some motivation to start a business such as leaving a paid employment where opportunities were not available to think and earn your own living, lost of jobs, having an idea for a new product or a new way to sell an existing product or the opportunity to invest into business may arise suddenly. In some people, the motivation to start a business whether small or medium develops slowly as they gain the knowledge and ability required for success as a business owner. Small businesses traditionally lead to increase of new jobs in Nigeria economy. By hiring a larger proportion of employees who are younger workers, older workers, women or workers who prefer to work part-time thereby contributing to solving unemployment problems. Small firms also provide a variety of goods and services to each other and much larger firms. Large firms generally buy raw materials from small businesses because it is less expensive, this eventually reflected in the price that consumers pay for their products. Nigeria is naturally endowed with entrepreneurship opportunities; however the realization of the full potential of these opportunities has been dampened by the adoption of inappropriate industrialization policies at different times (Ebiringa, 2012).

Nkechi, Ikechukwu and Okechukwu (2012) opined that Nigeria as a country has numerous business and investment potentials due to the abundant, vibrant and dynamic human and natural resources it possesses. Tapping these resources require the ability to identify potentially useful and economically viable fields of endeavours. Nigerians have made their marks in diverse fields such as science, technology, academics, business and entertainment. Thus, entrepreneurship activities and innovative ingenuity in Nigeria have developed enterprises in the following areas. Agricultural/agro-allied activities where there are foodstuffs, restaurants,

fast food vending etc. In the area of solid minerals, there are quarrying, germ stone cutting/polishing and crushing engineering.

In power and transport, there are power generations, Haulage business (cargo and passengers). In the area of information and telecom business, there are manufacturing and repairs of GSM accessories and the printing and selling of Recharge cards. In hospitality and tourism business, there are hotels, accommodation, resorts centres, film and home video production; in oil and gas business, there are construction and maintenance of pipelines, drilling, refining by products. In the area of environmental and waste management business, there is refuse collection/disposal, recycling, and drainage/sewage construction job. In engineering and fabrication work, there are machines and tools fabrications. There is also the building and construction, where there are plan and design services and material sourcing (Agbeze, 2012).

Neglect of agricultural activities such as farming has contributed to no small measure to Nigeria's unemployment rate. Farming in the 1960s and early 1970s was the major occupation that many Nigerians were engaged in particularly the youth. But with discovery of oil in the early 1970's farming was relegated to the background. Agriculture in Nigeria has not been given the recognition it deserves if it is to make significant contribution to sustainable development of Nigeria in terms of jobs creation and providing food in abundance to Nigerians. On this note, Senator Victor Egba observed that, "Agriculture has a lot of potentials that cannot only transform the national economy but also tremendously impact the personal lives of the farmers, including the youth (Daily Trust, 2013:30). Hence, poor agricultural policies meant to encourage youth to engage in farming have seriously contributed to the decay of agriculture in Nigeria that has made youth not to have encouragement to take farming as a reliable occupation (Dalhatu and Bagaji, 2014).

Nigeria was traditionally an agricultural country, providing the bulk of its own food needs and exporting a variety of agricultural goods, notably palm oil, cacao/cocoa, rubber, and groundnuts (peanuts). At this time, the place called Nigeria had entrepreneurs who had the entrepreneurial mind-set prevalent at the time. The peoples of Hausa, Ibo, Yoruba and Benin all had their own entrepreneurs, who were exposed to entrepreneurship opportunities outside their native areas. The Hausas had astute entrepreneurs who managed workers with skills in tanning, dyeing, weaving, and metalworking which were highly developed (Ebo 2012). The Ibos also specialized in buying and selling goods and have perfected their entrepreneurial expertise in inventory control, management and distribution – which up till today, has remained their prevalent way of entrepreneuring. The Yoruba are predominantly town dwellers who practiced small-scale, domestic agriculture and are well known as traders and craftspeople. Since the 13th century, Yoruba artists have been producing masterpieces of woodcarving and bronze casting. Like the Ibos, the finished products were traded on as business ventures and enterprises (Afolabi, 2015). The development of these various skills can serve as a means of overcoming not only the present recession but future recession. Investment in entrepreneurial

skill as specialized by the various regions in Nigeria can actually help promote nonoil economic activities in Nigeria.

Providing the platform for the Hausas to develop entrepreneur skill in animal and poultry can raise employment in the agroallied industries as well as the leather and cloth industries. Moreover, with Igbos and the South South specializing in farm produce such as palm and cassava, as well as trading, the opportunity to grow the food and cosmetic manufacturing industries is there. The same goes to the Yorubas which can provide skill in craft, production of cocoa and other natural resources endowed in the area. In short, the various regions in Nigeria are so blessed with natural resources that the need for importation of these resources shouldn't arise. Such resources when fully exploited can raise economic output, increase job employment opportunities, provide revenue for the government, raise the welfare of the citizens and reduce poverty.

In the early 2000s, entrepreneurship studies were introduced into the Nigerian educational system especially in higher institutions as a mandatory course. The Centre for Entrepreneurship Development (CED), which has the objective of teaching and encouraging students of higher institutions (especially in science, engineering and technological (SET)) to acquire entrepreneurial, innovative, and management skills, was established. The Centre's goal is to make the graduates self-employed, create job opportunities for others and to generate wealth (Thaddeus, 2012). He continued that entrepreneurship development in Nigeria became significant only after the Nigerian civil war. At the end of the war the 2nd National Development Plan focused on the development of the 3Rs objectives of Reconstruction, Re-development and Reconciliation. The activities in the plan challenged/tasked the ingenuity and inventive skill of the individuals.

Lasisi and Shodiya (2017) decried that as of 2011, the services sector is Nigeria's largest and fastest growing sector, accounting for 59% of GDP and 58% of employment. The authors noted that unlike most advanced economies and a few industrialized emerging economies where economic growth has led to a shift from agriculture to manufacturing, structural change in Nigeria has resulted in a shift from agriculture to the services sector. Trade accounts for 17% of GDP and 23% of employment and has recorded average real GDP growth rate of 5.48%, higher than the economy wide real GDP growth of 5.31% over the past four years. The current retail distribution range from the traditional street trading and open market, to neighborhood groceries and now westernized shopping malls. The potential of this sector on the back of favorable demographics continues to attract investments by global consumer goods companies and retailers.

Table 3: Growth in selected sectors of the economy (2010-2016)

	2010	2011	2012	2013	2014	2015	2016
Export	12011476	15236666	15139326	15262014	12960493	8845159	8835612
% growth	39.57%	26.85%	-0.64%	0.81%	-15.08%	-31.75%	-0.11%
Import	8163975	10995864	9766557	9439425	10538781	110776068	9480367
% growth	48.96%	34.69%	-11.18%	-3.35%	11.65%	5.10%	-14.41%
GDP	54204795	63258579	71186535	80222128	89043615	94144960	101489492.20
%	118.62%	16.70%	12.53%	12.69%	11.00%	5.73%	7.80%

Source: Central Bank of Nigeria Statistical Bulletin 2016

Table 3 shows that while import fell from 5.10% from 2015 to -14.41% in 2016, export fell by more 0.11% in 2016 as against 31.75% in the previous. This goes to show that small and medium scale businesses in Nigeria can be a source of overcoming recession if actually given adequate attention. The table also shows that despite the recession, GDP grew from 5.73% in 2015 to 7.80% in 2016. Looking at table 2, oil revenue fell from 43.62% in 2015 to 29.66% in 2016 while nonoil revenue fell from -5.88% in 2015 to -3.16% in 2016 which shows that the nonoil sector dominated by small and medium scale enterprises can be relied upon during recession. This supports the findings made by Teru (2017) in her investigation that the role by the entrepreneurship in the Nigerian society create employment, provide goods and services, generate revenue to the government, utilize available resources both human and material and reduces the level of poverty. Abdullahi (2009) also assert that entrepreneurship contribute more to income earning, embarking on entrepreneurship afford people to earn good income to do well and had reduced persons below the poverty line. Ahiauzu (2010) assert that there is a positive relationship between entrepreneurship and economic growth while Henderson (2007) explained that entrepreneurship is increasingly being recognized as a primary engine of economic growth. By combining existing resources with innovative ideas, entrepreneurs add value through the commercialization of new products, the creation of new jobs, and the building of new firms. The Global Economic Monitor indicates that nations with higher levels of entrepreneurial activity enjoy strong economic growth. In short, entrepreneurs are the link between new ideas and economic growth.

2.6 Promoting Entrepreneurship in Nigeria

Entrepreneurship can be used to overcome recession in Nigeria. The growing rate as well as fall in some business ventures has provided the need to promote entrepreneurship in Nigeria. The fact that over a 1000 business ventures have collapse in the past two decades inclusive with medium and big scale companies such as Dunlop, Limca, and the poor performance of Peugeot has necessitated promotion of entrepreneurship in Nigeria. One of the most pressing

challenges confronting Nigeria's is the limited availability of sector-specific skills and the need to develop human capital by establishing a base of capable professionals and entrepreneurs. Nweze, Okolie, and Ituma (2014) called for the need to improve on the present quality of curriculum delivery in the entrepreneurial development studies in Nigerian Institutions of higher learning and an appreciable rise in the level of funding of entrepreneurial development studies by the various tiers of government. According to Fasehun (2013), entrepreneurship development programmes facilitate development of human resources for self-employment by setting up small scale industries and the quality of performance of the entrepreneur determines whether resources would grow rapidly or slowly and whether the growth involves novelty where new products and production techniques are developed. The difference in economic growth rates of countries of the world and the speed of overcoming recession as witnessed in countries such as United States of America is largely due to the quality of entrepreneurs in these countries. Production factors of land, labour and capital are said to be dormant or indolent without the entrepreneur who organize them for productive ventures. Baldwin (2002) pointed that entrepreneurial skills students can acquire during training to enable them to be self-reliant include marketing skills, financial resources skills, self-motivation skills, time management skills, administrative skills, innovative skills, professional skills, practical skills etc.

Afolabi (2015) urged that a sustainable approach to poverty reduction is through encouraging youths, particularly those with identified entrepreneurial skills to go into private business particularly in science and technology because these have natural potentials for business development. As a result, there is need for reforms in the educational curriculum to prepare students for self-reliance. Studies by UNIDO-Nigeria (2012) show that Micro, Small and Medium Enterprises (MSMEs) has the propensity to drive the Nigerian Economy with the report showing that there are over 17 million MSMEs employing over 31 million Nigerians. There is no gainsaying the entrepreneurship account for over 80% of enterprises that employ about 75 % of the Nigeria's total workforce, and therefore formulating and effectively implementing entrepreneurship friendly policies represents innovative ways of building the capacity to engage in entrepreneurial activities and creating job opportunities thus, playing a central and invaluable role in helping Nigeria realize its quantity advantage. In addition, the 2012 Global Entrepreneurship Monitor (GEM) also identified Nigeria as one of the most entrepreneurial countries in the world as they showed that 35 out of every 100 Nigerians (over a third) are engaged in some kind of entrepreneurial activity or the other.

In the past forty years or so, the government had established various support institutions specially structured to provide succor and to assist SMEs to contend with some of the hurdles along their growth path. Some of these specialized institutions include the Nigerian Industrial Development Bank (NIDB), the Nigerian Bank for Commerce and Industry (NBCI), the National Economic Reconstruction Fund (NERFUND), the Nigerian Export-Import Bank (NEXIM), the National Directorate of Employment (NDE), Industrial Development Coordinating Centre (IDCC), Peoples Bank, Community Banks, Construction Bank, Family Economic Advancement

Programme (FEAP), State Ministries of Industry SME schemes, the Nigerian Agricultural and Cooperative Development Bank (NACDB), BOI (Bank of industry) etc (Nwachukwu, 2012). It is widely believed that entrepreneurship is beneficial for economic growth and development. Entrepreneurship has been remarkably resurgent over the past three decades in countries that achieved substantial poverty reduction (Naude, 2013). Individually, ascertaining the link between the two concepts would not be unachievable.

2.7 Challenges of Entrepreneurship in Nigeria

Olowu (1983) cited in Bolawale & Ilesanmi (2014, p.134) argued that the major problem of SMEs consists of finance, organization and technology. The finance problem derives from the fact that the bulk of the funds available to it are originally from the owner of the enterprises. Babalola (1982) also cited in Bolawale & Ilesanmi (2014, p.134) suggested that if the small and medium scale enterprise could be given attention in an economy, it could play an important role in arresting the persistent decline in the value of enterprises. It could be counted upon for promoting stability and growth in GDP through the quick returns it generates. It has been observed that there were many bottlenecks in the growth and development of enterprises in Nigeria such as difficulties in local sourcing of raw materials, capital inadequacy, poor managerial and technical knowhow, as well as infrastructure deficiencies, the problem of long-term funds and working capital has pre-eminence. Some of the problems of SMEs in Nigeria to include:

a) Access to finance

Finances has become a major constraint to business development and entrepreneurs in Nigeria and most developing economies. Firms' perceptions of access to finance as a constraint had slightly worsened since the 2002 Investment Climate Assessment (ICA) survey 42.8%, as can be anticipated given the tightening in the credit environment. Access to finance was most severe in rural areas of Nigeria.

b) Cost of finance

In the last few months, more than ever since the year 2000 after universal banking, the Nigeria banking sector has been in the center of attention. Serious questions were also raised about the influence of the 2007 global economic crisis on the banking sector, and this question goes along with the question of the fate of the banks in Nigeria. Having a history of previous illiquidity, and because of rigorous prudential guidelines and monetary policy of the Central Bank of Nigeria, this phenomenon was something banks in Nigeria became aware of. As a result it can be said that times of cheap credits for entrepreneurs have passed. It is a fact that sources of capital and loans for banks are getting more costly as margins for deposit money banks have inevitably grown since the financial crises. Analyzing the characteristics of crediting arrangements (prices, conditions of installment, etc) for businesses in Nigeria, it can be deduced that credits are very expensive nowadays.

c) Electricity and Infrastructural Development

Lack of electricity is seen as a major obstacle in the Nigeria since most of the power cuts lasted for many hours or even days. However, the existing power shortage has changed this perspective. Poor access to infrastructure also affects a large percentage of the population. Only about one in every three households in rural areas has electricity and even when it is available, the supply of electricity is often unreliable. Forty per cent of electricity is generated privately and at a cost that is three times higher than electricity supplied from the grid. Fostering the private sector and entrepreneurship depends on a supportive business environment, yet Nigeria's business climate lags behind many countries in comparable positions. According to Teru (2015) the Nigeria's infrastructure can be deemed to be a nightmare to both entrepreneurs and the rest of the country's population, with the existing tremendously gone up cost of doing business due to the deteriorating infrastructures. The Doing Business Index ranked Nigeria an aggregate 125 out of the 183 economies assessed. Nigeria's rank for each of the ten sub-indices is as follows: Ease of Doing Business 125, Starting a Business 108, Dealing with Construction Permits 162, Employing Workers 37, Registering Property 178, Getting Credit 87, Protecting Investors 57, Paying Taxes 132, Trading Across Borders 146, Enforcing Contracts 94 and Closing a Business 94 (World Development Indicators, 2015).

d) Skills of workers

Most businesses, especially large ones, were constrained by this factor. According to the ICA report, the Productivity and Investment Climate Survey data show strong evidence that skill shortages significantly reduce both the absolute level and the growth rate of in-firm productivity. Eniola & Ektebang (2014) was quick to point to the fact that most entrepreneurs manages their business with the traditional approach that results in low performance in terms of productivity, low-quality products to small and local market. It is noted that use of a traditional approach by SMEs tend to have effect on productivity and, as a result, are weak in terms of competition. Eniola & Ektebang (2014) note that innovation doesn't come from a single person but comes from the business itself, thus innovation is there, but someone in collaboration with others has to bring it out. This can only happen when there is incentive support and freedom within and outside the firm for self-expression then, there is often a good will. Entrepreneurs take bold creative steps but situations encourage creativity. Creativity is, however, enhanced when people have some freedom, but not too much; high internal commitment to the task; but not too high a commitment; high proportion of intense rewards, but some extrinsic rewards as well; some competition but not winnertake- all competition. Entrepreneurial activity depends on the process of innovation following creativity, not on creativity alone.

e) Tax administration and tax rate

The various tax regimes of local, state and federal government tends to affect entrepreneur development in Nigeria. Teru (2015) posit that entrepreneurs in a country have a responsibility of funding the government through paying taxes, however most of the taxes charged on

entrepreneurs are not lawful and have effect on increasing cost of doing business. According to Fagge & Zubairu (2014), the allocative losses involved affect smaller and younger businesses more than others. On average, businesses held back by this problem are slower to grow and their annual job creation rates are lower by about a third. Most of the small and medium scale enterprises complains of high rate of tax imposes on them which slower their rate of growth and employment in the country, as government increases tax every year on their little earn profit.

f) Competition From The Informal Sector

Fagge & Zubairu (2014), opined that this includes both unfair competition and competition from illegally-traded products including smuggled products, unregistered traders and formal firms (avoiding taxes).

g) Standard of Education

The Nigerian education sector has fallen drastically that it is a known saying that "most Nigerian graduates are unemployable". Since they can't be employed, then the same institution cannot be said to improve or sharp their skill for entrepreneurship. Teru (2015) assert that education is the key to knowledge and that it plays a strong role in farming the burgeoning entrepreneur and based on today's world, the entrepreneur require education that will empower him to meet the require quality.

h) Poor Business Perception by Entrepreneurs

Most entrepreneurs in Nigeria lack idea and innovative skills. Some simply go into business based on what they see others doing. Innovative entrepreneurship requires doing something different from what others are doing even if the products and services are the same. A look at Innoson Motors shows an idea for vehicles worthy of Nigeria environment while makers of FAN AFRIK produced fans that last long in the Nigerian weather. These are innovations from one person's idea in collaboration with others for execution. Teru (2015) observed that Nigeria the face of the global economic crisis and its energy crisis requires graduates who will be job "creators" and not job "seekers".

i) Government Policies

When any government points out grave obligation to the sustainable growth of the SME subsector, the economy of that given government essentially witnesses pregnant transformation and prosperity. Unfortunately, Motilewa, Ogbari, & Aka, (2015) lament that this goose that is laying these fantastic golden eggs has not received its prime of place. It is often relegated to the background in policy formulation by government, especially in the developing economies. Study by the National Planning Commission and NISER (2003) on the relationship between Production and Employment in Nigeria reveals that many government policies have not solved unemployment issues in Nigeria. The study specifically shows that government policies increase the cost function of many enterprises, and also increases import dependence of production activities in Nigeria on outside countries. Thus, the policies failed to address the unemployment issues it was meant for.

Conclusion

Entrepreneurship is critical for the survival of Nigeria's economic future. The present recession has served as an eye opener into the diversification of the Nigerian economy from mono-economic culture to diverse economy. Promoting entrepreneurship skill will serve as a means of fast recovery from recession taking a cue from the USA in its recent recovery from recession that was fast tracked by policies that promoted entrepreneurship and business development. From studies reviewed, entrepreneurship entails identifying, utilizing and maximizing profitable business opportunities in a sustainable manner that can foster the economic growth and development of a community or nation. Business entrepreneurship usually results in flourishing micro, small and medium enterprises (MSMEs) which generates gainful employment, creates wealth and consequently grows the economy. Nevertheless, government policies and the prevailing business environment, particularly the uncontrollable factors can impede the significant impact of entrepreneurship on economic growth/development as observed by this paper. The present economic situation which has seen exchange rate value doubled in the last two years, oil price fallen, militancy and terrorist activities affected revenue and government expenditure, low economic output, high cost of living, high inflation rate, persistent budget deficit, etc have called for the need to pay attention to entrepreneurship as a panacea for sustainable development and speedy economic recovery.

The government, higher institutions, private led sectors, and individuals all have great role to play at ensuring entrepreneurship development in Nigeria. Government must first provide an enabling environment for entrepreneurship to display their skill and contribute to business growth and development. Several authors have recommended infrastructural development and other policy framework for the government, however, it is imperative that government evaluates most recommends, assess the feasible ones and implement them.

Institutions should promote entrepreneurship in their curriculum. Entrepreneurship training and development should start from the student level especially from secondary since there is high rate of drop out after secondary studies in Nigeria. There should be political goodwill by governments in funding, implementing and sustaining entrepreneurship training in Nigerian post primary schools and higher institutions. Private institutions should increase campaign on entrepreneurship training and development for the society while also highlighting the benefits. Such programme should be made cheap to ensure massive participation and access.

Governors and local government chairmen should invest entrepreneurship vis-à-vis their natural endowed resources. This will promote skill development, regional output and lower dependence on federal allocation.

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Effects Introduction of New Method for Servicing and Maintenance of Automobile Engines in Nigeria Government Agencies, Case Study: Maritime Academy of Nigeria, Oron, Akwa Ibom State, Nigeria

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Abstract: *This research investigates preventive maintenance management of automobile engines in Nigeria Government agencies, the case study of maritime Academy of Nigeria, Oron. A budget based optimization methodology is used by putting into consideration the age of the equipment (automobile Engines obtained from the institution maintenance data). This is necessary to provide cost effective maintenance management / replacement programme for critical components of automobiles engines and to reduce the cost of maintenance and quick damaging of automobile engine. The data were analyzed using budget optimization methodology. The findings show that Maritime Academy of Nigeria has been spending a lot of money on the maintenance of their automobile engine, that a lot of vehicle of less than three year of purchasing has been scrapped because of poor maintenance, the Maritime Academy of Nigeria did not have standard workshop up till date. The results provide effective cost and reliability template which can be used to perform a budget based maintenance planning programme in the institution and in all Nigeria Government agencies.*

Key words: *Preventive Maintenance; Reliability; Automobile engines; periodic maintenance; Maritime Academy*

INTRODUCTION

In engineering field we have different type of maintenance which are:

Breakdown Maintenance (BM): This refers to the maintenance strategy, where repair is done after the equipment failure/stoppage or upon occurrence of severe performance decline.

Preventive Maintenance (PM): This concept was introduced in 1951, which is a kind of physical check up of the equipment to prevent equipment breakdown and prolong equipment service life. PM comprises of maintenance activities that are undertaken after a specified period of

time or amount Of machine use (Herbaty, 1990). During this phase, the maintenance function is established and time based maintenance (TBM) activities are generally accepted (Pai, 1997). This type of maintenance relies on the estimated probability that the equipment will breakdown or experience deterioration in performance in the specified interval. The preventive work undertaken may include equipment lubrication, cleaning, parts replacement, tightening, and adjustment. The production equipment may also be inspected for signs of deterioration during preventive maintenance work.

Predictive Maintenance (PdM): Predictive maintenance is often referred to as condition based maintenance (CBM). In this strategy, maintenance is initiated in response to specific equipment condition or performance deterioration (Vanzile and Otis, 1992).

Corrective Maintenance (CM): This is a system, introduced in 1957, in which the concept to prevent equipment failures is further expanded to be applied to the improvement of equipment so that the equipment failure can be eliminated (improving the reliability) and the equipment can be easily maintained (improving equipment maintainability) (Steinbacher and Steinbacher, 1993).

Maintenance Prevention (MP): Introduced in 1960s, this is an activity wherein the equipment is designed such that they are maintenance free and an ultimate ideal condition of "what the equipment and the line must be" is achieved (Steinbacher and Steinbacher, 1993).

Reliability Centered Maintenance (RCM): Reliability Centered Maintenance was also founded in the 1960s but initially oriented towards maintaining airplanes and used by aircraft manufacturers, airlines, and the government (Dekker, 1996). RCM can be defined as a structured, logical process for developing or optimizing the maintenance requirements of a physical resource in its operating context to realize its "inherent reliability", where "inherent reliability" is the level of reliability which can be achieved with an effective maintenance program.

Productive Maintenance (PrM): Productive maintenance means the most economic maintenance that raises equipment productivity. The purpose of productive maintenance is to increase the productivity of an enterprise by reducing the total cost of the equipment over the entire life from design, fabrication, operation and maintenance, and the losses caused by equipment degradation.

Computerized Maintenance Management Systems (CMMS): Computerized maintenance management systems assist in managing a wide range of information on maintenance workforce, spare-parts inventories, repair schedules and equipment histories. It may be used to plan and schedule work orders, to expedite dispatch of breakdown calls and to manage the overall maintenance workload.

Total Productive Maintenance (TPM): TPM is a unique Japanese philosophy, which has been developed based on the Productive Maintenance concepts and methodologies

With all the explanation above you will discover that the best method to adopt in the institution [MAN, Oron] is preventive method so that the entire vehicle and the equipment will have long life span and also preventing our vehicle from breakdown.

METHODOLOGY

Data for this research were collected from both primary and secondary sources. The primary information was obtained from maintainers, supervisors, engineers and managers. This information include: wear and tear, Engine failure on the road or at a particular position and what it can cause if there is continuous failure. The main data were obtained from the log book for a period of one month. This data include the Movement covered, Mileage before, Mileage After, Mileage covered, ten critical parts were selected for the study. This data formed input into a maintenance and replacement model developed by Kamran (2008). The information was used to predict future maintenance planning for the Automobile engines (Vehicles) in the next One with a given budget and the objective of reducing maintenance cost and increasing the reliability of the Automobile Engines used by the institution. The methods used in solving the problem are generalized reduced gradient (GRG) and simulating annealing (SA).

RESULT AND DISCUSSION

Let me give us an example based on the research I made before I was invited to join the transport board committee. With the help of Mr. Victor Smart and Mr. Uwem (drivers), I used Haice bus of plate number 19D02FG as a case study on the 11/06/13 the vehicle was serviced with the mileage number of 52907KM. here are the detailed movement of the vehicle and the mileage covered as follow.

Table I for the Toyota Hiace Bus in Maritime Academy of Nigeria according to the driver

Date	Movement covered	Mileage Before	Mileage After	Mileage covered	Remark
12/06/13	MAN-Area Command MAN-Airport) 2x Airport-MAN) 2x	52907	53156	249km/h	
13/06/13	MAN-Airport Airport-MAN MAN-Calabar Calabar-MAN	53156	53572	416km/h	
14/06/13	MAN-Airport Airport-Uyo Uyo-Le-Meridian Le-Meridian-Uyo	53572	53816	244km/h	

15/06/13	MAN-Ikotekpene Ikotekpene-Calabar Within Calabar-Tinapa	53816	54244	428km/h	
16/06/13	Tinapa-Town Tinapa-MAN	54244	54521	277km/h	
18/06/13 And 19/06/13	MAN-Le-Meridian) 2x Le-Meridian-MAN) 2x Facilities Tour	54521	54930	409km/h	
20/06/13	MAN-Airport) 2x Airport-MAN) 2x MAN-Sky point, Shuttle MAN-Uyo Uyo-MAN	54930	55169	239km/h	
21/06/13	Within MAN-Skypoint	55169	55245	76km/h	
22/06/13	MAN-Biase LGA Cross River State	55245	55738	493km/h	
24/06/13	MAN-Calabar Calabar-MAN	55738	56218	480km/h	
25/06/13	MAN-Uyo Uyo-MAN	56218	56618	400km/h	
28/06/13 29/06/13 30/06/13 01/07/13	MAN-Calabar Calabar-Biase LGA Biase-Calabar Dropping of guest, Hotel-Oron Beach Hotel-Airport-Calabar Calabar-MAN	56618	57785	1167km/h	

The table above showed the movement and mileage data of vehicle 19D02FG, which also applicable to all vehicles in academy.

With all this we will see that our vehicle in academy cannot undergo **Periodic Maintenance**. The Haice bus 19D02FG is overdue for servicing with the total mileage covered between 12h June to 1st July 2013, compare to last servicing date 11/06/13, we will observe that is not up to a month, and as at the time am compiling this report the current mileage number is 57785-52907 is equal to 4878 which can cause wear and tears of the vehicle and can cause the vehicle to breakdown at anytime, considering periodic servicing with the data at hand the vehicle is unsafe condition.

Due to this, I hereby suggest the lasting solution for vehicle maintenance to the chief executive and the management boards the methods that our vehicle in Academy can adapt with, which is **Preventive Methods** as explained above.

The method stated above (**Preventive Methods**) at the beginning will give all the vehicles in Academy long life and the cost of maintenance will be minimal at the long run, it will be a lot of

fortunes to the Academy and all Agencies and Parastertal in Nigeria, if they can follow the right procedure Before this preventive maintenance could be achieved we need something to put in place so that the institution and any others like Agencies and Parastertal will not be at lost, which are.

1. **Log Book:** There will be a log book for all vehicle users (Driver) and they shall be taught on how to use the log book so that when the car reaching the maximum mileage to service and to replace any other spear part in the vehicle, the driver shall inform the supervisor.
2. **Workshop/Seminar:** There should be workshop for all drivers by inviting the VIO, Road safety and any other body that are expert in the field. So that they will be able to know road wordiness and how to drive safety within and outside Academy even outside the state, to note th sound of a vehicle when it changes, when the friction take place, when any indication shown on the dash board.
3. **Re-organized & Re-modernized:** The auto mechanics workshop in Maritime Academy of Nigeria Oron, need to be re-modernized that all the equipment will be well fixed and the maintenance of **ALL ACADEMY VEHICLES** will be taking within academy. So as to reduced the cost of maintenance.
4. **Training:** Training the, technician and craftsman (Mechanics) in any standard Toyota company so that they will be able to bring out up to standard repairs. And all academy vehicle will be in good condition for long period of time
5. **Materials & Spear part:** With the availability of material in the store by sending expert to go and bring those material to the academy so that bad material or spear part will not be supply and also to get the required mechanical tools and spear part material like engine oil, oil filter, fuel filter, top cylinder gasket. etc. with this entire academy vehicle will have along life span.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The following conclusions were made:

- i. Preventive maintenance can be used to determine the life span of academy vehicle. This can assist management in taking decisions on future academy vehicle purchase, operation and maintenance
- ii. The Management fleet, pool and the other vehicle will be maintain within Academy in a good condition
- iii. The Academy vehicles will have the higher average of operation and availability.

Recommendations:

Due to this I brought to the Nigeria Government Agencies a new method of maintenance called **Preventive Method**. The following recommendations are made:

- i. There is need for the institution (Maritime Academy of Nigeria, Oron) to keep good maintenance record of vehicle. This will serve as a data base for information
- ii. Good maintenance schedule and practice should be developed for equipment. This will reduce avoidable failure and increases vehicle availability.
- iii. Feedback between the driver and the Maintenance department should be encourage to track vehicle performance
- iv. There is need for the management of the institution (Maritime Academy of Nigeria, Oron) to adopt a structured maintenance information system presented in this research project.

Calling me to defend this for better explanation and understanding will also be welcome. **IT IS POSSIBLE, I CAN DO IT! YOU CAN DO IT! CAN DO IT!!!**

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Appraisal of the Management of Internally Displaced Persons (IDPs) in Nigeria

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Abstract: *Inter-communal clashes, fuelled by ethnic and religious tensions and also the Boko Haram insurgency and activities of Fulani killer herdsmen are the causes of Internally Displaced Persons (IDPs) from their various communities across Nigeria. This paper appraised the management of Internally Displaced Persons (IDPs) in Nigeria. Through the use of secondary sources of data collection, the paper revealed that Boko Haram insurgency and killer of herdsmen are the major causes of Internal Displacement of Persons in Nigeria. In the North- East of Nigeria, majority of the IDPs are caused by the Boko Haram insurgency, while others were forced to leave their place of origin because of community clashes between herdsmen and farmers especially in North-Central Nigeria and other IDPs were caused by natural disaster. The paper further observed a gross mismanagement of the IDP Camps due to lack of clear policies to manage them as well as corruption and lack of proper supervision by the authorities in Nigeria and recommended government of Nigeria to put in place intensive policies in order to checkmate the excesses of officials vested with the responsibility of managing the IDP camps in order to prevent mismanagement and embezzlement of funds. Furthermore, there should be stiff punishment to any official caught misappropriating funds meant to cater for the IDPs.*

Key words: *Management, Internally Displaced Persons.*

Introduction

Internally Displaced Persons (IDPs) is a social problem that affects not only Nigeria but the entire world. In Nigeria, the post-independence has its share on Internal Displaced Persons (IDPs). Scholarly works of Ibieta and Gariwey (2017) revealed that during Nigeria's civil war between 1967 and 1970, a good number of eastern Nigerians crossed Nigeria's border to become refugees in Cameroon, Chad, Niger, but the majority of south easterners were internally displaced within Nigeria. More recently, constant ethnic and religious clashes, communal clashes due to boundary disputes, grazing land disputes between farmers and pastoralists and widespread flooding across states in Nigeria which became unprecedented in

2012 have all converged to bring the issue of internal displacement to the front burner of political discourse and federal government policy and consequent appropriation of funds (Adeaja-Kubra, 2013).

Consequently, the conflict in the North-East of Nigeria arising from the Boko Haram insurgency emerging in 2009 appears to have triggered the highest displacement of hundreds of thousands of affected victims who have been compelled by the intensity of the conflict (both terrorist attacks and military operations) against the terrorists to flee their homes, businesses and farms, to safer parts of the country where more than 1.76 million people are internally displaced in the North Eastern region of Nigeria (Imasuen, 2015; International Organization for Immigration IOM, 2016). According to International Organization for Immigration (2016), the total number of IDPs in North East and North Central Nigeria is estimated at over 2 million people, making Nigeria host to the six largest IDP populations in the world.

Borno, Adamawa and Yobe States experienced a critical increase in IDPs throughout 2015 and 2016: in February 2015, the number of IDPs displaced as a result of the armed conflict was estimated at 946,000; by October 2016, this figure had risen to an estimated 1.68 million (International Committee of the Red Cross ICRC, 2016). Of these, the majority are located in Borno State, including approximately 528,000 IDPs in Maiduguri Metropolis, Borno State, and 864,000 IDPs in areas outside of Maiduguri Metropolis, often beyond the reach of humanitarian actors. While 22% of these IDPs are residing in official IDP camps and camp-like settings, the majority are residing within the host community.

From forgoing, the displaced populations are living in squalid conditions characterized by overcrowding and limited access to safe, sanitary and dignified accommodation. IDPs and returnees in Nigeria hosted in camps and displacement sites are often living in congested shelters or isolated in insecure or inhospitable areas, making them vulnerable to exploitation and abuse. The situation is most precarious in settlements such as camps, displacement sites, and unfinished buildings. The lack of shelter is, therefore, a major and persistent challenge and one of the main barriers to return. Displaced people in the region also face precarious health conditions and have poor access to health services. The health problems they report are mostly related to the change in their living conditions.

In addition, access to food and drinking water, as well as meeting their basic needs, remain problematic for most displaced people, especially in semi-arid regions. Limitations in access, availability, and quality have made water the most significant source of conflict between the displaced and host communities. Severe malnutrition in Nigeria and asylum countries has become more prevalent as the quantity and quality of available food has dramatically decreased. Some 5.2 million people are facing acute food insecurity in north-east Nigeria, an increase of 50 per cent since March 2016, according to the food security sector's *Cadre Harmonisé*, a regional initiative that assesses the food security across the Sahel from March 2017 (UNHCR, 2017). Affected households have had consecutive years of restricted income

levels, destruction of assets and livelihoods, and reduced food access, leading to an increase in negative coping strategies. It is in recognition of this fact that the study interrogated the management of Internally Displaced Persons (IDPs) in Nigeria.

Methodology

This research adopted analytical research design to examine the management of Internally Displaced Persons (IDPs) in Nigeria. Evidential documented secondary materials relevant to this work were used as sources of data collection in this paper. Thematic, analytical and explanatory techniques were used in the analysis of the secondary data in the context that better addresses the concern of the paper.

Internally Displaced Persons

The concept of internally displaced persons has become highly disputed (Cohen & Deng, 1998; Bennett, 1998). The United Nations Secretary-General(1992) defined persons or groups who have been forced to flee their homes suddenly or unexpectedly in large numbers, as a result of armed conflict, internal strife, systematic violations of human rights or natural or man-made disaster, and who are within the territory of their own country (United Nations Commission on Human Rights, 1992). This definition typifies the circumstances faced by displaced persons as an unintentional move by persons within state borders. The explanation also covers persons absconding from armed conflict, internal strife and organized violations of human rights. IDPs were characterized as including persons displaced by natural disasters and sundry man-made calamities.

There are many causes of displacement which includes: droughts, tsunamis and tornadoes as well as occurrences such as oil spills, aircraft mishaps, military equipment explosion, the definition is broad enough to take these other causes into cognizance. In an attempt to fill the gaps and omissions in the above explication, the Guiding Principles on Internal Displacement was unveiled to the UN in 1998 and has huge acknowledgment for treating internal displacements in the world by various state and non-state actors, regional and sub-regional bodies. The definition presents this group as: - Persons or groups of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of armed conflict, situations of generalized violence, violations of human rights or natural or human-made disasters, and who have not crossed an internationally recognized State border (Office for the Coordination of Humanitarian Affairs (OCHA), 2004). It is imperative to note that this conceptualization of “internally displaced person” is rather expressive or descriptive, rather than being an authorized or legal definition (Mooney, 2003). This simply states in clear realistic terms the condition that displaced persons face within their habitual residence. The concept confers no special legal standing or status on internally displaced persons as the one given to “refugees” does. Kälin, Müller and Wyttenbach (2004) explain that IDPs do not need such legal attention. He added that refugees have lost the protection of their own homeland and have crossed the international borders to another state,

and by so doing, have lost their human rights to the basic things of life and therefore need special legal status. Internally displaced persons on the other hand, still enjoy the privileges and protection of the habitual residence of a particular state.

Management

Management is one of the most important activities of human life. To accomplish aims that could not be achieved individually, people started forming groups. Managing has become essential to ensure the coordination of individual efforts. Management applied to all kinds of organizations and to managers at all organizational levels. Principles of management are now used not only for managing business but in all walks of life viz; government, military, social and educational institutions. Essentially, management is same process in all forms of organization. But it may vary widely in its complexity with size and level of organization. Management is the life giving element of any organization.

Henri Fayol (1841-1925) defined management as a conduct of affairs of business, moving towards its objective through a continuous process of improvement and optimization of resources. Koontz (1909-1984) sees management as the process of designing and maintaining an environment in which individuals, working together in groups, efficiently accomplish selected aims. Mary Parker Follett (1868-1933) defined management as the art of getting things done through people. George, R. Terry (1877-1955) defined management as the process consisting of planning, organizing, actuating and controlling, performed to determine and accomplish the objectives by use of people and resources. ILO defined management as the complex of continuously coordinated activity by means of which any undertaking administration/public or private service conducts its business. Lawrence A. Appley (1904-1997) defined management as guiding human and physical resources into a dynamic, hard hitting organization until that attains its objectives to the satisfaction of those served and with a high degree of morale and sense of attainment on the part of those rendering the service.

Nature of Internally Displaced Persons in Nigeria

The rise in the numbers of internally displaced persons in Nigeria has become an issue of national concerns. Many Nigerians have been displaced as a result of natural disaster, ethno-religious conflicts, communal clash and the Boko Haram insurgency in the North East and some part of Northern West has increased the number of IDPS (Funmi, 2014). The insurgency perpetrated by the Boko Haram on residents on daily basis in Adamawa, Borno and Yobe States in particular has increased the number of displaced citizens with some Nigerians reportedly taking refuge in the neighboring countries of Cameroon, Niger Republic and Chad (Funmi, 2014). The number of ,internally displaced persons (IDPS) in the country has been increasingly in leaps and bound each passing day since the beginning of the insurgency in the North-East Nigeria. The officially registered number of conflict and disaster induced IDPS stands at 868,235 in Borno, Yobe and Adamawa States (Chibuzor, 2015).

At the start of 2014, there were many issues expected to shape the years, Boko Haram was among them. But not many people thought that thousands of people will be displaced from their homes as a result of the insurgency. There were high expectations that the militant's activities will be limited, but turned out to be negative. It is crystal clear that high record of internally displaced people (IDPS) occasionally by ethnic's conflicts, natural disasters and insurgency now placed Nigeria top on the list of countries in Africa with highest number of IDPS.

In March, 2014, IRIN, a humanitarian website published that an estimated 350, 000 people were displaced since 2013. The website claimed that 290, 000 people were internally displaced while the rest fled to Cameroon, Chad and Niger. The UN High Commissioner for refugees (UNHCR) in its figure estimated a higher number of internally displaced persons at 470,000 (Adeola, 2014). In a report, the Nigerian military was said to have claimed that Boko Haram killed more than 1, 500 people in the first three months of 2014 alone and more than half of those killed were civilians. In May, 2014, a report by the Internal Displaced Monitoring Council (IDMC) and the Norwegian Refugee Centre (NRC), " Global Overview, 2014: People Internally Displaced by Conflict and Violence", stated that the number of internally displaced persons in Nigeria was approximately 3 percent of the number of IDPS in Africa and 10 percent of IDPS in the world (Adeola, 2014).

The report posits that 2013, alone, 470, 500 persons were displaced in Nigeria and that was the third highest in the World behind Syria with 6.5 million and Colombia with 5.7 million. According to the 2014 report of the IDMC and the Norwegian Refugee Centre, out of the 33 million internally displaced persons all over the world, Nigeria accounts for 3.3 million or a whopping 10 percent of the total population of IDPS in the world.

In April, 2014, a statement by the National Commission for Refugees, Migrants and Internally Displaced Persons (NCFMIDS) claimed that Borno state was in the lead with Nasarawa following after it. The figures from the commission also indicated that Nigeria had IDPS in 24 states of the Federation (Adeola, 2014).

Internally displaced people (IDPS) the vast majority of whom are women and children face a range of threat to their physical safety and restrictions on their freedom of movement. Many are traumatized by the violence that prompted them to flee and are afraid to return. Those whose homes have been damaged or destroyed by conflict and flooding have nowhere to go back to. Most internally displaced families live and share resources with host communities (Internal Displacement Monitoring Centre IDMC, 2014).

Causes of Internally Displaced of Persons in Nigeria

The causes of internal displacement of persons are multi-faceted, complex and often overlapping. Among the causes, here are the major causes discussed below:

- i. **Inter-communal Conflict:** -Communal conflict along ethnic and religious fault lines have fostered a climate of instability and violence throughout the north and the middle belt, the dividing line between the Muslim North and Christian South. Episodes of inter-communal violence in the middle belt states of plateau, Taraba, Benue and Nasarawa have left more than 400 people dead in 2014, and destruction. In the east and north east, more than 85,000 people fled their homes between January and August, 2014 including the states affected by Boko Haram such as Bauchi and Taraba (Internal Displacement Monitoring Centre IDMC, 2014).
- ii. **Religious, sectarran and electoral violence both religious and ethnicity are politically manipulated for populist causes.** Ethnicity has placed a significant role in religious conflicts in northern Nigeria. The politics of religion in Nigeria is also evident in the Sharia law- debate that engulfed the country after its return to democracy in 1999, there has since been an exponential rises in religious violence, with the vast majority taking place in northern Nigeria, where it flares regularly in flash point areas such as the cities of Kaduna and Zaria in Kaduna State, mainly in the form of Urban riots (IDMC, 2014).
- iii. **Boko Haram attacks in Nigeria:** -Boko Haram began its insurgency with assaults on members of the security services, politicians, civil servants and other authority figures in the northern states of Borno, Bauchi, Kano and Yobe. It started to expand its operations in 2010, when it bombed buildings in Jos, and has since acquired tanks, rocket launchers, anti-aircraft and anti-tank weapons and sub-machine guns (IDMC, 2014). However, going by the above causes, since the beginning of 2014, the increase of violence caused by Boko Haram insurgency has triggered a massive wave of displacement in the north eastern part of Nigeria. The country's also prone to natural disaster and community clashes which have generated and continue to cause displacement all across its territory.

In order to respond to the need for accurate and up to date information regarding the movements of internally displaced persons (IDPS) in the context of the current humanitarian crises, IOM began in close collaboration with the government of Nigeria, the Displacement Tracking Matrix (DTM) program. The objectives of the DTM program is to support a comprehensive system to collect and disseminate data on IDPS by strengthening the capacity of the National Emergency Management Agency (NEMA), the State Emergency Management Agency (SEMA), the Nigerian Red Cross Society (NRCS) and other partners in the field to undertake IDPS assessment in a unified and systematized manner (Displacement Tracking Matrix DTM, 2015).

This report encompasses both the data collected through the assessments conducted in a total of 79 local government areas and 574 wards where IDPS presence has been reported either in camps or in host communities and the result of the camp profile exercises conducted in the

formal settlements identified in Adamawa and Borno State. It also presents the data collected by NEMA for plateau, Nasarawa, Abuja, Kano and Kaduna States. Due to security reasons, Madagali and Mmichika local government areas in Adamawa as well as Gujba and Gulani in Yobe were not accessible at the time of the assessment. In Borno, only 3 local government areas were accessible during the evaluation by DTM from January to February, 2015: Maiduguri, Jere, and Biu.

Challenges faced by Internally Displaced Persons (IDPs)

In a study conducted by Kabiru (2015) on the nature and management of Internally Displaced Persons (IDPs) in Northern Nigeria from 2012-2015, the study findings revealed the following challenges of IDPs in Nigeria:

- i. **Lack of adequate and safe shelter:** - Access to adequate shelter is the most immediate need IDPs face in the initial stages of displacement. In the middle belt and parts of the north-east recurrent ethnic and inter-communal clashes frequently cause displacement as a result of the destruction of homes, schools, and markets (IDMC, 2014). The majority of IDPs in Nigeria take refuge in host communities. This may involve staying in the homes of family or friends, paying for temporary accommodation or seeking refuge in makeshift camps like settings such as schools, sports centres, Churches, Mosques and University campuses.
- ii. **Basic Needs Unmet:-** IDPs are often unable to exercise their basic rights to food and essential household items such as sleeping, mats, mosquito nets, jerry can, soap and cooking utensils. They usually lose access to their sources of revenue when they flee. Assistance for those living in camps, when provided, is inadequate.
- iii. **Poor Health and Hygiene:** - IDPs often have only minimal access to health services and their lack of access is of particular concern given that the overwhelming majorities are women and children. Most health facilities in areas of the north east affected by conflict were closed as of mid-2014 as a result of insecurity and the displacement of staff (IDMC, 2014).
- iv. IDPs and host communities have only limited access to safe drinking water and adequate sanitation, leading to a decline in health and hygiene among both IDPs and their host communities. The contamination of water sources has contributed to cholera outbreaks in a number of displacement sites in Biu, Borno state in 2014 (IDMC, 2014).
- v. **No access to education:** - With many IDPs sheltering in schools and humanitarian assistance often limited to life saving intervention, displaced children are generally unable to pursue their education. Boko Haram attacks against schools since 2012 and state government closure of facilities in the worst affected areas, such as Borno

State, have drastically decreased access. All schools in the town of Baga, Bama, Jejeri, Umarari, Garnam, Mai malaria, Mungono and Ganboru were forced to close between February 2012 and June 2013. Unidentified gunmen destroyed 14 schools in the Borno state capital of Maiduguri between January and April, 2013, and at least 256 were destroyed across the state. All state schools in Borno were closed in March 2014 (Internal Displacement Monitoring Centre, 2014).

Management of Internally Displaced Persons (IDPs) in Nigeria

Different sectors through humanitarian, NGOs and government agencies seek to highlight the current gaps and challenges in meeting the needs of IDPs, and provide concrete recommendations to improve protection, assistance and durable solutions for IDPs identified. According to United Nations High Commissioner for Refugees (UNHCR, 2014), the management of IDPs in Nigeria is from these organizations mentioned below:

Food Aid and Security

- i. NEMA, ADSEMA and faith based organization have supplied food items to the NYSC camp in Girei Local Government Area. The food items include rice, semovita, maize, cassava flour, noodles, yams, beans, bread and palm oil. ADSEMA provides meat and fish. According to ADSEMA the food items available in the NYSC camp will be sufficient for a period of 3 months. FOMWAN volunteers and IDPs cook food and serve wet rations 3 times a day.
- ii. In the month of August, 2014, CISCOPE/OXFAM from its SCHO funded responses distributed food items mainly maize and rice to 1, 050 IDP households in Michika Local Government Area.
- iii. American University of Nigeria (AUN) has distributed food items to 2, 000 IDP households in host communities in Yola metropolis and Jimeta through Adamawa Peace Initiative.
- iv. The Mubi Emirate Council, NEMA and Dangote Foundation have supplied food items to support registered 6, 561 IDPs in Lamode and Kolere in Mubi Local Government Area.

Water Sanitation and Hygiene

- i. SEMA, Red Cross, OXFAM/ CISCOPE and IRC are the leading agencies providing WASH support in the NYSC IDP camp.
- ii. OXFAM through its implementing partners, CISCOPE leads WASH committee in the NYSC IDP camp and conducts regular hostel to hostel awareness on personal and menstrual hygiene. It also mobilize the IDPs and volunteers to remove solid waste,

- washing of toilets, sweeping of IDP camp and cleaning of drainages prior to the attack on Michika Local Government Area, OXFAM/CISCOPE distributed hygiene kits to 1,00 households, trained 50 volunteers, on water pre-filtration treatment and time delay before consumption, sensitized communities on appropriate hygiene practices and constructed 15 VIP latrine in Michika Local Government Area before the attack.
- iii. OXFAM through its partners, CISCOPE has prepositioned hygiene kits for 1, 200 households to support IDPs in the communities from its ongoing ECHO funded responses.
 - iv. Red Cross and coordinates environmental sanitation in the NYSC IDP camp. In order to meet the urgent need for additional toilet facility in the NYSC camp, NRC advocated with AUN which has commenced the construction of 5 bio-degradable pit latrines and 5 washing cubicles in the female hostels (UNHCR, 2014).
 - v. IRC has distributed 30 hand washing station stands, 50 wash solid waste disposal bins, 62 liters, 2 Wheel Barrows, 2 Shovels, 3 Metal Brooms, 60 Mobs/Buckets, 87 Hand Brush, 2 public address systems, weighing scales and supported excavation of 4 solid waste maintenance pits in the NYSC camp. IRC has trucked water to meet the urgent need for drinking water among IDPs living in host communities in Mubi Local Government Area.
 - vi. SEMA has supplied cutlasses, brooms and disinfectant to support environmental sanitation in the NYSC camp.

Education

- i. Adamawa state Government has announced 13 October as the resumption date for schools in the state. In preparation for the resumption of schools, SEMA has commenced registration of pupils according to age groups and allocated a temporary learning space in the NYSC camp. This shall give about 2, 000 school age children access to education.
- ii. Essential recreational materials supplied by UNICEF have been distributed in the NYSC camp.
- iii. SEMA and Red Cross have finalized plans with the Local Education Authority to supply learning materials to the NYSC camp. In the same vein, AUN is in the process of deploying 23 teachers and supply of 300 text books to the NYSC camp.
- iv. Some of the registered IDPs are teachers by profession and they are being mobilized to support educational activities in the camp.

Health

- i. A 6 bed clinic has been set up in the NYSC camp. The clinic is managed by staff of Girei Local Government Area. Currently, 4 nurses who run two shifts (morning and evening), 1 medical doctor and 2 environmental officers provide ongoing medical and health care support in the camp. The camp has a store where drugs are kept.
- ii. 80 percent of drugs are supplied by the state Government through the state ministry of health. However, Primary Health Care Agency (PHCA), Nigeria Medical Association (NMA) Sure-P and faith based organizations supply drugs to the Clinic.
- iii. Most of the drugs include anti-malaria, antibiotics, de-wormer and pain reliving drugs. Immunization and vaccination of newly registered IDP children is carried out.
- iv. An agreement between SEMA and the specialist hospital in Yola to support IDPs for referral and secondary care is in place. IDPs with critical or special medical attention have been supported to access secondary care in the specialist hospital.
- v. UNICEF has distributed dignity kits in some host communities and RH kit in health centres.
- vi. IRC has conducted a survey of Primary Health Care (PHC) centres in some of the communities hosting IDPs with the aim of supporting IDPs to access medical and health care.

Emergency Shelter and NFIs

- i. ADSEMA provide emergency shelter for the 4, 236 registered IDPs in NYSC camp located in Gieri Local Government Area. The IDP camp is fenced with security post at the entrance to check indiscriminate movement in and out of the camp. Newly registered IDPs are allocated a space in the hostels and supplied with essential NFIs such as mattresses, nylon mats, cups, plates and spoons.
- ii. Males and female are put in separate hostels in the camp, children under 5 stay with their mother in the female hostels.
- iii. As at 27 September, 2014 750 mattresses, 5, 000 blankets, 500 mosquito nets, 150 plastic buckets and 200 cups have been supplied to the IDP camp.
- iv. It was reported that some IDPs preferred nylon mats to mattresses. The store officer reported that the women in particular most times return mattresses in exchange for nylon mats. This is common among women with high number of children (between 5-7 children) as the mattresses do not provide enough sleeping space for the household.

- v. The government plan to relocate the IDPs in Mubi Local Government Area to Biu, Yola and Maiduguri has not been accomplished there by causing agitation among the IDPs.

Safety and Security

- i. A combination of State Security Service (SSS), Police, Civil Defense, Peace Corps and civilian JTF provide a general security in the NYSC camp. They participate in the screening and registration of new IDPs. They also screen food and NFIs that are supplied to the camp. They are represented in different camp committees such as security and discipline, psycho-social support, registration and secretariat.
- ii. The civil defense and peace corps provide security at the female hostels

Conclusion

The causes of Internally Displaced of Persons (IDPs) in Nigeria are multi-faceted, complex and often overlapping. Inter-communal clashes, fuelled by ethnic and religious tensions and also the Boko Haram insurgency are the causes of the displacement of persons from their various communities. However, the Boko Haram insurgency in particular is the major cause of internal displacement of persons in northern Nigeria. The study findings revealed that majority IDPs in the North-Eastern Nigeria are caused by the Boko Haram insurgency, while significant number of IDPs North-Central were forced to leave their place of origin because of community clashes between herders men and farmers and others IDPs were caused by natural disaster.

In controlling the activities of the Boko Haram insurgent, the government adopted counter – terrorism approach (counter-insurgency measure) which leads to further displacement of persons, the government uses force and violence on the insurgent. Furthermore, counter insurgency measures such as the ban on the use of motorcycles have resulted in loss of means of livelihood and subsistence for some households. Also find use of carrot and stick approach by government to manage and control the insurgency which is the using of reward and punishment in order to motivate, manage and control behavior and situation as it is use by the management scientists, and administrators. The government used the carrot and stick approach because it was the same approach or measure the government takes over Niger Delta Militant, through this measure the government succeeds in managing and controlling the activities of the Niger Delta militants.

In the management of Internally Displaced Persons (IDPs), the study revealed that the vast majority of IDPs are women and children faces a range of threats to their physical safety and restrictions on their freedom of movement, many are traumatized by the violence that prompted them to flee and are afraid to return. Those whose homes have been damaged or destroyed by conflict and flooding have nowhere to go back to. Most internally displaced families live and share resources with their host communities. The efforts by both national and

State governments to address the needs of IDPs are inconsistent, and poor access means of support from international agencies and Nigerian civil society is also limited, people who live in or near camps receive some assistance, but often not enough to meet their food and other basic needs. They also tend to live in cramped and unhygienic conditions, the most vulnerable IDPs are the young, older people and those with disabilities are most at risk. There is lack of strategy guiding humanitarian assistance and only limited discussion of durable solution at international, national and local level.

Recommendations

Based on the discourse of the paper, the following recommendations are made:

- i. The Federal Government of Nigeria, in collaboration with the state governments should build permanent camps for the registered IDPs with schools and health clinics in order to facilitate healthy life and produce skillful human being among the internally displaced persons for the betterment of their life and the general society.
- ii. The government should provide stable electricity in all the camps and also provide efficient food items and portable drinking water for the IDPs, safety and security of their life.
- iii. The Federal Government of Nigeria should put intensive policies in order to checkmate the excess of government officials vested with the responsibility of managing the IDPs in order to prevent mismanagement and embezzlement of funds. The government should also punish any official caught appropriating funds meant to cater for the IDPs.

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Studies on Some Diseases Associated with Mitochondrial Disorder

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Abstract: *This work was aimed at studying some diseases associated with a mitochondrial disorder. Mitochondria are tiny structures inside almost every cell in the body; all the way from the skin to the organs inside the body. Their main job is to use the food and oxygen that enter the cells to make energy. Almost all of the energy the body needs for daily life and growth comes from mitochondria are ubiquitous subcellular organelles that play essential roles in energy production, metabolism, and signal transduction. The energy generated in this oxidative phosphorylation process is utilized for the synthesis of adenosine triphosphate (ATP), Mitochondria are also involved in programmed cell death or apoptosis. The term “Mitochondrial disease” refers to a group of disorders; each of these conditions involves a problem with mitochondria which can arise from two sources: mutations of DNA in mitochondria, or mutations of DNA in nuclear genes. Mitochondrial DNA has a mutation rate of about ten times that of nuclear DNA. Symptoms include: Developmental delay or regression in development, seizures, migraine headaches or strokes, muscle weakness (maybe on and off), poor muscle tone (hypotonia), poor balance (ataxia), painful muscle cramps, unable to keep up with peers (low endurance), chronic fatigue, stomach problems (vomiting, constipation, pain), temperature problems from too little or too much sweating, breathing problems, eyes are not straight (strabismus), decreased eye movement (ophthalmoplegia), loss of vision or blindness, droopy eyelids (ptosis), loss of hearing or deafness, heart, liver or kidney disease at a young age, parts of the body are shaky (tremors) Medications are used to treat certain symptoms such as Seizures can be controlled with medications called anticonvulsants, Muscle cramping and stiffness may be relieved with medications called muscle relaxants, Spasticity (tight or rigid muscles that constantly contract). Creating monohydrate, Vitamin C, Vitamin E, Alpha lipoid acid, Co-enzyme Q10, Riboflavin, Thiamine, L-carnitine are some of the drugs of choice.*

Key words: Mitochondria, DNA, Disease & Symptoms

INTRODUCTION

Mitochondria are tiny structures inside almost every cell in the body; all the way from the skin to the organs inside the body. Their main job is to use the food and oxygen that enter the cells to make energy. Almost all of the energy your body needs for daily life and growth comes from

mitochondria are ubiquitous subcellular organelles that play essential roles in energy production, metabolism, and signal transduction (Martinou and Youle, 2011). Multimeric protein complexes organized within the inner membrane of the mitochondrion catalyze the reactions in the citric acid cycle and transport of electrons, resulting in the formation of a proton gradient. The energy generated in this oxidative phosphorylation process is utilized for the synthesis of adenosine triphosphate (ATP), which drives a multitude of necessitous reactions within all cells, especially those with high energy requirements such as neurons and myocytes (Cheng and Ristow, 2013). Mitochondria are also involved in programmed cell death, or apoptosis; whereby upon detection of a stress signal, they will release cytochrome c into the cytosol which triggers downstream caspases to initiate apoptosis (Renault & ChipuK (2014).

MORPHOLOGY IN RELATION TO FUNCTION

As evidence of the impact of mitochondrial structure on function (Heath & Shore, 2006), some have shown that enhanced network branching induced by up-regulating mitochondrial fusion (Ong *et al.* 2010) or else down-regulating fission (Ong *et al.* 2010) can decrease or prevent apoptotic signalling. Inhibiting mitochondrial fission also prevents fission-induced ROS release in hyperglycaemic conditions (Yu *et al.* 2006). The opposite also appears to occur: enhanced network fragmentation by upregulating mitochondrial fission (Frank *et al.* 2001; Ong *et al.* 2010) or downregulating mitochondrial fusion (Lee *et al.* 2004) can promote pro-apoptotic signalling in live cells, although this causal link has not always been observed (Youle & Karbowski, 2005). Further to this, promoting mitochondrial fission and network fragmentation has been associated with reduced respiratory capacity and increased ROS production (Yuet *al.* 2008). In addition, the major protein involved in mitochondrial fusion – mitofusin 2 – influences expression of oxidative phosphorylation genes (Pich *et al.* 2005), indicating overlap at the genetic level between regulatory pathways for mitochondrial morphology and metabolism (Zorzano *et al.*, 2010). Mitochondrial membrane potential is also closely associated with reversible changes in mitochondrial morphology (Guillery *et al.* 2008), and additional findings demonstrate an intricate relationship between mitochondrial dynamics, structure and function (McBride & Soubannier, 2010).

MORPHOLOGY AND ORGANELLE INTERACTIONS

The classic picture of cellular mitochondria based on low-resolution electron micrographs is of a set of relatively small bean shaped particles scattered around the cytosol. However, our understanding of the morphology of the organelle has changed with the advent of higher resolution electron microscopes and cryopreservation of samples. Foremost, mitochondria are now known to be highly dynamic and can be punctate as previously proposed, but can also be organized as a continuum or reticulum under some cell conditions. Further, the organelle moves within the cell in the punctate state or as a reticular unit to provide foci of energy production such as at the nucleus during cell division, or to synapses in neuronal cells at times of high information transfer.

INTERNAL STRUCTURE

A typical low-resolution electron micrograph of bovine heart mitochondria is shown below. Such images led to a model in which there was a distinct outer membrane and a convoluted inner membrane surrounding the matrix space. These convolutions were called cristae. The space between the inner and outer membranes was called the intracristal space. Improved electron microscopy techniques have provided a more complex picture.

ORGANIZATION OF MITOCHONDRIAL GENOME

A unique feature of mitochondria is that they contain their own mitochondrial DNA (mtDNA). This genome is a relic of their free living bacterial origins before they were engulfed by ancient eukaryotes and co-opted for aerobic respiration. Compared to the nuclear genome, replication of the mitochondrial genome is not tightly controlled and may occur at any stage of the cell cycle, instead of being confined to mitosis and meiosis (Ristow, 2013). This results in varying mtDNA copy numbers per cell (Pohjoismäki & Goffart, 2011). Most human cells contain at least 1,000 mtDNA molecules distributed among hundreds of mitochondria, except for mature human oocytes, which have more than 100,000 mtDNA copies. (Veltri KL & Espiritu 1990). The human mitochondrial genome is composed of double-stranded circular DNA approximately 16.6 kbp in size and contains 37 genes. These genes encode 2 rRNA, 22 tRNA, and 13 polypeptides that are subunits of the OXPHOS system (8). All remaining components required by the mitochondria, such as DNA polymerases and other subunits of OXPHOS, are encoded by the nuclear genome. Except for a small regulatory region called the displacement loop (D-loop), the entire mitochondrial genome is comprised of coding sequences (Nussbaum et al., 2007). This characteristic, compounded with the greater potential for oxidative damage and lack of any internal DNA repair mechanisms, makes mtDNA about 10 times more likely to acquire mutations compared with nuclear DNA (Spelbrink, 2010).

What are the signs and symptoms?

Every cell in the body, except red blood cells, contains hundreds to thousands of mitochondria working to make energy. The mitochondria in some areas of the body may be working properly, but not in other areas. This can cause a wide variety of symptoms.

There is no one identifying sign or feature of mitochondrial disease. Symptoms can vary and range from mild to severe, even among affected family members. In mild cases, young people may learn to cope and adapt to the amount of energy they have and don't realize they have symptoms, or adults may comment that they were very healthy as a child, but not really athletic.

People with Mitochondrial disease often have one or more of these symptoms: Developmental delay or regression in development, seizures, migraine headaches or strokes, muscle weakness (may be on and off), poor muscle tone (hypotonia), poor balance (ataxia), painful muscle cramps, unable to keep up with peers (low endurance), chronic fatigue, stomach problems

(vomiting, constipation, pain), temperature problems from too little or too much sweating, breathing problems, eyes are not straight (strabismus), decreased eye movement (ophthalmoplegia), loss of vision or blindness, droopy eye lids (ptosis), loss of hearing or deafness, heart, liver or kidney disease at a young age, parts of the body are shaky (tremors) (Hamilton, 2010)

MITOCHONDRIAL DISEASES

The term “Mitochondrial disease” refers to a group of disorders; each of these conditions involves a problem with mitochondria

HOW IT HAPPENS

Mitochondrial disorders can arise from two sources: mutations of DNA in mitochondria, or mutations of DNA in nuclear genes. Mitochondrial DNA has a mutation rate of about ten times that of nuclear DNA(Yakes and Van Houten 1997) This may be because there are so many more mitochondria per cell compared with two pairs of nDNA genes per cell, and also that the system of replication of mitochondria is prone to errors due to less efficient systems for DNA repair(Linnane et al.,1989)

Mitochondria and Neurodegeneration

It has long been thought that mitochondria play a critical role in a variety of diseases characterized by neuro-degeneration. Early on the focus was on oxidative stress and the effect this had on energy production. More recently emphasis has shifted to disease-causing alterations in mitochondrial trafficking and/or removal of defective organelle by mitophagy (Hamilton Health Science, 2010)

Role of Mitochondria in Parkinson’s diseases. Although as of now there is no definitive evidence in any of the diseases below. The proposal that mitochondrial dysfunction played a role in Parkinsons disease originated with the observation that the Complex I inhibitors rotenone and MPTP caused Parkinsonian symptoms. More recent work has identified Complex I protein changes in patients with the disease. Proteomic studies showed that complex I of brains from Parkinsons patients had an average decrease of 34% in the 8 kDa subunit, and contained 47% more protein carbonyls in catalytic subunits coded for by mitochondrial and nuclear genomes. Further, NADH-driven electron transfer rates through complex I inversely correlate with complex I protein subunit modifications. Similar patterns were observed when the mitochondria from brains of control subjects were incubated with NADH in the presence of rotenone, but not with exogenous oxidant, indicating that the oxidative damage is induced from within the complex and not by exogenous free radicals. The damage caused by Complex I dysfunction and consequent superoxide production is broader than just in this complex, and is found in DNA, lipids and proteins of PD brains, particularly in the substantia nigra which has low concentrations of anti-oxidant proteins. Oxidative damage is also seen in peripheral tissues.

Importantly, these broad oxidative effects are observed in animals treated with rotenone, confirming that the initial free radical generator is Complex I (Christoffels et al., 2015)

Mitochondria and Alzheimers Disease (AD).

As in PD, membrane-associated oxidative stress, increased free radical production, and perturbed Ca²⁺ homeostasis have been observed. Increased mitochondrial permeability and cyt c release, which is promoted by A β oligomerization and polymerization, is thought to trigger the opening of MPTP leading to apoptosis. Different from PD there is evidence of reduced cytochrome c oxidase activity. This is at least in part due to oxidative damage of mtDNA that is beyond that seen in normal age controls. Complex I down regulation is also seen in AD brains. As in PD, the primary insult leading to AD is not known. Most likely this is a heterogeneous disease, with altered mitochondrial function leading to reduced ATP production, increased free radical production, and increased apoptosis (Reddy & Beal2008)

Mitochondria and Huntingtons Disease

Huntingtons disease is linked to the presence of an elongated polyglutamine (polyQ) stretch in the huntingtin protein (Htt). This mutation in Htt correlates with neuronal dysfunction in the striatum and cerebral cortex and eventually leads to neuronal cell death. How this happens remains unclear but like PD and AD focus is now on anomalous mitochondrial dynamics, and trafficking along with disrupted mitophagy. In addition, deficiency in oxidative metabolism and defects in mitochondrial Ca²⁺ handling are considered essential contributing factors to neuronal dysfunction in HD (Guedes *et al.*, 2016)

Amiotrophic Lateral Sclerosis

Amiotrophic lateral sclerosis or ALS has been shown to involve the misfolding of the predominantly cytosolic antioxidant protein superoxide dismutase (SOD1). Mitochondria also contain SOD1 as well as a second form of this enzyme SOD2, which is not affected by the disease. Wild type SOD1, and a copper chaperone for SOD1 (CCS), are localized to the intermembrane space (IMS) in normal mitochondria. It has been proposed that the nascent SOD1 polypeptide with no metal ion bound can efficiently enter mitochondria and that the maturation of SOD1 including metal ion binding and intra-molecular disulfide bond formation inside mitochondria and the subsequent retention in IMS involve the SOD1-CCS interaction. The ALS-related mutant SOD1 proteins have also been found in the IMS, but also in the matrix and outer membrane of mitochondria. Once associated with mitochondria, the mutant SOD1 is seen to cause impaired respiratory complexes, disrupted redox homeostasis, and decreased ATP production. However, the primary effect could be altered mitochondrial cell transport As in Parkinsons disease, the reason that mitochondrial dysfunction is observed predominantly in neurons may relate to altered mitochondrial cell transport in these extended cells. Thus it has been shown that primary neurons isolated from G93A SOD1 transgenic mice and cortical neurons transfected with G93A SOD1, have reduced antegrade mitochondrial transport.

CURRENT TREATMENT OPTIONS

Whether caused by mutations in mitochondrial genes or in nuclear genes related to mitochondrial function, mitochondrial disorders are relatively rare in the population. A study in 2008 found that one in 200 children is born each year with a disease-causing mitochondrial DNA mutation, but in most cases these are due to a very low mutation load these cause only mild forms of mitochondrial disorders or are asymptomatic. However, these pathogenic mutations could nonetheless be passed on to future children at more significant levels (Elliott et al 2008). It was also previously thought that least one in 8,500 of the population carried mitochondrial DNA mutation with a disease-causing mutation load (Schaefer et al., 2004) It has been calculated that at least 3,500 women in the UK, many of whom are of childbearing age, carry a potentially problematic level of mtDNA mutation, but this may be an underestimate (Brown et al., 2006)

It is difficult to be precise as to how many people are affected by mitochondrial DNA disorders, as there is thought to be a high rate of under-diagnosis and misdiagnosis due to the wide range and varying severity of the symptoms experienced. It can also be hard to establish whether a mitochondrial disorder has been caused by problems in nuclear genes or mitochondrial genes. New mitochondrial disorders are also still being identified. An estimated figure for the total prevalence of people affected by mitochondrial DNA disorders and mitochondrial disorders caused by nuclear genes is 1 in 5,000 (Schaefer et al., 2004)

MEDICATIONS AND SUPPLEMENTS

Medications are used to treat certain symptoms such as:

Seizures can be controlled with medications called anti-convulsants

Muscle cramping and stiffness may be relieved with medications called muscle relaxants

Spasticity (tight or rigid muscles that constantly contract) can be eased with medications or injections of Botox

Recent research has shown that several vitamin supplements can help relieve symptoms and improve function: Creatine monohydrate, Vitamin C, Vitamin E, Alpha lipoic acid, Co-enzyme Q10, Riboflavin, Rhamine, L-carnitine, L-arginine

CONCLUSION:

In conclusion, it realised that mitochondrial infection occurs within the population. A clinical and diagnostic method exists but the most reliable and significant method of treatment has a low success rate. However, with recent advancements in therapeutic cloning involving genetic transfer, it is obvious that absolute treatment could soon be achieved

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Knowledge Management and Supply Chain Performance of Public Universities in Rivers State

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Abstract: *This study focused on knowledge management and supply chain performance of public universities in Rivers State. A causal draft research model was conveyed to handle the three (3) hypotheses formulated for the study. The survey research method was employed on a population of three public Universities (Rivers State University, Ignatius Ajuru University of Education and University of Port Harcourt) domiciled in Rivers State, whereas a total of 346 respondents were obtained from the public universities studied. Primary data were obtained by means of a structured questionnaire and the simple regression analysis was used to test the hypotheses earlier stated. The results indicate that there is a very strong, positive and significant influence of knowledge acquisition and knowledge utilization on supply chain performance, while knowledge sharing had a strong, positive and significant influence on supply chain performance. Based on the findings, the study therefore concludes that, knowledge management positively and significantly influences supply chain performance of public universities in Rivers State, and recommends amongst others that public universities' managements should focus on operationalizing the individual components of knowledge management (knowledge acquisition, knowledge sharing and knowledge utilization), and combine efforts to put into operation collaborative technologies to encourage supply chain performance in their institutions.*

Key words: *Knowledge acquisition, Knowledge sharing, knowledge utilization, Supply chain performance.*

INTRODUCTION

In recent decades, it has become manifest that competition is more among supply chains (SCs) than between individual organizations (Attia, 2015; Shakeriny, Dehnavi&Shaten, 2016). Hence, managers' midpoint of attentions should not only be on the planning and operations of internal activities, but also on

how the diverse capabilities, resources, and processes of all the firms in a supply chain can be valuably incorporated and harmonized. The swell in global competition has informed organizations of the need to appreciate the fact that they have to better handle their supply chains in order to carry on. Supply Chain Management (SCM) tenders to businesses the way to connect technology with people in an endeavor to bring into line the technology coupled with the capabilities of every given business alongside its business partners to facilitate rapid respond to customers' needs (Serdaris *et al.*, 2014; Sakaset *al*, 2014; Shaik & Abdul-Kader, 2013; Marinagi & Akrivos, 2011).

Managing sustainable supply chains extends further than traditional approaches, supported by performance metrics of cost, time, and flexibility of supplies and deliveries, as it necessitates collaboration and long-drawn-out precision transverse all companies in a supply chains, guaranteeing "moral, economic, legal, social and technical" performances that are requisite under a sustainability perception (Zimon, Tyan Sroufe, 2019). To visage these multifaceted challenges, there is mounting consciousness that knowledge is a strategic resource that needs to be appreciated (Rashed *et al.*, 2010; Samuel *et al.*, 2011; Tan & Cross, 2012; Xu *et al.*, 2014).

How firms should plan their knowledge management (KM) activities is a contested question (Bolosani *et al.*, 2017), and acknowledgment of KM as a strategic building block of these days' competitiveness is rising. The embracing of suitable KM approaches is also acknowledged to be a means to realize sustainability goals (Martinez *et al.*, 2018). Knowledge is analyzed as a key strategic reserve for organizational continued existence, firmness, enlargement and enhancement (Hassan & Al-Hakim, 2011, (Kyobe, 2010). Hence, knowledge management (KM) would support companies to stay competitive, as they share information with the external partners and being acquainted with firms' competitors' products, services, tactics and best practices.

Knowledge is therefore, a decisive reserve that ought to be managed suitably not only in solitary companies but also crosswise supply chains. In essence, knowledge engendered in any division of a supply chain and curving through intercompany links ought to be managed appropriately for realizing superior business significance (Thomas *et al.*, 2017; Rodriguez-Chriquez *et al.*, 2016). To continue to exist in international markets where the demand for green production is growing, the efficacy of supply chain management must cultivate (Wang, Liu, Liu & Huang, 2019). Moreover, it is essential that companies and managers arrive at a towering altitude of ripeness in their supply chain management practices, to lessen risks of disruptions (Tubis, 2021). This is very imperative to educational supply chain.

Educational supply chain characterizes supply chain management concept to the educational institutions and it aims at improving the wellbeing of the end customer or the society. To achieve this goal, educational institutions require a confident degree of knowledge regarding the partners in their supply chains as well as suppliers, customers, and the consumer. The performance of the supply chain in educational setting depends on the unspoiled harmonization of all supply chain stakeholders to make certain attainment of enviable outcomes. This study embodies educational supply chain management model for public universities as it supposes that knowledge management can lend a hand to trim down the knowledge gaps that are most important in the educational supply chain, to make certain a perceptible and translucent environment. In short, it is fundamental for present and upcoming managers of supply chains in the universities to learn how to put into operation proper knowledge management practices in their institutions as well as in their relationships with external partners.

There are, however, only a few empirical studies spotlighting the relationship between Knowledge management and supply chain performance in the academic settings, more specifically in higher education institutions (Ngoc-Tan & Gregar, 2018; Raj-Adhikari, 2010; Mathew, 2010; Yang & Chen, 2009). Thus, the number of empirical studies on how the concepts of knowledge management impacts on supply chain performance is scarce, especially in relation to the education sector in the developing countries, such as Nigeria. In view of that, this contemporary study desires to provide empirical evidence on how knowledge management impacts supply chain performance in public universities in Rivers State of Nigeria.

LITERATURE REVIEW AND HYPOTHESES

Knowledge-Based View Theory

The Knowledge-Based View (KBV) situates that the achievement of a firm that is involved in bringing into being, assimilating and issuing knowledge is evaluated by the firm's aptitude to cultivate new knowledge based on its peculiar resources. Hence, the fundamental resource of the firm is knowledge (Grant, 1996). Knowledge-based firms are additionally innovative, proficient and operative than any other firms (Bierly & Chakrabati, 1996; Davenport & Prusak, 1998). This as a result implies that knowledge is the solitary spring of justifiable supply chain performance. To realize grander performance, with the indispensable resources and loftier proficiencies (Davenport & Prusak, 1998), the firm requires tacit knowledge to integrate and coordinate other resources and capabilities (Grant, 1996). Knowledge management has an important locus as a prime cradle of organizational competence. Knowledge constitutes circumstantial information, experiences, values and thoughts of specialists (Davenport & Prusak, 1998), it is a touch that can be transmitted, recollected, authorized, collated and deposited into a computer-based knowledge fountain, and employed to generate value for a business (Carlsson, 2004). The Knowledge-Based View Theory is relevant to this study for the reason that, an emphasis on knowledge management by public universities forms the basis for achieving sustainable supply chain performance in their institutions. Since the efficacy of supply chain performance is based on knowledge and the knack to repeatedly grow new knowledge; knowledge management is hence a vital dynamic and resource that possibly will propel sustainable supply chain performance for public universities.

Knowledge Management

Knowledge management scope concerns the generation, communication, transformation and application of knowledge that is sufficient onto the reasoned action in situated contexts in which individuals and organizations find themselves (Zhu, 2008),

Knowledge management is the emerging body of techniques, apparatuses, systems and principles through which establishments can obtain, cultivate quantity, dispense and deliver a yield on their intellectual possessions (van Donk & Riezebos, 2005). Knowledge Management as seen by Chuang (2004), is the aptitude of a company to obtain, produce, handover, assimilate, share and apply knowledge related resources and activities across functional boundaries. Knowledge management is viewed as a fundamental strategic asset that facilitates the coordination and integration between supply chain members (Rashed *et al.*, 2010; Samuel *et al.*, 2011; Tan & Cross, 2012; Xu *et al.*, 2014).

Knowledge management can thus, be perceived as a methodical style to handling and powering an establishment's knowledge chattels which might embrace knowledge of the establishment's customers,

products, market, procedures, finances and peculiar services. Knowledge management takes care of the organizational improvement of knowledge with innumerable technologies, utensils, and progressions to accomplish established goals. Knowledge management concerns management of data, information, unambiguous and inferred knowledge. The main enablers of knowledge, in any business, are employees, processes and technology.

The application of knowledge management according to Tesavrita, Suryadi, Wiratmadja, and Govindaraju (2017), can be observed at both an intra-organizational and an interorganizational level. While intra-organizational knowledge management spotlights on knowledge management approaches, procedures, undertakings, and technologies contained by the boundaries of an organization, inter-organizational knowledge management denotes the utilization of knowledge management to bring about the relationships with external partners (suppliers, customers, service providers, etc.). In view of the fact that sustainable growth matters affect all companies in a supply chain, it is imperative to take in hand answers from a shared rather than an individual point of view. Therefore, knowledge management between diverse companies is even more significant than that of each company on the inside, for realizing sustainable growth that adds value to the whole public. Yang and Chen (2007) noted that, this would enable the organization to gain sustainable competitive advantage, as well as, to improve organizational effectiveness. To this end, it is possible to conclude that knowledge management deals with knowledge and its foundation progressions in establishments, and the attainment of goals and competitive advantages springing from the right utilization of knowledge.

According to Dev Raj Adhikari (2010), knowledge management in educational institutions can be defined as the systematized and methodical method of engendering and circulating information, and deciding on, extracting, and positioning explicit and tacit knowledge to build inimitable value that can be used to fortify teaching-learning atmosphere. Habib and Jungthirapanich (2009) identified research framework of educational supply chain management for the Universities as:

1. Education Suppliers (Suppliers of the student, Suppliers of the faculty, Suppliers of Assets or Equipment and Suppliers of Educational Materials.
2. Research Suppliers (Suppliers of Internal Research Projects (University Self-Funding) b) External Research Projects (External Research Funds, Ministry of Education, Private Organizations, etc.), and
3. Customers made up of (Education Customers: Graduates with sought after quality, Families, Employers of government and private organizations, and Research Customers (Funding organizations of research projects, and Quality research outcomes (Researchers, research publications, findings etc.)

Jungthirapanich (2009) research structure of educational supply chain management for the Universities portrays two categories of contributions to the society, which are human resource contribution (quality graduates) and research contribution (research findings).

Mathew (2010) contended that knowledge management delivers some of the clarifications to the difficulties that are applicable for sustainable higher education teaching learning processes. Dev Raj Adhikari (2010) stressed that in contemporary times, trying to manage the educational institutions without knowledge management initiatives can bring about defeat. Maponya (2004) stated that if knowledge management is applied meritoriously, it can result in enhanced decision-making competences, condense “product” development cycle time, enhanced academic and administrative services, and

abridged costs. This study adopts knowledge acquisition, knowledge dissemination and knowledge utilization as the dimensions of knowledge management.

Knowledge Acquisition

Knowledge acquisition fallouts from employees' involvement and collaboration of people, resources, and technology (Chiu *et al.* (2016.)). Knowledge is a substantial font for learning novel things, deciphering problems, producing core competencies and establishing new positions for personages and the business at currently and in the future (Nasimi *et al.*, 2013). Knowledge acquisition is the progression of locating knowledge externally and making it fitting for succeeding application (Holsapple, 2003). Hence, the knowledge engendering externally will facilitate the firm's supply chain performance. Knowledge generation thus, embraces generating knowledge or innovation by means of accessible knowledge in an organization.

Knowledge acquisition is essential because congregating knowledge from suppliers, employees and customers remains the top priority for organizations to guarantee unremitting perfection. Thus, through superior knowledge acquisition, public universities can power their supply chain faster, cheaper and at higher quality than their competitors.

Knowledge Sharing

Knowledge sharing (KS) denotes bartering knowledge amid academics and researchers between peers contained by a university to enrich their personal knowledge base and that of their universities (Veer Ramjeawon & Rowley, 2018). Knowledge sharing ethos assists higher educational institutions to advance research and teaching activities (Madbouly *et al.*, 2020). Therefore, knowledge sharing demands a philosophy and setting that expedite any possibility of knowledge sharing by means of evolving teamwork, networking, and collaboration.

Knowledge Utilization

Knowledge utilization talks about distributing knowledge generated by the academics and researchers within a university to peripheral stakeholders or cohorts for its application and convention and service to society (Ramjeawon & Rowley, 2018). Knowledge utilization therefore, concerns the dispensing of knowledge that emanated from scholarly endeavors within a university to outer shareholders or allies for its use and resolution and service to humanity.

Supply Chain Performance

Performance measurements are convenient pinpointing utensils for healthier decision-making and a major necessity of fruitful unceasing modernization (Soosay & Chapman, 2006). In order for organizations to increase their performance and survive in a competitive atmosphere, they also have to join forces and construct enduring relationships with upstream and downstream partners in the supply chain (Huo, 2012; Xu *et al.*, 2014). Scholars have suggested immeasurable structures for supply chain performance, in order to qualify the adeptness and the usefulness of the supply chain, where different dimensions of supply chain performance are reflected (Lin, Huang & Li, 2002; Lin & Li, 2010; Gunasekaran *et al.*, 2004; Sillanpaa & Kess, 2011).

Empirical Review

Ngoc-Tan and Gregar (2018) investigated the influence of knowledge management on innovation in an academic setting, by means of survey data composed in 2017 in 30 public universities correspondingly located in 3 regions of Vietnam. The study adopted the Structural Equation Modeling (SEM) to test the hypothesis concerning knowledge management and innovation, and found that knowledge management expansively influences technical innovation in academic surroundings and that not all constituents of knowledge management are directly linked with administrative innovation.

Nurul and Lee (2018) examined the influence of knowledge sharing on the service innovation performance of restaurant in North Kalimantan, Indonesia. The study used 150 employees working in the restaurant businesses in North Kalimantan and data were composed by means of survey method with questionnaire. The regression analysis was employed to demonstrate the influence of the independent variable on the dependent variable. It was found that the influence of knowledge sharing on the performance of service innovation displayed significant results. Knowledge sharing activities was found to have a positive influence on innovation performance of restaurant business services in North Kalimantan.

Nausheen and Lin (2013) studied the connection between knowledge management practices and company performance, using a purposively selected sample of 412 employees at dissimilar managerial positions. The study looked at the predicting linkage of knowledge management practices (sharing of best practices and building of consistent process, continues employee learning, effective management of knowledge, innovative culture development, and management of core competencies) with company performance. The questionnaires concerning knowledge management practices and company performance were administered to respondents, and data analyzed using correlation and regression analysis to institute the association amid several Knowledge management practices and company performance.

Fagade (2011) studied the impacts of knowledge management on supply chain management most especially in emerging economy like Nigeria by means of interview and personal observations and found that the rate of change in business environment restate why the knowledge management method: that is based on development of mutual respect and interdependence that is much anticipated in the new business milieu, most particularly in supply chain in collaborating all-inclusive partners in the network.

From the review of literature, the study developed the following conceptual framework:

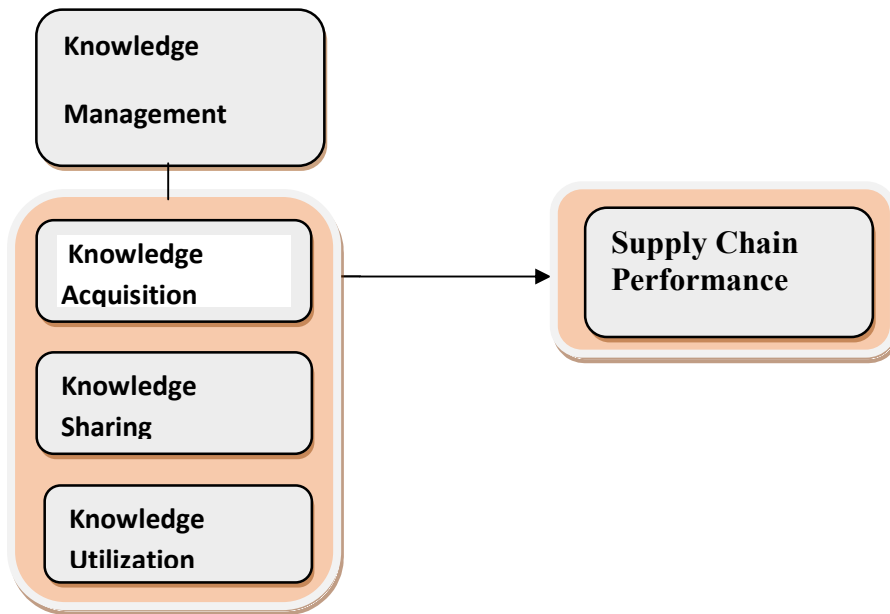


Figure1: Conceptual Framework of Knowledge Management and Supply Chain Performance.

Source: Authors' Desk Research, (2022).

From the conceptual review, the following hypotheses were formulated:

Ho₁: Knowledge acquisition does not significantly influence supply chain performance of public universities in Rivers State.

Ho₂: Knowledge sharing does not significantly influence supply chain performance of public universities in Rivers State.

Ho₃: Knowledge utilization does not significantly influence supply chain performance of public universities in Rivers State.

METHODOLOGY

This empirical study addresses how supply chain management contributes to successful university operations. This study employed a survey research design on a population consisting of three public universities in Rivers State (Rivers State University, Ignatius Ajuru University of Education and University of Port Harcourt).

Sample Technique and Sample Size for the study

The total population of academic staff in the three universities combined is 2,517. The University of Port Harcourt has a teaching staff, of 1,390 (Uniport Staff Profile, 2020), Rivers State University has a teaching staff strength of about 686, while, Ignatius Ajuru University of Education boast of 441 teaching staff (University Official Staff Profile, 2017). This is demonstrated in Table 1.

Table 1: Total population of academic staff of the public universities in Rivers State

Categories	Uniport	%	Rivers State University	%	IAUE	%
Teaching staff	1,390	100	686	100	441	100
Total	2,517					

(Source: Establishment Units of Universities Studied, 2015)

The Rivers State University has 686 academic staff, the Ignatius Ajuru University of Education has 441 academic staff, and the University of Port-Harcourt has 1390 academic staff. This summed up to 2517 academic staff for the three universities studied.

The total population of academic staff consists of 2517 as indicated by establishment units of the three institutions under study. To obtain sample size of academic staff from the population of 2517, the Taro Yemen's Formula for sample size determination was used. The formula is $S = N/(1 + Na^2)$.

Where n is the sample size

N is the population

1 is constant and

e is level of significance (i.e. 0.05).

Therefore; $n = 2517/1 + 2517(0.05)^2$

$$n = 2517/1 + 2517(0.0025) = 2517/1 + 6.2925$$

$$n = 2517/7.2925 = 345.$$

Based on this formula, a total sample size of 346 respondents was used. The sample size of the study emanates from the three public universities in Rivers State, while the simple random sampling technique was adopted to arrive at the respondents per institution from the sample size. The sample was chosen for

the sake of equal representation of opinions, experience in knowledge management and supply chain performance of public universities of in Rivers State, and to elicit accurate information bordering on the study. The researchers assessed the Professors, Associate Professors or Readers, and Senior Lecturers as respondents. The study used self-administered questionnaires to assemble primary data from the respondents based on a 86.5 per institution. On the whole, information from the three public universities brought the total number of respondents to 346.

Results

Reliability Cronbach's α was conducted to examine the internal consistency of multi-item constructs. All constructs prove their reliability. The exact results of the scale reliability analysis are reported in Table 2.

Table 3 Shows the reliability measure of Knowledge Management and Chain Performance (n=346).

Scale	Dimension	Items	Reliability
KA	Knowledge Acquisition	5	0.851
KD	Knowledge Dissemination	5	0.951
KU	Knowledge Utilization	5	0.914
SCP	Supply Chain Performance	4	0.978

Source: SPSS 22.0 Output, based on 2022 field survey data.

Knowledge acquisition (KA), knowledge dissemination (KD) and knowledge utilization (KU) have values of 0.851, 0.951 and 0.914 respectively. In the interim, supply chain performance (SCP) attain value of 0.978. All constructs have the values that exceeds the normally conventional threshold value of 0.7 (Bagozzi & Yi, 1991) and are sufficient for the succeeding phase of simple regression analysis.

Test of Hypotheses

Table 3: Influence of Dimensions of Knowledge Management on Supply Chain Performance (n=346)

Independent Variables	Dependent variable	Estimate	P Conclusion
Knowledge Acquisition ==> Supply Chain Performance		.0875	Supported (P > 5%)
Knowledge Sharing ==> Supply Chain Performance		.0774	Supported (P > 5%)
Knowledge Utilization ==> Supply Chain Performance		.0924	Supported (P < 5%)

Note: *,** Significant at < 0.10 and < 0.05 respectively

Table 3 shows that for hypothesis one, two and three, the significant is .000 which is lesser than 0.05; there is a significant, influence of knowledge acquisition, knowledge dissemination and knowledge utilization on supply chain performance with the R-square (Coefficient of Determination) that there is 87.5%, 77.4% and 92.4% direct influence of the knowledge acquisition, knowledge determination and knowledge utilization on supply chain performance. This shows that the dimensions of knowledge management can affect supply chain performance to a high degree.

Discussions of Findings

The results of hypothesis one shows that knowledge acquisition has a very strong, positive and significant influence on supply chain performance (0.875: 0.000<0.05), knowledge dissemination has a strong, positive and significant influence on supply chain performance (0.774: 0.000<0.05), and knowledge utilization has a very strong, positive and significant influence on supply chain performance (0.924: 0.000<0.05).

It is clear as crystal that these results of depict the significance of knowledge management in academic institution. To start with, the pragmatic result demonstrates that Knowledge management (knowledge acquisition, knowledge dissemination and knowledge utilization) broadly and positively influence supply chain performance of public universities in Rivers State. This indicates that knowledge acquisition, knowledge dissemination and knowledge utilization facilitates for supply chain performance in public universities. By positioning knowledge management in inventiveness, the universities can exploit its knowledge reserve to build up innovative academic programs, improve its existing programs by putting

forward novel courses and disciplines to meet societal demand. This supports Ngoc-Tan and Gregar (2018) findings that knowledge management expansively influences technical innovation in academic surroundings.

This is also in line with Yahya and Goh (2002) who found out that knowledge management is a course of action that boosts knowledge application to realize innovation or advancing business performance.

CONCLUSION

The aim of the present study was to investigate the influence of knowledge management on supply chain performance. Consistent with previous studies, we are able to achieve complete convergence between the three dimensions of knowledge management (knowledge acquisition, knowledge dissemination and knowledge utilization) in terms of their response to supply chain performance. Besides, the results of the tests provide empirical evidence that these dimensions of knowledge management impact on supply chain performance. Accordingly, the study concludes that knowledge management significantly influences supply chain performance of public universities in Rivers State.

RECOMMENDATIONS

In line with the findings of the study, the following recommendations were made:

1. Public universities' managements should focus on operationalizing the individual components of knowledge management (knowledge acquisition, knowledge dissemination and knowledge utilization), and combine efforts to put into operation, collaborative technologies to encourage supply chain performance in their institutions
2. Public universities should ensure adequate and rewarding knowledge management packages to attract superior supply chain performance in their universities.
3. Given that empirical evidence has shown that knowledge management is vital to the success of supply chain performance, public universities should embrace this activity to achieve collaboration levels that can improve supply chain performance in their institutions.
4. In order to consistently increase supply chain performance, public universities managers should always direct efforts towards integrating their resources and processes to ensure consistent fluidity with the functioning of knowledge management.

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Development and Characterizations of Mechanical Properties of Sisal Fiber Reinforced Recycled Polypropylene Composites (SFRRPPC)

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Abstract: *This study evaluated the mechanical properties of a composite developed from recycled polypropylene reinforced with a blend of sisal fibre at different proportions. Five samples of the composite with different compositions were produced using the compression moulding technique with a consolidation pressure of 2.5 MPa. The homogeneous blend of the sisal fibre and polypropylene was achieved by introducing the recycled polypropylene (PP) while the rolls of the two mill machine were in counter clockwise motion and soften for a period of 5 minutes at a temperature of 190°C. Upon achieving a band and bank formation of the PP on the front roll, the prepared sisal fibre was introduced gradually to the bank, cross mixed and allowed to mix for 3 minutes. The composite was casted and labeled accordingly. The following results were obtained; optimal flexural and tensile strengths at a fibre loading of 10%; optimal impact strength at 30 % fibre loading and optimal average hardness at fibre loading 40%.*

Key words: *Keywords: Composite, Fibre, Mechanical properties, and Strength*

1. Introduction

A composite is an engineered material made from two or more constituent materials with significantly different physical or chemical properties combined together to form a resultant material with features that are different from the individual components. For a long time, fibres such as carbon, glass and aramid have dominated the composite manufacturing sector. This is predominantly because of their relatively superior mechanical and thermal properties. However, with increasing environmental concerns, researchers have investigated the possibility of replacing them with natural fibres in the manufacture of composites. Research has been done using natural fibres such as coir, sisal, banana, jute and investigating the possibility of using them as reinforcements in composites for non-structural applications. Natural fibre-reinforced

composites (1) uses renewable raw materials, (2) are combustible, (3) have low density, (4) possess good thermal properties, (5) are bio-degradable, (6) are non-toxic, (7) low cost and (8) have great performance. Therefore, natural fibre reinforced composites form a new class of materials with desired properties which can substitute scarce wood in many non-structural applications such as ceiling boards, walls, room partitioning, door panels, electronic and food packaging (Asdrubali et al., 2015; Bajwa et al., 2015; Ramanaiah et al., 2011).

Sisal fibres on the other hand are extracted from sisal (*Agave sisalana*) leaves. The fibres are hard and are among the widely used natural fibres because of their availability. Each sisal plant produces 200-250 leaves and each leaf contains 1000-1200 fibre bundles (Mukherjee & Satyanarayana, 1984). Sisal fibres can easily be extracted from sisal leaves by retting and decortication. Additionally, the fibres are readily available, cheap, easily biodegraded and are of great performance. Sisal has competitive mechanical properties as compared to some other natural fibres Figure 1.1, shows the composition of a composite material: matrix, reinforcement and the interface between the two.

2. Materials and Methods

2.1. Materials

The materials used in this work include the Fibre material, Matrix material and the Mould material.

2.1.1. Fibre

The Sisal fibre used in the present investigation was sourced from local market. Sisal fiber possessed higher ultimate tensile strength compared to other natural fibers, such as sisal Fibre (polymers).

2.1.2. Polypropylene

In preparation for recycling, the waste PP bottles collected were cleaned with water to remove impurities and subsequently sun dried to ensure no moisture remains. After which, they were shredded into small sizes. This was done for easier melting.

2.1.3. Equipment

The equipment used in this project are given in Table 3.1.

Table 1 Equipment used in PP-Sisal fibre composite fabrication.

S/N	Equipment	Manufacturer/Model No.	Location accessed
1	Two Roll Mill	North Bergen, U.S.A (Model: 5183)	NILEST- Zaria*
2	Compression Moulding Machine	Wenzhouzhiguang Ltd, China (Model: 0557)	NILEST- Zaria
3	Universal Material Testing Machine	Norwood Instruments Ltd, (Cat. Nr. 261)	ABU, Zaria**
4	Digital Weighing Balance	Mettler Instruments Ltd (Model no: AE200)	NILEST- Zaria
5	Microhardness Tester	Vicker Hardness Tester (Model no MV 1-PC)	ABU, Zaria
6	Resil Impact Tester	CEAST Resil Family (6957.0000)	NILEST- Zaria

*NILEST- Nigerian Institute of Leather and Science Technology, Zaria, **ABU- Ahmadu Bello University, Zaria

2.2. Methods

2.2.1. Manufacture of Mold

The mold was constructed according to the shape of the composite to be fabricated. For this work, a square mold of 150 mm x 150 mm x 3 mm dimension was adopted. The mold was produced with the use of a 3 mm heavy gauge iron sheet so that it is not affected by the high temperature during composite manufacture. Hence, the effect of mold bending was eliminated which results in perfect-shaped composite.

2.2.2. Preparation of Composite Moulds

The composites samples were produced by a mixing process involving the introduction of the Recycled Polypropylene (PP) while the rolls of the two rolls mill machine were in counter clockwise motion and soften for a period of 5 minutes at a temperature of 190°C. Upon achieving a band and bank formation of the PP on the front roll, the prepared Sisal fibre was introduced gradually to the bank; cross mixed and allowed to mix for 3 minutes. The composite was sheeted out and labeled accordingly.

The composite obtained from the mixing process was then placed into a metal mould of dimensions 150 mm x 150 mm x 3 mm and was placed in the hydraulic hot press (Compression Moulding Machine) for shaping at temperature of 160°C and pressure of 2.5 MPa for 5mins. The resulting composite was then cooled in a cool compression moulding machine platen under 2.5 MPa pressure at room temperature for 3mins and labeled accordingly.

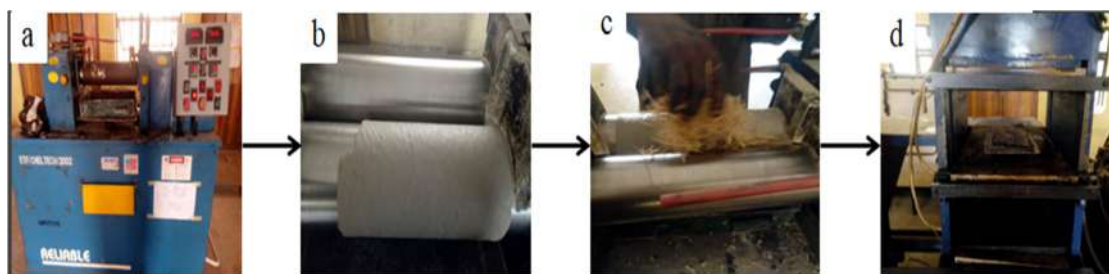


Plate 2 Composite production process; a) Two roll mill machine b) PP compounding c) Mixing PP with Sisal fiber d) Compression Moulding Machine

2.2.3. Characterization Process

The PP-Sisal fibre composite was prepared using randomly oriented fibre and is characterized into samples SF1, SF2, SF3 and SF4 using 10, 20, 30 and 40 % weight fraction of Sisal fiber, respectively. The experimental characterization of PP-Sisal composite was performed by testing the tensile, flexural, impact and hardness properties of the developed composite. These tests were carried on the samples cut from the developed composite as per the relevant ISO and ASTM standards for composite laminates as shown in Table 2. Three specimens from each sample (SF1, SF2, SF3 and SF4) were tested and the average properties were calculated.

Table 2 Test standards adopted

Type of test	Test Standard
Tensile test	BS EN ISO 527-2:1996
Flexural test	EN ISO 14125:1998
Impact test	ASTM D256
Hardness test	ASTM D785



Plate 3 Testing Set-up; a) Tensile test b) Flexural test c) Impact test d) Hardness test

2.2.3.1. Tensile Strength Test

The tensile strength test was carried out using Universal Testing Machine according to ASTM D-638. A dumbbell shaped samples with gauge dimensions 50 mm x 10 mm x 3 mm were subjected to a tensile force and tensile properties such as the tensile strength, % elongation, and modulus for each sample was determined. These were automatically generated by the machine.

2.2.3.2. Flexural Strength Test

The flexural strength test on the blends was carried out in accordance with ASTM D-790. The specimen measuring 100 mm x 25 mm x 3 mm was placed on a support span horizontally at 80 mm gauge length and a steady load was applied to the center by the loading nose producing three-point bending until the sample specimen failed. The maximum load (N) and the corresponding deflection (mm) were recorded accordingly as the sample specimen failed. The flexural strength and flexural modulus were calculated using the equations;

$$\text{Flexural Strength} = 3FL/2bd^2 \text{ (MPa) (Eq. 1)}$$

$$\text{Flexural Modulus} = FL^3/4bd^2D \text{ (MPa) (Eq. 2)}$$

Where,

F = Maximum Load at break

L = distance between the support spans at both edge of the specimen = 80 mm

b = Sample width = 25 mm

d = Sample thickness = 3.2 mm

2.2.3.3. Impact Strength

The impact test was carried out according to the ASTM D-156 standard; the specimen was cut to specimen dimension 64 mm x 12.7 mm x 3.2 mm and 45° notched was inserted at the middle of the test specimens from all the produced blend samples. The impact energy test was carried out using Izod Impact Tester (Resil impactor testing machine). The specimen was clamped vertically (IZOD) on the jaw of the machine and hammer of weight 1500 N was released from an inclined angle 150°. The impact energy for corresponding tested specimen was taken and recorded. Impact strength was also calculated and recorded accordingly. The Impact strength was determined using equation;

$$\text{Impact Strength} = \frac{\text{Average Impact Energy}}{\text{Sample Thickness}} \quad (\text{J/m}) \dots\dots\dots (\text{Eq. 3})$$

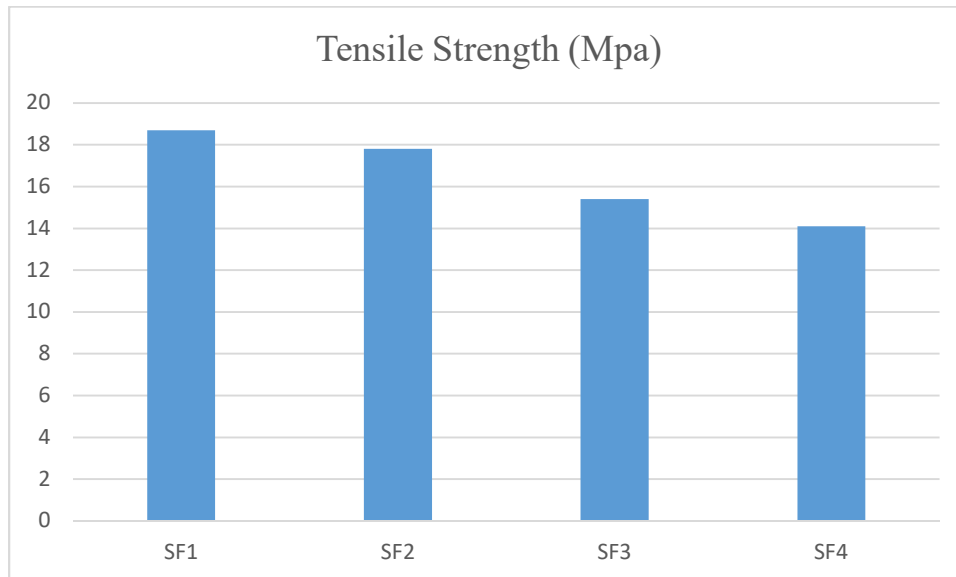
2.2.3.4. Hardness

The hardness test was carried out in accordance with ASTM D2240 standard using Micro Vicker Hardness Tester. The sample measuring 30 mm x 30 mm x 3 mm was placed on the mounting stage and the stage was raised such that the sample come in contact with the dial point and exacts pressure/force on the sample and the reading was taken directly from the system screen. This was repeated three (3) times at different positions on the sample and average hardness was calculated.

4. Results and Discussion

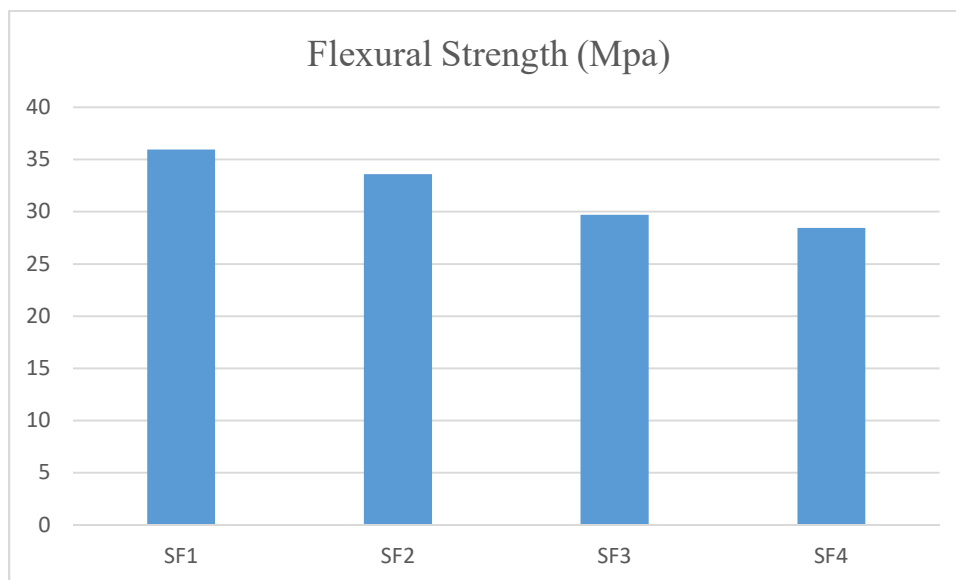
4.1 Tensile Strength of the Manufactured Composite

Figure 4.1 shows the tensile strength of Sisal fibre-PP composite at different fiber loading. It can be observed that the tensile strength decreases linearly with increasing fibre content. Therefore, the composite with 10 % fibre loading exhibits the highest tensile strength while the Sisal-PP composite with 40% fiber loading has lowest tensile strength. This indicate that the tensile strength largely depends on the matrix.



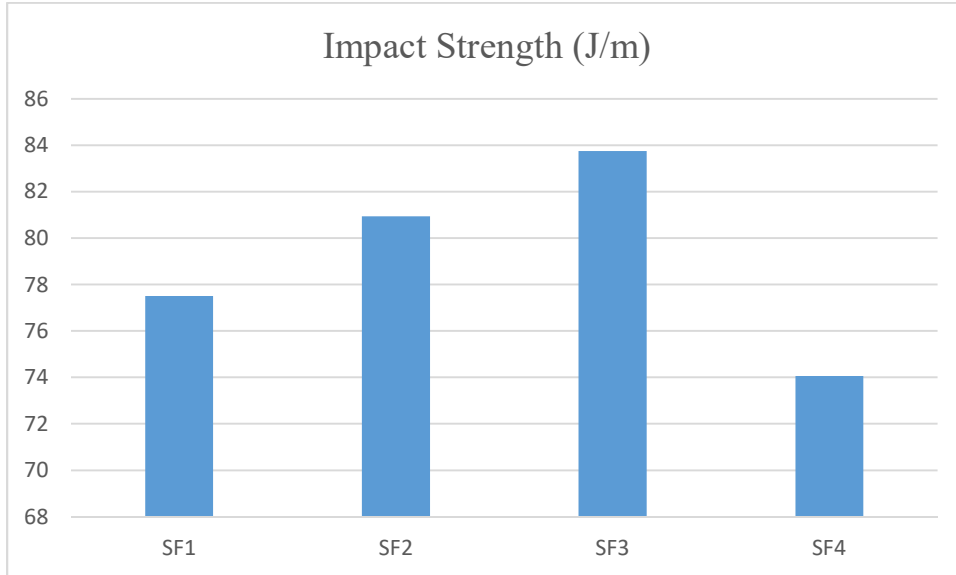
4.2 Flexural Strength of the Manufactured Composite

Figure 4.2 shows the Flexural Strength of Sisal fibre-PP composite at different fiber loading. It can be observed that the sample SF1 with 10% fiber loading exhibits the highest flexural strength, while the PP-Sisal composite SF4 with 40% fiber loading has lowest flexural strength. Similarly, the flexural strength largely depends on the matrix.



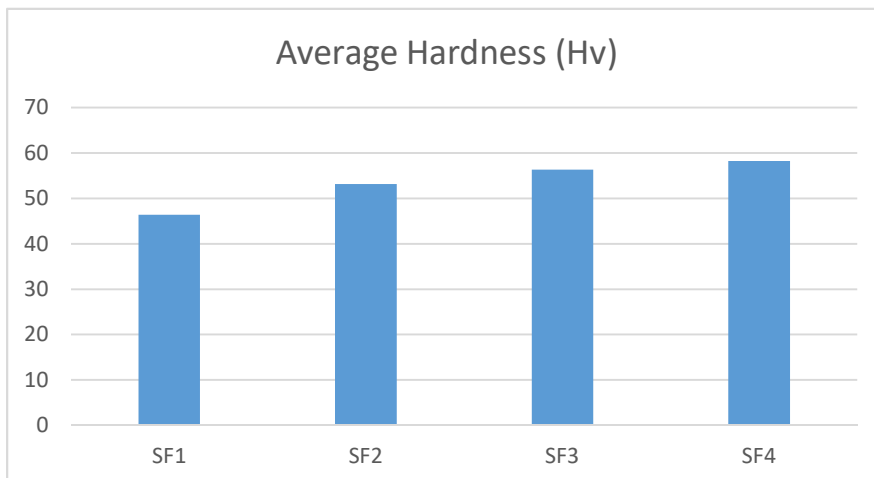
4.3 Impact Strength of the Manufactured Composite

Figure 4.3 shows the impact strength of PP-Sisal composite at different fiber loading. Overall, it can be observed that the sample SF3 with 30% fiber loading exhibits the highest tensile strength, while the sample SF4 with 40% fiber loading has the lowest impact strength. The impact strength of the composite increased gradually with fibre loading up to 30 %. However, steep decline was recorded at 40 % fibre loading. This indicate that the impact strength of the composite depends on the fiber.



4.4 Average Hardness of the Manufactured Composite

Figure 4.4 shows the average of PP-Sisal composite at different fiber loading. If the composite SF4 with 40% fiber loading exhibits the highest average hardness, while the PP-Sisal composite SF1 with 10% fiber loading lowest average. This indicate that the average hardness of the composite depends on the fiber.



5. Conclusion

This study evaluated the mechanical properties (i.e. flexural, tensile, hardness and impact) properties of a composite manufactured from recycle polypropylene reinforced with a blend of sisal fibre. Four sets of composites with different fibre loadings were produced using a consolidation pressure of 2.5 MPa.

The composites samples were produced by a mixing process involving the introduction of the Recycled Polypropylene (PP) while the rolls of the two rolls mill machine were in counter clockwise motion and soften for a period of 5 minutes at a temperature of 190°C. Upon achieving a band and bank formation of the PP on the front roll, the prepared sisal fibre was introduced gradually to the bank, cross mixed and allowed to mix for 3 minutes. The composite was sheeted out and labeled accordingly.

Then the composite were obtained from the mixing process was placed into a metal mould of dimensions 150mm x150mm x 0.3mm and was placed on the hydraulic hot press (Compression Moulding Machine) for shaping at temperature of 160°C and pressure of 2.5 MPa for 5mins. It was cooled on a cool compression moulding machine platen under 2.5 MPa pressure at room temperature for 3mins and labeled accordingly.

- Optimal flexural and tensile strengths at a fibre loading of 10%.
- Optimal impact strength a fibre loading 30%.
- Optimal average hardness at fibre loading 40%

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