

Innovations

Process Innovation and Performance of Manufacturing Firms in South-East Nigeria

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Abstract: *This study investigated the effect of process innovation on the performance of manufacturing firms in Southeast Nigeria. The researchers adopted a cross-sectional survey research design and used the Krejcie and Morgan formula to determine a sample of 401 senior and junior staff from a population of 3,440 employees across ten manufacturing firms in the region. Primary data was collected via a structured questionnaire and analysed using partial least square – structural equation modelling at a 5% significance level. The findings revealed that product redesign had a significant positive effect on customer satisfaction and market share. Quality improvement also had a significant positive effect on customer satisfaction and market share. In conclusion, process innovation plays a crucial role in enhancing productivity, reducing costs, and delivering superior product performance by designing and streamlining manufacturing processes to meet industry needs. The study recommends that manufacturing firms analyse and optimise production processes to eliminate inefficiencies and redundancies, potentially through lean manufacturing principles. Also, the firms should focus strategically on areas with the highest potential for improvement, and promote a culture of continuous improvement.*

Keywords: *Process Innovation, Performance, Product Redesign, Customer Satisfaction, Quality Improvement Market Share, Technology Advancement, and Timely Delivery.*

1. Introduction

Process innovation is a critical element in the growth and survival of manufacturing firms. It involves the implementation of new or improved processes that result in higher efficiency, productivity, and quality. Process innovation is used to improve manufacturing processes, such as reducing cycle times, improving quality, and reducing costs (Elenurm, 2021). Process innovation is also used to improve supply chain management, product design, and customer service. Furthermore, focusing on the process aspect of innovation can lead to a culture of continuous improvement, where organisations are constantly looking for ways to improve their operations and deliver greater value to their customers (Ezenwakwelu, et al., 2021). This can help manufacturing firms stay competitive and adapt to changes in the market environment.

On the other hand, organisational performance is crucial for the success and sustainability of manufacturing firms. Several studies have highlighted the importance of organisational performance in achieving competitive advantage, meeting customer needs, and improving profitability in manufacturing firms. Gbadamosi and Osabutey (2015) found that organisational performance is a key determinant of the competitiveness and sustainability of manufacturing firms in Nigeria. The authors argued that manufacturing firms that perform well are better equipped to face challenges such as competition, changing customer demands, and economic uncertainties.

The influence of process innovation on firm performance has been widely studied in the literature, with several scholars highlighting the positive relationship between process innovation and performance (Elenurm, 2021; Du, Liu, & Zhang, 2019). While a significant amount of research broadly addresses process innovation, there was a distinct need for studies focusing specifically on the types of process innovation relevant to the South-East Nigerian context. Additionally, the diverse nature of the manufacturing sector in South-East Nigeria, which includes industries such as food processing, textiles, and pharmaceuticals, had not been adequately examined. This study filled the gap by investigating the effect of process innovation on performance across manufacturing firms in these various industries in South East Nigeria. The study specifically examined the effect of product redesign on customer satisfaction, and the effect of quality improvement on market share.

2. Literature Review

Process Innovation

Innovation is the process whereby individuals or organisations conceptualise, create, or develop new ideas, products, and processes; or the situation whereby these activities are implemented in new ways (Ogbo, Okechukwu&Ukpere, 2012). Innovation is simply doing new things or doing old things in new ways (Don-Baridam, Etim&Esubok, 2021). Innovation has been described as one of the crucial strategies for growth, penetration of new market terrains, improvement of firm market share, and the creation of a competitive advantage for the organisation (Ponta, Puliga, &Manzini, 2021). Innovation is the process of introducing something new that creates value for the organisation and its stakeholders (Ezenwakwelu, Akpan&Ogbogu-Asogwa, 2021). It involves generating and implementing new ideas that lead to new products, services, or processes. Process innovation focuses on the way in which organisations generate, evaluate, select, and implement ideas to create new products, services, or processes (Akpan, Al-Faryan&Iromaka, 2022). Process innovation involves improving the way in which tasks are performed, and it can lead to significant improvements in productivity, efficiency, and effectiveness. By focusing on the process aspect of innovation, organisations can streamline their operations, improve their use of resources, and reduce waste.

Process innovation is the creation and implementation of new or significantly improved methods, workflows, or techniques within an organisation, with the goal of enhancing efficiency, effectiveness, and creating greater value for the organisation and its customers. In addition, process innovation helps to streamline workflows,

reduce wastes, and leverage technology to empower manufacturing firms to boost their performance. Process innovation was studied using product redesign and quality improvement.

Process innovation refers to the implementation of new or improved processes that result in higher efficiency, productivity, and quality (Elenurm, 2021; Parida, Sjödin&Reim, 2019). It is a critical element in the growth and survival of manufacturing firms, as it helps them stay competitive and meet the changing demands of customers (Elenurm, 2021; Armendáriz&Dumitrescu, 2021).

Performance

Generally, performance refers to the state or quality of an organisation's function. Phuong, Bach, Linh, Ly, Dat, An, and Hung (2023) define performance as the process of explaining the quality of effectiveness and efficiency of past actions. Effectiveness and efficiency are the two key components of organisational performance. Therefore, the organisational performance index measures the degree of efficiency and effectiveness in achieving organisational goals. Performance is the effectiveness and efficiency of an organisation in converting raw materials into finished products that meet customer demands, while minimising costs and maximising profits. Performance was seen through the lens of customer satisfaction, and market share. Measuring organisational performance is crucial to ensure that organisations follow strategies that lead to goal achievement (Ihionu, Igwe, &Akpan, 2023). There are different approaches to measuring performance, including objective and subjective scales, each with its advantages and disadvantages (Guenther &Heinicke, 2019). The balanced scorecard approach, introduced by Kaplan and Norton (1996), is one of the widely used approaches for measuring organisational performance. This approach uses both financial and operational scales to measure performance.

Process Innovation and Performance

A substantial body of research has consistently demonstrated a positive correlation between process innovation and the performance of manufacturing firms. Process innovation, encompassing the implementation of new or significantly improved production methods, technologies, and work organisation, has been shown to enhance operational efficiency, reduce costs, and improve product quality (Halilaj et al., 2018).

Several studies have emphasised the causal relationship between process innovation and superior firm performance. For instance, Zahra and George (2002) found that process innovation is a key driver of firm growth and profitability. Similarly, Cooper and Kleinschmidt (2016) argue that process innovation can lead to increased market share, productivity, and overall competitive advantage. Furthermore, the literature highlights the role of process innovation in facilitating organisational learning and adaptability (Liao et al., 2017). By experimenting with new production methods and technologies, firms can acquire valuable knowledge and capabilities, enabling them to respond effectively to changing market conditions and customer demands.

The empirical evidence overwhelmingly supports the notion that process innovation is a critical determinant of manufacturing firm performance. By investing in process

improvement initiatives, organisations can achieve significant gains in efficiency, quality, and competitiveness. Therefore, it was hypothesised that:

3. Methodology

Research Design

This study adopted a survey research design. A survey design was deemed appropriate for this study as it allowed for the collection of quantitative data from a large sample of respondents within a relatively short period. This design enabled the researchers to investigate the relationship between the variables under study efficiently.

Participants

The study population comprised employees of manufacturing firms in South East Nigeria. A sample of 401 participants was selected from a population of 3440 employees using the Krejcie and Morgan table. Ten manufacturing firms were purposely selected to represent the manufacturing sector in the region. The sample size was determined based on the Krejcie and Morgan table to ensure adequate representation of the population.

Reliability and Validity of Research Instrument

To assess the internal consistency of the measurement scales, Cronbach's alpha and composite reliability were employed. Cronbach's alpha determines the extent to which items on a scale measure the same construct, while composite reliability provides a more robust estimate of internal consistency. A value of 0.70 or above for both Cronbach's alpha and composite reliability is generally considered acceptable (Nunnally, 1978).

Content and face validity were used to assess the instrument's validity. Content validity was established by ensuring that the items in the questionnaire adequately represented the constructs being measured. This was achieved through a comprehensive review of the literature and expert judgement. Face validity was assessed by examining the questionnaire items to determine if they appeared to measure the intended constructs.

Data Analysis Techniques

Descriptive statistics were calculated for all variables and presented in tabular form with percentages. To assess the relationships between variables and test the research hypotheses, Spearman's rank correlation coefficient was employed. The strength and direction of the relationships were determined by the partial least square – structural equation modelling, while statistical significance was evaluated using the p-value at the 0.05 level. All statistical analyses were performed using SPSS version 26 and SmartPLS 3.2.9.

4. Results and Discussions

Participants Demographic Details

Respondents were asked to provide information on their gender, age, marital status and educational qualification. Other demographic information included position in the organisation and years of experience in the organisation. The results are shown in table 1 below:

Table 1: Sample Demographics

Respondents' Characteristics	Frequency (N = 401)	Percent (%)
Respondents' Gender		
Female	193	48.1
Male	208	51.9
Total	401	100
Respondents' Age		
< 35 Years	261	65.1
35-50 Years	102	25.4
> 50 Years	38	9.5
Total	401	100
Respondents' Highest Education Attainment		
B.Sc./HND	313	78.1
M.Sc./MBA	79	19.7
Ph.D/DBA	9	2.2
Total	401	100

Source: Survey Data, 2024.

Table 1 presents the demographic profile of the respondents. A slight male majority is evident, with 51.9% (n=208) being male and 48.1% (n=193) female. The sample is predominantly young, as 65.1% (n=261) of respondents are under 35 years old. The 35-50 age bracket comprises 25.4% (n=102), while those over 50 years account for 9.5% (n=38). Notably, the sample is highly educated, with 78.1% (n=313) holding a bachelor's degree.

Test of Hypotheses

Hypotheses were tested using the path coefficients (r) and the coefficients of determination (r² or predictive accuracy) (Geisser, 1975). According to Cohen (1988), path coefficients between .10 - .029, .30 - .49, and .50 - 1.0 are considered weak, moderate, and high correlations, respectively. Also, the effect size of each path in the model was determined using Cohen's f² (Cohen, 1988). An independent latent variable's effect on a dependent latent variable is determined by the effect size. Exogenous latent variables with f² values of 0.020 to 0.150, 0.150 to 0.350, and over 0.350, respectively, have a small, medium, or significant impact on endogenous latent variables (Cohen, 1988). The following hypotheses were formulated for this study:

- i. Product redesign has a positive effect on customer satisfaction in manufacturing firms
- ii. Product redesign has a positive effect on market share in manufacturing firms

- iii. Quality improvement has a positive effect on customer satisfaction in manufacturing firms
- iv. Quality improvement has a positive effect on market share in manufacturing firms.

The results of the test of hypotheses one to three are shown in table 2 below:

Table 2: Hypotheses Testing

Hypotheses	Correlation Coefficient (r)	Predictive Accuracy (r ²)	Adjusted (r ²)	P-Values	T-Values	Effect Size (f ²)	Predictive Relevance (Q ²)
PR -> CS	0.703	0.492	0.491	0.000	8.390	0.15	0.501
PR -> MS	0.699	0.489	0.486	0.010	9.217	0.19	0.231
QI -> CS	0.717	0.514	0.512	0.002	7.498	0.16	0.142
QI -> MS	0.787	0.619	0.614	0.010	11.214	0.16	0.165

Where: PR = Product redesign, QI = Quality improvement, MS = Market share, CS = Customer satisfaction. r², = 0.19 = weak, r²,0.33 = moderate, r², 0.67 = substantial (Chin, 1998). Effect size (f²), 0.02 = small, 0.15 = moderate, while 0.35 = large. Predictive Relevance (Q²), > 0 = satisfactory (Hair, et al., 2019).

Source: SmartPLS 3.2.9 Output on Research Data, 2024.

Table 2 revealed significant paths between product redesign and customer satisfaction ($r = 0.703$; $r^2 = 0.492$, $t = 8.390$; $p < 0.05$), and product redesign and market share ($r = 0.699$; $r^2 = 0.489$, $t = 9.217$; $p < 0.05$). The results demonstrate that product redesign is a significant predictor of both customer satisfaction and market share, thus the hypotheses that product redesign has significant effect on customer satisfaction and market share were accepted. Therefore, manufacturing firms that invest in redesigning their products are likely to see improvements in customer satisfaction levels and increases in their market share. Further, observations show significant paths between quality improvement and customer satisfaction ($r = 0.717$; $r^2 = 0.514$, $t = 7.498$; $p < 0.05$), and v and market share ($r = 0.787$; $r^2 = 0.619$, $t = 11.214$; $p < 0.05$). These results highlight the pivotal role of quality improvement in driving customer satisfaction and expanding market share. Based on the results, the hypotheses that quality improvement has a significant effect on customer satisfaction and market share were accepted, suggesting that manufacturing firms focusing on quality are likely to achieve better overall performance and competitive positioning.

Discussion of Findings

The research hypotheses were tested using partial least squares – structural equation models. The results revealed that product redesign and quality improvement have significant effects on customer satisfaction and market share. This implies that

product redesign and quality improvement are crucial for enhancing customer satisfaction and gaining a competitive edge in the market. By introducing innovative and improved product features, businesses can better meet customer needs and preferences, thereby increasing customer loyalty and attracting new customers. Also, by delivering high-quality products or services, businesses can build strong brand reputation, reduce customer complaints, and foster customer trust, ultimately leading to increased market share.

These findings align with several studies. For example, Landais, Palanque and Sengupta (2020) found that product redesign led to a significant increase in customer satisfaction scores. Yu and Jain (2010) revealed that customers who experienced the redesigned product exhibited higher levels of satisfaction and loyalty compared to those using the previous version. Meng, Bai and He (2018) affirmed that service innovations incorporated into product design positively impacted customer satisfaction and perceived value.

Also, Oktavia, Mukti, and Liansari (2024) found a strong positive correlation between product quality and market share across various industries. Deming (2012) emphasised the link between quality and customer satisfaction, highlighting how satisfied customers contribute to market share growth through loyalty and positive word-of-mouth. Wahjoedi, Harjanti, and Rahayu (2022) found that quality improvement initiatives lead to increased brand equity and market share through improved brand reputation and customer perception.

While the majority of research supports the positive effect of quality on market share, some studies have found negating or insignificant results. Aaker and McGinnis (1986) found that the relationship between perceived quality and market share weakened in highly competitive markets. Zeithaml, Parasuraman, and Berry (1996) indicated that the impact of service quality on market share might vary depending on the specific industry and customer segment. Yum and Yoo (2023) found that service quality had a weak effect on customer loyalty and customer satisfaction in mobile social media. Also, Yi, Zhao and Li (2009) found that while some aspects of the redesign improved user experience, others inadvertently introduced complexities that led to dissatisfaction among a specific user group.

5 Conclusion and Recommendations

Conclusion

The study emphasises the significant role of process innovation in enhancing the performance of manufacturing firms in Nigeria, particularly in South-East Nigeria. Process innovation, which encompasses product redesign and quality improvement, was identified as a key driver of customer satisfaction and market share, measures of performance.

Process innovation plays a vital role in designing and optimising processes to meet industry-specific needs, leading to improved productivity, cost reduction, and enhanced product performance. Moreover, staying updated with the latest trends in process engineering is essential for Nigerian industries to remain competitive globally and achieve higher production rates and improved product quality. Process innovation has been highlighted as a critical factor for companies in Nigeria's

manufacturing and service sectors to enhance quality. Process innovation involves introducing new or improved business methods that influence the creation and marketability of products and services offered by companies. It is considered a prerequisite for higher quality and significantly contributes to companies' returns on innovation.

Recommendations

The study proffers the following recommendations:

- i. To achieve higher customer satisfaction, leading to increased brand loyalty and repeat business, manufacturing firms can leverage product redesign by prioritising the most critical customer-identified issues and actively involving them throughout the process to ensure the redesign meets their needs and expectations.
- ii. Manufacturing firms can leverage continuous quality improvement to solidify their market share by focusing on understanding customer expectations, incorporating high-quality materials and processes, implementing rigorous quality control, and consistently exceeding customer expectations, ultimately building brand trust and loyalty.

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