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Process Supply Chain Integration and Organization Performance of Energy Sector Parastatals in Kenya

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Abstract: *Kenya's energy sector parastatals encounter notable challenges pertaining to organizational performance. According to KenGen's 2020 annual report, there was a 4% decline in revenue, dropping from Shs. 45.9 billion in 2019 to Shs. 44.1 billion in 2020, indicating a decrease in organizational performance. Similarly, Kenya Power experienced a 25% decrease in profits, falling from Shs. 3.5 billion in 2022 to Shs. 2.625 billion in 2023. It is against this problem that the researcher assessed the effect of process supply chain integration on the organizational performance of energy sector parastatals in Nairobi County, Kenya. The study was anchored on relational exchange theory. A descriptive research design was adopted.The target population was the energy sector parastatals in Nairobi County, including the Kenya Electricity Generating Company Limited, Geothermal Development Company, Kenya Electrical Transmission Company, Energy and Petroleum Regulatory Authority, Kenya Power and Rural Electrification and Renewable Energy Corporation. Descriptive and inferential statistical methods were employed in data analysis. Descriptive findings revealed that the process supply chain integration affected the organizational performance of energy sector parastatals. The correlation analysis results showed that the relationship between process supply chain integration and organizational performance of energy sector parastatals was positive and significant ($r=0.476^{**}$; $p=0.000$) at 1% significance level. Therefore, streamlined workflows, agile operations, and optimized processes determined the organizational performance. As per regression analysis results, the coefficient of determination was 0.226 thus 22.6% of variation in organizational performance was explained by changes in process supply chain integration. The study concluded that streamlined workflows allow organizations to minimize redundancies, thereby enhancing operational efficiency. Moreover, the agile operations enhance the response to market fluctuations and customer needs which consequently bolster revenue prospects, which means that process integration affected organizational performance. It was recommended that the energy sector parastatals should synchronize workflows, operations, and task interactions for seamless operations and enhanced efficiency. This will lead to increased operational efficiency, reduced redundancies, and minimized delays which will promote organizational performance.*

Key Words: *Process Supply chain Integration, Organizational Performance, Energy Sector Parastatals*

I. Introduction

Supply chain management emphasizes the optimization of customer and attaining operational efficiency (Liao & Widowati, 2021). It signifies a deliberate efforts by an organization to design and operate supply chains with effectiveness and efficiency.According to Ye, Liu, Li, Lai, Zhan, & Kumar (2022) supply chain management relies on both physical and information flows. Physical flows involve the processing, transportation, and storage of goods and materials, constituting the visible aspect of the supply chain. Equally crucial are information flows, which facilitate collaboration among supply chain partners, ensuring alignment of organization's plans and efficient coordination of daily operations across the supply chain (Ngo, Quang, Hoang, &Binh, 2024).Supply integration incorporates seamless collaboration and alignment of activities, processes, and information among various entities within a supply chain (Bodendorf, Dentler, &Franke, 2023). This optimizes efficiency, reduce costs, and enhance overall performance. Ultimately, it fosters closer relationships and coordination between suppliers, manufacturers, distributors, and other

stakeholders. Through effective integration, organizations can work together more effectively, share resources and information, and collectively address challenges and opportunities within the supply chain ecosystem (Alzoubi, Elrehail, Hanaysha, Al-Gasaymeh, & Al-Adaileh, 2022). Process integration harmonizes and aligns diverse processes within the supply chain, including inventory management, transportation, and distribution.

Process integration enhances efficiency and effectiveness through streamlining workflows, reducing redundancies, and eliminating bottlenecks (Ngo et al., 2024). It ensures that each supply chain step is tightly coordinated and optimized to fulfill overall network objectives. Moreover, process integration ensures that each supply chain step is aligned and optimized to meet network objectives and productivity. In energy sector state-owned parastatals, supply chain integration is essential for efficient coordination and collaboration across energy production, distribution, and delivery (Liao &Widowati, 2021). This integration reduces costs and enhances reliability, ultimately ensuring uninterrupted supply while maximizing overall performance.However, Kenya's energy sector parastatals encounter significant challenges regarding organizational performance. KenGen's 2020 annual report revealed a 4% revenue decline, from Shs. 45.9 billion in 2019 to Shs. 44.1 billion in 2020, signaling a decrease in organizational performance. Similarly, Kenya Power's profits decreased by 25%, from Shs. 3.5 billion in 2022 to Shs. 2.625 billion in 2023. Additionally, the geothermal sub-sector faces low investment, resulting in a capacity of only 863 MW compared to a potential of 7,000-10,000 MW. The undesirable performance could possibly be attributed to ineffective supply chain integration. Past research works have explored supply chain management, but there is a contextual gap as they do not specifically focus on energy sector parastatals or explore the direct implications of process supply chain integration components on organizational performance. The present study addressed these gaps by examining the effect of process supply chain integration on the organizational performance of energy sector parastatals in Nairobi County, Kenya.

II. Objective of the Study

The objective of the study was to examine the effect of process supply chain integration on organizational performance of energy sector parastatals in Nairobi County, Kenya.

III. Literature Review

Process integration aligns diverse supply chain operations within an organization, enhancing coordination and efficiency (Kramarz, Hong & Lee, 2020). Within the energy sector, process integration seeks to establish a unified and interconnected framework of operations, enabling different functions to collaborate seamlessly in optimizing performance and minimizing waste. This result in cost savings, heightened productivity, and improved sustainability. Integrating procurement processes with energy production can lead to timely and cost-effective sourcing of materials and resources, thereby contributing to enhanced organizational performance (Lee, Sung, & Choi, 2021). Streamlined workflows, a cornerstone of process integration, entail the fluid and efficient flow of tasks and information across different phases of a process. This involves minimizing unnecessary steps, resolving bottlenecks, and enhancing overall productivity. By eliminating redundancies and automating routine tasks, organizations can ensure a seamless progression from one stage of the workflow to another, establishing an operational environment that is both effective and time-efficient (Hassan &Abbasi, 2021). This optimization not only accelerates operational speed but also reduces errors, leading to an overall enhancement in output quality.

Within the framework of process integration, agile operations denote an organization's ability to promptly adapt to evolving circumstances, demands, or market dynamics (Hassan &Abbasi, 2021). This flexibility in operations enables swift responses to unexpected challenges. Agile operations guarantee that integrated processes can adjust and grow in sync with the changing requirements of the business environment, promoting resilience and innovation. Embracing agility empowers organizations to sustain competitiveness, optimize resource allocation, and better fulfill the requirements of a continuously evolving landscape (Kramarz et al., 2020). Optimized processes involve improving and perfecting each component within a workflow to achieve optimal efficiency and effectiveness. This includes deploying technology, harnessing data analytics, and implementing continuous improvement methodologies to pinpoint and eliminate inefficiencies. Optimization aims to achieve the most favorable outcomes in terms of cost savings, resource utilization, and overall performance. By adjusting processes based on data-driven insights and adhering to industry best practices, organizations can ensure that their operations are not only integrated but also operating at peak efficiency (Fagbele&Uzoka, 2020). This results in increased productivity and sustained success for the organization.

Relational exchange theory delves into comprehending the dynamics of enduring relationships in supply chain activities (Saglam, Çankaya, Golgeci, Sezen, &Zaim, 2022). It underscores trust, mutual cooperation, and interdependence as

pivotal factors shaping the outcomes of these exchanges, contrasting with short-term, economically-driven transactions. The theory aims to elucidate how ongoing exchanges characterized by mutual dependence and continuous interaction evolve over time, offering insights into the complexities of sustained relationships. Patil, Garg, Gabaldon, Patil, Niranjan, and Hawkins (2023) assert that relational exchange theory explains the intricacies of ongoing exchange relationships, emphasizing trust and cooperation. Additionally, it sheds light on the benefits of sustained relationships, including reduced transaction costs and improved problem-solving capabilities. This theory underscores the significance of building enduring relationships characterized by ongoing interaction and collaboration, which are essential for effective integration across supply chain processes. By fostering trust and cooperation, supply chain partners can align their activities, share information, and work together towards common objectives, thereby enhancing the overall integration and performance of the supply chain.The relationship between process supply chain integration is illustrated in Figure 2.1:

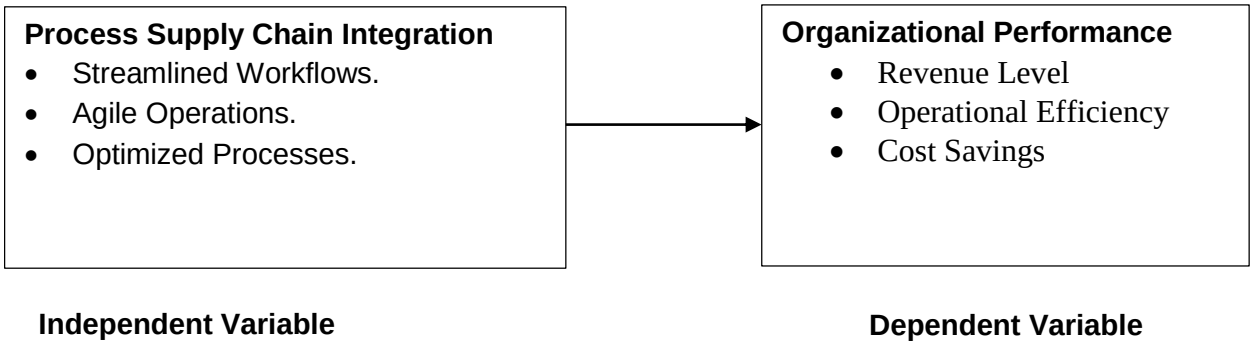

Figure 1: Conceptual Framework

Within process integration, streamlined workflows and optimized processes lead to cost savings by minimizing redundancies and enhancing resource allocation. Furthermore, agile operations facilitate rapid adaptation to market fluctuations, thereby enhancing organizational performance over time. Empirical studies related to supply chain integration were reviewed. Kwadzo and Ocloo (2020) examined the impact of process integration on performance of manufacturing firms in Nigeria. The results revealed a strong positive correlation between process integration and performance indicators, with highly integrated firms showing better performance outcomes. Wambua (2021) undertook a study on the supply chain integration and performance of manufacturing firms in Nairobi, Kenya. Findings showed that customer integration had a positive and significant effect on performance. It was also revealed that supplier integration had positive but insignificant effect on performance.

Omollo and Odari (2024) assessed the determinants of supply chain performance in the Energy Sector in Kenya, focusing on Kenya Power. Findings revealed that supply chain performance in KPLC was influenced by factors including information communication technology, procurement professionalism, buyer-supplier relationships, and contract management. Jacobs (2019) did a study on the process integration and procurement efficiency in South African Construction Companies. The study findings showed that process integration efforts in construction firms led to reduced procurement lead times, improved cost control, and enhanced supplier collaboration. Research gaps were identified from the reviewed studies. While Kwadzo and Ocloo (2020) focused on process integration in manufacturing firms in Nigeria, they did not delve into the specific mechanisms or strategies for streamlining workflows within the supply chain context. There was also a gap in the exploration of agile operations within supply chain integration.
Though Wambua (2021) and Omollo and Odari (2024) examined aspects of supply chain integration and performance in manufacturing and the energy sector, respectively, they did not explicitly discuss the adaptability or agility of operations within the supply chain to respond to changing circumstances. The study by Jacobs (2019) examined process integration in South African construction companies and its impact on procurement efficiency, but did not specifically focus on optimizing processes to achieve maximum efficiency and effectiveness within the supply chain operations. The current study examined process supply chain integration and its effect on energy sector parastatals' organizational performance.

IV. Research Methodology

The study adopted a descriptive research design.This design facilitated the collection of detailed data for analysis. The target population was the energy sector parastatals in Nairobi County, Kenya. Therefore, the study's unit of analysis was the six energy sector parastatals including the Kenya Electricity Generating Company Limited, Geothermal Development Company, Kenya Electrical Transmission Company, Energy and Petroleum Regulatory Authority, Kenya Power and Rural Electrification and Renewable Energy Corporation. The unit of observation was the 140 managers and supervisors drawn from procurement, finance and accounts, logistics, stores and warehousing departments of the aforesaid parastatals. Simple random sampling technique was employed to select a sample from the population. The sample size was determined using Slovins' formula to get a sample of 104 as follows:

$$n = \frac{N}{1+Ne^2}$$

Where: n = sample size
N = population size
e = margin of error which is 0.05
1 = is a constant value

$$n = \frac{140}{1+140(0.05)^2}$$

$$n = \frac{140}{1.35}$$

$$n = 103.7 \approx 104$$

The researcher used structured questionnaires to collect data. Data was analyzed by utilization of Statistical Package for Social Sciences (SPSS) version 25. Descriptive and inferential statistics were employed in the study to analyze data. Inferential statistics involved the use of correlation analysis and regression analysis to establish the relationship between supply chain integration and organizational performance. After analysis, the data was presented in form of tables. In regression analysis, the following model was utilized: $Y = \beta_0 + \beta_1 X_1 + \varepsilon$

Y= Organizational Performance of the Energy Sector Parastatals
β_0 =constant
β_1=Beta Coefficient
X_1 = Process Supply Chain Integration
ε = the error of Estimate

V. Findings and Discussions

This section presents both descriptive and inferential findings of the study. The researcher administered 104 questionnaires to the respondents, with 75 completed and returned. This yielded a response rate of 72.1%, deemed sufficient for the study. Therefore, the findings are based on 75 respondents.

5.1 Descriptive Findings and Discussions

Descriptive analysis was undertaken to establish the effect of process supply chain integration on organizational performance of energy sector parastatals. Findings are presented in Tables 1 and 2:

Table 1: Effect of Process Supply Chain Integration on Organizational Performance of Energy Sector Parastatals

	N	SA	A	N	D	SD	Mean	Std. Dev
Streamlined workflows promotes adaptability to the changes in supply chain.	75	46.7%	38.6%	10.7%	4%	0%	4.28	0.815
Optimized processes contribute lead to reduced lead times.	75	36%	42.7%	13.3%	6.7%	1.3%	4.05	0.943
A culture of continuous improvement fosters innovation and efficiency.	75	21.3%	41.4%	20%	12%	5.3%	3.61	1.114
Our supply chain activities are aligned with customer	75	21.3%	29.3%	37.4%	9.3%	2.7%	3.57	1.016

demands.								
Flexible supply chain operations allows for quick adaptation to changing market conditions.	75	21.3%	36%	30.7%	10.7%	1.3%	3.65	0.979
Agile operations minimizes wastage and maximizes productivity.	75	38.7%	33.3%	20%	6.7%	1.3%	4.01	0.993

The descriptive research findings established that process integration in the supply chain affected the performance of energy sector parastatals. In Particularly, 46.7% of the respondents strongly agreed while 38.6 also concurred, thus 85.3% at least agreed (Mean=4.28; Std. Dev.=0.815) that the streamlined workflows promotes adaptability to the changes in supply chain. Therefore, streamlined workflows within energy sector parastatals fosters their ability to adjust to shifts in the supply chain, ultimately bolstering their organizational effectiveness and performance. As per the findings, 78.7% of the respondents agreed (Mean=4.05; Std. Dev.=0.943) that optimized processes contribute lead to reduced lead times. Process optimization minimize delays and eliminate inefficiencies in the supply chains. This promotes better performance. Additionally, 62.6% of the respondents agreed that a culture of continuous improvement fosters innovation and efficiency. However, 20% and 12% had differing opinions and disagreed respectively. This implies that a culture of continuous improvement fosters enhanced performance by encouraging innovation and proactive problem-solving throughout their operations. In the same breadth, 37.4% of the respondents were indifferent (Mean=3.57; Std. Dev.=1.016) that their respective supply chain activities are aligned with customer demands while 36% agreed that flexible supply chain operations allows for quick adaptation to changing market conditions.Moreover, 72% of the respondents agreed (mean=4.01; std. dev.=0.993) that agile operations minimizes wastage and maximizes productivity. Agile operations enhance the efficiency and performance of energy sector parastatals through effective resource usage. Overall, the descriptive findings revealed that process integration within the supply chain enhances performance by improving coordination of processes, resulting in minimized delays, while also optimizing resource allocation and cost-effectiveness. The study findings relates to a research by Kwadzo and Ocloo (2020) who found a strong positive correlation between process integration and performance. Contextually, the research was undertaken from manufacturing firms while the current study was conducted from energy sector parastatals.

Table 2: Organizational Performance of Energy Sector Parastatals

	n	**SA**	**A**	**N**	**D**	**SD**	**Mean**	**Std. Dev**
Revenue trends are closely monitored and analyzed to make informed operational decisions.	75	46.7%	37.3%	14.7%	1.3%	0%	4.29	0.767
Our organization consistently seeks ways to streamline processes and reduce operational waste.	75	25.3%	38.7%	29.3%	4%	2.7%	3.80	0.959
Operational efficiency is regularly assessed and used as a benchmark for improvement initiatives.	75	36%	45.3%	12%	6.7%	0%	4.11	0.863
Cost savings initiatives are integral to the overall success of our organization	75	34.7%	42.7%	20%	1.3%	1.3%	4.08	0.850
Continuous improvement in cost-saving strategies is a priority for our organization.	75	38.7%	44%	14.7%	1.3%	1.3%	4.17	0.828
Supply chain integration affect the organizational performance.	75	22.7%	42.7%	24%	9.3%	1.3%	3.76	0.956

As per the findings in Table 4.5, 84% of the respondents agreed (Mean=4.29; Std. Dev.=0.767) that revenue trends are closely monitored and analyzed to make informed operational decisions. Close monitoring of revenue trends provide insights into the performance, allowing for the identification of patterns, fluctuations, and potential areas for improvement. 83.3% of the respondents agreed (Mean=4.11; Std. Dev.=0.863) that operational efficiency is regularly assessed and used as a benchmark for improvement initiatives. Assessing operational efficiency indicates performance by evaluating processes, resource utilization, and productivity, offering insights into goal achievement. 77.4% of the respondents agreed (Mean=4.08; Std. Dev.=0.850) that cost savings initiatives are integral to the overall success of our organization. 82.7% of the respondents agreed (Mean=4.17; Std. Dev.=0.828) that continuous improvement in cost-saving strategies is a priority for their respective organizations. Cost-saving strategies indicate performance by demonstrating efficiency in management of resources, reduced expenses, and highlighting its ability to sustain performance. The descriptive research findings showed that process supply chain integration affected the performance of energy sector parastatals.

5.2 Inferential Findings and Discussions

Inferential data analysis was done to establish the relationship between process supply chain integration and organizational performance of energy sector parastatals. It included correlation and regression analysis.

5.2.1 Correlation Analysis Results

Correlation analysis was conducted to determine the direction and strength of the relation between process supply chain integration and organizational performance of energy sector parastatals. Findings are presented in Table 3.

Table 3: Correlation between Process Supply Chain Integration and Organizational Performance

		Organizational Performance
Process Supply Chain Integration	Pearson Correlation	.476**
	Sig. (2-tailed)	.000
	N	75

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

The correlation analysis results shows that the relationship between process integration and organizational performance of energy sector parastatals was positive and significant (r=0.476**; p=0.000) at 1% significance level. This implies that an increase in process integration contributes to increase in organizational performance. According to the results, streamlined workflows, agile operations, and optimized processes as indicators of process integration determine the organizational performance by enhancing efficiency, adaptability, and productivity across operations.

5.2.2 Regression Analysis Results

Regression analysis was to predict the organizational performance from the variation in supply process chain integration. The results are presented in Tables 4, 5 and 6.

Table 4: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.476[a]	.226	.216	.44823

a. Predictors: (Constant), Process Supply Chain Integration

The model summary in Table 4 shows that the correlation coefficient and coefficient of determination were 0.476 and 0.226 respectively. The result means that there existed a strong relationship between process supply chain integration and organizational performance. The R^2=0.226 meant that 22.6% of variation in organizational performance was explained by changes in process supply chain integration. Therefore, process supply chain integration affected the organizational performance of energy sector parastatals.

Table 5: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.295	1	4.295	21.376	.000[b]
	Residual	14.666	73	.201		
	Total	18.961	74			

a. Dependent Variable: OrganizationalPerformance

b. Predictors: (Constant), Process Chain Integration

The results of analysis of variance (ANOVA) shows that the F-value was significant (F=21.376; P=0.000) at 95% confidence level. This means that the overall model was significant. It implies process supply chain integration affected the organizational performance of energy sector parastatals.

Table 6: Regression Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.273	.385		5.909	.000
Process Supply Chain Integration	.456	.099	.476	4.623	.000

a. Dependent Variable: OrganizationalPerformance

The study applied the linear regression model $Y = \beta_0 + \beta_1 X_1 + \varepsilon$ which was interpreted as $Y = 2.273 + 0.456X_1$. As per the results, the beta coefficient (β=0.456), meant that one-unit change in process integration led to 0.456-unit change in organizational performance of energy sector parastatals. The t-value (t=4.623; p=0.000<0.05) was significant at 95% confidence level. This implies a significant relationship between process integration and organizational performance. Therefore, it was concluded that process integration significantly affected the organizational performance.

VI. Conclusion

The study concluded that process supply chain integration affect the organizational performance of energy sector parastatals. The findings revealed that process integration determines efficiency of operations, responsiveness to market dynamics, and adaptability to evolving industry trends. The streamlined workflows allow organizations to minimize redundancies, thereby enhancing operational efficiency. This enables them to promptly respond to market demands, adjust to industry trends, and seize emerging opportunities. Ultimately, the integration of streamlined workflows into the organizational processes significantly promote supply chain efficiency and position energy sector parastatals for sustained success. Moreover, the agile operations enhance the response to market fluctuations and customer needs which consequently bolster revenue prospects. They provide framework for refining processes leading to notable cost reductions. Optimized processes are integral to shaping the performance of energy sector parastatals. They minimize bottlenecks and enhance resource allocation, fostering smoother operations and accelerated throughput. Consequently, this cultivates a more effective supply chain, adept at addressing evolving market demands with efficiency.

VII. Recommendation

The study recommends that the energy sector parastatals should synchronize workflows, operations, and task interactions for seamless operations and enhanced efficiency. This will lead to increased operational efficiency, reduced redundancies, and minimized delays.

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