

PROCESS INNOVATION AND SUSTAINABILITY OF WATER PRODUCTION FIRMS IN RIVERS STATE

Ojuka, B. A.

Department of Business Administration, Faculty of Administration and Management, Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Nigeria

and

Wechie, Ibekwe

Department of Business Administration, Faculty of Administration and Management, Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Nigeria

ABSTRACT

This study examined the association between process innovation and sustainability of water production firms in Rivers State. Objective of the study was to examine the relationship between process innovation and measures of sustainability (environmental sustainability, economic sustainability, social sustainability) of water production firms in Rivers State. The study adopted a correlational research design. The population of the study covered 108 registered and approved water production firms in Rivers State, while 20 selected water production firms in Rivers State were studied as sample size. Primary data were collected using questionnaire. The data were analyzed using Spearman's Rank Order Correlation Coefficient. The findings revealed amongst others that there is a positive and significant relationship between process innovation and measures of sustainability of water production firms in Rivers State. It was concluded that effective process innovation foster sustainability of water production firms in Rivers State. Based on the findings, it was recommended that; process innovation which are technology driven should be given proper attention with concerted efforts made to integrate it to the operations of organizations as they are vital for improved environmental, economic and social sustainability.

Keywords: Process Innovation, Environmental Sustainability, Economic Sustainability and Social Sustainability

INTRODUCTION

Over the years, the concept of organizational sustainability has continued to gain prominence across different sectors and fields. The concept offers competitive advantage and creates value for organizations, their stakeholders, and society. Many authors refer to the sustainability concept as ambiguous and subject to debate or controversy; even though, there is consensus that, in general, sustainability refers to the ability or capacity to endure. On the other hand, sustainability associated with the development concept, turns to be a new archetype of social,

environmental, and economic development which has started to spread globally in our time (Leskar, 2019).

The increasingly competitive business environment has made imperative for organizations to put in place systems and processes that will guarantee appreciable sustainability in the interest of its stakeholders. To this end, several solutions have been developed to ensure that desired organizational outcomes are achieved despite the dynamics of competition. Innovation is one concept that has gained enormous popularity in both business research and practice to improve organizational sustainability (Odumeru, 2013). Process innovation is considered as an organization's capability to marshal, integrate, and leverage organizational resources to improve or create new processes (Sidhartha & Maheshkumar, 2012). Faith and Simon (2023) defined process innovation as the process of enhancing an organization's production and logistics methods in order to dramatically enhance all of its supporting activities, such as purchasing, accounting, computing, and maintenance.

Process innovation plays a pivotal role in the quest to gain competitive advantage, especially in a turbulent business environment (Linton & Walsh, 2008). It offers the potential for profound influence on a firm's performance, through reduced expenses (Bernstein & Kök 2009), enhanced efficiency, and both operational and product quality (Reichstein and Salter 2006). Process innovation can be a costly and difficult practice if the knowledge and experience is lacking. Letangule & Letting (2012) suggest that companies should invest in both technical and managerial innovations synchronously. Adoption of new technologies cannot be realized unless they work in harmony with new organizational processes and systems, since performance depends on how well innovation of different types advances organizational goals together. Corters, *et al.*, (2012) also discuss how formalized roles in process innovation projects can have the adverse effect on its success. On the other hand, formalized processes are beneficial for reducing uncertainty.

Empirical evidence which connects workplace innovation with sustainability abounds in literature. For instance, Gokmen and Hamsioglu (2011) examined the relationship between innovation and organizational performance. The study discovered the existence of a positive relationship between innovation and organizational performance. Wolff and Pett (2004) and Walker (2004) conducted comparative research for the effects of product and process innovations on firm performance. They indicated that particular product improvements are positively associated with firm growth. Lin and Chen (2007) studied the relationship between innovation and firms sales. The result indicated that organizational innovations rather than technological innovations appeared to be the most vital factor that increases total sales in an organization. From the above review, it is evidence that none of the studies have been able to study organizational sustainability with regards to process innovation, to fill this gap this study is poised to examine the relationship between process innovation and sustainability of water production firms in Rivers State.

The specific objectives therefore were:

- i) To investigate the relationship between process innovation and environmental sustainability of water production firms in Rivers State.

- ii) To investigate the relationship between process innovation and economic sustainability of water production firms in Rivers State.
- iii) To investigate the relationship between process innovation and social sustainability of water production firms in Rivers State.

Conceptual Framework

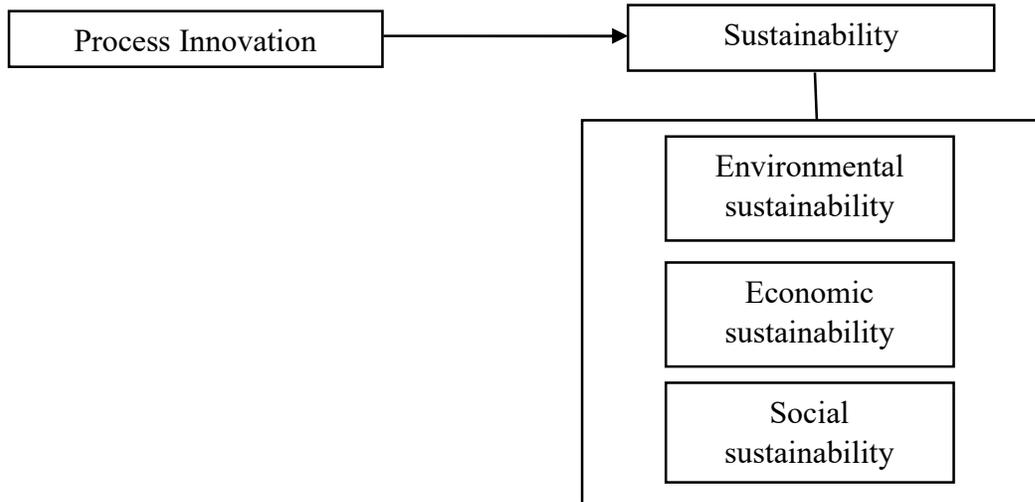


Figure 1: The relationship between Process Innovation and Sustainability

Source: Desk Research, (2025), with measures of Sustainability adapted from the work of Richard *et al.* (2009).

Research Questions

In view of the objectives stated above, the following research questions guided the study:

- i) What is the relationship between process innovation and environmental sustainability of water production firms in Rivers State?
- ii) What is the relationship between process innovation and economic sustainability of water production firms in Rivers State?
- iii) What is the relationship between process innovation and social sustainability of water production firms in Rivers State?

Statement of Hypotheses

The following hypotheses were stated in null form as follows.

- Ho:1 There is no significant relationship between process innovation and environmental sustainability of water production firms in Rivers State.
- Ho:2 There is no significant relationship between process innovation and economic sustainability of water production firms in Rivers State.

Ho:3 There is no significant relationship between process innovation and social sustainability of water production firms in Rivers State.

LITERATURE REVIEW

Theoretical Review

This study is guided by the Resource-Based Theory and Schumpeterian Theory on Innovation.

Resource-Based View Theory

The resource-based view (RBV) theory was postulated in 1984 by Wernerfelt as a major philosophy that has been embraced to investigate the matter (Hogler, 2016). The argument in the theory is that a firm consists of a collection of productive resources' and these resources may only contribute to a firm's competitive position to the extent that they are exploited in such a manner that their potentially valuable services are made available to the firm. Wright and McMahan (2009) affirm that RBV is more suitable in explaining performance, based on path dependency and administrative heritage. It is however less useful in predicting under what circumstances the specific resources of a company will generate a sustainable competitive advantage. Another criticism is that the inside-out perspective tends to neglect the importance of contextual factors, including the Porter-based factors (such as threat of market entry and threat of suppliers), as well as the institutional setting, which is particularly crucial from a HRM point of view. Hence, to fully understand (strategic) human resource management in, for example, different institutional settings, there is need for an additional theory (Wright and McMahan, 2009).

Achieving a sustainable competitive advantage lies at the heart of much of the literature in strategic management and strategic marketing. The resource-based view offers strategists a means of evaluating potential factors that can be deployed to confer a competitive edge. A key insight arising from the resource-based view is that not all resources are of equal importance, nor do they possess the potential to become a source of sustainable competitive advantage. The sustainability of any competitive advantage depends on the extent to which resources can be imitated or substituted. Barney and others point out that understanding the causal relationship between the sources of advantage and successful strategies can be very difficult in practice. Thus, a great deal of managerial effort must be invested in identifying, understanding and classifying core competencies. In addition, management must invest in organizational learning to develop, nurture and maintain key resources and competencies. This theory was relevant to the present study as it provides a framework for understanding how a firm's unique resources and capabilities can be leveraged to achieve a competitive advantage through process innovation, ultimately contributing to long-term sustainability.

Schumpeterian Theory on Innovation

Schumpeter theory of Economic Development on Innovation was propounded by Schumpeter (1949). The theory believes that individuals possess mental and creative ability to convert innovative ideas to economically viable products or services that meet the demands of the people. This assertion is premised on the fact that business environment changes over-time and exerts considerable in businesses. The theory argues that entrepreneurs are risk-takers and their innovative ideas are orchestrated based on their proactiveness in the environment. Although, environmental factors are succinctly external to them but responding to the environmental factors calls for holistic understanding on the interplay of those factors for sound decision making. The theory opines that being proactive to the business environment helps entrepreneurs to secure and

sustain greater operational effectiveness that afford them greater leverage for improved performance. However, the theory describes entrepreneurs as visionary change management agents who introduce new economic activity that leads to a change in the market.

Schumpeter argued that anyone seeking profits must innovate. That will cause the different employment of economic system's existing supplies of productive means (Schumpeter, 1934). Schumpeter believed that innovation is considered as an essential driver of competitiveness (Porter & Stern 1999) and economic dynamics (Hanush & Pyka, 2007). He also believed that innovation is the center of economic change causing gales of "creative destruction", which is a term created by Schumpeter in *Capitalism, Socialism and Democracy* (Schumpeter, 1942). According to Schumpeter innovation is a "process of industrial mutation, that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one". He divided the innovation process into four dimensions: invention, innovation, diffusion and imitation (Burton-Jones, 1999). Then he puts the dynamic entrepreneur in the middle of his analysis [Schumpeter, 1942]. In Schumpeter's analysis, the invention phase or the basic innovation have less of an impact, while the diffusion and imitation process have a much greater influence on the state of an economy. The macroeconomic effects of any basic innovation are hardly noticeable in the first few years (and often even longer). This theory is relevant to the present study as it provides a deeper understanding of process innovation that influences organizational sustainability and their overall performance.

Conceptual Review

Process Innovation

Process innovation is considered as an organization's capability to marshal, integrate, and leverage organizational resources to improve or create new processes (Sidhartha & Maheshkumar, 2012). Faith and Simon (2023) defined process innovation as the process of enhancing an organization's production and logistics methods in order to dramatically enhance all of its supporting activities, such as purchasing, accounting, computing, and maintenance. This definition matched that of Rogers (1962), who believed that process innovation encompassed any major enhancements made to the entire process of production and delivery, regardless of the tools, technologies or software utilized. They also underlined the need for businesses to innovate their business practices in order to increase their productivity across the board. The term "process innovation" typically refers to a completely new approach that has not yet been adopted or implemented by the company. The process may have been created by the business itself or with outside assistance (Namusonge, Muturi & Olaniran, 2016).

According to Alves, Galina and Dobelin (2018), "process innovation" refers to the adjustments made in an organization as a result of the adoption of new information and communication technologies. This comprises putting new approaches into practice or improving an existing technique in order to develop an organization's entire process. Process innovation is an integrated strategy employed by a business to improve the entire production process (Hari, Fredi & Eneng, 2020). According to Domnich (2022), process innovation is an organizational capacity that involves combining resources and manufacturing processes to develop new processes or enhance current ones.

Process innovation plays a pivotal role in the quest to gain competitive advantage, especially in a turbulent business environment (Linton & Walsh, 2008). It offers the potential for profound

influence on a firm's performance, through reduced expenses (Bernstein & K k 2009), enhanced efficiency, and both operational and product quality (Reichstein and Salter 2006). Process innovation can be a costly and difficult practice if the knowledge and experience is lacking. Letangule & Letting (2012) suggest that companies should invest in both technical and managerial innovations synchronously. Adoption of new technologies cannot be realized unless they work in harmony with new organizational processes and systems, since performance depends on how well innovation of different types advances organizational goals together. Corters, *et al.*, (2012) also discuss how formalized roles in process innovation projects can have the adverse effect on its success. On the other hand, formalized processes are beneficial for reducing uncertainty.

Organizational Sustainability

Organizational sustainability is one of the most imperative measure in evaluating organizations, their activities, and environments. It refers to an actual output or results of an organization as measured against its intended outputs (or goals and objectives). Sustainability is "an economic, social, and ecological concept Boudreau and Ramstad (2015). It is intended to be a means of configuring civilisation and human activity so that society and its members are able to meet their needs and express their greatest potential in the present, while preserving bio-diversity and planning and acting for the ability to maintain these ideals indefinitely. Sustainability is providing for the best for people and the environment both now and in the indefinite future (Colbert and Kurucz, 2017).

Organizational sustainability involves assessing activities, monitor growth and make the strategic changes that will subsequently lead to the realization and achievement of corporate goals. Richard *et al.* (2009) organizational sustainability focuses on three major areas: (a) financial performance and investment; (b) shareholder expectation and economic value; and (c) production capability. Organizational sustainability, according to Bibhuti (2018) is the relative strength and ability of an organization to achieve corporate goals through internal work motivation, wide-ranging management style, greater commitment, employees' retention, job satisfaction and work place opportunities which have significant and important effects on corporate success.

Measures of Organizational Sustainability

Studies on organizational sustainability have frequently distinguished between various measures of this phenomenon. In his model, Malik *et al.*, (2011) argued that organizational sustainability is an abstract concept and its basically impossible to measure. Instead of measuring organizational sustainability, he suggested that an organization determines proxy measures, which will be used to represent their effectiveness. In it may be included such things as efficiency of management, performance of employees, core competencies. Other scholars included different measures such as productivity, profits, growth, turnover, stability and cohesion. The measures for the study include; environmental sustainability, economic sustainability and social sustainability.

Environmental Sustainability

Environmental sustainability can be defined as the combination of several organizational competencies or the overall performance of the organization to reduce the overall carbon footprint of the products (Lam and Lai, 2015). The implications of four primary natural resources, including air, water, soil, and minerals, as well as energy resources, are being monitored (GRI, 2012). The contribution of the company to the local quality of the air is

monitored for healthy air resources. The use of water and water pollutants is regulated to determine the availability of clean and healthy water. Both direct and indirect influences on land resources can be regulated to reduce their consequences for soil and biodiversity. Soil contaminants represent an important part of achieving environmental sustainability because they deplete soil resources. Regulators also keep an eye on nonrenewable energy sources and fossil fuels to figure out how the company affects these resources.

According to Singh, Chakraborty and Roy, (2016) environmental sustainability involves ecosystem integrity, carrying capacity and biodiversity. This means to avoid stressing a valued ecosystem beyond the limits of its resilience, stability and carrying capacity. An environmental sustainability entails that natural wealth act as a source of economic inputs and as a sink for wastes (Kahn, 2015; Basiago, 2018). A state in which the demand placed on the environment can be met without reducing its capacity to allow all people to live well now and in the future. Goodland and Daly (2016) defined environmental sustainability as holding waste emissions within the assimilative capacity of the environment without impairing it. It also means keeping harvest rates of renewable within regeneration rates.

Economic Sustainability

Economic sustainability is defined as the maintenance of non-dealing reduction capital stocks (Spangenberg, 2015; in Kalua, 2015). But in relation to this study, the meaning of economic sustainability as defined by Stavins et al. (2013), will be more meaningful. They defined economic sustainability as “the maintenance of the present well-being by paying attention to inter-temporal distributional equity, dynamic efficiency and international equity”. Azapagic (2012) argued that, achievement in economic viability serves as the most important part of organizational sustainable development’ since benefits that comes from job growth will afford society and the organization the possibility of improving their living conditions. To further buttress the point, Dyllick and Hockets (2012) argued that, an organization’s economic sustainability showed the organization that it has the strength to accomplish its tasks and responsibility that leads to considerable profits. Amongst Economists, sustainability has become interesting and been a very critical and debating issue (Stavins, Wagner, & Wagner, 2013). However, most Economists have agreed on the importance of economic sustainability, viewing it as the maintenance present of well-being with due regard to inter-temporal distributional equity as well as capital stock (Stavins et al., 2013).

Social Sustainability

Social sustainability is a process for creating sustainably, successful places that promote wellbeing, by understanding what people need from the places in which they live and work (Woodcraft, 2015). Social sustainability encompasses the notions of equity, empowerment, accessibility, participation, sharing, cultural identity; and institutional stability (Singh, Chakraborty, & Roy 2016). Wanamaker, (2018) assert that it is a process of framework that promotes wellbeing within an organization's own members while also supporting the ability of future generations to maintain a healthy community. Social sustainability encompasses the impact of corporations on people and society - whether corporate, public sector, educational or nonprofit, it improves the lives of their employees, stakeholders, customers and the community in which they operate (Benajo, 2010). According to Cella-De-Oliverira (2013) social sustainability refers mainly to aspects as skills, motivation and loyalty of employees and business partners, it obliges the organization to internalize the social costs, maintaining and providing the growth of the social capital; avoiding exploiting the individual, giving incentive to auto-

renewable structures; promoting democracy, amplifying the scope of personal choices and distributing resources and property rights in a fair manner (Dyllick & Hockerts, 2002). It causes management to understand the impact of its operations on the social systems and how the expectations of the different social groups relating to the organization are carefully considered (Beteie & Ahiawe, 2012).

Empirical Review

Ahawo (2020) determined the effect of process innovation on Organization Performance of humanitarian organizations in Kenya. The study was anchored on three theories; Porter's Generic Strategies; Diffusion Theory of Innovation and Schumpeter Theory of Innovation. The study adopted a descriptive cross sectional research design. The target population was the top and middle managers of humanitarian organizations in Kenya which were selected through random sampling. Data was collected through questionnaire and analyzed through SPSS software. The result of the effect of process innovation on organizational performance indicated a strong positive correlation between the variables with a coefficient of correlations (r) of 0.709. The coefficient of determination (R^2) was 0.503 which indicated that 50.3% of change in organization performance in the humanitarian organization in Kenya could be attributed to innovation. The study concluded that process innovation is a good predictor of organization performance and hence recommended that; for the humanitarian organizations in Kenya to achieve enhanced organizational performance, they should come up with process innovation within the organization which should be encouraged and embraced by all so as to achieve increased organizational performance.

Iherobiem and Sanusi (2023) investigated how process innovation might be used as a strategic tool to improve organizational performance in the context of Nigerian manufacturing companies. The study employed a descriptive survey methodology and population of the study consisted 7,533 employees from specifically 3 chosen manufacturing companies in Nigeria: Lafarge Africa Plc, Flour Mill Nigeria PLC and PZ Cussons. The sample size for the study was estimated using Andrew Fisher's Formula to be 366 and the distributed questionnaire was designed on a five-point Likert scale. Out of the 366 questionnaires that were distributed, 340 were returned, giving the study a response rate of 93%. SPSS was used to examine the data that were obtained. The study found a substantial correlation between the two variables and it was determined that process innovation is important for improving organizational performance.

Akpoviro, Amos and Olalekan (2019) studied the impact of process innovation on organisational performance. 114 copies of questionnaire were administered to major telecommunication operator employees in Lagos State, Nigeria to get primary data that treated and tested appropriate research questions and hypotheses accordingly. The study adopted survey method and Cronbach Alpha for test retest reliability. SPSS was also employed in testing the research hypothesis. The study found out that process innovation has a significant effect on organisational performance and there exist a significant relationship between service modification and sales volume. The study recommends that there should be clarified objectives with the process innovation project which helped to visualize a future layout and also a clear linkage between suppliers and uncertainty reduction in the process innovation must be observed which reduced uncertainties in process times for the current state and the future.

METHODOLOGY

In this study, the researcher utilized the correlational research design. The target population of this study covered 108 registered and approved water production firms in Rivers State as obtained from the Yellow Pages Directory, Rivers State Ministry of Commerce and Industry as updated last 2014, out of which twenty (20) water production firms in Rivers State was studied as sample. The research data for this study was collected mainly from the primary source. The instrument used in collecting data for this study was the Questionnaire. The instrument was subjected to a critical assessment by experts in the field of Management. The reliability for the study was determine using the Cronbach alpha coefficient. Data analysis was at the inferential level and the study relationships were examined with Spearman’s Rank Correlation Coefficient (r^o). All analyses were done through the application of Statistical Package for Social Science (SPSS 23.0).

DATA ANALYSIS AND DISCUSSION OF FINDINGS

The result of the data generated for the study are presented and discussed below.

Relationship between Process Innovation and the Measures of Sustainability

Table 1: Correlations Matrix for Process Innovation and the Measures of Organizational Sustainability

			Process innovation	Environmental sustainability	Economic sustainability	Social sustainability
Spearman’s rho	Process innovation	Correlation	1.000	.757**	.902**	.643**
		Coefficient Sig. (2-tailed)	.	.000	.000	.000
		N	50	50	50	50
	Environmental sustainability	Correlation	.757**	1.000	.680**	.669**
		Coefficient Sig. (2-tailed)	.000	.	.000	.000
		N	50	50	50	50
	Economic sustainability	Correlation	.902**	.680**	1.000	.750**
		Coefficient Sig. (2-tailed)	.000	.000	.	.000
		N	50	50	50	50
	Social sustainability	Correlation	.643**	.669**	.750**	1.000
		Coefficient Sig. (2-tailed)	.000	.000	.000	.
		N	50	50	50	50

**Correlation is significant at the 0.01 level (2-tailed).

Source: Research Data 2025 and SPSS Output version 23.0

Table 1 illustrates the test for the previously postulated bivariate hypothetical statements. The results are stated below:

H₀₁: There is no significant relationship between process innovation and environmental sustainability of water production firms in Rivers State.

The result as depicted in table 1 revealed that there is a strong and positive relationship between process innovation and environmental sustainability of water production firms in Rivers State. The data indicates that process innovation is significantly associated with environmental sustainability (where $\rho=.757$ and $P<0.05$). The finding suggests that process innovation enhance organizational sustainability which is measured in terms of environmental sustainability. Hence on the basis of the result, the null hypothesis (H_{01}) is rejected and alternate accepted.

H₀₂: There is no significant relationship between process innovation and economic sustainability of water production firms in Rivers State.

The result as depicted in table 1 revealed that there is a very strong and positive relationship between process innovation and economic sustainability of water production firms in Rivers State. The data indicates that process innovation is significantly associated with economic sustainability (where $\rho=.902$ and $P<0.05$). The finding suggests that process innovation enhances organizational sustainability which is measured in terms of economic sustainability. Hence on the basis of the result, the null hypothesis (H_{02}) is rejected and the alternate accepted.

H₀₃: There is no significant relationship between process innovation and social sustainability of water production firms in Rivers State.

The result as depicted in table 1 revealed that there is a strong and positive relationship between process innovation and social sustainability of water production firms in Rivers State. The data indicates that process innovation is significantly associated with social sustainability (where $\rho=.643$ and $P<0.05$). The finding suggests that process innovation enhances organizational sustainability which is measured in terms of social sustainability. Hence on the basis of the result, the null hypothesis (H_{03}) is rejected and alternate accepted.

Discussion of Findings

The result as depicted in table 1 revealed that there is a strong and positive relationship between process innovation and the measures of sustainability (environmental, economic and social sustainability) of water production firms in Rivers State with ρ value of .757, .902, .643 at $P<0.05$ respectively. The finding is in accordance with the works of Ahawo (2020) who determined the effect of process innovation on Organization Performance of humanitarian organizations in Kenya. The result of the effect of process innovation on organizational performance indicated a strong positive correlation between the variables with a coefficient of correlations (r) of 0.709. The coefficient of determination (R^2) was 0.503 which indicated that 50.3% of change in organization performance in the humanitarian organization in Kenyan could be attributed to innovation. Iherobiem and Sanusi (2023) further investigated how process innovation might be used as a strategic tool to improve organizational performance in the context of Nigerian manufacturing companies. The study found a substantial correlation between the two variables and it was determined that process innovation is important for improving organizational performance. The study outcome also support the works of Zand and Rezaei (2020) who investigated the impact of process and product innovation strategies on business performance due to the dynamic environmental mediator role. The results showed that process and product innovation strategies have a positive and significant effect on business performance.

CONCLUSION AND RECOMMENDATIONS

Innovation plays an important role in improving the sustainable performance of organizations as evidence from the extant studies. It is one of the most important competitive weapons and generally seen as a firm's core value capability. Thus, it is considered as an effective way to improve firm's productivity due to the resource constraint issue facing firms. The study illustrates that product innovation, process innovation and market innovation are key determinants of organizational sustainability. Accordingly, the study concluded that effective process innovation significantly contributes to firm's overall performance and sustainability. In line with the findings and conclusions, it is therefore recommended that process innovation which are technology driven should be given proper attention with concerted efforts made to integrate it to the operations of organizations as they are vital for improved environmental, economic and social sustainability.

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