



Process Improvement and Performance of Manufacturing Firms in Kaduna State, Nigeria

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Abstract

Despite the growing awareness of the critical role that process improvement plays in organizational success, many manufacturing firms in developing economies, including Nigeria, struggle to effectively implement these strategies. The broad objective of this paper is to ascertain the relationship between process improvement and performance of manufacturing firms in Kaduna State, Nigeria. Specifically, the study seeks to examine the relationship between kaizen methodology and performance of the studied firms. The study was grounded on Complex Adaptive Systems (CAS) Theory, postulated by Holland (1995). Correlational research design was employed, a sample size of four-hundred (400) was obtained using Taro Yamane formular. The data collection instrument employed was the questionnaire while Pearson Product Moment Correlation was used to ascertain the relationship between the studied variables. Results obtained from a test of the hypothesis reveals a Pearson R coefficient of 0.762, indicating a strong positive relationship between kaizen methodology and performance of the studied firms. The P-value of 0.000 reveals that the result was statistically significant. Base on the findings, the researcher concluded that the relationship between process improvement and performance of the studied manufacturing firms in significant and positive. As a follow up to the conclusion of the study, the researcher recommended that the studied firms should strive towards continuous improvement of their manufacturing processes as it could directly impact performance level.

Key Words: *Process improvement, Kaizen methodology, performance, waste reduction*

Introduction

On a chronological basis, the rise of process improvement as a strategic direction in organization development has its origins in the post industrial times where efficiency and productivity became focal areas of business operations. Process improvement is a disciplined approach to making work processes more effective through the elimination of waste, action or inaction that appears to add no value to some process participants. In the early days, the idea got a lot of attention in the Western economies that happened in the automotive manufacturing industry when Toyota introduced lean production techniques. Adoption of the process improvement strategies over time has spread across the world that affects a broad spectrum of sectors (Brown & Mason, 2022). Process improvement has become a critical factor in the face of the ever-

challenging dynamic global economy. The world is being industrialized and diverse economies are continuously diversifying their economy and in doing so, companies must insist on continuous improvement strategies in order to deliver efficient operations, minimize wastes and maintain a competitive edge.

The need to adapt to the highly competitive global economy through operational excellence in their business operations has become a dire necessity in recent years among businesses in Nigeria. Process improvement strategies are slowly taking root in the Nigerian firms especially in the manufacturing industry with the aim of improving productivity, sustaining quality of the product, and cutting down costs. The manufacturing industry, which has been a major contributor to the gross domestic product (GDP) of the country, has its own challenges including poor

infrastructure, waste of materials involved, lack of uninterrupted power and excessive cost of production (Adetunji & Adewale, 2021). To conquer these obstacles Nigerian businesses are increasingly incorporating process improvement processes, such as process mapping, root cause and kaizen processes. Such tactics would enable companies to utilize the limited resources in the best ways possible and still stay competitive in local and international markets. Process improvement is of key consideration in the modern day business environment where organizations have to maintain or improve their performance and cut down wastage, stay competitive and dynamic. The rise of continuous demands of efficiency in operations has been aggravated by the trend in technological development with industries being revolutionized by these advancements. Such transformations have led to a paradigm shift on the way companies need to tackle both their internal processes and the manner they position themselves in the market. Businesses now have to constantly review and improve in their processes so that they can be competitive (Nwokolo, 2021).

Innovation and process improvement is not something optional to business, but a much needed innovative process in the manufacturing business that is very competitive in the global market. Technological changes are vulnerable in the facilitation of the process improvement. Implementation of automation technologies, as an example, enables organizations to limit the reliance on human effort, thus human error exploit, reduce wastage and increase production speeds. Automation increases the product quality and efficiency of operations, which play a critical role in firms that desire to satisfy the needs of the customers and remain ahead of their competitors. In the contemporary competitive international marketplace, companies that do not embrace effective process improvement practices run the risk of being displaced by the competitors. Firms which aim at ensuring that its manufacturing processes improve by the use of various technological advancements are better positioned to ensure that they achieve excellence as well as ensuring that there is a competitive advantage (Nguyen & Kim, 2023).

Although there has been increased awareness on how important process improvement is to the success of organizations, many firms in the developing economies, such as Nigeria, find it difficult to implement such a process successfully. Though the processes of the advanced economies have been highly optimized with the use of process improvement strategies to improve the efficiency of businesses, the target manufacturing firms are experiencing numerous processes that prevent them from utilizing the benefits of the deliberate application of process improvement strategies (Amadi

& Uche, 2023). Though scholars like Ogunleye (2020), Nwokolo (2021) and Adedeji and Olubunmi (2019) who carried out related studies in the Nigerian environment have recommended a full implementation of process improvement methodologies by manufacturing firms, most Nigerian manufacturing firms have not fully embraced this idea. This gives credence to carrying out a study of this nature in selected manufacturing firms in Kaduna State, Nigeria. The broad objective of this study is to ascertain the relationship between process improvement and performance of manufacturing firms in Kaduna State, Nigeria. Specifically, this study seeks to determine the relationship between kaizen methodology and organizational performance.

Review of Related Literature

Conceptual Review

Process Improvement

Process improvement is a set of methods systematically aimed at enhancing and streamlining organization processes in a bid to deliver improved performance results. It revolves around pinpointing the existing areas of inefficiencies, optimising work processes, and initiating strategic moves to enhance productivity, lessen the costs involved, and enhance the product or service quality on offer. By extension, the thing that process improvements fundamentally do is that they help create value by eliminating waste, reducing redundancies, and fostering the optimal use of resources (Alves, 2023). Process improvement also relies on one of the basic functions of process improvement, which is process mapping where the current work flow is documented to provide a good understanding of the organisation processes. The technique helps in isolating the areas of bottlenecks, duplication and waste in the system. According to visualizing the process, decision-makers operate to identify inefficiencies better and find optimization areas. This is the knowledge that can form the basis of making any changes that would result in more efficient and streamlined operations (Singh & Sharma, 2022).

Root cause analysis is another methodology of process improvement. This method aims at finding the root cause of a process inefficiency or flaws instead of curbing the symptoms. Root cause analysis entails the use of several tools (including 5 Whys and Fishbone Diagrams), which assist companies in researching the underlying causes of process complications and taking long-term corrective actions (Lee, 2022). Improvements in efficiency and quality can become more permanent by dealing with the root causes. A common approach to continuous improvement that has gained a lot of popularity is Kaizen in which one focuses on small changes to achieve great improvements as time goes by. Kaizen also creates an

atmosphere in an organization where employees at every echelon take the initiative to find and address issues. According to this methodology, the key thought is that gradual yet coherent alterations bring significant improvements in productivity and quality in the long run (Jang & Lee, 2023). Kaizen is in line with lean concepts that deal with minimizing wastage and maximizing value addition in an organization.

Performance metrics are also important to performance improvement to track progress, and gauge success. Such measures may incorporate the important performance measures (KPIs) including cycle time, error rates, and resource use. Monitoring such measures, an organization can gauge how successful improvements are and make evidence-based decisions to improve processes further. Significant monitoring keeps the spirit of constant change, and it keeps the organization flexible to render services in the changing market conditions (Odeyemi & Adebayo, 2021). The crux of this study is the kaizen methodology of process improvement..

Kaizen Methodology

Kaizen methodology focuses on change that aims at the continuous and gradual betterment. Kaizen refers to a philosophy that involves any betterment or rectification that leads to an improvement in productivity of an organization (Fariba & Ziba, 2013). Kaizen is a very strong concept forming most of the Japanese management styles (JMS) that have successfully transformed the Japanese industry of manufacturing and business organizations in Europe and America (Zailani, Shaharudin, & Saw, 2015). Kaizen focuses on the detection and eradication of losses that take place within the production process within an organization (Alves, 2014). Kaizen manufacturing refers to the simple and ordinary improvements and refinements that should be made on key end to end organisational transformation processes so as to serve and promote the entire continuous improvement strategy of an organisation. Demis, Teklegeorgis and Jemila (2020) also provided a few fundamental content of kaizen management practices that include; Total Quality Management (TQM), Total Productive Maintenance (TPM), Value Stream Mapping (VSM), Kanban, five S, kaizen event, suggestion system, five whys, error proofing and Toyota production system.

Performance

Performance in an organizational setting is the realization of the goals and objectives that have been set and are usually estimated using several key performance indicators (KPIs). It includes extremely many aspects that may comprise productivity, profitability, market share, level of customer satisfaction, and employee engagement. A sound

performance level is a sign that the organization makes effective use of resources available to deliver the desired results and address situations within and outside the organization (Kaplan & Norton, 2023). Organizational performance is multi-dimensional that is determined by many important factors. Internal procedures are also a major factor because efficiency and effectiveness are reinforced by streamlined and stream-lined workflows. As an example, companies using the process improvement methods can experience significant changes in their operational productivity because of the elimination of wastes and increased productivity (Womack & Jones, 2024). The latter can be done by prioritizing the optimization of the processes so that the firms could eliminate inefficiencies that undermine performance thus promoting the maximization of output and overall effectiveness. Another factor which is decisive in determining performance is the quality of goods or services. Organisations that focus on quality management are in a better position to address the expectations of the customer and increase satisfaction. This, in its turn, may result in higher customer loyalty and repeat business, without which no long-term success is possible (Deming, 2023). The component of material wastes reduction was the performance measurements used in this study.

Waste Reduction

The concept of material waste reduction relates to key economic activities involved in modern manufacturing industry as a way of reducing waste produced in the manufacturing procedures. The importance of waste minimization has become increasingly evident in more recent years, especially in the context of lean manufacturing that draws its focus to removing waste of any kind, be it overproduction, waiting, excess inventory, and/or defective products (Womack & Jones, 2024). Minimizing materials wastage does not only lead to environmental sustainability, but also efficiency and profitability of the firms. Adoption of the majority of techniques is also critical to effective reduction of material wastes. One of the best known approaches includes the just-in-time (JIT) production. This strategy shores that materials and components will be created or provided on demands only hence cutting down unnecessary inventory that can be stored and avoid costs (Ohno, 2023). Also to be used is the concept of recycling which is reprocessing resource material that would have been considered as waste material. By establishing recycling programs, organizations will have an opportunity not only to decrease the amount of waste needing to be placed in landfills but also to recover valuable materials, which can be used in the production process once again (Smith, 2023). The next innovative solution to waste reduction is the usage of alternative materials. Deciding to utilize more

environmentally-friendly or easily recycled material is also a method of cutting down on the waste created by companies, in addition to advancing their sustainability reputation (Johnson & Roberts, 2024). Companies that specialize in the reduction of material waste also have an increase of resource efficiency. Through material optimization, organizations are in a position to reduce the cost of production and become more productive. Investigations show that manufacturers who have been dealing with waste reducing strategies have reported high saving costs that have seen them become very competitive in the market (Taylor, 2023).

Theoretical Framework

The present study was based on a theory known as Complex Adaptive Systems (CAS) Theory by Holland, 1995. The theory provided that organizations have interrelated parts whose interactions were complex and dynamic and which were responsive to changes in the environment. This theory is especially needed to comprehend operations of organizations in non-linear and unpredictable environments where they can be affected by other factors like, technology, market trends, and consumer habits. In a business perspective, CAS Theory indicates that an organization operates as a dynamic entity, considering that an organization has to respond to external changes, as well as to the internal challenges. Compared with more traditional models, the CAS Theory does not prioritize the assessment of organizations as arrays of processes and linear systems. The fact that there is some interconnectedness means that there is a possibility that when one area gets improved upon there can be a series of knock on effects throughout the organization (Gharajedaghi, 2011). As an example, a technological innovation in manufacturing can not only increase efficiency in the production process but can also affect the distribution logistical process, labour and relationships to the customers. The Complex Adaptive Systems Theory is an elaborate theory of comprehending the dynamic process of organizations. It focuses on the significance of adaptability, emergent behaviour and connectedness and provides a lot of useful information on how process improvement is able to transform the performance of organizations. In this way, by using this theoretical perspective we will focus this paper to examine the complexities relating to process improvement strategies and performance of the manufacturing firms that were studied.

Empirical Review

In a quantitative study by Ogunleye (2020), Process Improvement in the Manufacturing Industries in Lagos States, Nigeria, the researcher used structured questions and questionnaires that were administered to 150 manufacturing firms in Lagos State through stratified random sampling to guarantee sectorical diversity.

Analysis of data through descriptive statistics and regression analysis, that demonstrate that a significant increase in productivity and efficiency occurs due to improvement of the process, and firms implementing waste-reduction strategies and quality management systems report an 25-percent increase in output.

In another research work, Nwokolo (2021) examined the subject of Process improvement and Operational Performance in the context of manufacturing firms in Enugu State, in Nigeria. They used a mixed approach where they used a structured questionnaire in surveying 120 firms and complemented their results through interviews with key managers. The findings were indicative of the extent to which there was a relationship between process improvement and enhanced performance to the operations, especially in the areas of shortened lead times and waste.

Adedeji and Olubunmi (2019) examined Process Improvement and Organizational Performance and its application in case of Nigerian small and medium-sized enterprises (SMEs). They conducted a cross-sectional survey of 100 SMEs in Oyo State and applied quantitative and qualitative method in the process of data collection. Statistical analysis has pointed out that the companies that are using effective methods to minimize waste have recorded improved performance indicators, such as improved customer satisfaction and less cost operations.

Process Improvement in the Service Industry A Study of Its Adoption and Effectiveness is a study conceived by Hiarini and Vagnoni (2016) in Italy. The qualitative methodology was used with 20 service firms being interviewed and secondary data analyzed. The results obtained indicated that process improvement leads to great improvements in services providing by streamlining operations as well as enhancing customer satisfaction.

In the same manner, Womack and Jones (2017) examined The Lean Startup: How Today Entrepreneurs Use Continuous Process Improvement to Create Radically Successful Businesses. In this study, the longitudinal case study approach was used on a number of startups in the United States. The conclusion was that startups that employ process improvement have a shortened product-market fit cycle and that it increases customer feedback loops, making business performance better.

Gap in Knowledge

A review of extant literature shows that none of the empirically reviewed examined process improvement as it relates to performance of manufacturing firms in Kaduna State, Nigeria.

Methodology

The study took correlational research approach because it aims at determining the relationship between the variables under study. Employees of four manufacturing companies in Kaduna State were utilized (Northern Noodles Ltd (275), Olam Poultry and Animal Feed (243), Sunglass Ltd (354), and Nigerian Breweries Malting Plant (372)) resulting in the demanded total of 1,244 employees. With a margin of error of 5%, sample size of 400 was arrived at using Taro Yamane formula, and Bowley (1926) formula was used to proportionately allocate questionnaires among firms Northern Noodles Ltd (88), Olam Poultry and Animal Feed (78), Sunglass Ltd (114), and Nigerian Breweries Malting Plant (120). A formulated

questionnaire employed was fulfilled through a structured questionnaire using a five point likert scale (SA-5, A-4, UD-3, D-2, SD-1). Face and content aspects of validity were checked and Cronbach alpha reliability test produced results of 0.741 which is higher than the set criterion of 0.70, thus internal consistency was established. The reliability result was indicated in Table 1 where that is, Cronbach Alpha= 0.741, number of items= 10, computed using SPSS version 22. Lastly, the correlation between the variables that this study tries to establish was analyzed using Pearson Product Moment Correlation Coefficient.

Data Presentation and Analysis

Data Presentation

Table 1: Returned and Unreturned Questionnaire

Analysis of Returned and Unreturned Questionnaire

Returned (Valid)	378	94.5%
Unreturned	22	05.5%
Total questionnaire administered	400	100%

Source: Field Survey, 2025

The above table indicates that three hundred and seventy-eight (378) copies of the questionnaire, signifying 94.5 percent of the four hundred (400) copies of the questionnaire were returned validly, and

22 signifying 5.5 percent were not returned. Based on that, a sample size of three hundred and seventy eight (378) copies of the questionnaire was used in the analysis.

Table 2: Descriptive Statistics for Kaizen Methodology

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Q1	378	1.00	5.00	3.1000	1.32637
Q2	378	1.00	5.00	3.2000	1.41152
Q3	378	1.00	5.00	3.2000	1.26231
Q4	378	2.00	5.00	3.3000	.96244
Q5	378	1.00	5.00	3.4000	1.21223
Valid N (listwise)	378				

Source: Field Survey, 2025

The analysis above reveals that mean scores for questions bothering on kaizen methodology are >2.5. This makes the responses adequate for the study.

Table 3: Descriptive Statistics for Organizational Performance (Waste Reduction)

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Q1	378	1.00	5.00	2.6521	1.21627
Q2	378	1.00	5.00	3.4222	1.41353
Q3	378	1.00	5.00	3.5027	1.27621
Q4	378	1.00	5.00	3.5213	.95254
Q5	378	1.00	5.00	3.3146	1.07244
Valid N (listwise)	378				

Source: Field Survey, 2025

The analysis above reveals that mean scores for questions bothering on organizational performance (waste reduction) are >2.5. This makes the responses adequate for the study.

Table 4: Correlations

		Kaizen Methodology	Org. Performance
Kaizen Methodology	Pearson Correlation	1	762**
	Sig. (2-tailed)		.000
	N	378	378
Org. Performance	Pearson Correlation	762**	1
	Sig. (2-tailed)	.000	
	N	378	378

****.** Correlation is significant at the 0.05 level (2-tailed).

Source: Field Survey 2025

The result shown in the table 4 above demonstrated that the Pearson R coefficient is 0.762, which denotes strong positive correlation between the kaizen methodology and firm performance of the companies investigated. The P-value of 0.000 indicates that the difference is significant with the P- value of less than 0.05 being an indication of a very low probability that the difference is favourable.

Discussion of Findings

The results of a test of the hypothesis indicated that there is a significant and strong positive relationship between kaizen methodology and performance of the manufacturing firms under consideration. This is in line with the study by Ogunleye (2020) who carried out a quantitative research entitled Process Improvement in Nigerian Manufacturing Industries in Lagos State, Nigeria. The results of the study reveal that process improvement aided by an application of kaizen approach has been found to contribute immensely to productivity and efficiency. The study Nwokolo (2021) arguing that Process Improvement and Operational Performance in Nigeria could not be left out in view of the findings in a test of the hypothesis. The findings were that an effective process improvement led to better operational performance, especially in realisation of shorter lead times and elimination of waste. The fact that there is a correlation between Process Improvement and Organizational Performance, as studied by Adedeji and Olubunmi (2019) in context of the Nigerian small and medium-sized enterprises (SMEs) also complies with the results of the hypothesis test. The research results found that companies with sound and effective waste reduction methods recorded better business performance indicators, such as

Test of Hypothesis

H₀ The relationship between kaizen methodology and performance of manufacturing firms in Kaduna State, Nigeria is not significant and positive.

customer satisfaction and less cost of operation. The study of Chiarini and Vagnoni (2016) conducted in Italy is also consistent with the conclusion made based on a test of the hypothesis. The study results indicated that the process improvement process using an approach that adopts the kaizen methodology is the method of significantly improving delivery of services due to process streamlining and increased levels of customer satisfaction.

Summary, Conclusion and Recommendation

Summary

The results taken in a test of the hypothesis show a strong positive relationship between the kaizen methodology and performance of the studied firms with a Pearson R coefficient of 0.762. The P-value holds a value of 0.000 thus indicating that the result is statistically significant.

Conclusion

Based on the above, the study holds that the connection between process improvement and performance of the manufacturing firms under examinations to be significant and positive. That is, material waste of the reviewed firms is likely to be reduced by adoption of a continuous improvement technique such as the kaizen methodology. This in turn has the potential to affect positively the general level of performance in these firms.

Recommendation

Following the conclusion of the study, the researcher will recommend that the firms which were studied should seek improvement in their manufacturing activities continuously because it may directly influence the level of performance.

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