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Influence of Advanced Manufacturing Technology on Management Accounting Practices of Selected Manufacturing Firms in Nigeria

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Abstract:

Investment in advanced technology in manufacturing sector may involve a huge amount but seems to be cheaper in the long run when compared to intensive use of labour. Unlike human, machine does not need motivation and other incentives to function well. Also, machine has no feelings to react to changes in the organisation. Human being tends to demand more wages when there is increase in the revenue in their organisations. In light of the foregoing, this study set out to specifically examine the influence of advanced technology on performance of firms and the relationship between labour cost and firm's performance. The hypotheses were tested at 0.05 significance level that is 95% confidence level. Data was collected from secondary tools, literature on prior work, including studies and survey reports. With EVIEWS 10.0 version, the data collected was analysed using Panel Least Squares regression method. The study examined thirteen (13) industrial goods producers firms listed in the Nigerian Stock Exchange from 2010-2018, that is, nine (9) years period. This study concludes that advanced technology has positive and significance effect on performance of manufacturing firms. The study also concludes that use of intensive labour has significant but negative relationship with firm performance. This study recommends that companies' managers should make adequate provisions for investment in advanced and modern technology when preparing management accounting for the company. The study also recommend that manufacturing firms should invest in advance and modern technology to improve operating efficiency, reduce operating costs and reduce delivery costs.

Keywords: *Advanced technology, manufacturing firm, firm performance, labour cost, investment in technology*

1. Introduction

Experience has shown that most goods manufactured in advanced economies are cheaper, affordable and of better quality. (Egbunike, 2009). Advancements in manufacturing and information technologies have significantly intensified competition, both in the domestic and the international markets (Laitinen, 2001). Manufacturing of goods and services by organisations nowadays is greatly affected by the advancement in technology such as machines/equipment, information and communication technology comprising of knowledge, tools, and method used for the production (Dauda, 2009). The state of technology determines the quality and quantity of goods and services produced likewise the performance of any firm or organisation in terms of patronage and customer retention. The level of change in technology may influence the plastic manufacturing firm's ability to produce quality goods and services to align with customers' changing tastes and preferences which influences their choice of purchase and which may also make the organisations of study not to be productive, profitable, create wealth and improve the performance through customer retention to improve the growth of the firms (Ndubuisi-Okolo, Okegbe, & Ugwu, 2019).

In reaction to the rise in market competition, manufacturing companies are regularly reviewing and reviewing their manufacturing strategies to stay competitive (Isa & Foong, 2005). Among the strategies typically adopted by these firms to achieve this goal is adoption of advanced manufacturing technology (AMT). The changes in the manufacturing strategies and processes often necessitate appropriate changes in their management accounting practices to take into account of the changing production cost structure. For decades, scholars and practitioners have shown a considerable amount of interest in issues related to appropriate management accounting practices for manufacturing firms in the advanced manufacturing environment. Numerous debates have been held questioning the capability of the traditional management accounting practices in providing adequate, relevant, timely and accurate information to management for planning, control and decision-making purposes in the new manufacturing environment (Isa & Foong, 2005).

The new strategy in the manufacturing industry is the adaptation of new technologies that are capital intensive with insignificant labour involvement. For example, Just in Time (JIT) and Total Quality Management which influence radical changes in various ways in the business conduct. There is urgent need for Nigeria to join other countries of the world in adopting Advanced Manufacturing Technology. To achieve this, the irregular power supply and other

infrastructural decay in the country must be remedied for the country to survive the heat of trade liberalization and remain competitive in the world market. It is in the light of this absolute need for change that Osisioma (2004) buttressed that the world is changing every day. Things are happening fast, that we can hardly keep up with. Every new technological advancement hurries us further into the future. Emerging trends pass us by before we can even comprehend them. The world of tomorrow looks less and less like the world of yesterday with every day that passes.

Technological innovation and advancement in technology, nature of technological change and diversity of technology influence operations of companies that are technologically inclined (Ogugua & Nze, 2011). So, for the manufacturing firms to compete efficiently, there is need to adapt to the changes in technology in order to be relevant in this technologically-oriented and dynamic business environment (Dauda & Akingbade, 2011). Through adoption of newer and more advanced technologies, manufacturing firms can improve their production abilities, advance their productivity, and expand their lines of goods and services and satisfy their customers more to make them return for purchase.

Baldwin, John & Sabourin (2009) stated that advanced technology is an innovation activity which affects firm performance. The manufacturing sector is a key enabler of innovations of many technologies in other sectors of the economy. The technological growth in Nigeria is insignificant and the insignificant industrial growth rate has continued to provoke doubts whether Nigeria would live up to global changes and challenges in keeping afloat and being able to deliver goods and services to the teeming population as and when due. Among the approaches for the actualization of these competition is creating an enabling environment that is receptive of the new technologies. This involves government policy to inaugurate functional education to produce graduates that are trainable and exceptional (Egbunike, Egolom and Agwaramgbo, 2015).

2. Problem Statement

Adeyeye (2014) noted that due to backwardness in manufacturing technology in Nigeria, compared to advanced countries, Nigerian manufacturers found it difficult to stand against its competitors from foreign countries. The local companies cannot compete with the foreign counterparts in terms of product quality and other areas of marketing capabilities (Gelende & Fuente 2003).

A survey by Manufacturers Association of Nigeria (MAN) in 2006 shows that 30 percent of the manufacturing sector were classified as closed down, 60 percent were ailing firms while only 10 percent were operating at sustainable level (MAN, 2006). This high mortality rate in the sector clearly indicates the inability of the sector to cope with its technological challenges and other challenges. According to Nwosu, Awurum & Okoli (2015) over 750 firms in the sector have folded-up in the recent past and many more face the prospect of imminent collapse in the near future. The inability of the manufacturing sector to cope with challenges is reflected in its dismal performance over the years. All indicators of performance for the sector are negative. Capacity utilisation which is a very good measure of performance for the sector has been alarmingly low over the years Nwosu, Awurum & Okoli (2015).

Manufacturing sector has not witnessed substantial improvement as the capacity utilisation revolves around 35% to 40%. Its contribution to the Gross Domestic Product (GDP) between 2013 and 2014 was around 6.81-7%, while the growth rate is just 7.86%. This is considered too low for a country that has huge consumption power like Nigeria; having an estimated market size of about 170million. It had been pointed out earlier that one of the major problems with the Nigerian manufacturing sector is low technological development in the sector Nwosu, Awurum & Okoli (2015). Investment in modern technology in the sector have been minimal inferring that most firms operating in the sector are most likely using outdated production technology. Nevertheless, despite the low performance and high mortality rate in the sector, there are some firms that are performing well using all performance indices. The enhancement in technology should go together with non-technological innovations Nwosu, Awurum & Okoli (2015). Technological innovation alone is not enough to make the sector work, hence the imperative of non-technological factors to foster economic growth. Product and process innovation only lead to higher productivity when performed in combination with organisational innovation (Polder, Leeuwen, Mohnen & Raymond, 2010).

3. Objective of the Study

The general objective of this study was to examine the influence of advanced technology on management accounting practices of selected manufacturing firms in Nigeria. The specific objectives of the study therefore are to

- Examine the influence of advanced technology on performance of firms.
- Evaluate the relationship between labour cost and firm's performance.

4. Research Hypothesis

The hypothesis of this study is stated in null form.

- Advanced technology has no significant influence on performance of firms.
- Labour cost has no significant impact on firm's performance.

These hypotheses were tested at 0.05 significance level that is 95% confidence level.

5. Literature Review

5.1. Manufacturing Technology and Productivity

Manufacturing technology is a generic name to describe manufacturing technologies which combines both scope and capabilities in a manufacturing industry. The major focus of manufacturers is the ability of the present manufacturing technology to meet these challenges in the global environment. From a strategic perspective, manufacturing technology is

the tool that firms adapt react to the increasingly volatile and complex business environment. In the context of this study, manufacturing technology is defined as advance manufacturing technologies which consist of a group of computer-based technologies and advance manufacturing technologies when compared to previous manufacturing technologies (Ismail, Razak & Lazim, 2014).

The development of new products and use of modern technology in manufacturing processing is crucial for improvements in productivity but innovating firms are not the only ones to profit from successful innovations; instead, as these advances are diffused, they ultimately contribute to higher productivity, competitiveness, employment and standards of living in the country as a whole (Papaconstantinou, 1997).

5.2. Organizational Performance

Organisational performance is the concept that is used to describe how well an organisation is doing to reach its vision, mission, goals and goals. Assessing organisational performance is a crucial aspect of strategic management. Management must know how well their organisation is performing to find out what strategic changes, if any, to make. Performance is a very complex concept, however, and a lot of attention needs to be paid to how it is assessed (Emiaso & Egbunike, 2018). Organisational performances comprise the actual output of an organisation as measured against its targeted outputs. It is the objective of most organisations because only through better performance, are organisations able to grow and progress. Organisational performance encompasses three specific areas: financial performance; (profits, return on assets, return on investment,); product market performance (sales, market share); and shareholder return (total shareholder return, economic value added).

5.3. Management Accounting Practices

Baines & Langfield-Smith (2003) examined the impact of firms' competitive strategy on management accounting practices among manufacturing firms in Australia and conclude that changes in firms' competitive strategy towards product differentiation strategy leads to choose of modern management accounting practices. Chenhall, Kallunki & Silvola (2011) stated that product differentiation is related with innovation and management accounting practices. The study also suggests that differentiation strategy is linked with new management accounting techniques. Mat (2010) concluded that there is no significant association between competitive strategy and Management accounting practices.

5.4. Customer Service Delivery

According to Gbadamosi (2013) Integrated Inventory Management is key to organisational profitability and efficient customer service delivery. He describes inventory control as the managerial activity performed to ensure that materials sufficient for uninterrupted organisational operations are available both in quality and in quantity. It is concerned with the control of the physical quantities and the monetary values of inventory items at predetermined levels or within safe limits. The philosophy of inventory control is that the organisation neither suffers a stock-out situation nor ties down large capital in form of heavy stock carrying. Akinlabi (2017) stated that majority of the supermarket had integrated the use of electronic inventory systems which had enhanced effective customer service delivery. He also noted that lead time had positively influenced the use of electronic inventory systems as well as the quality of service delivery which in turn led to effective customer service delivery.

5.5. Operational Efficiency

Operating efficiency positively impacts profitability in the short-run (Dietrich, 2010). Inventory management has become a critical issue for firm's productivity. Large manufacturing firms have saved millions of dollars in costs and decreased inventories while improving efficiency and customer satisfaction through inventory management practices (Ngumi, 2015; Adu-Fosu 2016; and Shockley and Turner, 2015).

5.6. Customer Satisfaction

Customer satisfaction can be described as a measure of a firm's customer base in terms of size, quality and loyalty (Morgan & Rego, 2005). Customer loyalty and product repurchase are as a result of satisfaction that customers derived from the service of the firm. Satisfaction refers to the quality of the products, price, services and the extent to which company meets and exceeds the requirements of the customer (Eckert, 2007). Customer satisfaction is one of the strategies a firm adopt to enhance profit. The central focus of companies today is to satisfy the ever-changing taste of customers which consequently has an impact on the competitiveness of a firm (Akinlabi, 2017). Manufacturing firms may recognise customer's satisfaction in terms of on-time delivery or meeting customer's specification needs and request (Eckert, 2007). Factors such as customer's needs that is, having the products as and when needed on hand can be used to measure customer's satisfaction in manufacturing industry. Therefore, manufacturer may need to pay specific attention to the changing technology to be able to meet the changing taste of their customers. Definitely, meeting the changing tastes of customers can boost a firm's competitive advantage (Kinyugo, 2014).

6. Empirical Literature

Emiaso & Egbunike, (2018) examined the relationship between organisational performance of the Nigerian's manufacturing companies and the application of strategic management accounting techniques in Delta State, Nigeria. Their study indicated that application of strategic management accounting tools has a positive relationship with organisational performance of companies. They also found a significant difference in effectiveness of decision making between application of strategic management accounting tools and traditional management accounting techniques and concludes

that implementation of strategic management accounting practice is necessary to enhance organisational performance of the firm. The study recommended that manufacturing companies should put in place appropriate measures to apply Strategic Management Accounting tools to ensure efficient and realistic decision-making process that will boost organisational performance.

Ndubuisi-Okolo, Okegbe, & Ugwu (2019) investigated the relationship between technological adaptation and customer retention of plastic manufacturing firms in Enugu State. Correlation Research Design was adopted for the study. Pearson's Product Moment Correlation Co-efficient was used to analyse their data. It was found that technology adaptation has significant positive relationship with customer retention of manufacturing firms in Enugu State. Based on the findings, the study recommended that firms should be ready to adapt and evolve to new technology in order to provide more effective and efficient output which will aid the rate of customer retention in the industry.

Ismail, Razak & Lazim (2014) studied the impact of manufacturing technology in facilitating lean manufacturers to achieve superior manufacturing performance while operating with challenges from external environment. The study identifies many challenges facing manufacturing firms in developing countries which include adopting the right technology, using the technology efficiently and continuously reviewing production technology in order to achieve maximum output. The findings showed that manufacturing technology mediate the relationship between environmental factors and performance of lean manufacturers.

Adeyeye (2014) examined the influence of technological innovation on organisational performance. The findings of the study showed that strategic planning and marketing capability independently and jointly influence organisational performance. Also, the study showed a positive interaction between performance variables (resources availability, staff quality, productivity, sales revenue, financial strength, public image and good will). The study recommended that there is need for organisations to be technologically innovative to be able to compete in the market and companies should train their employee for better efficiency and effectiveness.

Nwosu, Awurum & Okoli (2015) examined the impact of technological innovation on performance of Nigerian manufacturing firms. The empirical result of the study showed that process innovation has significant positive effect on the performance of manufacturing firms that product innovation has significant and positive effect on the performance of manufacturing firms; that organisational structure has significant and positive effect on the performance of manufacturing firms; and that employee development significantly affect firm's performance positively. The study concludes that technological innovation is a critical factor to success of manufacturing firms. The study recommends that Nigeria manufacturing firms should give more serious attention to technological innovation, endeavor to lay more emphasis on employee development as it is an indispensable factor that facilitates technological innovation and that manufacturing firms should adopt appropriate structure because appropriate structure provides a solid foundation for company's operation and technology.

7. Materials and Methods

The purpose of the study was to find the influence of factors of advanced technology on performance of manufacturing firms and study the relationship between labour cost and firm's performance. These hypotheses were tested at 0.05 significance level that is 95% confidence level. Data was collected from secondary tools, literature on prior work, including studies and survey reports. With Eviews 10.0 version, the data collected was analysed using Panel Least Squares regression method. The study examined thirteen (13) industrial goods producers firms listed in the Nigerian Stock Exchange from 2010-2018, that is, nine (9) years period.

7.1. Model Specification

Based on the objectives and hypotheses of this study, the following model is formulated.

The formula is first explicitly defined below:

Financial Performance = f(investment in modern equipment, efficient service delivery, production, labour cost, goodwill, customer satisfaction, advertising).

$$FP = \beta_0 + \beta_1 \text{INVST} + \beta_2 \text{ESD} + \beta_3 \text{PRO} + \beta_4 \text{LABOUR} + \beta_5 \text{GDWIL} + \beta_6 \text{CARE} + \beta_7 \text{ADV}$$

Significance level of the study is 0.05.

Variable	Definition	Measurement
FP	Financial Performance	Natural log of sales values
INVST	Investment in modern equipment	This is measured as a natural log of changes in the value of property plant and equipment.
PRO	Production	Natural log of cost of production for the year.
GDWIL	Goodwill	Natural log of value of goodwill.
ADV	Advertising	This is dummy variable, 1 is selected if the company uses modern technology to advertise and 0 is selected if otherwise.
ESD	Efficient Service Delivery	This is a dummy variable, 1 is selected if companies take order online and 0 if otherwise
LABOUR	Cost of labour	Natural log of the cost of labour
CARE	Customer Care	This is a dummy variable, 1 is selected if the company has a complaint management department which uses modern technology and 0 is selected otherwise.
E		Error term
B ₀		Intercept
B ₁ - β ₇	Slope coefficients representing the influence of the associated independent variable on the dependent variable	

Table 1: Variable Measurements

8. Data Analysis

8.1. Unit Root Test

Variable	Level	First Difference
Firm Performance (FP)	Stationary	-
Investment in Modern Technology (INVST)	Stationary	-
Efficient Service Delivery (ESD)	Not Stationary	Stationary
Production (PRO)	Stationary	-
Employees Remunerations (LABOUR)	Not Stationary	Stationary
Goodwill (GDWIL)	Stationary	-
Customer Care (CARE)	Not Stationary	Stationary
Advertisement on Modern Technology (ADV)	Stationary	-

Table 2: Phillips-Perron Fisher Unit Root Test

Table 2 shows the result of the Augmented Dickey-Fuller unit root test conducted to check for seasonal correlation among the variables. The test was conducted at 0.05 level of significance. The result shows that some of the variable was suffering from unit root at level and some were stationary at level as displayed in table 2. Therefore, the variables that were not stationary were differenced and subjected to Augmented Dickey-Fuller unit root test again, and the three (3) remaining variables were stationary at first difference.

Null Hypothesis:	Obs.	F-Statistic	Prob.
FP does not Granger Cause ADV	91	38.2894	0.0512
ADV does not Granger Cause FP		3.94533	0.0229
FP does not Granger Cause CARE	91	1.31018	0.2751
CARE does not Granger Cause FP		0.06744	0.9348
FP does not Granger Cause ESD	91	7.21177	0.0013
ESD does not Granger Cause FP		3.47860	0.0353
GDWIL does not Granger Cause FP	91	1.06257	0.0301
FP does not Granger Cause GDWIL		0.28517	0.0526
INVST does not Granger Cause FP	91	3.54558	0.0331
FP does not Granger Cause INVST		1.73976	0.0117
LABOUR does not Granger Cause FP	91	0.53699	0.5865
FP does not Granger Cause LABOUR		0.46467	0.6299
PRO does not Granger Cause FP	91	0.14375	0.0063
FP does not Granger Cause PRO		0.15937	0.0529

Table 3: Pairwise Granger Causality Tests

The Granger Causality test in table 3 was conducted to ensure that the variables included in this study are useful to determine the firm performance or forecasting firm performance. The result indicate that the independent variables are useful to predict the dependent variable.

Dependent Variable: FP				
Sample: 2010 2018				
Periods included: 9				
Cross-sections included: 13				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1496825.	1626459.	0.920297	0.3595
INVST	20.17171	13.74177	1.467912	0.0150
ESD	2901335.	1209957.	2.397883	0.1182
PRO	-0.012812	0.011447	-1.119266	0.0255
LABOUR	-2.770204	0.967000	-2.864741	0.0050
GDWIL	14187.16	21713.43	0.653382	0.5149
CARE	-2026285.	1367992.	-1.481211	0.1414
ADV	0.604429	0.207130	2.918107	0.0043
R-squared	0.527949			
Adjusted R-squared	0.497634			
F-statistic	17.41534			
Prob(F-statistic)	0.000000			
Durbin-Watson stat	1.879877			

Table 4: Regression Result

The regression result in table 4 shows the relationship between the variables and the Durbin Watson statistic. Probability result of 0.0150 in the table shows that there is significant relation and positive relationship between investment in modern technology (INVST) and firm's performance. The probability result of 0.1182 in table 4 shows statistically insignificant but positive relationship between efficient service delivery (ESD) and firm performance. The regression result of 0.0255 show a significant but negative relationship between production (PRO) and firm performance. The 0.0050 probability result in the table 4 also indicate statistically significant but negative relationship between employee remuneration (LABOUR) and firm performance. The regression result of 0.5149 indicate statistically non-significant but negative relationship between goodwill (GDWIL) and firm performance (FP). The 0.1414 result indicate statistically insignificant relationship between customer care (CARE) and firm's performance. The result 0.0043 also indicate that the use of modern technology to advertise (ADV) and firm performance are statistically significantly and positively related. Durbin-Watson statistic result of 1.9 indicate that there is no autocorrelation among the variables. The R-squared result of 0.53 indicate strong relationship among the variables, the reaming 47% may be accounted for by other variables not considered in this study.

9. Discussion of Result

Durbin-Watson statistic result of 1.9 indicate that there is no autocorrelation among the variables. This means the variables suitable for our model. Probability result of 0.0150 in the table shows that there is significant relation and positive relationship between investment in modern technology (INVST) and firm's performance. This means that when a firm increases its investment in modern technology, it will perform better and sales will increase. This result is in consonance with the stud of Adeyeye (2014). Adeyeye discovered that technological innovations have significant influence on organisational performance. Technological innovations were measured in this study with INVST, ADV, CARE and ESD. The probability result of 0.1182 in table 4 shows statistically insignificant but positive relationship between efficient service delivery (ESD) and firm performance. This means improved ESD will not necessarily improve FP. This is in agreement with work of Egbunike et al (2015) that stated that advanced manufacturing technology improve efficiency, reduces operating costs and improves delivery costs.

The regression result of 0.0255 show a significant but negative relationship between production (PRO) and firm performance. This means when production increases, FP will reduce. The 0.0050 probability result in the table 4 also indicate statistically significant but negative relationship between employee remuneration (LABOUR) and firm performance. Egbunike et al (2015) found that Nigerian firms have not invest much in Advanced Manufacturing Technology. This means a huge amount is still spent on labour indicating intensive use of manual process. Our findings indicate significant negative relationship between firm performance and labour cost, this means that intensive use of labour will not lead to improvement in firm's performance.

The regression results of 0.5149 indicate statistically significant but negative relationship between goodwill (GDWIL) and firm performance (FP). This result is different from the findings of Adeyeye (2014). Adeyeye found a positive interaction between performance variables that is, productivity, sales revenue, public image and goodwill. The 0.1414 result indicate statistically insignificant relationship between customer care (CARE) and firm's performance. The probability result of 0.0043 also indicate that the use of modern technology to advertise (ADV) by manufacturing firms and firm performance are statistically significant and positively related. This shows that the use of modern advanced technology in advertisement leads to improvement in firm performance. This result is in agreement with the conclusion of

Adeyeye (2014) that Strategic planning capability and marketing capability jointly and independently predict organizational performance.

10. Conclusion and Recommendation

From the empirical findings, this study concludes that advanced technology has positive and significance effect on performance of manufacturing firms. The study also concludes that labour cost has negative relationship with firm's performance. This study recommends that companies' manager should make adequate provisions for investment in advanced and modern technology when preparing management accounting for the company. The study also recommend that manufacturing firms should invest in advance and modern technology to improve efficiency, reduce labour costs and improves delivery costs. Management when preparing the management account should consider the aforementioned variables and continue to invest in advanced technology.

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