

INNOVATION AND SUSTAINABILITY OF PLASTIC MANUFACTURING
FIRMS IN OYO STATE, NIGERIA

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Abstract

This study examined the relationship between innovation and sustainability of plastic manufacturing firms in Oyo State, Specifically, the study ascertained the relationship that exists between process innovation and operational sustainability, market innovation and financial sustainability of plastic manufacturing firms in Oyo State. Descriptive survey research design was employed with the use of structured questionnaire. This study was carried out in two plastic manufacturing firms in Oyo State which are Altak Plastic Limited and Black Horse Plastics Industry Limited, Ibadan. Five Hundred and Two (502) copies questionnaire were administered. The entire population was adopted as the sample size in this study. The data generated for this study were analysed with appropriate statistical techniques. The techniques included frequency, percentages and mean score. The Objectives were analysed using simple regression, where f -cal and f -tab with significance

level 0.05 was used to test the hypotheses using Statistical Package for Social Sciences (SPSS) version 16. The study found that there is a significant positive relationship between innovation (Process and market) and sustainability (operational and financial) of plastic manufacturing firms in Oyo State, Nigeria.

Keywords: Innovation, Sustainability, Manufacturing Firms, Market- operations, Finance.

1.0 Introduction

Innovate or die is a well-known language frequently used by so many successful business organisations such as; Gillette, Microsoft, Proctor and Gamble. This simply means that organisations innovate and survive/live or die as a result of obsolete or lack of innovation. Globally, innovation is broadly seen as strategic tool for every organisation desiring to grow, survive and maintain sustainability within its industry. Innovation in an organisation is considered as one of the essential components for survival and growth, as these innovative activities (product innovation, process innovation, technology innovation, marketing innovation, organizational innovation); create value and competitive advantage for successful organizations (Ekeh, 2023). Innovation remains the major strategy and driving force for organisations' growth and survival in any competitive business environment, as the introduction of novel products and services has remained the thrust behind the spring up enterprises and the expansion of the existing ones (Ukpabio Siyanbola. and Oyebisi, 2019). In the past few decades, innovation have proven to either be sustainable or disruptive to companies all over the world; innovation and adaptability are key tools to surviving any form of hardship and staying relevant in the current competitive market (Akimwale, Adepoju, and Olomu 2017).

Another major concern of management apart from being innovative, is the sustainability of those innovations in terms of; economy, operations, human resources, environment, finance and social. Businesses are not just about making profit but also about making positive impact to the society and the world at large. While firms are in operation and competing for survival, the impact of their activities (in the air, water and forest) are equally

crucial. Environmental protection, economic prosperity and social equity are very important factors within the society in which every business operates.

This study therefore seeks to determine the relationship that exists between innovation and sustainability of plastic manufacturing firms (with specific reference to: process innovation and operational sustainability; marketing innovation and financial sustainability) in Oyo state, Nigeria,

Statement of the Problem

Innovation is generally seen as an important tool for competing firms to outwit their competitors and maintain sustainability. However, Innovations have posed many challenges to firms and blue chip companies. Also, innovation initiatives frequently fail, and successful innovators have a hard time sustaining their performance and activities. These mixed results and different views from different countries and writers necessitated this study to determine the nature of the relationship between strategic innovation and sustainability of plastic manufacturing firms with specific reference to process innovation and operational sustainability, market innovation and financial sustainability of plastic manufacturing firms in Oyo State.

Objectives of the Study

The broad objective of this study is to examine the relationship between innovation and sustainability of plastic manufacturing firms in Oyo State, Nigeria. The specific objectives are to:

- 1) Ascertain the relationship that exists between process innovation and operational sustainability of plastic manufacturing firms in Oyo State,
- 2) Appraise the relationship that exists between market innovation and financial sustainability of plastic manufacturing firms in Oyo State.

2.0 Litterature Review

Innovation

The Latin verb *innovare*, which means “into new,” is where the word innovation originates (Simuka, 2024). Innovation relates to the doing of new or novel things or the doing of old things through new strategies so as to enhance sales, cost, and profit or market performance (Abdilahi & Hassan 2017). Innovation has also been suggested to be the use of institutional, technological or human resources in ways that achieve new products, process, markets and practices (Abdilahi & Hassan 2017), Innovations can manifest as a new service or product, a new technological process in production, a new organizational administration structure or system, a new program or plan. (Ekeh, 2023).

Process Innovation

Ukpabio, Siyanbola, and Oyebisi, (2019) averred that process innovation entails changes in the way of producing or developing products, including new logistics, new raw material, new production lines, new production process and new technological process which basically rest on the use of new technology to increase efficiency and quality of production. Celikyay and Adiguzel (2020) maintained that Process innovation focuses on improving the methods and procedures by which products are manufactured or services are delivered. It aims to enhance efficiency, reduce costs, and optimize resource utilization. Edward-Schacter (2018) viewed process innovation as the implementation of new or significantly improved production methods and techniques which may involve changes in equipment or production organisation or both. Process innovation is that which takes the form of an improvement in production process or technology, which would in turn result in cost reduction (European Commission, 2019). Process innovation is the introduction of a new and improved way of production or service delivery by a company that involves major modifications in methods, equipment, tool, and machine (Expósito & Sanchis-Llopis, 2019; Obeng and Boachie, 2018). In general terms, process innovation is the implementation of a new or significantly improved production or delivery method involving technological, equipment or software changes (OECD, 2023).

Market Innovation

Saka (2021) averred that market innovation is the ability of a firm to come up with new marketing methods and technique in terms of pricing, promotion, distribution and product to add more customers to its existing customer base or create a new market for its products(Anoke & Ibrahim, 2022). Firms continuously engage in market innovation because marketing techniques via online makes it possible to meet potential customers anywhere in the world within the snap of a finger. Market innovation is essential to business organisations as it helps to augment the sales efforts by increasing the need and demand for that product in order to improve sales and consequently more profits for the innovative organisation. OECD (2023) defined Marketing innovation as the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing. These strategies lead to tactical marketing actions which involve change in product packaging, product design, product distribution methods as well as product advertisement.

Sustainability

Sustainability has been defined by different authors from different dimensions. The most cited definition from business dimension was that presented at the World Commission on Environmental and Development (1978) as cited in Rahman, Abdullatiff and Abdulwahab (2022) as the development that meet today's need without compromising the ability of future generations to meet their own needs. Bom, Jorge, Ribeiro and Marto (2019) described Sustainability from three dimensions which are: Social; the act of incorporating concept of equity accessibility, cultural identity and institutional stability. Environmental; Involves preservation of national capital, ecosystem integrity, carrying capacity and biodiversity and financial sustainability; which implies economic feasibility while development moves towards environmental and social sustainability. Anoke, Igwebuike, Agagbo, and Odumu,(2021) summarised, sustainability as broadly used concept to indicate programmes, projects, activities, initiatives and actions aimed at the preservation of a

particular resource for a longer period. He therefore described Sustainability from four distinct areas known as the four pillars of sustainability which are: human, social, economic and environmental.

Operational Sustainability

Operational sustainability is a method of evaluating whether a business can maintain existing operational practices without placing future resources at risk (Kimberlee,2020). Operational sustainability can also be referred to as the concept of doing business where the social, economic and environmental factors are associated with the operations of the company. It ensures processes to meet the current requirement as well as plan for the future (Kiran,2023).

Financial Sustainability

Financial sustainability is the way in which firms are financially managed to ensure that current financial success does not jeopardise future financial success (Opunsuju Anoke, & Onu, 2020). Zabolotnyy and Wasilewski (2019) defined financial sustainability in terms of two dimensions namely: value and continuity. Financial sustainability deals solely with the company's long-term financial security as an important part of the overall goal of sustainability. Concept for financial sustainability is also important for risk management (Lenssen, Dentchev and Roger, 2014). Gleißner, Günther and Walkshäus (2022) described financial sustainability from three dimensions Which are: a real growth of the form that prevents its shrinkage or liquidation over time, a significant probability of form survival, an adequate level of risk exposure by the firm, and an attractive risk-return profiled for the owners.

Theoretical Framework

This study was anchored on disruptive innovation theory. relevant to this study theory to the discussion of this topic. The theory is relevant as it discussed extensively the need to strategise and innovate by creating value networks, new markets and compete with

traditional products, making a disruption in the market and causing existing product and services to get displaced and become obsolete thereby replacing old ones.

Empirical Review

Simuka (2024) investigated the effect of Innovation on the Performance of SMEs in Zimbabwe: A Case Study of Manufacturing Companies in Harare. A quantitative research approach was adopted. A total sample size of 66 respondents was selected randomly. A structured questionnaire was distributed to respondents and the response rate was approximately 76%. Data were processed on excel which were later uploaded on the SPSS software. Cronbach Alpha of 0.886 was obtained and this indicated the strong reliability and validity of the study results. Composite and Average variance extracted was also used to assess the validity of the study. It was discovered that experienced human capital, leadership, access to funding, competition, and organisation mission and culture are important in influencing innovation in SMEs. In addition, the study found that product innovation had an impact on manufacturing SMEs' organisational performance.

Akoma, Adeoye, Akinlabi and Ayeni (2023) explored the relationship between innovation and performance of SMEs in Nigeria manufacturing firm. The study adopted survey research design of 504 populations of owners and managers of 126 SMEs, food and beverages, agro allied and animal feeds, plastic and rubber, and wood furnishing and fitting companies in five Local Government Areas in Ogun State, Nigeria. Total enumeration method was adopted for the study as data were collected through structured questionnaire. Cronbach's Alpha reliability coefficients for the dependent variable, the independent variable and the moderators ranged from 0.88 to 0.95. This indicated that the instrument employed had a high level of consistency above the recommended criterion of 0.7. The response rate was 87%. Data were analysed using descriptive and inferential (hierarchical regression) statistics. The findings revealed that pro-activeness had a negative and significant moderating effect on the relationship between innovation and performance of SMEs in the Nigeria manufacturing firm.

Olatunle and Gumus (2023) evaluated the effect of innovation strategies on the performance of SMEs in Kaduna State. The study employed the survey research design and cross-sectional approach of data collection. Krejcie and Morgan (1970) table for determining sample size was used to obtain a sample size of three hundred and thirty-eight (338) owners of SMEs in Kaduna State. Proportional sampling technique was used in selecting the sample size based on the nature of the population. A total of 338 copies of the questionnaire were distributed for data collection, only 305 copies were retrieved for analysis. Data collected were subsequently analysed using multiple regression analysis. Findings from the study established that innovation strategies (in terms of process, product and organisation) have a significant and positive effect on SMEs performance in Kaduna State.

Iherobiem (2023) examined the Effect of Sustainability and Firm Innovative Performance: A Study of Manufacturing Firms in Nigeria. The study employed descriptive survey approach, with three Nigerian manufacturing companies as the target population. The study used a purposeful sampling strategy, and the researcher decided that a sample size of 120 was manageable. A pilot study was conducted to evaluate the validity and reliability of the research instrument prior to the collection of data. A 91% response rate was obtained. The analysis showed that sustainable supply chain management practices had a positive and significant impact on the innovative performance of manufacturing companies in Nigeria, demonstrating that economic, environmental, and social dimension of sustainability all had a significant positive impact on this performance.

Ekeh (2023) assessed the effect of product innovation on growth of medium enterprises in North Central Nigeria. Survey research design was adopted for this study. The population of the study comprised of 243 medium enterprises in North Central Nigeria. The study adopted the census approach where the entire population of 243 owners/managers of these medium enterprises in North-Central Nigeria served as the sample size of the study. Copies of Questionnaire(243) were therefore, administered on this sample but only 223 were

usable for analysis. Both descriptive statistics (percentages, frequency counts and mean values) and inferential statistics (correlation and regression analysis) were employed for data analysis. Regression analysis was used to test the null hypothesis. The regression result revealed that product innovation had significant positive effect on the growth of medium enterprises in North-Central Nigeria.

3.0 Methodology

Research Design

The study adopted descriptive survey research design. This design is considered appropriate for this study since the study explored the opinions of the respondents on the Organisational innovation and sustainability of plastic manufacturing firms in Oyo State, Nigeria.

Area of the Study

The study was conducted in Oyo State. This study was carried out in Two (2) plastic manufacturing firms in Oyo State which are; Altak Plastic Limited and Black Horse Plastics Industry Limited, Ibadan, Oyo state respectively.

Population of the Study and Sample size

The population of this study consists of various stakeholders of those plastic firms within the study area, which involved 502 staff of two plastic manufacturing firms in Oyo State Nigeria owned by private individuals in the study area. This includes management, managers, supervisors and some experienced and senior staff directly responsible for the policy development, forecast and implementation within plastic manufacturing firms in Oyo state, Nigeria. The entire population was adopted as the sample size for this study. This approach ensures comprehensive coverage and allows for a more accurate analysis of the strategic innovation practices and sustainability outcomes across all relevant firms. By

using the entire population, the study minimizes sampling error and provides a more robust foundation for generalizing the findings to the entire population of interest.

Method of Data Collection

The method of data collection for this study was both primary and secondary. The primary data were collected with the use of structured questionnaire. The questionnaire was distributed to plastic manufacturing firms via google doc in their respective communication platforms, where management, managers, supervisors and some experienced staff can access it. However, the secondary data were from literature review of existing studies on strategic innovation and sustainability of manufacturing firms.

Method of Data Analysis

The objectives were analysed using simple Regression, while the hypotheses were tested using Sig f-change and f-change. All these tests were carried out through Statistical Package for Social Sciences (SPSS) version 16.

Model Specification

Linear Regression Model

$$Y = a + bx + e$$

Objective 1

$$\text{OprSust} = f(\text{ProInn}) + e \dots\dots\dots 1a$$

$$\text{OprSust} = a + \beta_1\text{ProInn} \dots\dots\dots 1b$$

Objective 2

$$\text{FinSust} = f(\text{MKTtInn}) + e \dots\dots\dots 2a$$

$$\text{FinSust} = a + \beta_1\text{MKTInn} \dots\dots\dots 2b$$

Where:

Oprsust = Operational Sustainability

TechInn = Technological Innovation

Proinn = Process Innovation

Mktinn = Market Innovation

e = error term

β = coefficient of independent variables

a = intercept

Table 1: Data Analysis

Regression

Table 4.4 b: Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. Change	
1	.915 ^a	.837	.837	2.39065	.837	2575.767	1	500	.000	1.787

a. Predictors: (Constant), Process Innovation

b. Dependent Variable: Operational Sustainability

The table above provided the summary of the results of a regression analysis examining the relationship between process innovation and operational sustainability in plastic manufacturing firms in Oyo State, Nigeria.

Model Information:

Model R: This is the multiple correlation coefficient, indicating the strength and direction of the linear relationship between process innovation and operational sustainability. An R of .915 suggests a very strong positive correlation.

R Square (Coefficient of Determination): This represents the proportion of the variance in operational sustainability that can be explained by process innovation. An R Square of .837 means that 83.7% of the variance in operational sustainability can be explained by process innovation.

Adjusted R Square: This adjusts the R Square for the number of predictors in the model. It remains at .837, which indicates that the inclusion of process innovation as a predictor explains the variance well.

Std. Error of the Estimate: This is the standard deviation of the residuals (prediction errors). A lower value indicates better fit of the model to the actual data.

Change Statistics:

R-Square Change: This shows how much the R Square changes when process innovation is added to the model. The change is .837, indicating a substantial improvement in predicting operational sustainability with the inclusion of process innovation.

F-Change: This is the ratio of the mean square regression (MSR) to the mean square error (MSE), used to test the significance of adding process innovation to the model.

Sig. F-Change: This is the p-value associated with the F Change statistic. A value of .000 indicates that the relationship between process innovation and operational sustainability is statistically significant at the 0.05 level.

Durbin-Watson: This statistic tests for the presence of autocorrelation (relationship between successive residuals) in the residuals from a regression analysis. A value close to 2 (here, 1.787) suggests no significant autocorrelation.

Test of Hypothesis

Null Hypothesis (H_0): Process innovation does not have any significant relationship with operational sustainability of plastic manufacturing firms in Oyo State, Nigeria.

Alternative Hypothesis (H_1): process innovation has a significant relationship with operational sustainability of plastic manufacturing firms in Oyo State, Nigeria.

Decision Rule:

Reject null hypothesis if Sig.f-change > f- Change, otherwise accept

Based on the results:

Since the p-value (Sig. F Change = .000) is less than the significance level (typically 0.05), we reject the null hypothesis.

There is sufficient evidence to conclude that there is a significant relationship between Process innovation and operational sustainability in plastic manufacturing firms in Oyo State Nigeria.

The model with process innovation as a predictor explains a substantial amount (83.7%) of the variance in operational sustainability, indicating strong predictive power.

Therefore, the findings from Table 1 provide strong support for the alternative hypothesis that process innovation significantly impacts operational sustainability in the context of plastic manufacturing firms in Oyo State, Nigeria. The decision rule is to reject the null hypothesis due to the highly significant relationship demonstrated by the regression analysis.

Objective 2:

Appraise the relationship that exists between market innovation and financial sustainability of plastic manufacturing firms in Oyo State, Nigeria.

Regression

Table 4.5.b: Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. Change	
1	.976 ^a	.953	.953	1.15845	.953	1.014E4	1	500	.000	.064

a. Predictors: (Constant), Marketing Innovation

b. Dependent Variable: Financial Sustainability

Model Information:

R (Multiple Correlation Coefficient): The value of .976 indicates a very strong positive correlation between market innovation (predictor) and financial sustainability (dependent variable). This means that changes in market innovation are strongly associated with changes in financial sustainability.

R-Square (Coefficient of Determination): With an R Square of .953, the model suggests that 95.3% of the variance in financial sustainability can be explained by market innovation. This is an exceptionally high value, indicating that market innovation plays a dominant role in predicting financial sustainability.

Adjusted R Square: The adjusted R Square remains at .953, meaning that even after accounting for the number of predictors in the model, market innovation still explains a significant portion of the variance in financial sustainability.

Std. Error of the Estimate: The value of 1.15845 indicates the standard deviation of the residuals (the difference between the observed and predicted values). A smaller standard error suggests a more accurate model fit.

Change Statistics

R-Square Change: The R Square change is .953, meaning that the inclusion of market innovation significantly improves the prediction of financial sustainability.

F Change: The F Change of 1.014E4 (or 10,140) is a large value, indicating that market innovation contributes significantly to the model's predictive power.

Sig. F Change: With a p-value of .000, the result is statistically significant at any reasonable alpha level (e.g., 0.05), demonstrating that market innovation is a significant predictor of financial sustainability.

Durbin-Watson: The value of .064 indicates potential positive autocorrelation in the residuals (close to 0 suggests strong positive autocorrelation). This could suggest that the residuals are not independent, which might affect the validity of the model.

Test of Hypothesis

H₀: Market innovation does not have any significant relationship with financial sustainability of plastic manufacturing firms in South West Nigeria.

H₁: Market innovation has a significant relationship with financial sustainability of plastic manufacturing firms in Oyo State, Nigeria.

A regression analysis was performed where market innovation (independent variable) was tested to see if it predicts financial sustainability (dependent variable).

The very high R Square value (.953) indicates that market innovation explains a substantial portion of the variation in financial sustainability.

The significant F Change (with $p = .000$) shows that adding market innovation as a predictor improves the model significantly.

Decision Rule

Reject null hypothesis if Sig. f-change $>$ f- Change, otherwise accept

Since the p-value (Sig. F Change = .000) is less than the standard significance level (e.g., 0.05), we reject the null hypothesis.

The evidence strongly suggests that market innovation has a significant relationship with financial sustainability in plastic manufacturing firms in Oyo State, Nigeria.

The decision is to reject H_0 and accept H_1 , as the data show that market innovation substantially influences financial sustainability.

In conclusion, the results from Table 2 demonstrate that market innovation significantly impacts financial sustainability, explaining over 95% of the variance. Based on these findings, the decision rule leads to rejecting the null hypothesis, providing strong support for the alternative hypothesis that market innovation is a crucial factor in the financial sustainability of plastic manufacturing firms in Oyo State Nigeria.

Discussion of Results

The analysis for objective 1 reveals a very strong positive relationship between process innovation and operational sustainability with the regression result ($f\text{-cal}=2575.767$, $f\text{-tab}=0.000$). The higher mean score for process innovation compared to operational sustainability suggests that respondents perceive process improvements as key to enhancing operational efficiency. This finding is consistent with Ghosh (2021), who reported that process innovation, particularly in manufacturing, leads to better resource

management and operational streamlining, ultimately improving sustainability metrics in industrial settings.

The regression analysis for objective 2 indicates a positive relationship between Marketing innovation and financial sustainability in plastic manufacturing firms in Oyo State, Nigeria (f-cal=1.0140, f-tab=0.000). This outcome supports the hypothesis that firms that adopt comprehensive innovation strategies are better positioned to achieve economic, operational, human resource, and environmental sustainability. Gupta and Patel (2023) found similar results in their study, emphasizing that a holistic approach to innovation fosters long-term sustainability by addressing multiple dimensions of business performance simultaneously.

Findings

The findings of this study reveals that:

1. There is a strong positive correlation between process innovation and operational sustainability, with the regression result (f-cal=2575.767, f-tab=0.000) indicating that process improvements are crucial for enhancing operational efficiency in these firms.
2. The regression result (f-cal=1.0140, f-tab=0.000) indicates a positive relationship between market innovation and financial sustainability, confirming that market innovation enhances the financial sustainability of plastic manufacturing firms in South West, Nigeria.

Conclusion

Based on the results obtained from the test of the hypotheses, it is concluded that strategic innovation in terms of: process and market innovation is significantly positively related to operational and financial sustainability of Plastic manufacturing firms in Oyo State Nigeria.

Reccommendation

This study therefore recommends that Plastic manufacturing firms in Oyo state, Nigeria need to be conscious of maintaining standard operational process as that can greatly affect operational sustainability of Plastic manufacturing firms in Oyo State.

In addition Government (both State and Federal) is expected to design, implement and control operational policies guiding operational process of manufacturing firms in Oyo state.

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