EFFECT OF ENVIRONMENTAL MANAGEMENT PRACTICES ON TECHNOLOGICAL INNOVATION PERFORMANCE OF MANUFACTURING COMPANIES IN NIGERIA

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Abstract:
This paper investigates the effect of environmental management practices on technological innovation on the performance of manufacturing firms in Nigeria which is crucial in both research and practice as a result of the impact of manufacturing firms' activities on the environment. We sampled some manufacturing industries in the south eastern region of Nigeria particularly in Anambra state. A number of empirical studies have attempted to examine the practice of environmental management practices in Nigeria following waste management, however some other have pointed out the impact of environmental management accounting on firm's performance Current studies on environmental management practices dwelt on the profitability performance of the organization. Thus, it is imperative to explore the mechanism of how environmental management practices promote technological innovation performance so as to encourage this kind of practice among manufacturing companies in Nigeria. The data collected were analyzed with the aid of ordinary least square regression techniques. Result revealed that environmental management practices had a significant effect on technological innovation performance in manufacturing companies. Therefore, manufacturing companies and policy makers should note that environmental management practices remain crucial in enhancing the technological innovation performance of any manufacturing firm.
Keywords: Environmental management practices, Technological Innovation, Firm Performance, Product Innovation, Process innovation.

Introduction

Global warming leading to ocean overflow afterwards encroaching in sea shores, unremitting cases of recurring tsunami across the globe, climate change and many other occurrences has once more brought to the fore the consciousness of the fact that human activities on the earth affects life negatively. The extent of its effect on the environment is alarming in many parts of the world (Abdul, Nikhil & Bhangban, 2007). According Yakhon & Dorweiler (2004), the impact of business activities on the environment is found in several forms which includes air, water, underground pollution, oceans, atmosphere, and land pollution given rise to the need for corporate organizations to account for its activities impacting on the environment. Environmental management practices could provide an overall system view to deal with these environmental issues arising from organizational activities ranging from raw material inputs, production process, packaging, to waste disposal. Environmental management has the potential to play a pivotal role in the technological innovation performance of an organization as it remains the major strategy

and driving force for firm's growth and survival in any competitive business environment. (Ukpabio, Siyanbola & Oyebisi 2017)

Throughout the world, many researches had been done on corporate environmental management practices, examining connection between the practice of environmental protection/management and performance of firms and these have generated mixed results. Some researchers came up with a negative view that implementing the practice of environmental management may damage a company's economic interests or reduce its competitive power; while society may gain benefits, the company itself bears all costs involved in such practices, Stanwick & Stanwick (1998) as cited in Jiehui, Qinglan , Juanmei & Chunlin (2015). A study by Amedu, Iliemena, and Umaigba (2019), revealed that most Nigerian manufacturing companies are silent on environmental information disclosure. In practice, it is obvious that some companies in Nigeria are not willing to practice environmental management programs despite their knowledge of the dependency of the organization on the environment, they still go as far as taking for granted strict environmental protection regulations. On the other end, some scholars came out with a different opinion that the practice of environmental management could ameliorate not only the environment but also economic performance of a company (wanger 2008; jyang etal 2015; Osemene, Kolawole, & Oyelakun 2016; Ucheagwu, Akintoye, & Adegbie 2019).

A number of empirical studies have attempted to examine the practice of environmental management practices in Nigeria following waste management (Afolalu et el 2019; Ogunmakinde et el 2019; Ayodeji et el 2020), however, some other have pointed out the impact of environmental management accounting on firm's performance (iliemena, 2020). Current studies on environmental management practices dwelt on the profitability performance of the organization. Thus, it is imperative to explore the mechanism of how environmental management practices promote technological innovation performance so as to encourage this kind of practice among manufacturing companies in Nigeria.

Earlier environmental management practices focused on contaminant control during productive process and end-of-pipe treatment, whereas, the practice of environmental management in this study will focus on how to prevent or reduce environmental impact of product in all product lifecycle stages, the application of environmental management system such as ISO14001, EMAS and then internal policies for environmental performance. Thus, it is needful to consider the effect of these practices on the process/ product innovation performance of manufacturing companies.

How does environmental management practices affect innovation performance of manufacturing company? Does compliance level meet policies guidelines checklist for manufacturing companies in Nigeria? What relationship exist between environmental practices tools, product / process lifecycle and manufacturing companies' sustainability? These are the major questions that this paper will explore.

Review of Related Literature

Conceptual Review

Environmental Management Practices

Countless environmental problems that have plagued the world today, made the subject of environmental management practices vital issue for consideration. According to Ameer & Othman 2011, incorporating environmental initiatives in the strategic decisions of companies is considered as an effective way to achieve benefits that will lift competitive advantage and positively impact the performance of an organization. Basically, the environmental management relates to reduction of the impact of an organization's operation on the natural system (both living and non-living) and the ecosystems (land, air and water). Environmental management practices can be seen as the effort and activities of an organization aiming at reducing their negative impact on the environment and improving environmental sustainability. Haj Mohammad, Vachon, Klassen, & Gavronski (2013) defined environmental management practices as "the level of resources invested in activities and know-how development that lead to pollution reduction at the source", including the application of environmental management systems (e.g., ISO14001). Environmental management practices are also efforts put in place by the organization to recycle materials and reduce waste, the practice of environmental audits, total quality management, pollution prevention plans, training employees on environmental sustainability, product life-cycle costing, hiring an expert on environmental management, Research and Development, environmental standards for suppliers, and employee incentive programs for environmental suggestions, and many more (Theyel 2000). Summarily, environmental management practices can be seen as the acts and precautions taken by organizations to reduce or eradicate their negative impact on the environment.

There are several factors that motivate organizations to practice environmental management. Considering Environmental regulations, though some companies in Nigeria risk fines and penalties, carry out their operations not minding the environmental regulations but in the real sense, a company can only be considered to be "Authentic" and avoid penalties if it meets the requirements of environmental regulation (Hunt 1990 as stated in Jiehui etel 2015). Another motivating factor is Economic interests. Apart from the fact that the practice of environmental management reduces negative impact of organizational activities on the environment, it also brings economic benefits by generating recycling revenue, boosting sales, achieving first-mover advantage, enhancing social reputation, and improving product quality (Rennings, Ziegler, Ankele & Hoffmann 2006). Gaining a competitive edge is another motivating factor for practicing environmental management. Jiehui etel 2015 in their work stated that environmental management practices are one of the strategic choices in order to gain competitive advantages. The practice such as using clean production technology and product re-design, optimizing production technology, improving resource utilization and reducing production costs can bring competitive advantages and business opportunities. Stating further, Weng, Chen & Chen (2015) found out that establishing a green image by implementing environmental

management can lessen the negative impact of competitors, which have earlier implemented environmental management. The involvement of companies in Environment-friendly products, green marketing, and green consumption are advantageous to winning them recognition from the public and customers.

Product Life-Cycle Costing

Considering product life-cycle costing could contribute to the effects of environmental management practices. According to Iliemena 2020, lifecycle costing in environmental accounting requires that costs relating to the environmental consequence of a product be captured throughout the product lifecycle.

Technology Innovation Performance

The idea of technological innovation usually includes product and process innovation (Thuc and Caroline, 2010). It is a means for an organization to achieve a sustainable competitive advantage. According to Organization for Economic Cooperation and Development (OECD), technological innovation is defined as a procedure including product innovation and technological process innovation that involved repetition of steps to achieve the desired outcome starting from the conception of idea, development, production, commercialization and marketing of inventions based on new technology knowledge. technological innovation has been considered by several studies as being in form of processes or products and as being proxy by many scholar (OECD, 2005; Harty, 2005; Hagedoorn and Cloodt 2003 ; Chen and Chen 2006; de Valence, 2010,) by new product development, processing systems, production processes, physical equipment or tools, number of patents, R&D investment, patent citations, sale of innovative products, the cost and speed of new product development, the sales rate of new products, the success rate of innovative projects, and leading or participation in the development of industrial standard. In this study, we used the announcement, sales rate, and development speed of new products, R&D investment, and the success rate of innovative projects as the measure indicators of technological innovation performance.

Product innovation performance

Product innovation remains one of the major roots of competitive advantage to firms (Mohd and Syamsuriana, 2013). According to Hult et al. 2004 as cited in Ukpabio et al 2017, when firms engage in innovation, the quality of their goods and services is improved and this enhances the performance as well as the competitive advantage of the firm. Engaging in such an innovation protect a firm from threat and give such firm an opportunity of first-mover advantage. Product innovation entails 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 are new to the market and introduction of goods that are new to the firm. These will be used to proxy product innovation in this study.

Process innovation performance

Process Innovation is as important as product innovation performance. Its essentiality is in the fact that it gives a firm an advantage over its competitors. Interestingly, studies have revealed that process innovation is positively related to performance of firms (Masood, 2013; Tuan et al., 2016). Process innovation can be defined as changes in the ways of producing or developing products, basically it rests on the use of new technologies to increase the efficiency and quality of production. Engaging in research aimed at producing specific inventions or modifying existing techniques is also a process innovation performance.

Theoretical Framework

Natural Resources based view theory

Natural resources-based view is an aspect of resources-based view which proposes that there are three key strategic capabilities: pollution prevention, product stewardship, and sustainable development. Each of these has different environmental driving forces, builds upon different key resources, and has a different source of competitive advantage. According to NRBV, pollution prevention technologies involve much tacit knowledge through skill development and "green" teams (Hart, 1995). The tacit knowledge results in a resource that is difficult to be replicated. Product stewardship technologies could produce knowledge of entire "product life cycle", which can be converted into the potential for competitive advantage through strategic priority. Further study by Hart & Dowell (2010), concluded that tacit knowledge and product life cycle knowledge, which are generated by environmental management practices, are significant for corporate competitiveness and performance. Hence the relevance of the theory to the present study.

Methodology

This study used the descriptive statistics method. Questionnaire was used to collect data. We generated twenty-five valid questionnaire through fact-to-fact interview with environmental management experts and manufacturing industries executives in south eastern region of Nigeria in general and Anambra states in particular.

For Environmental management practices, the scale of Xue & Gao (2004) was used. It includes eight items such as establishment of green management objectives, improvement of staff environmental awareness, increases in investment in environmental protection and so on.

A 5- point scale was used for the study:

1= No consideration
2= Planning to be considered
3= Having been considered
4= Being implemented to some extent
5= Having been implemented successfully

Cronbach alpha coefficient of 0.882, was obtained for the study. This is more than 0.7, indicating good reliability. The second state was the formal investigation state, where we asked senior managers in the manufactory industries selected using systematic random sampling technique. A total of 200 formal questionnaire were given out, and 150 questionnaires were received, which represented 75% response rate. Sample of manufacturing industries selected for the study include millennium industries Ltd, Awka, premier botting company Onitsha and Innoson automobile manufacturing company Nnewi

Variable measurement:
The measurement of the variables is carried out using dependent and independent variable. Dependent variable is innovation technology that comprises of process innovation and product innovation. Independent on the other hand is Environmental management practices.

Product innovation is proxied with 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 are new to the market and introduction of goods that are new to the firm. Process innovation on the other hand is proxied with introduction of new or significantly improved method of manufacturing; purchase/ lease of machines/equipment, introduction of supporting activities for manufacturing process and engagement in research aimed at producing specific inventions or modifying existing techniques.

The respondent was asked in the last five years if their firm have engaged in the above listed innovation activities. Their responses were based on yes=1 and No=2

Result and Discussion

Data were analyzed using ordinary least square regression techniques to know the effect of management environmental practices on innovation technological progress of listed manufacturing companies in Nigeria.

Research result presentation and interpretation

Table 1; environmental management practice introduced by manufacturing companies in Nigeria

Environmental management practice type	percentage	minimum	maximum
establishment of green management objective in last 10 years	95.10%	1	20
improvement of staff on environmental awareness in last 10 years	90.20%	1	5
Source; Author's compilation			

From the table 1 above, its shows that the establishment of green management objective in last 10 years at 95.1% indicated that environmental management practice in manufacturing companies is highly commendable. Similarly, improvement of safe environmental awareness in last 10 years at 90.2% demonstrated that the environmental management practices is sine-qua-non to the technology innovation progress in manufacturing company's performances in Nigeria.

Regression output

Dependent variable; INNTP

Method least square

Samples= 150

Included observation

	INNTR) dependent variable)			
variable	**coefficient**	**std-error**	**e-statistics**	**probability**
firm performance	**0.141112**	**0.037554**	**3.730737**	**0.0001**
firm age	**0.641289**	**0.123005**	**-5.009876**	**0.0000**
production innovation	**0.750445**	**0.107503**	**-6.980675**	**0.0000**
process innovation	**0.821332**	**0.113701**	**-5.972115**	**0.0000**
environmental management practice	**0.092908**	**0.01526**	**6.080785**	**0.0000**
c	**2.00987**	**13.2152**	**0.908792**	**0.5008**

R	0.85125	mxan direct var	7.826095
R^2	0.99953	S.D. dependent	0.552368
Adjusted R^2	0.95172	Akala infor criterial	-5.9477
S.E of regression	0.011134	Schwar	-5.80037
sum squared resid	0.007121	Durbin watso sat	1.28919
log likelihood	164.588		
F-statistics	37832.59		
prob. (f-statistics)	0.00000		

Source; estimated regression result from Eview 10.1

The results show that the entire estimated coefficient is highly statistically significant as their p-value are extremely small. This indicated that there is significant positive effect of environmental management practices on innovation technology performance of the listed companies in Nigeria.

The R^2 obtained from the innovation technological performance is at 0.99953. this suggest that the independent variable (environmental management practices) explain 99% of the innovation technological performance in manufacturing companies in Nigeria. Similarly, the correlation value at 0.85125 implies that there is positive relationship between environmental management practices and innovation technology in manufacturing companies.

The hypothesis tested used f-statistic value at 37832.59 with probability (0.00000) indicated there is significant effect of environmental management practices on innovation technology in manufacturing companies in Nigeria. Evidently, the empirical result shows that environmental management practices have a significantly positive effect on technological innovation performance of manufacturing companies in Nigeria. This result conforms with the research carried out by Jiehui et al (2015) in Ghana titled; the influence of environmental management practices and supply chain integration on technological innovation performance.

Conclusion and Recommendation

Result revealed that environmental management practices had a significant effect on technological innovation performance in manufacturing companies. Therefore, manufacturing companies and policy makers should note that environmental management practices remain crucial in enhancing the technological innovation performance of any manufacturing firm.

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