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**| RESEARCH ARTICLE**

## **The Effects of the Innovative Decisions on Firms' Innovative Performance of Nigerian Industry**

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**| ABSTRACT**

Firms have to keep innovating if they want to maintain competitive advantage; hence, this study investigates the innovation activities in Nigerian firms considering the role Nigeria plays in the African economy. Specifically, the objectives of this study are to (1) to determine the factors that affect firms' innovative activities and (2) to evaluate the impact of the innovative decision on innovation performance or product of firms. 2014 Enterprise survey data conducted by the World Bank is used, and CDM-model is adopted as the method of analysis. The results showed that improved supporting activities by firms has a significant positive relationship with firms' innovative performance, and giving employees time to develop new idea has a positive impact on innovation performance. Finally, the study recommends that firms should embark on the job training of staff because it will help them be more efficient by improving the working process.

**| KEYWORDS**

Innovative decision, innovative product, Enterprise survey, firm.

**| ARTICLE INFORMATION**

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### **1. Introduction**

The growth of a national economy depends on the performance of individual firms and households. A firm is an enterprise organization that aims to make a profit. Making a profit or surviving in this current world competitive business environment becomes more difficult because globalization that brought easy access to technologies. This means many firms can easily acquire these technologies and compete effectively. However, firms have to keep innovating if they want to maintain a competitive advantage.

Afuah (1998) defined innovation as the "use of new technical and administrative knowledge to offer a new product or service to customers. Schumpeter (1934) sees innovation as the driving force for development Marques et al. (2011) stated: "that encouraging firms to innovate will lead to a better economic performance of firms in terms of market and financial performance." This means that innovation could be what actually makes the difference between the firms' progress, implying that successful innovation activities by firms are expected to bring a successful innovative product that will result in to increase in the financial performance of a firm.

Having agreed on the importance of innovation plays in the firm's developments, it is unfortunate that we have not yet seen a study that investigates the innovation activities in Nigerian firms considering the role Nigeria plays in the African economy. Therefore, this study seeks to investigate the effect of innovation on the performance of manufacturing firms in Nigeria.

Specifically, the objectives of this study are 1) To understand the factors that affect firm innovative activities and 2) To estimate the impact of innovation-decision on innovation performance or innovative products.

In order to estimate the objectives of this study, we will make reference to the CDM framework explained by Crépon, Duguet, and Mairesse (1998). The CDM model is a four-equation knowledge production function model which incorporates three relationships: the productivity equation relating innovation output to productivity, the knowledge production function (or innovation equation) relating innovation input to innovation output, and the research investment equation linking innovation input to its determinants. Beneki, Giannias, and Moustakas (2012).

## 2 Literature Review

Many scholars and institutions have different opinions concerning the effect innovation have on the enterprise. Musa and Adamu (2017) said, "for a firm to remain in the industry and make meaningful profits, innovation must be a golden priority." Schumpeter (1934) "argued that innovative new products when first introduced to the market face limited direct competition and, as a result, allow firms to enjoy relatively high profits." Over time, these high profits are likely to erode due to imitation and competition. But firms that continue introducing innovative new products may be able to achieve high profitability for a sustained period (Sharma & Lacey, 2004). Like many other scholars, Varis & Littunen (2010) "argued that the ultimate reason for firms to engage in innovation activities is to improve the firm's performance and success."

World Bank (2015) stated that "Innovation and entrepreneurship are recognized as key building blocks of competitive and dynamic economies. Countries and regions with vibrant innovation and entrepreneurship ecosystems tend to witness higher productivity rates, leading to increased economic growth and more robust job creation, the main pathways through which the poor can escape poverty". As a key driver for firm growth, innovation fosters shared prosperity by stimulating formal employment and increasing wages. Also, Roberts (1999) "found out that in the long run, innovation activities had a positive impact on the return on investment of firms after studying the American pharmaceutical industry."

However, Daniyal (2015) "stressed that in some cases innovation can also be seen to have a negative or disruptive effect as in most cases there are risks associated with introducing a change." Daniyal (2015) went ahead and said some of the negative impacts of introducing innovation include: Lack of ownership of introducing and implementing innovation; risk aversion to change; a significant increase in training requirements; and lack of client stewardship and support.

**Table 1:** Factors that Influence Innovative activity

Classification	Factors of innovative activity of enterprise
<b>Market value</b>	Economic, financial, political, legal, marketing, competitors, administrative, social, natural and climatic, personnel.
<b>Sustainability</b>	Natural and climatic, political, legal, productive, financial, scientific and technical, economic
<b>Reliability</b>	Scientific and technical, financial, productive, economic, political, legal, administrative, consumers, suppliers, competitors.
<b>Activity</b>	Marketing, productive, administrative, political, legal, personnel, financial, economic, scientific and technical
<b>Sociality</b>	Social, skilled, financial, economic, political, legal, natural, climatic, scientific and technical, competitors

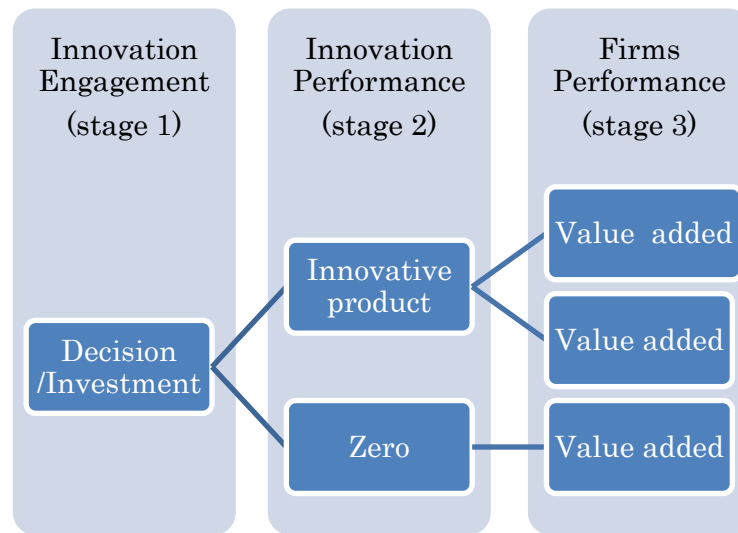
**Source:** Yachmeneva and Vol's'ka (2014)

Huse et al. (2005) “suggest that innovation appears to be the only way for an organization to convert change into opportunities and success. Normally, innovation can either be process or product” (OECD, 2005) stated that Product innovation is based on meeting customers’ preferences by designing a new or considerably improved product, whereas process innovation relates improvements of operations and supply chain. “Firms can follow innovation strategies more focused on products or processes. However, the setoff capabilities required for each are not necessarily equal, as well as its output” (Fonseca (2014)). It is almost impossible for a firm to engage in only one kind of innovation because they work hand to hand; in fact, research has proved that firms engaging only in process innovation perform lower than the firm that uses product innovation compliment to process innovation.

Globalization has led to an increase in competition among firms; this implies that a firm has to innovate more often in order to survive or have a competitive advantage. Clearly, there is an established relationship between innovation and firm performance. Metcalfe (1998) stated that “when the flow of newness and innovations desiccates, firms’ economic structure settles down in an inactive state with little growth.

Figure 2 explains innovation and a firm’s performance relationship, which comprises three stages. However, for this study, our main focus will be innovation and innovative performance (first and second stage). A firm has to make a decision to innovate or not; this decision will be made by the staff, and the caliber and number of staff that a firm has will affect the quality of an innovative decision. Muzamil (2018) said, “it can be anticipated that larger firms will engage more in purposive outflows of knowledge and technology.” Muzamil went ahead to say as knowledge resources are imperative for the success of a firm in innovation, small firms tend to source and acquire knowledge from external knowledge bodies. This makes them engage more in activities that are related to purposive inflows of knowledge and technology. There is no doubt that larger firms will have more capital than small or medium firms, so the large firms are expected to perform better in innovation performance. When a firm has agreed to innovate, the next is to invest in the idea and develop it into an innovative product.

**Figure 1: conceptual framework**



According to Nham, Nguyen, Pham, and Nguyen (2015), “Innovative performance is the combination of overall organizational achievements as a result of renewal and improvement efforts done considering various aspects of firm innovativeness, for instance, processes, products, marketing, organizational structure.” So having good innovative performance depends on the firm decision that brought new patent property, research, project, training, etc.

**2.1. Overview of the Nigerian manufacturing sector**

Nigeria is a middle-income, mixed, and the emerging economy ranked as the 27th-largest economy in the world in terms of nominal GDP and the 22nd-largest in terms of purchasing power parity. Nigeria has the highest economy in Africa by GDP and also has a population of approximately 199,885,311(estimated), with a middle-low income of \$ 2,080 per capita at nominal value, by the World Bank development indicator (2014)

The economic Progress of Nigeria was affected by civil war between 6 July 1967– 15 January 19, military rules, and continuous forms of violence in every part of the country, for example, the Boko Haram insurgency in North East, Fulani Herdsmen crises in Middle Belt and crude oil militants in the south. After a series of military regimes, Nigeria became a democratic country in 1999, which was assumed to have created a conducive political environment that triggered investment, especially in the industrial sector, but was not sustained because Nigeria was running a mono-economy, whereby half of its revenue comes from the oil sector.

The manufacturing sector in Nigeria is the weakest sector; Akinmulegun and Oluwole (2014) stated that “the manufacturing sector was characterized by increasing cost of production emanated from the high tariff, increased the cost of energy input, reliance on poor and inadequate public sector infrastructures and the rising cost of import. Nigeria is not exempted, and the nation is worse off by the sharp depreciation of the naira exchange rate”. It’s obvious that a country needs substantial capital investment to industrialize, which Nigeria lack because since the discovery of oil, less attention has been paid to export and foreign investment, which are ways that country can increase its savings, instead the government keeps borrowing money from international communities with no or less hope of paying back soon. Akinmulegun and Oluwole (2014) also said that “even the massive inflows of foreign exchange between the 1970s and 1990s through crude oil sales could not provide the necessary stimuli for development in the manufacturing sector as it failed due to over-dependent on the external sector for the supply of inputs in the face of fast technological driven development world”. In addition, there was weak demand for the sector's products and a low export market.

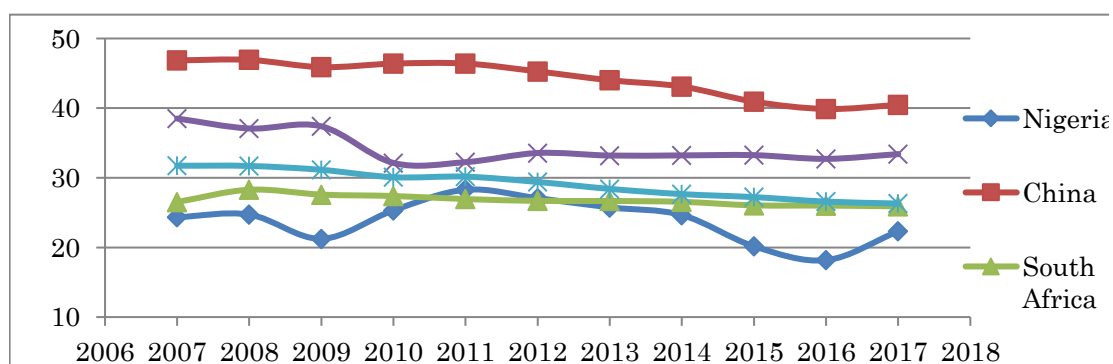
**Table 2:** GDP and Percentage of Manufacturing Contribution to GDP 2008-2017

Year	GDP (constant 2010 US\$) in billions	Manufacturing Value <sub>o</sub> (Constant 2010 US\$) in billions	Percentage Change in Manufacturing Value	Manufacturing % Share Contribution
2008	312	22		7.199816
2009	336	23	3.608053	6.904666
2010	363	24	2.501886	6.552817
2011	383	28	17.81541	7.331099
2012	389	32	13.45926	7.980241
2013	425	39	21.7971	9.111822
2014	452	45	14.72376	9.832991
2015	464	44	-1.46014	9.439027
2016	458	42	-4.31764	9.179912
2017	461	42	-0.2116	9.087254

**Source:** World Bank Development Indicator.

Table 2 explains the decrease in the contribution of the Nigerian manufacturing sector by percentage change. There was a steady decrease in contribution in the value of the manufacturing sector from 2014 to 2017.

**Figure 2:** Industrial Contribution to GDP of Emerging Countries (Value added by %)



**Data source:** World Bank Development Indicator

In Figure 2, we explained the percentage of industrial contribution to the GDP of emerging economies. China is currently the fastest growing economy in the world; which industrial sector is currently contributing over 40% of its value to the GDP. This means that for an emerging economy to grow faster, its industrial sector has to grow simultaneously.

### **3. Design and Methodology**

#### **3.1 CDM model**

In order to estimate the objectives of this study, we made reference to the CDM framework explained by Crépon, Duguet, and Mairesse (1998). The CDM model is a four-equation knowledge production function model which incorporates three relationships: the productivity equation relating innovation output to productivity, the knowledge production function (or innovation equation) relating innovation input to innovation output, and the research investment equation linking innovation input to its determinants. Beneki, Giannias and Moustakas (2012).

CDM model was constructed to solve the two economic problems that will arise during the regression. The first problem is selectivity bias because not all the firms engaged in innovation, and also some innovations, will actually fail. While the second is simultaneity bias, this occurs because many factors influence firms' innovation-decision like finance, etc.

To proceed with our analyses, we employ two-stage regressions because of the presence of an instrumental variable, which is innovation activity.

#### **First stage (innovation-decision/ investment stage)**

$$K_i = \beta_0 + \beta_{11}X_{11i} + \dots + \beta_{1n}X_{1ni} + u_{1i} \dots \dots \dots \text{equation1}$$

- $K_i$ : is Innovation Activity. Establishment gives employees time to develop a new idea is an example.
- $X_{11}, X_{1n}$ : are independent variables that affect innovative decisions. For example, the Use of email by firms and firms' experience.
- $\beta_0, \beta_{11}, \dots, \beta_{1n}$ : are associated coefficients.
- $u_{1i}$ : is error term.

#### **Second stage (innovative performance or innovation product)**

$$t_i = \beta_{20} + \alpha K_i^* + \beta_{21}X_{21i} + \dots + \beta_{2n}X_{2ni} + u_{2i} \dots \dots \dots \text{equation2}$$

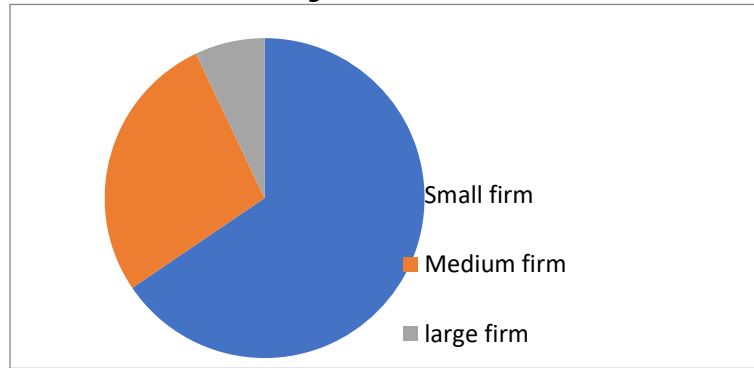
- $t_i$ : is innovative product. Establishment introduced new or significantly improved product or service is an example.
- $K_i^*$ : is the theoretical value of innovative activity.
- $\beta_{20}, \beta_{21}, \dots, \beta_{2n}, \alpha$ : are associated coefficients.
- $X_{21}, X_{2n}$ : are independent variables. For example, establishment has its own website
- $u_{2i}$ : is error term.

In this second stage, we investigated the impact of innovation-decision and investment (e.g., R&D, capital) on innovative products or a number of improved new products/ services or the number of patents.

#### **3.2 Estimation**

The source of data for this study is the Nigeria Enterprise Survey 2014 by the World Bank, made up of 2,676 surveyed firms. The interviewed firms were mostly manufacturing and services companies. The survey was conducted in 18 states out of 36 states of Nigeria. 282 firms were interviewed in Lagos state alone, which is the highest, followed by Kano 200 firms, and then Sokoto state is the state with the lowest number of interviewed firms by 115.

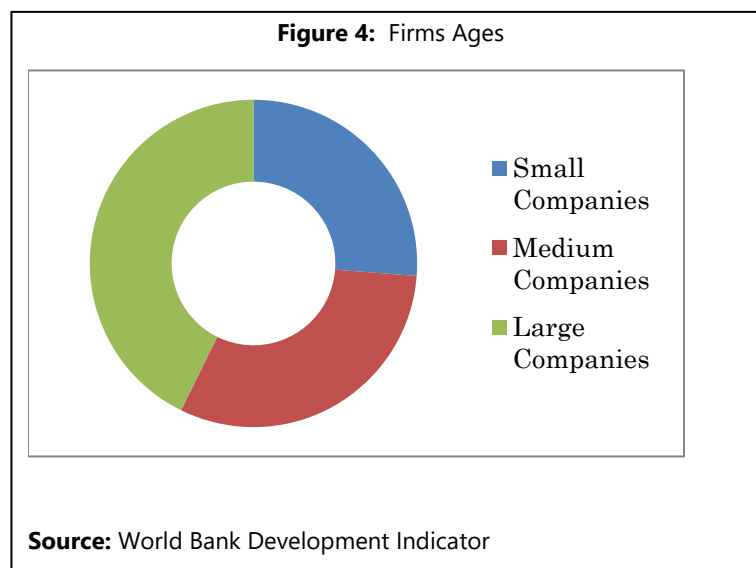
**Figure 3: Firm Size**



**Source:** World Bank Development Indicator

The size of the firm depends on the number of employees it has. Firms that have between 5 and 19 full-time employees have considered small firm; medium firms are firms that has between 20 and 99 full-time employees, while a large firm is a firm that has between 100 and above full-time employees. From the data, we observed that 1,753 firms are small firms, 734 are medium firms, and 189 are large firms.

**Figure 4: Firms Ages**



In Nigeria, Large firms had more experience, followed by medium firms and small firms. On Average, Nigeria firms had 16 operating years in 2014. To be specific, on average large firms had 25 operating years, medium firms had 18 operating years, and the small firm had 15 operating years.

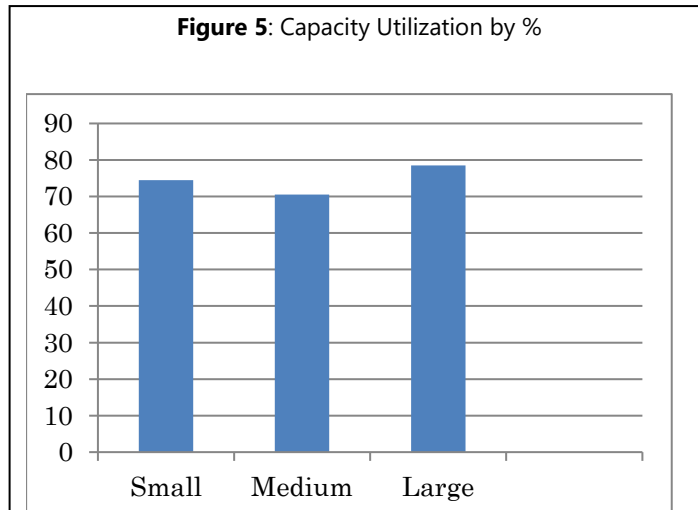


Figure 5 shows the competitive capacity utilization among the firms. However, the large firms that are more competitive use an average of 78.5% of their potential, followed by small firms that use 74.5%, and the last medium firms that use 70.5% of their potential.

**3.3 Data description**

In order to understand the nature of the data we are using for the study, we decided to run a statistically data description, and we obtained the result below.

**Table 3: Description of variables**

Name	Description	Obs	Mean	Std.Dev	min	max
Innovation activity 1	Establishment gives Employees time to develop new ideas.	2,598	.4291	.495	0	1
Innovation activity 2	Establishment spend on formal Research and development activities, either in-house or contracted with other companies	2,596	.173	.378	0	1
Improved method of manufacture	Introduced any new or significantly improved methods of manufacture	2,613	.497	.500	0	1
Improved supporting activities 1	During the last three years, has this establishment introduced any new or improved system	2,612	.478	.499	0	1
Improved supporting activities 2	Introduced any new or significantly improved supporting activities for your processes, such as maintenance systems or operations for purchasing, accounting, or computing.	2,618	.404	.490	0	1
Improved process	Introduced new or significantly improved processes	2,615	.396	.489	0	1
Use of website	Establishment has its own website	2,633	.196	.397	0	1
Use of email	Do You Currently Communicate with Clients and Suppliers by E-Mail?	2,637	.272	.445	0	1
Use of technology licensed	Do You Use Technology Licensed from A Foreign-Owned Company?	1,099	.124	.330	0	1
Total fixed assets per worker	(Totals sales – total cost)/ employees	925	7.702	10.495	-27	100
Employees	Num. Permanent, Full-Time Employees at the end of Last Fiscal Year	2,564	40.884	216.204	0	5000

Innovative Product	Establishment introduced New or Significantly improved Product or Service	2,610	.498	.500	0	1
Foreign ownership	% Owned by Private  Foreign Individuals Companies or Organizations	2,482	4.143	14.149	0	100
Process innovation	Total sum of innovation process taken by firms.	2,575	1.784	1.604	0	4

Source: World Bank development indicator (2014)

### 3.4 Regression

Probit Regression is employed because our data range from 0 to 1; basically, we ran two stages of least regression because the method contained instrumental variables.

Instrumental variables are endogenous variables that become the dependent variables in the first stage regression equation. Each is regressed on all exogenous variables. The predicted values from these regressions replace the original values of the endogenous variables in the second stage regression model.

We estimate equations 1 of stage one to get the value of innovation activity1 and innovation activity 2 and then calculate their theoretical values by predicting the value. Then we estimate equation 2 of stage two using the theoretical value of innovation activity1 and innovation activity 2.

The tables below show the result of the regressions. Tables 4 and 5 are the first stage, while Tables 6 and 7 present the second stage results.

**Table 4:** Innovative Decision and Investment 1(stage one)

$K_i$	Innovation activity 1	Coefficients	p-values
$X_1$	Improved method of manufacture	.6615524	0.000
$X_2$	Improved supporting activities	.8067962	0.000
$X_3$	Improved process	.3093996	0.075
$X_4$	Use of website	.0499103	0.691
$X_5$	Use of email	.0613361	0.596
$X_6$	Experience	.0113886	0.117
$X_7$	Use of technology licensed	-.0267764	0.608
$X_8$	Total fixed assets per worker	-.0113885	0.197
$X_9$	Employees	.0003378	0.177
	_con	-3.78	0.000
	Pseudo R2	0.2013	

Source: Authors computation from World Bank development indicator

**Table 5:** Innovative Decision and Investment 2 (stage one)

$K_i$	Innovation activity 2	Coefficients	p-values
$X_1$	Improved method of manufacture	.108981	0.621
$X_2$	Improved supporting activities	.7075854	0.000
$X_3$	Improved process	.4041647	0.044
$X_4$	Use of website	.13053	0.421
$X_5$	Use of email	-.1708405	0.097
$X_6$	Experience	.0130866	0.091
$X_7$	Use of technology licensed	.0789906	0.390
$X_8$	Total fixed assets per worker	.0050667	0.632
$X_9$	Employees	.0036214	0.001
A.	B. _con	-2.096364	0.000
C.	D. Pseudo R <sup>2</sup>	0.1948	

Source: Authors computation from World Bank development indicator



**Table 6: Innovation activity 1 on Innovative Performance (stage two)**

$t_i$	Innovative Product	Coefficients	p-values
$X_{10}$	Number of competitors	.0008872	0.641
$X_{11}$	Foreign ownership	-.0002502	0.965
$X_{12}$	Process innovation	.2230395	0.063
$K_i^*$	Innovation activity_1th	1.438471	0.045
$X_9$	Employees	.0003798	0.287
	_con	-.8200767	0.000
	Pseudo R <sup>2</sup>	0.1843	

**Source:** Authors computation from World Bank development indicator

**Table 7: Innovation activity 2 on Innovative Performance (stage two)**

$t_i$	Innovative Product	Coefficients	p-values
$X_{10}$	Number of competitors	.0029177	0.477
$X_{11}$	Foreign ownership	.0097929	0.004
$X_{12}$	Process innovation	.8018506	0.000
$K_i^*$	Innovation activity_2th	-2.46627	0.000
$X_9$	Employees	.001036	0.000
	_con	-.9883213	0.000
	Pseudo R <sup>2</sup>	0.3427	

**Source:** Authors' computation from World Bank development indicator.

#### 4. Findings and Discussion

Tables 4 and 5 show factors that affect innovative activity ( $X_2$ ). Improved supporting activities have the highest effects on innovation activity.

The innovation performance which results from a firm’s innovation activity of a firm is positively linked to process innovation and negatively to value-added per worker. This means that a firm engages in process innovation to improve its product or have a new product. The study also found that R&D has a negative effect on product and process innovations. However, this does not match with the view of many researchers; for instance, Bettina (2005) stated the input measure (R&D or innovation expenditure) is related to product and process innovations.

Also, Table 6 shows that giving employees time to develop a new idea has a positive impact on innovation performance. Also, foreign ownership has a direct positive effect on an innovative product; this attests to the fact that foreign ownership could be a source of more ideas, technology, or capital that will help in the innovation process or innovative product.

Finally, the numbers of full-time permanent workers have an impact on innovative product. Etienne and Charles (2017) Number of full-time employees is one of the factors of ‘international quality recognition. This reflects the idea that a firm’s size influences the international quality recognition of manufacturing companies.

#### 5. Conclusion

The study investigated the relationship between innovation and innovation performance in Nigerian manufacturing firms using 2014 enterprise survey data; specifically, the objectives of this study are 1) To understand the factors that affect firm innovative activities and 2) To estimate the impact of innovation-decision on innovation performance or innovative products. From the analyses, it was discovered that research and development negatively affect innovation performance in Nigeria firms which is unusual because firms invest in innovation to increase the quality and quantity of their product; as stated by Shouyu (2017), successfully developed and introduced innovation to get the benefits of innovation needs specific organizational resources and capabilities. Because innovation also shows multi-faceted, the performance of innovation in different enterprises may not be the same in different environments. However, the study also showed that giving employees time to develop a new idea has a positive impact on innovation performance.

We recommend that firms should embark on the job training of staffs because it will help them more efficient by improving the working process.

Moreover, this article also contributes to various strands of literature. First, the article contributes to the recent literature on Innovation and Firms' Performance CDM framework as detailed in Crepon et al. (1998), using Nigerian micro-level evidence for the first time. Methodologically, by employing two-stage regressions because of the presence of instrumental variable, which is innovation activity. The study was able to cut off ambiguous methods used by other scholars who have researched related topics.

The findings of this research should be considered very carefully because some variables seem identical. However, it is also interesting to note that this study will be expanded from stage 2 to stage 3, as indicated in Figure 1, which is "the impact of the innovative product on firms' performance."

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**Conflicts of Interest:** The authors declare no conflict of interest.

**Publisher's Note:** All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations or those of the publisher, the editors, and the reviewers.

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