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Technological Innovation And Performance Of Manufacturing Firms In Nigeria

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Abstract: ***This paper investigates the impact of technological innovation on the performance of manufacturing firms in Nigeria. The subject of technological innovation and its impact on firms' performances in developing nations is yet to exhaustively explored. Moreover, only few research efforts have been made to investigate the impact of product and process innovations on manufacturing SMEs performances within a developing country context. In order to enrich the literature, this paper assesses the impact of product and process innovations on the performance of manufacturing SMEs in Nigeria. The sample for this study was drawn from 305 SMEs in the textile/leather/apparel and footwear subsector; wood/furniture and woodworks subsector; and domestic/industrial plastic and rubber subsector in Southwestern Nigeria. Data collected was analyzed using correlation analysis and hierarchical regression analysis. The correlation result shows that product innovation and process innovation had significant positive relationship with firm performance. However, the regression result confirmed that product and process innovations have positive impact on the performance of firms. Additionally, process innovation maintained a significant impact on firm performance with the inclusion of control variables whereas product innovation had significant impact on innovation with the exclusion of the control variables from the model. Generally, technological innovation accounts for about 59.3% of variation in the performance of the manufacturing SMEs. The study concludes that product and process innovations are critical elements for enhancing the performance of manufacturing SMEs in Nigeria. Therefore, owners and managers of SMEs are encouraged to introduce more technological innovations in their firms as this has positive impact on firms' performances.***

Keywords: Technological Innovation, Firm Performance, Product Innovation, Process innovation, Nigeria.

I. INTRODUCTION

Organization scholars have long been interested in technological innovation as the source of value creation in firms. The subject of technological innovation has risen in prominence to become a global policy issue. Technological Innovation remains the major strategy and driving force for firms' growth and survival in any competitive business environment. Most studies refer to product innovation and process innovation as important elements towards development of organizations and nations (Freel, 2000; Oke, 2015). The introduction of novel products and processes has remained the thrust behind the spring-up of new firms and the expansion of the existing ones. The growth and development of developing nations lies in the innovative ability of its citizens and SMEs within the nation. The essential role of SMEs in the growth and the development of nations' economy cannot be gainsaid. SMEs have remained the catalysts for economic development both for the developed and developing nations in terms of employment generation, development of

indigenous entrepreneurship, forward integration with large-scale enterprises and added value to gross domestic product (GDP) (Ussahawanitchaki, 2012). Globally, SMEs are responsible for about 75% of employment in any country (Olughor, 2015). Consequently, an essential issue dominating policy debates globally and particularly Africa, has been how to drive economic growth through improving the performance of SMEs (Obeng, 2009; Audrey and Jaraji, 2016). The OECD, in its research, found that SMEs contribute over 55% of GDP and 65% of total employment in high -income countries while it contributes about 95% and of total employment and about 70% of GDP in middle income countries (OECD, 2004). Conversely, in low-income countries, particularly in the least developed economies, the contribution of SMEs to employment and GDP is less than that of the informal sector, where the great majority of the poorest of the poor make a subsistence level of living. Therefore, an important policy priority in developing countries should be geared towards the reformation of policies that divide the informal and formal sectors, so as to enable the poor to participate in markets and to engage in higher value added business activities.

The establishment of SMEs is highly essential for developing countries as these businesses employ unskilled workers who excessively dominate these countries (Bhhatia-Panthaki, 2007). Nigeria, like several developing countries, recognizes the importance of SMEs for economic growth and development. Conceptually, the definition of SME is nebulous as it varies from one country to another and even within the same country, it may vary from sector to sector depending on the purpose for which the definition is sort. The National Council of Industry (NCI) in 2003 defined SMEs as firms having between 10 and 100 employees and a total cost of working capital that is between N1million and less than N200million. Also, the Central Bank of Nigeria defines a SMEs operating in Nigeria as an enterprise with an asset base of N200 Million excluding land and working capital with labor force between 10 and 300 (Kelly, 2006). In Nigeria, the SME sector has been seen to contribute significantly to entrepreneurship, technology change and growth in productivity. SMEs in Nigeria constitute about 96% of Nigerian businesses (Oyelaran-Oyeyinka, 2007) and accounts for 75% employment rate (Umar *et al*., 2014) and 50% of industrial output (Nwankwo *et al*., 2012). More so, SMEs represents about 90% of the manufacturing sector (Oyelaran-Oyeyinka, 2007), and contributes 56.43% to manufacturing GDP (NBS, 2003). SMEs due to their flexibility and ability to promptly and effectively integrate inventions are more innovative than large firms (Li, 2003; Verhees, 2004). Studies have shown that SMEs that engages in innovation activities has enhanced performances (Freel, 2000; Westerberg, 2008; Garcia, 2014). Also, the study of SMEs increases stakeholders' awareness of the needs of these enterprises in respect to growth and development. Such awareness allows scientists, owners of enterprises, entrepreneurs and policy-makers to provide the needed support and formulate effective polices for SMEs (Norman, 2008). Nigerian SMEs, though essential to the nation's economy, are faced with numerous challenges such as inadequate and non functional infrastructural facilities, bureaucratic bottlenecks, inefficiency in the administration of incentives and support facilities, lack of easy access to funds/credits, uneven competition arising from import tariffs, lack of access to appropriate technology, absence of R&D, high dependence on imported raw materials, lack of scientific and technological knowledge and know-how, lack of appropriate managerial and entrepreneurial skills and lack of suitable training and development, fluctuating value of the Naira, government policies, etc. One essential element to overcoming most of the challenges faced by SMEs is innovation.

As opined by D'Cruz and Rugman (1992), a firm is likely to build a competitive edge given its ability to design, develop and market products or services that are novel and of better quality to that of its competitors. Thus for firms' survival and growth, innovation has become a necessity for all firms including SMEs (Kaplan and Waren, 2007). Given the importance of innovation in firms, several studies (Lin and Chen, 2007; Trienekens *et al.*, 2008; Bakar and Ahmad, 2010; Chong *et al.*, 2011; Mohd and Syamsuriana, 2013; Njogu, 2014; Olughor, 2015; Gu and Shao, 2015; Audrey and Jaraji, 2016) have assessed the impact of innovation on firm performance. But most of the previous studies focused more on the impact of innovation (i.e both technological and non-technological innovations) on the performance of firms (Johne, 1999; Georgellis *et al*., 2000; Medina and Rufin, 2009; Espallardo and Ballester, 2009; Zhang and Duan, 2010; Bakar and Ahmad, 2010; Ar and Baki, 2011). However, this study evaluates the impact of technological innovation on the performance of manufacturing SMEs in Nigeria.

II. LITERATURE REVIEW

TECHNOLOGICAL INNOVATION

Technological innovation has remained an increasingly important element of globalization and competitiveness (Gorodnichenko, *et al*., 2010). The concept of technological innovation is usually seen as encompassing product and process innovation (Thuc and Caroline, 2010). The OECD (1991), defined technological innovation as an iterative process initiated by the perception of opportunity for a technology-based invention leading to the conception, development, production, commercialization and marketing of inventions. According to Laryea and Ibem (2014), technological innovation entails the development, adoption and diffusion of products and/or applications resulting from scientific and/or technological discovery and knowledge. More so, technological innovation has been considered by several studies (OECD, 2005; Harty, 2005; de Valence, 2010) as being in form of processes or products which may include engineering and scientific concepts, new product development, processing systems, production processes, physical equipment or tools. This therefore means that the major features of technological innovation include; a continuous process development and introduction of new or significantly improved products/services, processes or strategies, development of an invention into innovation, introduction of an innovation to end-users as well as the adoption and diffusion of an innovation (Garcia and

Calantone, 2002; Laryea and Ibem, 2014). As globalization and international competition intensifies, technological innovation becomes more central to firms' performance within the domestic and international market. Studies have revealed that firms that are active in technological innovation usually adopt complementary organizational practices that enhance their performances (Philips 1997; Thuc and Caroline, 2010). More so, the importance of technological innovation as a driver of organizational changes within the firm has been considered by several studies (Henderson and Clark 1990; Dougherty 1992; Danneels 2002).

In recent times, significant efforts have been put into the measurement of technological innovation by scholars around the globe. According to Wakelin (1997), the different proxies for measuring technological innovation include choices between innovation process inputs, such as expenditure on R&D or the number of scientists and engineers in research departments, or an output, such as number of patents. In a study by Keller (2004), they opined that technological innovation is intangible, therefore it cannot be easily measured and has three indirect approaches that can be deployed for its measurement: R&D inputs, R&D outputs and the effect of technological innovation. It has been asserted that innovation plays an essential role in the survival of firms in the business environment. Innovations can in this context be viewed as a multidimensional concept (Neely *et al*., 2001). The relationship between innovation and firm performance has been confirmed in both empirical and theoretical studies. For instance, Calantone *et al*. (2002) examined the relationship between learning orientation, firm innovation and firm performance in US firms. Carol and Marvis (2007) examined the relationship between innovation and organizational performance of Taiwanese SMEs in the manufacturing and service sectors. They measured performance in terms of firm sales. Van *et al*. (2008) assessed the relationship between the degree of innovation and performance among a sample of 1,901 Spanish manufacturing SMEs and their study reveal evidence of a positive relationship between three types of innovation (product, process and managerial/systems) and performance. Similarly, Garrido and Camarero (2010) investigated the relationship between learning orientation, innovativeness and performance and finding of the study reveals that learning orientation significantly influences both innovativeness and performance. Also, Terziovski (2010) studied the innovation practice and its effects on performance of Australian SMEs. Their study revealed that innovation strategy is a key driver to performance of SMEs. Quite a number of studies (Carol and Marvis, 2007; Van *et al*., 2008; Terziovski, 2010; Mensah and Achuah, 2015) have focused on assessment of the relationship between innovation and performance within the SMEs.

Furthermore, business literature offers various classifications of innovations that have been developed and applied (Schumpeter, 1934; Johannessen *et al*., 2001; Avermaete *et al*., 2003). Some authors (Avermaete *et al*., 2003; Johannessen *et al*., 2001) discuss innovation from the perspective of output (product, process, organizational, marketing), while others (Damanpour, 1996; Jansen *et al*., 2006; Abernathy and Clark, 1985) describe the concept in terms of the degree of change (i.e., radical and incremental). Yet another perspective used in capturing the dynamic process of innovation is that of the various stages of innovation (i.e., invention initiative and realized innovation). Innovation is the output of initiatives within a firm. However, we classify technological innovation into two types: product innovation and process innovation (Dampour, 1992; Avermaete *et al*., 2003; OECD 2005).

PRODUCT INNOVATION

This can be considered as any good or service that is perceived by an individual or a firm as new (Kotler, 1991). Also, it refers to the introduction of new products or services in order to create new markets or customers, or satisfy existing market or customers (Wang and Ahmed, 2004; Wan *et al*., 2005). Product innovation entails diverse organizational strategies as well as unique inputs which results in novel outputs (Martinez-Ros and Labeaga, 2009). Production innovation has been investigated in accordance with a wide range of managerial phenomena, including entrepreneurial firms in the emerging countries (Li and Atuahena-Gima, 2001), continuous innovation in mature firms (Dougherty and Hardy, 1996), collaborative networks (Nieto & Santamaria, 2007), R&D spillovers (Audretsch and Feldman, 1996), human resource systems and organizational culture (Lau and Ngo, 2004), and leadership (Gruber, 1992). Product innovation is usually the result of producing and commercialization of new goods (products or services) or with improved performance characteristics. Product innovations assist SMEs to distinguish themselves from their competitors, through proffering solutions to individual or national challenges.

Product innovation remains one of the major roots of competitive advantage to firms (Mohd and Syamsuriana, 2013). This is because when firms engage in innovation, the quality of their goods and services is improved upon and this enhances the performance as well as the competitive advantage of the firm. (Forker *et al.*, 1996). As noted by Hult *et al*. (2004), product innovation shields a firm from threats and competitors creates opportunity for the innovating firm to enjoy the 'first mover' advantage. Bayus *et al*. (2003) proved that product innovation had positive and significant link with organizational performance. Alegre *et al.* (2006) opined that product innovation dimension was strongly and positively associated with firm performance. Also, Espallardo and Ballester (2009) in their study affirmed that product innovation positively impacts firm performance. Likewise, Varis and Littunen (2010) noted that introduction of product innovation is positively associated with firm performance was also confirmed by. Therefore, this study argues that:

HYPOTHESIS 1: Product innovation has positive impact on firm performance

PROCESS INNOVATION

This can be defined as changes in the ways of producing or developing products, including new logistics, new raw material, new production lines, new production processes/ methods, and new technology. This type of innovation does not stand on its own. In many cases, process innovation may

be the consequence of product innovation or/and organizational innovation. New processes basically rest on the use of new technologies to increase the efficiency and quality of production. This view on innovation was reflected by the first and second edition of the "Oslo Manual" the OECD's handbook for innovation surveys (OECD, 1997; OECD and Eurostat, 1997). Process innovation entails the implementation of new or improved production process or adoption of new tools, technology, or knowledge in producing a product (Langley *et al*., 2005; Oke *et al*., 2007).

Process Innovation is very essential in the manufacturing process of a firm as it gives a firm an advantage over its competitors. Interestingly, studies have revealed that process innovation is positively related to performance of firms (Vivero, 2002; Mohd and Syamsuriana, 2013; Tuan *et al*., 2016). Also, Anderson (2009) in his study noted that there is a relationship between new technology (used as a proxy for process innovation) and performance of a firm. Recent evidence by Gunday *et al.* (2011) reaffirmed that process innovation is significantly correlated to innovative performance. Hence, this study proposes that:

HYPOTHESIS 2: Process innovation has positive impact on firm performance

FIRM PERFORMANCE

Performance often entails organizational accomplishment or the achievement of organizational goals (Herath and Mahmood, 2014). Performance measurement and performance management practices have become common place in all businesses. The knowledge of the association between innovation and firm performance offers practical insights for proper management of firms. With this knowledge, managers of SMEs would be capable of optimizing their decision-making processes as it relates to various performance output. This knowledge will also assist them in the maximal allocation of the resources. As noted by Murphy *et al.* (1996), firm performance is a multi-faceted concept, which include indicator such as; production, finance or marketing (Sohn *et al*., 2007), or consequential such as relating to growth and profit (Wolff & Pett, 2006). Studies have described firm performance in terms, how organizational objectives are well achieved (Jarvis et al., 2000). Firm performance can be assessed by examining how successful an organization is in achieving its goals (Gerba and Viswanadham, 2016). Scholars have argued that performance of firms can be described as the firms' ability to produce suitable outcome and actions (Chittithaworn *et al*., 2011). Gerba and Viswanadham (2016) opined that performance can be in terms of financial and non-financial performance. This includes; return on investment (ROI), sales volume, sales value, profitability, total assets, employment size, capital employed, market share, customer satisfaction, productivity, turnover, delivery time, employees turnover, etc. In this study, performance is measured as total sales value (Carter and Jones-Evan, 2000; Gebreeyesus, 2007).

TECHNOLOGICAL INNOVATION AND FIRM PERFORMANCE

SMEs act as bedrock for innovations, inventions and problem solving. This usually comes to be in the process of solving the daily problems that confront the owners as entrepreneurs. A study by Klofsten (2005) revealed that technological innovation is positively related to overall firm performance. More so, Terziovski (2010) and Hajar (2015) in their study opined that technological innovation has a positive effect on firm`s performance. In addition, several studies in Turkey have demonstrated that technological innovation (product and process innovation) has significant and positive impact on firm performance (Kuswantoro, 2012; Atalay, 2013; Sattari, 2013). A study carried out by Rosli (2013) on SMEs in Malaysia, confirmed that product innovation and process innovation influenced firm performance significantly. Their result revealed a strong influence of innovation in the level of performance of the SMEs. Besides, a recent empirical study on firms in Britain revealed that various innovation types are related to innovative performance (Oke, 2015).

III. METHODOLOGY

DATA SOURCE

Primary data used in this study was collected from manufacturing SMEs in textile/leather/apparel and footwear subsector; wood/furniture and woodworks subsector; and domestic/industrial plastic and rubber subsectors in Southwestern Nigeria. Specifically, data was collected from manufacturing SMEs that are located along the Lagos-Ota-Agbara-Ibadan industrial axis where about 26.44% of manufacturing SMEs in Nigeria are domiciled. SMEs employing between 10 persons and 200 persons were sampled for this study. A total of 305 SMEs was sampled for this study.

MEASURES

INDEPENDENT VARIABLE

Technological innovation as an independent variable in this study was divided into product innovation and process innovation. Product innovation included five items: introduction of new or significantly improved product, introduction of new machines and equipment, introduction of additional refurbished or second hand equipment, introduction of goods that is new to the market, and introduction of goods that is new to the firm. Process innovation included four items: introduction of new or significantly improved method of manufacturing purchased/lease of machines/equipments, introduction of supporting activities for manufacturing processes, and engagement in research aimed at producing specific inventions or modifying existing techniques. The respondents were asked, in the last five years, if their firms have engaged in the above listed innovation activities". Their responses were based on 'yes' =1 and 'no' = 0.

DEPENDENT VARIABLES

The dependent variable firm performance was assessed using self-assessment of firm performance by the respondents as objective performance measures were not available (Love *et al.*, 2002). The performance indicator for this study was sales revenue (Kellermanns *et al.*, 2010).

CONTROL VARIABLES

Several control variables which are visible in the business performance literature were also introduced to the model. These variable include; highest level of educational qualification (Fairlie and Robb, 2007; Nichterand and Goldmark, 2009), work experience (Mengistae, 2006; Alowaihan, 2004), firm size (Ozgulbas *et al.*, 2006) and Firm age (Avermaete *et al*., 2003; Lee and Sung, 2005).

RELIABILITY TEST

Cronbach's alpha was used to determine the internal consistency of the technological innovation constructs. Internal consistency illustrates the degree to which all the items in scale measure the same or construct and thus it is related to the inner-relatedness of the items within the test (Tavakol and Dennick, 2011). As opined by George and Mallery (2003), a good Cronbach alpha should be 0.7 or greater. However, According to Kline (2000) a Cronbach alpha of 0.6 is acceptable. In this study, scales which have Cronbach's alpha coefficient that is 0.6 and above will be accepted.

IV. RESULTS AND DISCUSSION

SAMPLE CHARACTERISTICS

The study distributed a total of 320 questionnaires from which 305 questionnaires were retrieved indicating 95.3% response rate. As shown in Table 1, majority of the respondents were males as compared to the females. This indicates that the SME subsector surveyed are dominated more by males. The wood/furniture/woodworks subsector has about 98.7% males. The domestic/industrial plastic and rubber had 66.1% of males. However, the textile/leather/apparel & footwear subsector had a fair gender distribution as 50.5% were males and 49.5% were females. With reference to scale of operation, majority (83.6%) of the firms were parent company with only about 5.6% of the firms as subsidiary firms. Majority (83.4%) of the firms surveyed had between 10 and 49 employees with only about 16.6% having between 50 and 200 employees. Also, most (69.8%) of the firms had been in existence for about 5 to 10 years. About 5.6% of the firms had existed for between 11 to 15 years while 3.3% of the firms were between the ages of 16 and 20 and only 0.3% of the firms had existed beyond 20 years In terms of educational qualification, majority of the respondent had senior school certificate (SSCE) and ordinary national diploma (OND) as their highest educational qualification. However, about 21% of the respondents had higher national diploma (HND) as their highest qualification, about 7.0% had B.Sc/B.Tech as highest qualification, about 2.8% had MBA/M.Sc/M.A as their highest qualification, and only one of the respondent had PhD as highest qualification. Overall, 61.0% of the SMEs surveyed were firms in textile/leather/apparel & footwear subsector, about 25.6% of the firms were from wood/furniture/ woodworks subsector and 13.4% of the firms were from domestic/industrial plastic and rubber subsector.

Variables	Frequency	Percent
Gender		
Male	199	65.9
Female	102	34.1
Scale of Operation		
Parent Company	255	83.6
Subsidiary	17	5.6
Firm Size		
10-49	254	83.4
50-200	51	16.6
Firm Age		
5-10	213	69.8
11-15	17	5.6
16-20	10	3.3
Above 20	1	0.3
Highest Educational Degree		
No formal education	5	1.7
Primary school Certificate	2	0.7
SSCE/GCE	98	34.3
OND	92	32.2
HND	60	21.0
B.Sc/B.Tech	20	7.0
M.Sc./MBA/M.A	8	2.8
Ph.D	1	0.3
Subsector Type		
Textile/leather/apparel & footwear	186	61.0
Wood/furniture/woodworks	78	25.6
Domestic/industrial plastic & rubber	41	13.4

Source: Authors

Table 1: Sample Characteristics

INNOVATION ACTIVITIES OF SMES

Furthermore, table 2 shows the percentage of firms that had introduced each technological innovation type as well as the maximum and minimum number the technological innovation type introduced by the firms. Results shows that about 90.2% of the firms had introduced product innovation and about 87.9% of them had introduced process innovation. Maximum number of product innovation introduced was 20. The maximum number of process innovation stood at 5. However, the least number of each type of innovation introduced by the firms was 1. More so, about 83% of the firms had introduced only 1 process innovation. About 57% of the firms had introduced only 1 product innovation and about 43% had introduced at least 2 product innovations.

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Innovation Types	Percentage of Innovators	Minimum	Maximum
Product innovation introduced within the last 5 years	90.2	1	20
Process innovation introduced within the last 5 years	87.9	1	5

Source: Author

Table 2: Innovations Introduced by Manufacturing SMEs

CORRELATION AND REGRESSION ANALYSIS

A reliability test was carried out on the variables to determine the reliability of the variables. The result revealed a Cronbach Alpha of 0.778 for product innovation (5 items) and 0.715 for process innovation (4 items) which in theory is considered good (Nunally, 1978; George and Mallery 2003; Kline; 2003; Devellis, 2012). This indicates the degree to which the variables measures a uni-dimensional latent construct which suggests that the variables used for the study have relatively high internal consistency.

The correlation statistics in Table 4 shows that a significant positive relationship exists between the innovation dimensions and firm performance. Technological Innovation types such as; process innovation (r = 0.354) and process innovation (r = 0.459). This implies that the SMEs must continually engage in technological innovation to enhance their performances. More so, process innovation was the innovation dimension with the highest correlation value. This result is consistent with Twaliwi and Isaac (2017) whose study on impact of innovation on performance of SMEs in Gwagwalada revealed that product, and process innovations are positive and significant in achieving SMEs performance. Also, Control variables such as; firm size (r = 0.687) and highest educational degree (r = 0.194) had significant positive association with firm performance. The control variable 'work experience' (r = 0.155) was found to be positively associated with firm performance though the relationship was not significant. Conversely, the control variable 'firm age' (r = -.042) showed a negative relationship with the performance of firms.

	Mean	Std. Dev	1	2	3	4	5	6	7
Firm Performance	1.742	1.621	1						
Product Innovation	1.730	0.817	.354**	1					
Process Innovation	1.310	0.727	.459**	.419**	1				
Firm Size	13.47	6.578	.687**	.345**	.303**	1			
Higher Educational Degree	4.050	1.214	.194*	.188*	.096	.218*	1		
Work Experience	10.88	4.130	.155	.155	.254**	.102	.090	1	
Firm Age	8.580	3.448	-.042	.087	.012	.201*	.181*	.496**	1

** p<0.05, ** p<0.01, and *** p<0.001 are significant at the 0.05 (2 tailed), 0.01(2 tailed) and 0.001 (2 tailed) level respectively, N=305.*

Source: Authors

Table 3: Relationship between Technological Innovation and Firm Performance

Furthermore, the study assessed the impact of technological innovation on firm performance using hierarchical regression analysis. Results shows that in model 1, product innovation ($\beta = 0.271$, $p < 0.001$) has significant positive impact on firm performance and the explanatory power (R^2) of the model was 7.3% with a significant F-value of 21.002. In model 2, with the introduction process innovation into the model, Product innovation ($\beta = 0.147$, $p < 0.01$) and process innovation ($\beta = 0.325$, $p < 0.001$) had significant positive impact on firm performance. The explanatory power (R^2) of the model was also increased to 16.4.1% with increase in F-value to 25.225. In model 3, a control variable 'firm size' was introduced into the model. Findings revealed that process innovation ($\beta = 0.268$, $p < 0.001$), and firm size ($\beta = 0.450$, $p < 0.001$) had significant positive impact on firm performance. However, the regression coefficient for product innovation decreased from.147 to 0.016 indicating that firm size partially mediates the relationship between product innovation and the performance of the firms. The explanatory power (R^2) of the model increased to 34.4% with a significant F-value of 43.598. In model 4, with the introduction of another control variable 'higher educational degree' into the model, process innovation ($\beta = 0.270$, $P < 0.001$) and firm size ($\beta = 0.460$, $p < 0.001$) had significant positive impact on firm performance showing an increase in the impact of firm size on firm performance. This means that higher educational degree completely mediates the impact of firm size on the performance of the firms. More so, this result corroborates Ar and Baki (2011) as their study revealed that process innovation had significant positive impact on firm performance. Conversely, higher educational qualification showed a negative impact on firm performance. Moreover, the explanatory power (R^2) of the model increased to 35.6% with a significant F-value of 31.870. In model 5, additional control variable 'work experience' was added to the model. Findings revealed that process innovation ($\beta = 0.299$, $p < 0.001$) and firm size ($\beta = 0.591$, $p < 0.001$) had significant positive impact on firm performance. However, product innovation, higher educational degree and work experience showed a non-significant positive impact on the performance of the SMEs. The explanatory power (R^2) of the model increased to 54.0% with a significant F-value of 31.515. In model 6, a control variable 'firm age' was added to the model. The result shows that process innovation ($\beta = 0.209$, $p < 0.01$), firm size ($\beta = 0.636$, $p < 0.001$) and work experience ($\beta = 0.158$, $p < 0.05$) had significant positive impact on firm performance. However, product innovation and higher educational degree showed a non-significant positive impact on the performance of the SMEs whereas firm age had significant negative impact on performance. This result indicates that technological innovation is likely to impact the performance of firms more in younger firms than in older firms. Nonetheless, the explanatory power of the model rose to 59.3% with a significant F-value of 29.610. These results therefore imply that technological innovation accounts for about 59.3% of the variation in the performance of the manufacturing SMEs. These findings are consistent with Kuswantoro (2012), Atalay (2013) and Sattari (2013). Therefore, manufacturing SMEs in Nigeria should engage

more technological innovation in order to boost their performances.

Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Product innovation	.271***	.147**	.016	.021	.026	0.34
Process innovation		.325***	.268***	.270***	.259***	.209**
Firm size			.450***	460***	.591***	.636***
Higher Educational Degree				-.012	.033	.063
Work Experience					.022	.158*
Firm Age						-.265***
F	21.002***	25.225***	43.598***	31.870***	31.515	29.610***
R	.271	.405	.587	.596	.735	.770
R^2	.073	.164	.344	.356	.540	.593
Adjusted R^2	.070	.158	.336	.344	.523	.573

** p<0.05, ** p<0.01, and *** p<0.001 are significant at the 0.05, 0.01 and 0.001 level respectively.*

Source: Authors

Table 4: Impact of Technological Innovation on Firm Performance

V. CONCLUSION

This study assessed the impact of technological innovation on firm performance in manufacturing SMEs in Nigeria. The study sampled a total of 305 SMEs in textile/leather/apparel and footwear subsector; wood/furniture and woodworks subsector; and domestic/industrial plastic and rubber subsector in Southwestern Nigeria. The data was analyzed with the use of hierarchical regression analysis. Results revealed that product and process innovation positively impacts the performance of firms. Additionally, process innovation maintained a significant impact on firm performance with the inclusion of control variables whereas product innovation had significant impact on innovation with the exclusion of the control variables from the model. Also, the firm size and employees work experience were seen to be very essential as it the impact of innovation on the performance of the SMEs. Hence, manufacturing SMEs and policy makers must note that technological innovation remains critical in enhancing the performance of SMEs. This paper only considered the impact of process and product innovation (technological innovation) on the performance of SMEs. Further studies can consider the impact of non-technological innovation (marketing and organizational innovation) on the performance of SMEs and large firms.

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