Effect of Technological Innovation on Performance of Selected Manufacturing Firms in Nigeria

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Abstract

Technology innovation is key, as it can influence prosperity, consumption pattern, lifestyle, social relation, and cultural development. Technology determines, to a great extent, the demand for raw materials and energy, the ways and efficiency of manufacturing, product performance, transportation, and infrastructure, etc., thereby making significant impacts on the economic, environmental, and social dimensions of industrial development.

In the U.S., a new wave of technology innovations has arisen, largely due to the national endeavor to advance manufacturing in the thrust areas of national importance. The accelerated innovations entail rapid transfer of new technologies into design and manufacturing of high-performance products and services.

Relationship between technological innovation (Production Technology (PT), Marketing Technology (MT) and Age of Information Technology (AIT)) and performance (Market Share (MS) were examined using percentage score, correlation, and regression analysis. PT (0.0655) and MT (0.8189) had positive influence on MS at p = 0.001 while AIT (-0.1087) had negative influence on MS at p = 1.000. Furthermore, PT (0.560) and MT (0.6134) exhibited positive correlation (p = 1.000 with MS) while AIT (0.7750) exhibited negative correlation (p = 1.000 with MS).

Technological innovation has significant influence on market-share that exhibited a significant positive relationship with ROI in foods and beverages manufacturing firms in Nigeria. Study recommended that operators of manufacturing firms should adequately engage the use of production technology and appropriate marketing technology to drive performance positively.

Keywords: *Technological Innovation, efficiency of manufacturing, products and services, product performance and industrial development.*

Introduction

Technology innovation is key, as it can influence prosperity, consumption pattern, lifestyle, social relations, and cultural development. Technology determines, to a great extent, the demand for raw materials and energy, the ways and efficiency of manufacturing, product performance, transportation, and infrastructure, etc., thereby making significant impacts on the economic, environmental, and social dimensions of industrial development. (Kennon, 2022; Majed, 2018; Khan, 2020; Umar, 2021).

Previous Nigerian studies have given insight to the identification and measurement of major determinants of technological innovation, but the methodology used by some of them apparently have some short comings, making their application for policy formation not totally reliable. Such studies consulted include, Bankole (2016) which reported that, measuring productivity drivers involves ratio of total output to total inputs. This measure of physical productivity drivers attempts to produce more outputs with fewer inputs while maintaining quality. (Nto and Mbanasor (2020), however observed that this method of measuring technological innovation cannot produce reliable meaning especially when comparing productivity at different periods or when comparing different facilities producing similar outputs. Furthermore, the method did not contemplate the use of heterogeneous inputs in the production system, though; some authors suggested that this problem could be solved by adding up in 'constant price' money values.

The loophole in this approach is that the resultant productivity index turns out to be economic productivity and not physical technological innovation which conveys more and better meaning to users (David 2012; Iyaniwura and Osoba, 2021 and Oyeranti 2018). Pasca (2014) and GrossKopt, (2012) asserted that productivity drivers can be measured through nonparametric index numbers like growth accounting equation and productivity index. Oyeranti (2018) added that the notable shortcomings of the above approaches include biased estimates of productivity, because of the prevalence of inefficiency. Also, the parameter to be estimated cannot be tested with econometric tools to determine level of significance (Nto and Mbanasor 2020).

In the U.S., a new wave of technology innovations has arisen, largely due to the national endeavor to advance manufacturing in the thrust areas of national importance. The accelerated innovations

entail rapid transfer of new technologies into design and manufacturing of high-performance products and services (Mohanen and Hall, 2021; Mairesse and Mohnen, 2020 and Uremadu, 2019).

Statement of the Problem

The Nigerian manufacturing sector is one of the engines of growth for employment, a creator of wealth and the threshold for sustainable development but it seems to be facing more challenges than any other sector. Nigerian economy is yet to come on the path of sound growth and development because of low input of manufacturing sector to the economy Gross Domestic Product (GDP). Throughout the 1990s and 2020's. Nigeria continued to rely heavily on the export of oil, with utmost neglect of the sector. Many factors have contributed to the variation in sector share through time, many of which show both the vulnerability of manufacturing to global economic pressures, as well as the impacts that policy changes can have in reshaping the sector. Capacity utilization has also fallen continuously and these negative trends in the performance of manufacturing production indicate falling productivity. In addition, low-capacity utilization makes it difficult for profitable operations. Given this abysmal performance of the manufacturing sector in Nigeria, this study investigates the effect of technological innovation on the performance of manufacturing firms in Nigeria.

Objective of the Study

General objective of the study is to examine the effect of technological innovation on performance of listed foods and beverages firms in Nigeria. Specific objective is to:

i. determine the influence of technological innovation on market-share.

Concept of Technological Innovation

Mairesse and Robin (2021) found that product innovation appears to be the main driver of labour productivity in the French manufacturing and service industries. The impact of process innovation was either not significant or close to zero. Also, Legros and Galia (2022), analyzing the sources of knowledge and their effects on productivity in French manufacturing, found that the market share and firm size have a positive impact on innovation decision and intensity of research and development. The effect of innovation is divided into two parts; one going to the real output, and another pertaining to the price at which the output is sold. However, they concluded that it is very difficult to dissociate them because of measurement issues. Individual studies give further insights about the relationship between innovation and performance and raise detailed econometric

problems according to specificities of each other. Also, they give various understandings about the probability of firms to engage in innovative activities.

Theoretical Review

A firm is regarded as a system where there are various stakeholders, and its objective is to maximize stakeholder's wealth. Consequently, it is considered a black box operated to meet the relevant marginal conditions with respect to inputs and outputs. Considering this, several studies (Abdullah 2021; Gray and Birger1989; Costea 2016) have adopted different theories to underpin research carried out on factors that determine firm performance. Such theories employed in these literatures include agency theory, shareholders theory and stakeholders' theory.

Agency theory explains the relationship that exists between the principals (shareholders, stakeholders) as well as defines responsibilities of agents. The theory posits that as the representatives of the shareholders, the managers are expected to act in a manner that conform to the shareholders' interest. Consequently, the corner stone of this theory is on the assumption that the interests of principals and the agents diverge. Hence, the need to come up with a theory that will be used to help settle the interests' conflicts that might arise between these parties. Also, it is possible that when the interests" conflicts of these parties arise, management would not be able to perform their duties which include maximization of shareholders wealth which is been reflected in the performance of the firm.

Stakeholder's theory on the other hand, broadens the shareholders perspective on the creation of a firm and its value. The stakeholders" theory is an extension of the agency theory in that corporate accountability is no longer restricted to shareholders but to a broad range of stakeholders (Abubakar, 2021). This implies that the firm and its managers have a special obligation to perform and ensure that shareholders have a fair return on their investment. This in addition to satisfying the obligation of other stakeholders which goes beyond those required by law. The theory recognizes the importance of wealth creation as well as the firm's relationships with its multiple constituent groups.

Therefore, stakeholders refer to a group of constituents who have a legitimate claim on the firm. This legitimate right and ownership is acquired by those involve through an exchange relationship. The study however is underpinned by the stakeholder's theory. This theory is considered appropriate for the study as it considers all and sundry of a firm very important to the survival, success and improvement of the firm performance. As the theory explicitly spells out the special

obligations of the managers to perform to ensure that stockholders have fair return on their investments in additions to satisfying other stakeholders beyond what the law requires. More so, since the performance measure (return on investment) used by the study is arrived at from the additions of all funds made available to the firm through different means and sources, the stakeholder theory can cover these various parties interest points.

Shareholders theory according to Michael (2018) emanates from an economic perspective. That considers the creation of wealth for its owners.

Therefore, the performance use is from the perspective of shareholders, and shareholders are interested in the return of their investment. To measure performance and effectiveness of shareholders, agency theory comes in that is agency theory comes from the effectiveness of shareholders.

Theoretical Framework

The various theories in the study gave a clear view of firm's performance and how managers can ensure that stockholders have fair return on their investments to satisfying other stakeholders. Stakeholder's theory is appropriate for the study as it considers all and sundry of a firm very important to the survival, success, and improvement of the firm performance.

Empirical Review

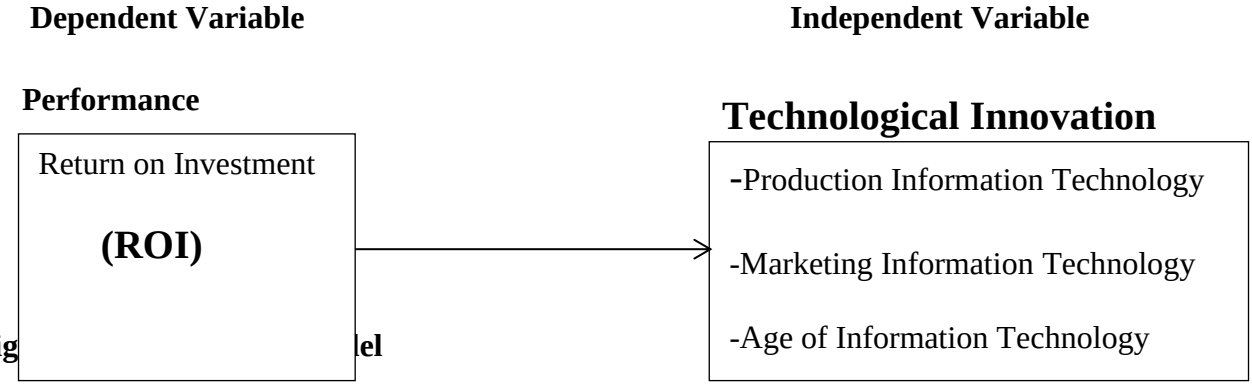
Abdullah (2021) states that, it has a degree of importance in the model referring to the strongest contribution that explains ROA. They concluded that smaller firms are more creative, innovative and tend to change more rapidly. Supported by this finding is Banz (2017), who found that as firms grow up, it becomes more difficult for them to sustain impressive performance. So, smaller firms are more creative, innovative and change more readily to enhance performance.

Gray and Birger (2012) tried to see if economic and organizational factors determine firm performance. Found a negative significant relationship on over 1000 firms in more than 300 business lines. Findings showed that organizational factors explain twice as much variance in firm profit rate as economic factors. The same result was found in the study of Pawan and Shuangi (2019).

Conceptual Framework

In a nutshell common measurement of performance often encountered in academic literature. This research adopted measurements of financial performance for assessment of productivity drivers on performance of selected food and beverages firms in Nigeria. Thus, the study conceptualized

at investigating the extent to which technological innovation influence market share of food and beverages firms in Nigeria. The study also, examined how financing structure influence return on investment of food and beverages firms in Nigeria.



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Source: Adapted from Myers. M and Majluf A. (2023)

Methodology

The study area is the Nigerian manufacturing sector especially the firms listed on the Nigerian Stock Exchange (NSE). All together Twenty (20) quoted foods and beverages manufacturing firms are listed on the floor of NSE market as at, 2022 with branches spread all over the country.

Primary data were sourced through structured questionnaire while, secondary data were sourced from the published account during the Eleven years (11) period of 2012 and 2022.

Multiple regression analysis was used to specifically resolve objective, which is return on investment of food and beverages manufacturing firms in Nigeria.

Results and Discussion

Data Presentation and Analysis

Empirical analysis of the effect of technological innovation on performance of manufacturing firms in Nigeria over a period of eleven years (2012-2022). Secondary data was used to address objective.

Social characteristics of Respondents

This part explains the respondents' social characteristics which cover sex, age, marital status, educational qualification, work experience and managerial cadre of the respondents.

The male respondents are 176 (59.46%) while the number of female respondents is 120 (40.54%). This shows that both male and female individuals constitute the workforce of each of the selected Companies. The result reveals a higher proportion of male respondents over female respondents in the company's workforce. The age bracket of the respondents are in three categories; 18-

35years, 36-50years as well as above 50years. The figure shows that the number of respondents within the age bracket of 18-35years is 104 (35.14%). Furthermore, respondents in the age brackets of 36-50years are 142 (47.97%), while respondents with the age above 50years are 50 (16.89%). Invariably, it can be deducted that lower percentage of respondents 50 (16.89%) is above 50years while the larger percentage of respondents with 246 (83.11%) ranged between 18 and 50years. Thus, they form the highest population workforce of respondents.

The respondents who are single are 101 (34.12%) while the numbers of married ones are 136 (45.95%). 59 (19.93% of the respondents are divorced. This revealed that both the single and married constitute the majority of the respondents in each of the selected companies. Thus, the implication is that the companies have more married than singles as their staff. The number of respondents that possess OND/NCE/A'LEVEL is 82 (27.7%), while respondents that possess HND/B.SC./B.TECH are 149 (50.34%). Respondents with MBA/M.SC/M.TECH are 65 (21.96%). The implication is that majority of the respondents are educated with minimum qualification being OND/NCE. Majority of the staff are however HND/B.SC/B.TECH holders. Respondents at the lower level of management are 77 (26.01%), while 133 (44.93%) are ranked middle level officers. The number of respondents at the top level of management is 86 (24.90%). The study shows that middle lever officers 107 (44.40%) and junior staff 74 (29.05%) have the highest percentages representing about 181 (75.11%) of the total respondents. With respect to years of experience, 88 (29.73%) respondents have work experience of 1-10 years. 141 (47.64%) have 11-20 years' experience while 67 (22.64%) respondents have at least 21years of work experience.

Table 4.1 Results of the Regression Analysis Showing the influence of Technological innovation on Market-share of Firms in Nigeria

Dependent variables	**Independent variables**	**Coefficient**	**Standard Error**	**T**	**p>|t|**	**[95% conf. interval]**	
Market Share	Production Information Technology	0.0655740	0.0584379	1.12	0.000*****	.180587	.049439

Marketing Information Technology	0.8189803	0.0515082	1.59	0.003*	.1319688 .0707799
Age of Information Technology	-0.1087138	0.0503759	-2.16	0.002*	-.0095679 .2078597
Constant	3.727758	0.3393012	10.99	0.000*	3.059972 4.395544

R-squared = 0.7218, **Adj. R-squared = 0.6117, P≤0.000 F (3, 292) = 62.16, Number of obs = 296, Root MSE = 1.2138**

Source: Researcher's computation using Stata, 2023

***** = Significant at 1% level.

Analysis showing the Relationship between Technological innovation and Market-share of Firms in Nigeria

Two of the independent variables (PIT and MIT) showed a strong positive correlation (r = 0.5602 and 0.6134) while AIT showed a negative correlation (r = -0.7750) p ≤0.05. This is shown in the table 4.2 below:

Table 4.2 Result showing the Relationship Technological innovation and Market-share of Firms in Nigeria

	Market Share	Production Information Technology	Marketing Information Technology	Age of Information Technology
Market Share	1.0000			
Production Information Technology	0.5602**	1.000		
Marketing Information Technology	0.6134**	-0.4354	1.0000	

Age of Information Technology	-0.7750	-0.3590	0.5460**	1.0000

Source: Researcher's computation using Stata, 2023.

**** = significant at 5% level**

Discussion of Findings

The objective and hypothesis seek to determine the influence of technological innovation on market-share of manufacturing firms in Nigeria. The result was found to have significant effect on market-share of manufacturing firms in Nigeria. More so, that the predictive power of technological innovation as used to explain variation in the dependent variable (market share of firms) is about 72%, $R^2 = 0.7218$; and Adjusted $R^2 = 0.6117$. The fitness of the model is validated given the significance of prob $\geq$ f = 0.000 and f (3, 292) = 62.16. This implies that technological innovation has significant influence on market-share of manufacturing firms in Nigeria. This outcome is consistent with the findings of Mohnen and Hall (2021), Mairesse and Mohnen (2020). Therefore, technological innovation can be operationalized by the proportion of total asset that is committed to technological innovation rather than another form of asset.

Conclusion

This study examined the effect of technological innovation on the performance of food and beverages manufacturing firms in Nigeria for a period of eleven years (2012-2022). Following the empirical analysis carried out in the study, the study concluded that technological innovation has significant influence on market-share of food and beverages manufacturing firms in Nigeria. According to the findings, production technology, market technology and age of information technology all had relationship with market share.

To this end, the study concludes that technological innovation has significant influence on market-share in food and beverages manufacturing firms in Nigeria within the period covered by the study.

Recommendations

Based on the foregoing, the study now makes the following recommendations to:

Operational management (Manufacturing Firms)

Operators in the manufacturing sector should engage more of technological innovation as this has been found to have positive effect on performance of food and beverages manufacturing firms.

Production processes, marketing and other aspects of operations should be done using appropriate and economical technology.

Policy Makers/ Government

Government should ensure that an enabling environment is provided to promote performance of firms and woo investors into food and beverages subsector of Nigeria manufacturing firms.

Robust policy that engenders growth of manufacturing firms should be formulated and followed.

Adequate facilities should be provided to schools to further enhance production of capable and updated graduates who ultimately serve as an input into the operating systems of firms in Nigeria.

Contributions to knowledge

The study is situated on the fact that there is need to examine the effect of technological innovation on the performance of selected food and beverages manufacturing firms in Nigeria for a period of eleven years (2012-2022) covering the period of economic boom, recession, and recovery in Nigeria.

To this end, the study contributed to knowledge in the following areas:

i. Previous studies on technological innovation and performance can be found in the works of Kennon (2022), Uremadu (2019), etc. Many of these studies used secondary data only while both primary and secondary data were used in this study which represents a major contribution to the body of knowledge.

ii. The study empirically affirms the Mairesse and Mohnen (2020), Hall (2021) and Mohnen and Hall (2021) contributed to literatures by establishing the effect of technological innovation, on the performance of food and beverages manufacturing firms in Nigeria.

iii. The study has also provided a framework for policy makers in their quest to understand what drives production and how they affect performance of food and beverages manufacturing firms in Nigeria.

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