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The Strategic JOURNAL of Business & Change MANAGEMENT
ISSN: 2312-9492 www.strategicjournals.com
Vol. 11, Iss.3, pp 691 – 708, October 23, 2024. www.strategicjournals.com, © Strategic Journals

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Accepted: October 11, 2024

DOI: http://dx.doi.org/10.61426/sjbcm.v11i4.3112

ABSTRACT

*Food manufacturing firms in Kenya are currently contending with inefficient processes that have caused a rise in production costs. The current study assessed the effect of process optimization within business process re-engineering on the production performance of food manufacturing firms in Nakuru County, Kenya. The study was anchored on absorptive capacity theory. A correlational research design was adopted. The study's target population was the 13 food manufacturing firms in Nakuru County. Data was collected by questionnaire and analyzed through descriptive and inferential statistical methods. Statistical Packages for Social Sciences (SPSS) aided data analysis. According to the descriptive findings, the manufacturing firms' production performance was affected by the process optimization. As per the correlation analysis results, the correlation coefficient was (r=0.528**; p=0.000). This implies a significant relationship, hence process optimization affects production performance. The regression analysis findings revealed R-squared value of 0.279, indicating that 27.9% of the variability in production performance was explained by process optimization. In conclusion, the process optimization streamlines manufacturing activities and enhances operational efficiency. The study recommends that food manufacturing firms integrate process optimization into their overarching operational strategy. The study provides valuable insights into enhancing manufacturing processes for improved production efficiency. It contributes to academic understanding and offers practical solutions for optimizing performance in the manufacturing industry.*

Key Words: *Process Optimization, Business Process Re-engineering, Production Performance, Food Manufacturing Firms*

CITATION: Mutua, J. M., Mong'are, O., & Gitachu, G. (2024). Effect of process optimization on production performance of food manufacturing firms in Nakuru County, Kenya. *The Strategic Journal of Business & Change Management,* 11 (4), 691 – 708. http://dx.doi.Org/10.61426/Sjbcm.v11i4.3112

BACKGROUND TO THE STUDY

Process optimization within business process re-engineering enhances workflows to boost efficiency (Truong, Lê, Paja, & Giorgini, 2021). It emphasizes streamlining operations by minimizing waste, improving speed, and maximizing resource utilization. Therefore, this approach enables businesses to adapt to changes while maintaining high levels of operational efficiency. Additionally, process optimization eliminates unnecessary processes, thus reducing waste and promoting efficient use of organizational resources (Abd-Rahman, Mohamad & Abdul Rahman, 2021). This allows companies to achieve streamlined operations and enhance product quality. In turn, the optimized processes contributes to increased profitability and plays a crucial role in enhancing organizational performance and market competitiveness.

Globally, the adoption of business process re-engineering has resulted in improved efficiency, cost reduction, and increased competitiveness among manufacturing firms (Harlan, Gow, Kornstädt, Alderson, & Lustig, 2023). BPR, particularly process optimization has been widely applied by manufacturing firms in the United States of America to streamline production processes and increase the competitiveness worldwide (Truong et al., 2021). Food manufacturing firms such as Kraft Foods, Nestle, and PepsiCo have implemented business process re-engineering (Massaro & Galiano, 2020). PepsiCo streamlined its supply chain by minimizing Stock Keeping Units (SKUs) which resulted in operational efficiency and cost savings. This is realized through the optimization and streamlining of production processes, along with cost reduction efforts, ultimately enhancing their competitive stance within an ever-evolving global market. In the UK context, Garcia-Garcia, Coulthard, Jagtap, Afy-Shararah, Patsavellas, and Salonitis (2021) noted that companies like Premier Foods have applied technology for automation and lean manufacturing to enhance production efficiency. McCain Foods, on the other hand, uses advanced planning systems to boost flexibility and adapt to market changes.

In the African region, manufacturing enterprises adopt business process re-engineering to achieve sustainable growth and ensure competitiveness in the long run (Olajide & Okunbanjo, 2020). While this approach has been embraced by most manufacturing firms in Africa, its execution has been lacking in effectively addressing evolving business conditions and shifting customer demands. As noted by Awolusi and Atiku (2019), these firms might not have embraced the most current technology and innovation necessary for executing the essential organizational transformations. Despite the inherent challenges, the adoption of Business Process Re-engineering has seen an increase among manufacturing companies in Nigeria in recent times (Olajide & Okunbanjo, 2020). Manufacturing firms in the country such as Dangote Group, Unilever, and Procter & Gamble are undertaking radical business process redesigning to reduce inefficiencies and stabilize production processes. Process automation and the use of computerized systems have been vital in cutting operational costs among firms (Ofoegbu, 2022). Implementation of BPR by manufacturing companies in Nigeria has improved their performance but they still must overcome the challenges of inadequate funding and technology infrastructure.

In Kenya, the manufacturing sector is a major contributor to the Country's GDP (Ongeri, Magutu, & Litondo, 2020). The sector is also a significant source of export earnings through a range of exportable goods such as textiles and processed foods. Nevertheless, manufacturing firms in Kenya have encountered recent obstacles such as limited value addition and elevated production expenses. As per a report by the Kenya National Bureau of Statistics (KNBS, 2020), the manufacturing sector witnessed a decline in its growth rate from 4.3% to 3.2% between 2018 and 2019. Moreover, its contribution to the GDP decreased from 9.3% in 2016 to 7.2% in 2021 (KNBS, 2022), indicating a deterioration in the performance of Kenya's manufacturing sector. The food manufacturing sub-sector is responsible for producing a wide range of food products that are consumed in Kenya (Ogada, 2017). According to the Kenya Association of Manufacturers (KAM), the food sector is the largest manufacturing sub-sector in Kenya, contributing about 25% of total manufacturing value-added. Despite this contribution, the industry has encountered challenges such as high production costs and technology which affect the performance of individual firms. Many food manufacturers in Kenya still struggle with aligning their business processes to accommodate the utilization of new technology. Food manufacturing firms such as Bidco Africa, Kenchic, and East African Breweries Limited (EABL) among others have embraced business process re-engineering (Kithinji, Rotich, & Kihara, 2021). They have employed new technologies and optimized their supply chains to reduce costs improve efficiency and enhance customer satisfaction. However, some food companies have performed poorly and collapsed in recent times due to the inability to adapt to the changing market conditions (Kithinji et al., 2021). Recently, companies such as Mumias Sugar Company, Cadbury Kenya, Alpha Grain Millers, and Kiambu Juice Company have experienced collapse, potentially as a result of their failure to adapt to evolving market demands. This could also be linked to inefficient operations, leading to unsustainable losses. The inability to adapt to changes in the market and technological advancements makes firms less competitive and ultimately jeopardizes their survival and sustainability. Inefficient processes cause low product quality, displeased customers, market share loss, revenue decline, and poor performance (Njuguna & Wanjohi, 2021).

Food manufacturing firms in Nakuru County, form a robust sector that significantly contributes to the region's economy and agricultural production (Adhiambo & Machoka, 2023). Among the notable food manufacturing entities, Nakuru hosts prominent companies such as Menengai Oil Refineries, specializing in the production of various edible oils. Another key player, Njoro Canning Factory, focuses on the canning and preservation of a variety of food products, including fruits and vegetables. Additionally, there are flour milling companies such as Premier Flour Mills, producing a wide array of flour products that serve both local and regional markets (Onyiego & Osoro, 2022). These food manufacturing firms in Nakuru County play a pivotal role in processing raw agricultural produce into value-added food products, generating employment opportunities, boosting the agricultural sector, and catering to the nutritional needs of the local and wider population.

Statement of the Problem

Process optimization within business process re-engineering encompasses redesigning and optimizing organizational processes to improve efficiency, product quality, production time management, and value for customers (Hashem, 2020). It enables manufacturing firms to streamline workflows and processes among various activities, contributing to increased production performance. However, manufacturing firms in Kenya are experiencing challenges in production performance. As indicated in a report from the Association of Manufacturers (KAM, 2021), manufacturing companies are currently contending with challenges related to insufficient value addition and elevated production costs, which have significantly impacted their production performance. As per report by Kenya National Bureau of Statistics (KNBS, 2020), the manufacturing sector experienced a reduction in its growth rate, dropping from 4.3% in 2018 to 3.2% in 2019. Additionally, KNBS (2022) reported that the sector's contribution to the GDP has been declining, decreasing from 9.3% in 2016 to 7.2% in 2021. In particular, the contribution to GDP was 7.9%, 7.6%, and 7.2% in 2019, 2020, and 2021 respectively. Additionally, food manufacturing firms including Cadbury Kenya, Alpha Grain Millers, Kiambu Juice Company have recently encountered inefficient operations and unsustainable losses and collapsed as a result (KAM, 2021). Food manufacturing firms face challenges in achieving their desired production performance, potentially stemming from inefficiencies and suboptimal operations. The current scenario might be associated with the limited implementation of process optimization within business process re-engineering. Furthermore, prior research works have not comprehensively addressed the business process re-engineering within the manufacturing firms. In the work of Njuguna and Wanjohi (2021), the effect of business process reengineering on agro-processing firms' performance in Nairobi City County was examined. The results underscored the importance of effective knowledge management and organizational restructuring in influencing the performance of these agro-processing firms. Similarly, Ongeri, Magutu, and Litondo (2020) evaluated the relationship between the business process re-engineering strategy and the food manufacturing companies' performance. The findings revealed that BPR prototypes, management of re-engineered processes, clear BPR definition, and vision influenced performance. Olajide and Okunbanjo (2020) examined the effects of business process reengineering on organizational performance in the food and beverage industry in Nigeria. The findings established that organizational resources, innovative thinking, and functional processes affects organizational performance. These studies provide valuable insights into the impact of BPR on firm performance. However, they insufficiently address the aspects of optimization of processes, which are critical components in maximizing operational efficiencies. To fill the gaps, the current study assessed the effect of process optimization within business process reengineering and its effect on the production performance of food manufacturing firms in Nakuru County, Kenya.

Objective of the Study

The objective of the study was to establish the effect of process optimization on production performance of food manufacturing firms in Nakuru County.

Research Hypothesis

H_{01}: Process optimization has no statistically significant effect on production performance of food manufacturing firms in Nakuru County.

LITERATURE REVIEW

This section outlines the theoretical framework, empirical literature review and conceptual framework.

Theoretical Framework

The study was anchored on absorptive capacity theory. Absorptive Capacity Theory was developed by Cohen and Levinthal (1990). The theory describes the ability of an organization to assimilate and use knowledge from the environment in which it operates. The core principle of absorptive capacity theory lies in the notion that a company's capability to innovate, enhance processes, elevate products, and refine services is contingent upon its capacity to acquire, integrate, and apply fresh knowledge (Howell, 2020). Knowledge is acquired by identifying and accessing external sources of information, and assimilation involves interpreting and comprehending this knowledge within the context of the organization's operations (Abou-Foul, Ruiz-Alba, & López-Tenorio, 2023). Application pertains to using the newly obtained knowledge to devise novel products and processes. Within the framework of absorptive capacity theory, the acquisition and effective utilization of novel knowledge hinge on the foundation of prior knowledge and the ability to recognize and respond to emerging information (Howell, 2020). Hence, enterprises with a robust foundation of prior knowledge are better positioned to absorb new information as they possess a deeper understanding of how it aligns with the organization's systems and operations. Furthermore, companies that can swiftly adapt to changes in the environment are equipped to identify and integrate novel knowledge (Madsen & Buhalis, 2022). Absorptive capacity encompasses both potential and realized capacities. Potential absorptive capacity signifies the ability to acquire and integrate, while realized absorptive capacity embodies the ability to apply knowledge to generate fresh products (Valentim, Lisboa, & Franco, 2016). Consequently, organizations rely on both these absorptive capacities to foster innovation and enhance performance.

Absorptive capacity theory relates to the process optimization in BPR as it focuses on the acquisition, assimilation, and application of new knowledge from the environment. This knowledge can be applied to optimize production processes to reduce waste and improve efficiency. Through optimization of processes, a manufacturing firm can use the absorptive capacity theory to ensure effective application of new knowledge to drive production performance improvements. Knowledge transfer is associated with complexities and absorptive capacity theory does not provide sufficient frameworks for overcoming these complexities. Innovation requires a clear combination, absorption of external and creation of internal knowledge creation though this is scantly addressed in the absorptive capacity theory. The theory may also place excessive emphasis on prior related knowledge, potentially neglecting the benefits of new, unrelated knowledge. Furthermore, it can be difficult to measure and implement absorptive capacity, which leads to challenges in practical application and inconsistent results across different contexts.

Empirical Literature Review

This section outlines the discussions on process optimization within the business process reengineering in connection to production performance. Further, the past related empirical have been reviewed in this section. Process optimization is an important element of business process re-engineering that focuses on reducing costs, eliminates wastes and improves the quality of products (Hashem, 2020). It aligns business processes with the strategic objectives of the firm to achieve competitive advantage and better performance. According to Al-Shammari (2023) process optimization involves identification of bottlenecks, inefficiencies, and areas of waste that are impacting the production performance of the organization. Based on the process analysis, the production processes by food firms are redesigned through simplification, elimination of non-value-added activities, and automation of specific tasks as per the requirements (Shirinkina, & Romansky, 2020). Process monitoring is an important aspect of process optimization in business process re-engineering (Garcia-Garcia et al., 2021). It enables manufacturing firms to ensure that the restructured process meets the intended purpose by delivering the desired outcomes in terms of efficiency. Hashem (2020) suggested that it is paramount for the firms to track and analyze the performance of new production and service provision services to ensure that they are meeting the overall production performance objectives. However, poor process monitoring lead to inefficiencies that cause bottlenecks and significant errors which contribute to decreased productivity, higher costs, and lower customer satisfaction. Process automation plays an important role in business process re-engineering among the food manufacturing firms by ensuring efficiency and effectiveness.

Automation reduces the time and effort required to complete tasks contributing to increased efficiency, faster turnaround times, and lower costs (Abd-Rahman et al., 2021). This promotes quality and higher customer satisfaction. The capability of manufacturing firms to adapt favorably to evolving customer requirements significantly influences their operational effectiveness. Tayyab, Jemai, Lim, and Sarkar (2020) contend that process automation is vital in achieving the above objective since it modifies and adapts the process to changing business requirements and customer needs. Moreover, the process control loops monitor the critical parameters of the production process to maintain the desired level of cost and efficiency. According to Polim and Lestari (2023) the sustainability of food manufacturing firms is determined by the ability to maintain appropriate variances in material usage and the associated costs. Process control loops are crucial in maintaining right variances. It minimizes process variability through adjusting the process variable to maintain consistency in material usage and cost control. This reduces waste and rework thereby increasing process efficiency. Palanisamy, Chelliah,and Muthuveloo (2021) undertook a study on optimization of organizational performance among Malaysian manufacturing SMEs. An examination of 157 responses obtained from a cross-sectional survey conducted among Malaysian manufacturing SMEs was conducted, analyzed using SPSS software version 24 and Partial Least Squares-Structural Equation Modeling (PLS-SEM). The results highlight that while talent retention and talent displacement significantly impact organizational performance, no influence was observed concerning talent harnessing and talent acquisition on organizational performance.

Adeodu, Kanakana-Katumba, and Rendani (2021) researched on implementation of lean six sigma for production process optimization in a paper production company in Nigeria. The application of lean six sigma tools revealed that the current production performance was below standard and generating excessive manufacturing waste, including low process cycle efficiency (23.4%), low talk time (4.11 sec), extended lead time (43200 sec), high non-conformance to six sigma values, elevated downtime (32.64%), and excessive labor flow (33). However, after implementing the lean six sigma tools for a specific period, substantial improvements were observed across all the considered parameters within the production line. Kering, Kilika, and Njuguna (2020) conducted a study on operational processes and performance of small and medium-sized manufacturing firms in Kenya. The study's findings indicated that strategy processes and competitive priorities significantly affected firm performance, as evidenced by the regression coefficients ($\beta = 0.5542$, $p < 0.05$) and ($\beta = 0.4201$, $p < 0.05$) associated with them. This implies a strong connection between these factors and manufacturing firms' performance. The study's overall outcomes indicated that about 37% of the performance changes in the firm could be attributed to operational processes. The operational processes encompassed strategy processes, competitive priorities, and manufacturing strategy, though the explanation of process optimization was lacking. Additionally, the study highlighted that the relationship between manufacturing strategy and performance was not statistically significant, indicating that the intrinsic processes did not impact performance. The present study addressed these gaps by delving into process optimization, thoroughly discussing aspects like process redesigning, process monitoring, process automation, and the implementation of process control loops. Murima (2017) assessed the role of business process re-engineering as a tool for gaining competitive advantage among cement manufacturing firms in Kenya. The results indicated that technology, employee competencies, organizational strategy, organizational structure, and culture collectively shape competitive advantage. However, the study was confined to descriptive analysis, and the link between business process re-engineering and competitive advantage wasn't established. Furthermore, the study variables weren't clear indicators of business process re-engineering. The current study employed both descriptive and inferential analyses, particularly regression analysis, to elucidate the relationship between business process re-engineering and food manufacturing firms' production performance.

Production performance of manufacturing firms is indicated by cost, quality and time (Gupta, Kumar, & Wasan, 2021). Cost parameter determines the production system's efficiency on the basis of cost control and cost-effectiveness. Firms analyze the material, labor and overhead costs and strive to minimize them to promote efficiency. Strategic cost analysis as well as process optimization identify opportunities for cost reduction and cost optimization (Björkdahl, 2020). Quality performance determines the ability of the products to conform to the required specifications and standards. Time expresses the speed at which the process of production operates where a shorter cycle time demonstrates higher efficiency and faster production, and better performance. Production performance also expresses the ability of the production process to respond to changes in demand, product variations, and other market requirements (Ganbold, Matsui, & Rotaru, 2021). Performance in manufacturing firms is marked by the integration of efficient processes, strategic resource allocation, the production of outputs of superior quality, and the consistent achievement or surpassing of predetermined targets (Björkdahl, 2020). A thorough assessment of performance in these firms includes the examination of key indicators like productivity, efficiency, and cost-effectiveness. The critical roles of monitoring and improving performance are integral in guaranteeing the competitiveness, profitability, and sustainability of production firms amid the dynamic business landscape. Therefore, ongoing initiatives to enhance processes, optimize resource utilization, and uphold high-quality standards significantly contribute to the overall success and resilience of production firms in today's evolving markets (Gupta et al., 2021).

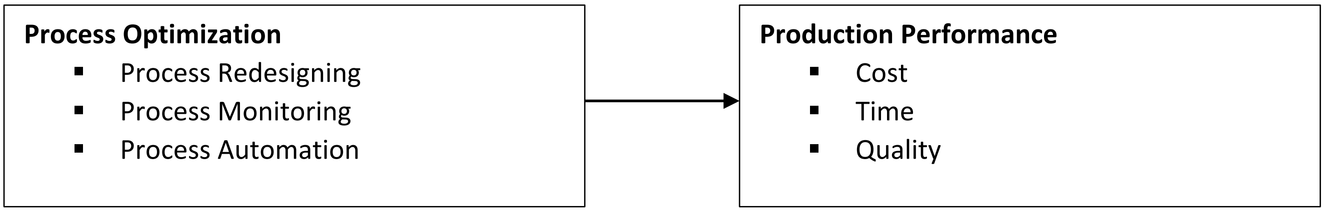
In Jordan, Khashman (2019) researched the effect of BPR on organizational performance. According to the findings, BPR, strategic alignment and ICT affected the performance of manufacturing firms. Shahul-Hameed et al (2022) examined the impact of BPR on organizational performance of manufacturing firms during the coronavirus pandemic. Based on the findings, top management commitment, organizational readiness for change, information technology capabilities and people management affected performance. Kithinji, Rotich, and Kihara (2021) assessed the association between implementation of a re-engineering strategy on manufacturing firms' performance. The study focused on a target population of 708 large manufacturing firms, all of which were registered with the Kenya Association of Manufacturers. A subset of 249 firms was selected for the study using a simple random sampling approach. Data collection was executed through the utilization of a questionnaire. The findings of the study showed that the adoption of a re-engineering strategy influence on the manufacturing firms' performance significantly. Moreover, the study highlighted that the connection between the re-engineering strategy and firm performance was influenced by the prevailing organizational culture within these manufacturing firms. The study's scope was confined to exploring the outcomes associated with the adoption of the re-engineering strategy, which encompassed enhancements in output quality, cost reduction, and service delivery improvements. However, the current study focused on the core components of business process re-engineering, which encompassed strategic cost analysis and the optimization of processes. Awolusi and Atiku (2019) conducted a study on the relationship between business process re-engineering and Nigerian oil and gas industry's profitability. The research utilized both exploratory and confirmatory factor analysis, along with the application of Structural Equation Modeling (SEM). The research findings showed that there is a positive effect of organizational structure and IT Infrastructures on profitability. However, management competence and support had an insignificant effect on profitability. Despite business process re-engineering being the predictor variable, the study focused more on organizational structure, management support and management competence.

Mohat, Munyoki, and Cheluget, (2020) assessed the relationship between business process re-engineering practices and performance of the telecommunication sector in Kenya. The research employed a cross-sectional research design and focused on 35 telecommunications companies in Kenya. Data collection was conducted through structured questionnaires, and the subsequent data analysis involved the utilization of both descriptive and inferential statistical methods. The study results indicated that within the telecommunications sector, various Business

Process Re-engineering (BPR) strategies were employed. These strategies encompassed the adoption of teleconferencing technologies, the implementation of computerized performance measurement and reporting systems, the establishment of shared information technology infrastructure, and the integration of a computerized procurement system. The outcomes of the study showed that the implementation of BPR strategies resulted in increased efficiency in customer service provision, an enhancement in product quality, and a reduction in non-value-adding processes. As a cumulative effect, these improvements contributed to achieving the desired level of performance. Ongeri, Magutu, and Litondo (2020) evaluated the relationship between the business process re-engineering strategy and the food manufacturing companies' performance. The study utilized a cross-sectional survey design, and structured questionnaires were employed to gather data from participants. The findings unveiled that 63.9% of the variations in overall firm performance were accounted for by factors such as resources mobilization, sponsorship and commitment, analytical processes selection, BPR prototypes, management of re-engineered processes, clear BPR definition, and vision. This highlights the significant relationship between the BPR strategy and performance.

Conceptual Framework

Conceptual framework illustrates research variables and their relationship (Hazen, Russo, Confente, & Pellathy, 2021). Figure 1 shows the association between process optimization (Independent Variable) and food manufacturing firms' production performance (Dependent Variable).



Independent Variables **Dependent Variable**

Figure 1: Conceptual Framework

METHODOLOGY

Research methodology outlines the research design, location of the study, population, sampling procedure and sample size, instrumentation, data collection procedure, data analysis and presentation.

Research Design: Research design is a structured framework that harmoniously integrates various research components to effectively tackle the research issue at hand (Ragab & Arisha, 2018). The current study employed a correlational research design encompassing both qualitative and quantitative approaches. The use of a correlational research design aids in elucidating the causal connections between variables within their natural context (Snyder, 2019). This research design aligned well with the study's objective, as it sought to describe and establish the correlation between process optimization and the food manufacturing firms' production performance. It therefore identified whether the predictor variable and response variable were related and to what extent. The correlational research design also assisted in predicting outcome. The researcher also sought to predict variation in production performance that was accounted for by change in the process optimization.

Location of the Study: The study took place in Nakuru County, which was selected due to its status as one of the country's highly industrialized regions. As confirmed by the Kenya Association of Manufacturers, Appendix V illustrates a list of 13 registered food manufacturing firms within Nakuru County.

Population of the Study: Population refers to the individuals, entities, or items that share common characteristics of interest to the researcher (Chang, Van-Witteloostuijn, & Eden, 2020). The target population comprises individuals meeting specific criteria that align with the study's focal point. In this research, the target population comprised the registered manufacturing firms actively operating within Nakuru County. The study encompassed a comprehensive survey of all 13 manufacturing firms, specifically those engaged in food production; these firms constitute the primary unit of analysis. The 66 managers of these manufacturing firms formed the unit of observation. The managers were engaged due to their roles as strategic decision-makers, making them well-suited to possess the requisite information regarding process optimization.

Sampling Procedure and Sample Size: Sample size refers to the number of people or entities that are included into a sample (Chang et al., 2020). The sample size depends on level of population variability. Smaller samples are preferred in highly homogenous population while large sample is required where the population is diverse. However, sampling was not done for the present study since the total target population was 66 as shown in Table 1, which was relatively small and manageable and thus census design was employed. Census design is a complete enumeration where data is obtained from every element of the population (Ragab & Arisha, 2018). It provided detailed information on all elements in the population.

Table 1: List of Food Manufacturing Firms in Nakuru County

Food Manufacturing Firms	Location	Number of Managers			Total
		Top Level	Middle Level	Lower Level	
1. Bahati Dairies	Bahati, Nakuru County	1	1	2	4
2. Bidco Elianto	Industrial Area, Nakuru County	1	2	3	6
3. Bunda Cakes & Feeds Ltd	Moses Mudavadi Road, Nakuru Municipality.	1	1	1	3
4. Delamere Dairy	Naivasha, Nakuru County.	1	1	2	4
5. 5. East African Maltings Ltd	Molo	1	2	2	5
6. Guildford Dairy Institute	Egerton, Njoro	1	2	2	5
7. Happy Cow Ltd	Naka Estate, Along Oginga , Nakuru County	1	1	2	4
8. Keringet	Molo, Nakuru County	1	2	2	5
9. Kenlands Factory	Nakuru Municipality	1	1	1	3
10. Menengai Oil Refineries Ltd	Industrial Area, Nakuru County	2	3	3	8
11. Njoro Canning Factory (Kenya) Ltd	Njoro, Nakuru County	2	2	3	7
12. Unga Holdings Limited	Industrial Area, Nakuru County	1	2	2	5
13. Valley Confectionery Ltd	Langa Langa, Nakuru County	1	2	2	5
Total		**16**	**22**	**28**	**66**

Source: *Kenya Association of Manufacturers Directory, 2022*

Instrumentation: Instrumentation encompasses the tools employed in collection of data for research. It also includes development of suitable instruments and testing them for reliability and validity (Snyder, 2019). Questionnaires with structured and unstructured questions were used in data collection. The questionnaires fitted the present study since it was based on views of managers concerning business process re-engineering. Further, the questions provided efficient means of obtaining adequate information for the study.

Pilot Study: Pilot study is a preliminary study conducted before the main study to determine the reliability and validity of the data collection instrument (Ragab & Arisha, 2018). Pilot study was undertaken from 7 food manufacturing firms operating in Kiambu County, where 7 managers were involved in particular. 7 managers are approximately 10% of the total population (66) thus adequate for the preliminary study as contended by Hazzi and Maldaon (2015).

Validity of the Data Collection Instrument: Validity pertains to the instrument's capacity to effectively assess the intended measurement (Ragab & Arisha, 2018). To establish content and construct validity of the questionnaire, the researcher sought expert opinions from supervisors. The research supervisors meticulously examined the questionnaire to ensure that it adequately captured all pertinent aspects of the study's objectives, covering process optimization and production performance. Through iterative discussions and revisions, the redundancies in the questionnaire were addressed, thereby enhancing its clarity and relevance to the research context. Finally, the content validity of the questionnaire was established, affirming its suitability for data collection in the main study.

Reliability of the Data Collection Instrument: Reliability determines the consistency of the data collection instrument (Kraus, Ribeiro-Soriano, & Schüssler, 2018). An instrument meets reliability requirements if it gives consistent results after being tested repeatedly under similar conditions. Reliability was determined through use of Cronbach alpha. The alpha values range from 0-1 and the threshold is α=0.7. If any variable fails to meet the threshold, the statements/questions are modified and adjusted to produce reliable results. Reliability test results are presented in table 2:

Table 2: Reliability Test Results

Variables	Items Tested	Cronbach Alpha Value
Process Optimization	5	0.867
Production Performance	6	0.741

Based on the findings presented in Table 2, theCronbach's alpha value for process optimization was α=0.867, meeting the 0.7 threshold, which signifies the reliability of statements about process redesigning, process monitoring, and process automation. Additionally, for production performance, the Cronbach's alpha value was α=0.741, indicating consistency in statements concerning production performance indicators like cost, time, and quality. Overall, all variables demonstrated alpha values meeting the 0.7 threshold, confirming the questionnaire's reliability for data collection in the main study.

Data Collection Procedure: Data collection procedure is the process of obtaining data for research (Hazzi & Maldaon, 2015). Before commencement of data collection, the researcher obtained authorization letters from Kabarak University and National Commission for Science, Technology and Innovation (NACOSTI). The aforementioned letters, along with the introduction letter, were availed to the food manufacturing firms as part of the data collection process. The actual data collection employed the drop and pick technique, consisting of a two-step process. In the first step, the researcher physically distributed the questionnaires to the managers. After a three-week period, the researcher returned to collect the completed questionnaires. This approach provided respondents with flexibility in completing the questionnaires at their convenience, thereby reducing potential biases in the collected data.

Data Analysis and Presentation: The researcher employed both descriptive and inferential methods of data analysis. Descriptive analysis is employed to provide summaries or descriptions of sample or dataset characteristics, encompassing statistics such as means, standard deviations, and percentages. Inferential statistics, on the other hand, encompass the array of statistical techniques used to draw conclusions regarding relationships between variables. For the context of this study, correlation and regression analysis were utilized as part of the inferential analysis. Statistical Packages for Social Sciences (SPSS) version 24 aided the data analysis. The regression model was as follows: $Y= \beta_0 + \beta_1 X_1 + \varepsilon$. Where:

β_0 - Constant/autonomous variable.

β_1 - Beta coefficient.

X_1 - Process Optimization

ε - Error of Margin.

RESULTS

This section includes the response rate, descriptive and inferential findings and discussions.

Response Rate

There were 66 potential respondents and 66 questionnaires were prepared and distributed. Among these, 47 were completed and returned, yielding a response rate of 71.2%, considered adequate for the study.

Descriptive Findings and Discussions

The objective of the study was to establish the effect of process optimization on production performance of food manufacturing firms. The descriptive findings are presented in Tables 3 and 4:

Table 3: Effect of Process Optimization on Production Performance

	SA 5	A 4	N 3	D 2	SD 1	Mean	Std. Dev
	Percentage (%)						
Process optimization maximizes productivity and minimizes the manufacturing costs.	46.8	25.5	23.4	4.3	0	4.15	0.932
Process redesigning leads to standardized manufacturing processes that reduces risks.	38.3	38.3	8.5	14.9	0	4.00	1.043
Our firm emphasize delivering value to customers through agile workflows.	27.7	12.8	23.4	14.9	21.3	3.11	1.507
Our firm has adopted Process automation which has increased productivity.	27.7	19.1	21.3	27.7	4.3	3.38	1.278
Process monitoring streamlines operations thereby enhancing product quality.	44.7	40.4	8.5	6.4	0	4.23	0.865
Average						3.77	

As per the findings, 46.8% of the respondents strongly agreed (Mean=4.15; Std. Dev.=0.932) that process optimization maximizes productivity and minimizes manufacturing costs. Process optimization boosts productivity by identifying and removing inefficiencies, streamlining workflows, and improving resource usage, resulting in higher output using fewer resources. This, in turn, reduces manufacturing costs by cutting waste, enhancing efficiency, and optimizing resource utilization, ultimately enhancing the overall cost-effectiveness of food manufacturing operations.38.3% of the respondents agreed (Mean=4.00; Std. Dev.=1.043) that process redesigning leads to standardized manufacturing processes that reduce risks. Process redesigning promotes standardized manufacturing processes, minimizing risks through the establishment of consistent procedures and protocols throughout operations. This standardization improves predictability, quality control, and compliance, thereby lowering the probability of errors or deviations that may result in risks or inefficiencies. However, the respondents were indifferent (Mean=3.11; Std. Dev.=1.507) that manufacturing firms emphasize delivering value to customers through agile workflows. Additionally, 21.3% of the respondents were different and 27.7% disagreed (Mean=3.38; Std. Dev.=1.278) that their respective food manufacturing firms have adopted Process automation which has increased productivity. This means some firms have adopted process automation and others have not. This may also suggest that others have adopted process automation and it has a small and moderate effect on production performance. Additionally, 44.7% of the respondents strongly agreed (Mean=4.23; Std. Dev.=0.865) that process monitoring streamlines operations thereby enhancing product quality. This means that process monitoring optimizes operations by consistently monitoring and analyzing production processes, promptly identifying potential issues in real time, enabling swift adjustments, and ultimately improving product quality through enhanced consistency and accuracy. This proactive methodology ensures timely mitigation of deviations from quality standards, minimizing defects, and optimizing production results. The results are consistent with the research by Kering, Kilika, and Njuguna (2020) on the operational processes and performance of small and medium-sized manufacturing firms in Kenya. The findings showed that strategic processes and competitive priorities had a notable impact on firm performance. The researcher also sought the views of the respondents pertaining to the performance of food manufacturing firms and the findings are presented in Table 4.

Table 4: Production Performance

	SA 5	A 4	N 3	D 2	SD 1	Mean	Std. Dev
	Percentage (%)						
Our operational efficiency has improved over the past five years.	55.3	25.5	8.5	6.4	4.3	4.21	1.122
We have incorporated business process re-engineering in our operational strategy.	14.9	36.2	17	25.5	6.4	3.28	1.192
Business process re-engineering improves process productivity.	44.7	40.4	12.8	2.1	0	4.28	0.772
Our profit levels have been on upward trend for the past five years.	38.3	36.2	8.5	12.8	4.3	3.91	1.176
The quality of our services meets the customer needs and expectations.	44.7	27.7	19.1	6.4	2.1	4.06	1.051
Business process re-engineering affect production performance.	55.3	31.9	8.5	4.3	0	4.38	0.822
Average						4.02	

The descriptive findings showed that 55.3% of the respondents strongly agreed (Mean=4.21; Std. Dev.=1.122) that their respective food manufacturing firms' operational efficiency has improved over the past five years. This implies that food manufacturing firms' ability can utilize resources and streamline processes to meet production goals. However, 17% of the respondents had differing views and 25.5% disagreed (Mean=3.28; Std. Dev.=1.192) that the food manufacturing firms have incorporated business process re-engineering in their operational strategy. It demonstrates partial incorporation of business process re-engineering in food manufacturing firms' operational strategy. This may hinder production performance by failing to fully optimize processes, potentially leading to inefficiencies and suboptimal outcomes. Additionally, 85.1% of the respondents agreed (Mean=4.28; Std. Dev.=0.772) that business process re-engineering improves process productivity. Business process re-engineering boosts process productivity through the identification and elimination of inefficiencies, streamlining of workflows, and optimization of resource allocation, leading to heightened output and efficiency. 38.3% of the respondents agreed that food manufacturing firms' profit levels have been on an upward trend for the past five years. 44.7% of the respondents agreed (Mean=4.06; Std. Dev.=1.051) that the quality of their food manufacturing firms' services meets the customer's needs and expectations. Moreover, 87.2% of the respondents agreed (Mean=4.38; Std. Dev.=0.822) that business process re-engineering affects production performance. The study's findings revealed that, business process re-engineering, incorporating elements such as business needs analysis, strategic cost analysis, integrated production technology, and process optimization, affects the production performance of food manufacturing firms. By systematically analyzing business needs and costs, integrating advanced production technology, and optimizing processes, these firms can enhance their production efficiency and effectiveness. This comprehensive approach to re-engineering processes results in improved productivity, reduced costs, and enhanced overall performance in food production operations. The findings of this study correspond with the research conducted by Kithinji, Rotich, and Kihara (2021) on the association between the implementation of a re-engineering strategy and manufacturing firms' performance. The findings demonstrated that adopting a re-engineering strategy affected performance. Additionally, the study aligns with the work of Ongeri, Magutu, and Litondo (2020) regarding the relationship between the business process re-engineering strategy and the performance of food manufacturing companies. Results showed that the performance of these firms was affected by business process re-engineering.

Inferential Findings and Discussions

Inferential analysis was undertaken to establish the relationship between process optimization and production performance in food manufacturing firms, employing correlation and regression analysis techniques.

Correlation Analysis Statistical Results

The correlation analysis examined the intensity and direction of associations between the study variables, quantifying how variations in one variable corresponded with changes in another, thereby providing insights into possible connections. The results are presented in Table 5:

Table 5: Correlation between Process Optimization and Production Performance

		Production Performance
Process Optimization	Pearson Correlation	.528**
	Sig. (2-tailed)	.000
	N	47

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

The results revealed a moderate and positive relationship (r=0.528**; p=0.002) between process optimization and production performance within food manufacturing firms. It demonstrates that elements encompassing process redesigning, process monitoring, and process automation affected production performance. Consequently, improvements in process optimization can be linked to enhancements in production performance in terms of quality and cost aspects. The results are consistent with the research by Kering, Kilika, and Njuguna (2020) on the operational processes and performance of small and medium-sized manufacturing firms in Kenya. The findings established a significant relationship between strategic processes and the firm performance. The overall correlation analysis findings indicated a relationship between business process re-engineering and production performance, which implies that the food manufacturing firms' production performance is affected by business process re-engineering. The study's findings align with the findings of Ongeri, Magutu, and Litondo (2020), who established a significant association between the business process re-engineering strategy and the performance of food manufacturing companies. In particular, the findings established that elements such as analytical processes selection, BPR prototypes, and management of re-engineered processes affected performance.

Regression Analysis Statistical Results

Simple linear regression was undertaken to establish the relationship between process optimization and the production performance. The findings are presented in Tables 6, 7, and 8:

Table 6: Model Summary for Process Optimization and Production Performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.528[a]	.279	.262	.33048

a. Predictors: (Constant), Process Optimization

The model summary shows a high correlation coefficient (R) of 0.528 and a coefficient of determination (R^2) of 0.279, indicating that process optimization accounts for 27.9% of the variation in production performance. These findings underscore the significant effect of process optimization on improving production performance in food manufacturing firms.

Table 7: ANOVA[a] for Process Optimization and Production Performance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.897	1	1.897	17.372	.000[b]
	Residual	4.915	45	.109		
	Total	6.812	46			

a. Dependent Variable: Production Performance

b. Predictors: (Constant), Process Optimization

The Analysis of Variance (ANOVA) results revealed a significant F-value of 17.372 (p=0.000), validating the overall model's fitness. This emphasizes the essential role of process optimization in impacting and improving production performance in food manufacturing firms.

Table 8: Regression Coefficients[a] for Process Optimization and Production Performance

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.098	.227		13.671	.000
	Process Optimization	.245	.059	.528	4.168	.000

a. Dependent Variable: Production Performance

The regression model applied was $Y=\beta_0 + \beta_1X_1 + \varepsilon$, with the coefficients interpreted as $Y= 3.098 + 0.245X_4 + \varepsilon$. This signifies that a one-unit change in process optimization results in a 0.245-unit change in production performance. The t-value of 4.168 was significant (p=0.000) at the 95% confidence level. These results indicate that process optimization significantly affects production performance in food manufacturing firms. The hypothesis was tested and conclusion drawn based on the regression coefficients. The null hypothesis was **H_{01}:** Process optimization has no statistically significant effect on production performance of food manufacturing firms in Nakuru County. The results indicated a statistically significant t-value of 4.168 (p=0.000) at a 95% confidence level, demonstrating the significance of the relationship between process optimization and production performance. This led to the rejection of the fourth null hypothesis, ultimately concluding that process optimization affected the production performance of food manufacturing firms.

Summary of Findings

This section presents the summary of findings on the effect of process optimization on production performance. Descriptive findings established that process optimization affects the manufacturing firms' production performance. In particular, process optimization enhances productivity by identifying and eliminating inefficiencies, streamlining workflows. This reduces manufacturing costs through waste reduction, thereby increasing efficiency, and ultimately improving the overall production performance. Additionally, process redesigning fosters standardized manufacturing processes, reducing risks by establishing consistent procedures and protocols across operations. This standardization enhances predictability, quality control, and compliance, thereby reducing the likelihood of errors or deviations that could lead to risks or inefficiencies. Furthermore, process monitoring optimizes operations by continuously monitoring and analyzing production processes, promptly identifying potential issues in real-time, facilitating swift adjustments, and ultimately enhancing product quality. Similarly, correlation results indicated a positive and significant association between process optimization and production performance at a 1% significance level. The finding implies that process optimization affects production performance. Regression analysis results also indicated a significant relationship between process optimization and production performance. The fourth null hypothesis stated that process optimization does not significantly affect the production performance of food manufacturing firms in Nakuru County. The results revealed a statistically significant t-value of 4.168 (p=0.000) at a 95% confidence level, indicating a significant relationship between process optimization and production performance. This led to the rejection of the fourth null hypothesis, concluding that process optimization impacts the production performance of these firms.

CONCLUSION AND RECOMMENDATION

The study concluded that process redesigning facilitates the streamlining and standardization of manufacturing processes, minimizing inefficiencies and enhancing operational effectiveness. Process monitoring enables continuous oversight and analysis of production processes, facilitating prompt identification of potential issues and opportunities for improvement. Process automation enhances efficiency and reduces human error by automating repetitive tasks, thereby improving productivity and resource utilization. Overall, process optimization contributes to increased efficiency and improved production performance.

It is recommended that food manufacturing firms should focus more on continuous process improvement initiatives to enhance efficiency and flexibility in production operations. This should encompass regular evaluation and refining of production processes, leveraging tools such as lean manufacturing principles and Six Sigma methodologies to identify and eliminate bottlenecks, redundancies, and non-value-added activities. By optimizing processes for agility, responsiveness, and quality, food manufacturing firms can improve the overall production performance. Other researchers should examine the integration of sustainability principles into business process re-engineering strategies within manufacturing firms. They should assess how initiatives such as eco-friendly production methods, and waste reduction strategies contribute to production performance improvement. Research should also be extended to explore the applicability and effectiveness of business process re-engineering in various industry sectors beyond manufacturing. Other authors should further examine how the principles and methodologies of process re-engineering can be adapted and tailored to sectors such as healthcare, finance, and service industries to enhance operational efficiency and performance.

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