

JUST-IN-TIME INVENTORY TECHNIQUE AND PROCUREMENT PERFORMANCE OF UPSTREAM MULTINATIONAL OIL AND GAS COMPANIES IN SOUTH- SOUTH NIGERIA

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Abstract

This study investigated the relationship between just-in-time (JIT) inventory technique and procurement performance of upstream multinational oil and gas companies in South-South Nigeria. The study was conceptualized using JIT inventory technique as predictor to procurement performance with measures such as material availability, timeliness and cost reduction. Cross-sectional survey design was employed in this study. The population of the study comprised 24 upstream multinational oil and gas companies operating in South-South Nigeria as enlisted in the finelib.com Nigerian Directory and Search Engine. The sample size of the study was the same as the population. The study administered 3 copies of structured questionnaire to Operations, Procurement/Logistics and Marketing Managers of the 24 of upstream multinational oil and gas companies, bringing the total number of respondents to 72. However, 67 respondents provided useable data for the study. Pearson's Product Correlation Coefficients with a 95% confidence interval was used to test the hypotheses. Each test was conducted at a 0.01 level of analysis with the help of the Statistical Packages for Social Sciences (SPSS) version 23.0. The study found the existence of significant relationship between JIT inventory technique and procurement performance of upstream multinational oil and gas companies in South-South Nigeria. Thus, the study concluded that JIT inventory technique significantly relates to procurement performance of upstream multinational oil and gas companies in South-South Nigeria; and recommend that managers of upstream multinational oil and gas companies in South-South Nigeria should adopt JIT inventory technique to boost their procurement performance.

Keywords: Cost reduction, just-in-time inventory technique, material availability, procurement performance, timeliness

Introduction

Advances in technology has remarkably altered virtually all aspects of our lives and our planet; and has disrupted old methods of business operations. This has led to intense competition across markets, including supply chains (Onchoke & Wanyoike, 2016). Atnafu and Balda (2018) notes that due to disruptions brought by globalization, most organizations now adopt practices that aid their production processes. To improve performance in supply chain output, Ambe (2012) advises that organizations need to change their production strategies, improve timeliness and reduce cost of production at a faster rate than their competitors.

Scholars (Ngei & Kihara, 2017; Ogbo, Onekanma & Wilfred 2014) identify just-in-time (JIT) inventory technique as a production system that improve supplier relationships, reduce inventory, reduce time and boost performance. According to Kinyua (2015), through JIT inventory technique,

organizations make what customers need with the right quantity, using minimal resources. Phan et al. (2019) states that the idea behind JIT inventory technique is to constantly pursue ways that make performance procedures more productive, with the eventual goal of providing products without wasting resources.

According to Agu, Obi-Anike and Eke (2016), the basic objective of JIT inventory technique is to achieve a balance between low inventory and high sales performance. JIT inventory technique extends to the oil and gas sector which is perceived as the most important energy commodity in demand world-wide, and the largest resource for man's energy needs (Atnafu & Balda, 2018).

However, as observed by Elioza (2018), there are problems of material inadequacies to aid operation within the Nigerian oil and gas upstream sector. There are also problems of delayed delivery and high cost of operations. The failure of most oil and gas companies to fully adapt to JIT inventory technique in procurement has affected the availability, delivery, cost and quality in their procurement.

Prior research on JIT inventory technique and procurement performance do not provide adequate knowledge for managers in the Nigerian context on how the technique affect their procurement performance. This is because most of such studies are foreign and conducted using other measures of procurement performance (Mbugi & Lutege, 2022; Alhassan et al., 2022; Akinlabi, 2021). Also, only a few of these studies focused on the nexus between JIT inventory technique and procurement performance of upstream oil and gas companies in South-South, Nigeria.

Thus, the current study examined the relationship between JIT inventory technique and procurement performance of upstream oil and gas companies in South-South, in Nigeria. The study measured procurement performance using material availability, timeliness, cost reduction, while JIT inventory technique was used unidimensionally.

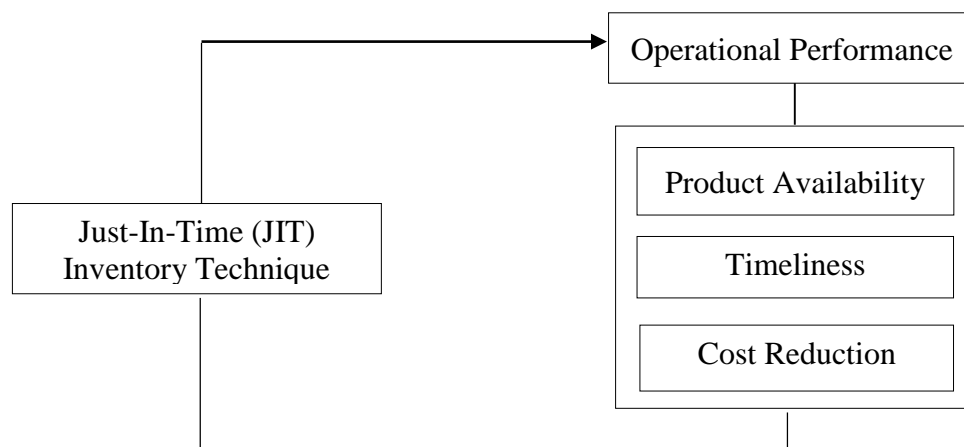


Fig. 1: Conceptual framework of relationship between just-in-time inventory technique and procurement performance of upstream multinational oil and gas companies in South-South Nigeria.

Theoretical Foundation

This study is premised on theory of constraints - an administrative reasoning that recognizes that every organization must be understood as a system with a goal, and so, every action taken by any part of the system must be judged by its impact on the whole system goal. According to

Panizzolo (2016), theory of constraints highlight that every system must have at least one constraint. The main constraints in most organizations may not be only physical but also, managerial-policy. Within the present study context, theory of constraints offers valuable insights for improving the relationship between JIT inventory technique and procurement performance of oil and gas multinational companies. By identifying constraints, focusing on critical inventory items, integrating inventory management and procurement processes, optimizing supply chain processes, and embracing continuous improvement, companies can enhance efficiency and effectiveness in managing their inventory and procurement activities.

Concept of JIT Inventory Technique

JIT inventory technique is a Japanese philosophy associated with having the right inventory in the right quality and amount in the correct place and at the opportune time (Ogbo, Onekanma & Wilfred, 2014). Kootanaee et al. (2013) view JIT as a concept of production that tends to minimize inventories by creating a pull system in which each component pulls the other to deliver the highest possible level of quality.

A major catch-point of JIT is that it help organizations plan the adequate amount of stock they require for optimal operations (Kehinde et al., 2020). JIT also open organizations to meet the needs of their production strategy and those of customers (Chan & Zhang, 2011). Thus, Adeyemi (2010) describes JIT as a process that enable quick response to customers' order without overstocking inventory.

Procurement Performance

Procurement performance is a measure of the quality of procurement outcomes in relations to strategic procurement goals and actions (Vaidya et al., 2003). Procurement performance is a crucial aspect of any business that seeks to achieve growth and success in the long run (Kukanja, 2017). Procurement performance can be broken down into three key areas: procurement planning, procurement execution, and post-procurement management.

Also, there are five key steps in procurement performance: planning, goal setting, acquiring goods and services, monitoring and controlling, and closing the purchasing process. Planning is essential for ensuring that the procurement process is efficient. The goal should be specific and measurable, and the planning process should include an assessment of potential alternatives. Goal setting ensures that procurement are met (Kukanja, 2017). The present study adopts material availability, timeliness and cost reduction as measures of procurement performance.

Material availability refers to the extent to which materials required for production or operations are on hand and accessible when needed (Christopher, 2016). According to Monczka et al. (2015), material availability refers to the ability of companies to obtain and access the materials and resources needed for their manufacturing or production processes.

Timeliness is a measure of the percentage of customer orders delivered on time and in full. On-time delivery means that the company fulfills its customer delivery tasks on time. According to Saura et al. (2008), timeliness refers to the gap between the publication of data and the period to which the data refer.

Cost reduction is a planned positive approach to reduce expenditure. It is a corrective function by continuous process of analysis of costs, functions, etc. The success of any organization largely depends on how it manages its cost of operation, compared to competitors. It certainly provides competitive advantage which is essential in this hyper competitive market or business world.

JIT Inventory Technique and Procurement Performance

Extant literatures shows that JIT inventory technique contributes to procurement performance of firms. Alhassan et al. (2022) examined the impact of inventory management on financial performance of listed Nigerian manufacturing companies and found that inventory control has a significant impact on financial performance. Similarly, Akinlabi (2021) examined the effect of inventory management practices on operational performance of selected flour mills companies in Nigeria and revealed that automated inventory system has positive significant effect on operational performance.

Relatedly, Hassan et al. (2020) examined the effect of inventory management practices on performance of Food and Beverage companies in Kwara State, Nigeria. The study revealed that inventory management practices had significant positive effect on performance of food and beverage companies in Kwara State, Nigeria; while the study of Mishra, Kumar and Garg (2018) which investigated JIT supply chain through general system theory found that the implementation of JIT inventory technique is key to firms' success.

Also, Sporta (2018) examined the effect of inventory control techniques on performance of Kenya's medical supplies agencies. The study showed that inventory control techniques have significant positive influence on performance of Kenya's medical supplies agencies. In an empirical examination of the impact of inventory management practices on competitiveness and performance of micro and small enterprises in Ethiopia, Atnafu and Balda (2018) found that higher levels of inventory management practice lead to enhanced competitive advantage and improved organizational performance.

In addition, Agum, Awogbemi and Taimako (2018) investigated the impact of inventory management practices on organizational performance and found that inventory planning, inventory valuation and inventory control has significant impact on operational efficiency, timely delivery, cost reduction and profitability of organization independently and jointly; while Phebe and Njoku (2018) found that inventory management has significant positive impact on performance of organizations.

In contrast however, Bawa, Asamoah and Kissi (2018) examined the impact of inventory management on the performance of listed manufacturing firms in Ghana. The study revealed that inventory management has no significant impact on performance of manufacturing firms in Ghana.

In view of these conflicting reports, the present study formulated the following hypotheses:

H₀₁: There is no significant relationship between JIT inventory technique and material availability of upstream multinational oil and gas companies in South-South, Nigeria.

H₀₂: There is no significant relationship between JIT inventory technique and timeliness of upstream multinational oil and gas companies in South-South, Nigeria.

H03: There is no significant relationship between JIT inventory technique and cost reduction of upstream multinational oil and gas companies in South-South, Nigeria.

Methodology

The cross-sectional survey design was employed in this study. The population of the study comprised twenty-four (24) upstream multinational oil and gas companies operating in South-South Nigeria as enlisted in the finelib.com Nigerian Directory and Search Engine (2022). The sample size of the study is the same as the population. The study used a structured questionnaire to collect primary data from 3 managers in each of the 34 firms. The reliability of the instrument was ascertained via the Cronbach's alpha test. The results of the test is as summarized in Table 1.

Table 1: Reliability Test - Cronbach's Alpha Analysis

S/N	Variables	Number of Items	Cronbach's Alpha Coefficients
1	Just-in-Time Inventory Technique	4	0.835
2	Material Availability	4	0.788
3	Timeliness	4	0.803
4	Cost Reduction	4	0.751

Source: SPSS Output from Field Data (2024).

The results of the Cronbach's alpha analysis in Table 1 shows that all the variables in the study produced high Cronbach's Alpha coefficients indicating that, there is inter-item consistency among the variables in the study. This means that, the instrument can produce comparative results if used repeatedly in similar condition.

The managers that served as respondents in the study are operations, procurement/logistics managers and marketing managers. A total of 72 respondents participated in the study. However, 67 respondents provided useable data for the study. Pearson's Product Correlation Coefficients with a 95% confidence interval was used to test the hypotheses. The tests were conducted with the help of the Statistical Packages for Social Sciences (SPSS) version 23.0.

Results and Interpretations

Table 2: Descriptive Statistics on JIT Inventory Technique

	N	Sum	Mean	Std. Deviation	Skewness	Std. Error	Kurtosis	Std. Error
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic
To what extent does your organization ensure timely delivery of materials to minimize inventory holding costs?	67	268	4.00	1.326	-1.327	.293	.640	.578
To what extent does your organization collaborate with suppliers to synchronize production schedules?	67	330	4.93	.502	-7.565	.293	59.129	.578
To what extent does your organization maintain a lean inventory by minimizing excess stock?	67	314	4.69	.556	-2.155	.293	6.665	.578
To what extent does your organization use technology to monitor real-time inventory levels?	67	329	4.91	.417	-5.798	.293	37.468	.578
Valid N (listwise)	67							

Source: SPSS Output from Field Data (2024).

Table 2 depicts high mean scores for the questionnaire items ranging over 3.00. This means that greater number of respondents agreed and strongly agreed to the research question with respect to

JIT inventory technique. However, it can be seen that question 2 which sought to determine the extent to which upstream oil and gas companies collaborate with suppliers to synchronize production schedules, has the highest mean score of 4.93. This shows that question 2 has the strongest influence on the variables.

Furthermore, the skewness statistics are all negative indicating a negatively skewed distribution with scores concentrating on the high end of the scale. Also, standard errors of skewness are 0.293 which shows that, the distribution is not skewed to a significant degree. In the area of the kurtosis, the results showed a positive kurtosis indicating a relatively peaked distribution. Values of the standard errors of kurtosis are less than 2 indicating that the distribution is not too high to a significant degree.

Table 3: Descriptive Statistics of Material Availability

	N	Sum	Mean	Std.	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Deviation	Statistic	Std. Error	Statistic	Std. Error
To what extent do you believe that your organization ensures the availability of necessary materials to meet production demands?	67	290	4.33	1.106	-2.145	.293	4.073	.578
To what extent do you believe that your organization maintains adequate safety stock levels to prevent material shortages?	67	298	4.45	.724	-1.419	.293	2.268	.578
To what extent do you believe that your organization collaborates with suppliers to ensure a consistent supply of materials?	67	315	4.70	.779	-3.583	.293	14.301	.578
To what extent do you believe that your organization has contingency plans in place for material availability disruptions?	67	258	3.85	1.246	-.580	.293	-1.165	.578
Valid N (listwise)	67							

Source: SPSS Output from Field Data (2024).

Table 3 depicts high mean scores of the questionnaire items ranging over 3.00, meaning that a greater number of respondents agreed and strongly agreed to the research question with respect to material availability. However, it can be seen that question 3 which sought to determine the extent to which upstream oil and gas companies collaborate with suppliers to ensure consistent supply of materials has the highest mean score of 4.70. This shows that question 3 has the strongest influence on the variables.

Furthermore, the skewness statistics are all negative indicating a negatively skewed distribution with scores concentrating on the high end of the scale. Also, standard errors of skewness are 0.293 which shows that, the distribution is not skewed to a significant degree. In the area of the kurtosis, the results showed a positive kurtosis indicating a relatively peaked distribution. Values of the standard errors of kurtosis are less than 2 indicating that the distribution is not too high to a significant degree.

Table 4: Descriptive Statistics of Timeliness

	N	Sum	Mean	Std. Deviation	Skewness	Kurtosis		
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
To what extent do you believe that your organization ensures timely delivery of materials from suppliers?	67	297	4.43	1.104	-2.192	.293	3.998	.578
To what extent do you believe that your organization sets and meets deadlines for procurement processes?	67	307	4.58	.838	-2.580	.293	7.015	.578
To what extent do you believe that your organization tracks and improves on-time performance of suppliers?	67	315	4.70	.628	-3.462	.293	17.341	.578
To what extent do you believe that your organization prioritizes urgent procurement requests to avoid production delays?	67	315	4.70	.759	-3.291	.293	11.707	.578
Valid N (listwise)	67							

Source: SPSS Output from Field Data (2024).

Table 4 depicts high mean scores of the questionnaire items ranging over 3.00. This means that greater number of the respondents agreed and strongly agreed to the research question with respect to timeliness. However, it can be seen that questions 3 and 4 which sought to determine the extent to which the surveyed firms track and improve on-time performance of suppliers as well as prioritize urgent procurement requests to avoid production delays, have the highest mean scores of 4.70 respectively. This shows that questions 3 and 4 have the strongest influence on the variables.

Furthermore, the skewness statistics are all negative indicating a negatively skewed distribution with scores concentrating on the high end of the scale. Also, standard errors of skewness are 0.293 which shows that, the distribution is not skewed to a significant degree. In the area of the kurtosis, the results showed a positive kurtosis indicating a relatively peaked distribution. Values of the standard errors of kurtosis are less than 2 indicating that the distribution is not too high to a significant degree.

Table 5: Descriptive Statistics of Cost Reduction

	N Statistic	Sum Statistic	Mean Statistic	Std. Deviation Statistic	Skewness Statistic	Std. Error	Kurtosis Statistic	Std. Error
To what extent do you believe that your organization achieves cost savings through effective procurement strategies?	67	278	4.15	1.004	-1.791	.293	3.662	.578
To what extent do you believe that your organization negotiates favorable terms with suppliers to reduce material costs?	67	301	4.49	.746	-2.229	.293	7.372	.578
To what extent do you believe that your organization implements cost-saving initiatives in the procurement process	67	300	4.48	.612	-1.139	.293	2.374	.578
To what extent do you believe that your organization balances cost reduction with maintaining quality and reliability of materials?	67	297	4.43	.783	-1.138	.293	.292	.578
Valid N (listwise)	67							

Source: SPSS Output from Field Data (2024).

Table 5 depicts high mean scores of the questionnaire items ranging over 3.00; meaning that a greater number of respondents agreed and strongly agreed to the research question with respect to cost reduction. However, it can be seen that question 2 which sought to determine the extent to which upstream oil and gas companies in South-South, Nigeria negotiate favorable terms with suppliers to reduce material costs, has the highest mean scores of 4.49. This shows that question 2 has the strongest influence on the variables.

Furthermore, the skewness statistics are all negative indicating a negatively skewed distribution with scores concentrating on the high end of the scale. Also, standard errors of skewness are 0.293 which shows that, the distribution is not skewed to a significant degree. In the area of the kurtosis, the results showed a positive kurtosis indicating a relatively peaked distribution. Values of the standard errors of kurtosis are less than 2 indicating that the distribution is not too high to a significant degree.

Table 6: Correlation between JIT Inventory Technique and Material Availability

		JIT Inventory Technique	Material Availability
JIT Inventory Technique	Pearson Correlation	1	.451**
	Sig. (2-tailed)		.000
	N	67	67
Material Availability	Pearson Correlation	.451**	1
	Sig. (2-tailed)	.000	
	N	67	67

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

Source: SPSS Output from Field Data (2024).

Table 6 reveals a correlation coefficient of 0.451** between JIT inventory technique and material availability. This indicates a moderate positive relationship between the variables. The probability value (0.000) produced by the correlation analysis is less than the critical value (0.05). This shows that the correlation between JIT inventory technique and material availability is

statistically significant. This implies that JIT Inventory technique can be used to achieve material availability among upstream multinational oil and gas companies in South-South, Nigeria. Thus, we reject the null hypothesis that there is no significant relationship between JIT inventory technique and material availability of upstream multinational oil and gas companies in South-South Nigeria.

Table 7: Correlation between JIT Inventory Technique and Timeliness

		JIT Inventory Technique	Timeliness
JIT Inventory Technique	Pearson Correlation	1	.832**
	Sig. (2-tailed)		.000
	N	67	67
Timeliness	Pearson Correlation	.832**	1
	Sig. (2-tailed)	.000	
	N	67	67

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

Source: SPSS Output from Field Data (2024).

Table 7 reveals a correlation coefficient of 0.832** between JIT inventory technique and timeliness. This is indicative of a very strong positive relationship between the variables. More so, the probability value (0.000) is less than the critical value (0.05); meaning that the relationship between JIT inventory technique and timeliness is statistically significant. This further suggests that JIT inventory technique can be used to achieve timeliness among upstream multinational oil and gas companies in South-South Nigeria. Hence, we reject the null hypothesis that there is no significant relationship between just-in-time inventory and timeliness of upstream multinational oil and gas companies in South-South Nigeria.

Table 8: Correlation between JIT Inventory Technique and Cost Reduction

		JIT Inventory Technique	Cost Reduction
JIT Inventory Technique	Pearson Correlation	1	.403**
	Sig. (2-tailed)		.001
	N	67	67
Cost Reduction	Pearson Correlation	.403**	1
	Sig. (2-tailed)	.001	
	N	67	67

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

Source: SPSS Output from Field Data (2024).

Table 8 reveals a correlation coefficient of 0.403** between JIT inventory technique and cost reduction. This P(r) value indicates a moderate positive relationship between JIT inventory technique and cost reduction. More so, the probability value (0.000) is less than the critical value (0.05). This shows that there is statistically significant relationship between JIT inventory technique and cost reduction. This further implies that JIT inventory technique can be used to achieve cost reduction among upstream multinational oil and gas companies in South-South, Nigeria. Therefore, we reject the null hypothesis that there is no significant relationship between just-in-time inventory and cost reduction of upstream multinational oil and gas companies in South-South Nigeria.

Discussion of Findings

The results of correlation analysis in the previous section showed that there is a moderate positive

correlation between JIT inventory technique and material availability, a very strong positive correlation coefficient between JIT inventory technique and timeliness, and a moderate positive correlation between JIT inventory technique and cost reduction. The analyses also showed that all the correlations are statistically significant. These suggests that a statistically significant relationship exists between JIT inventory technique and procurement performance of upstream multinational oil and gas companies in South-South Nigeria.

These findings corroborate that of Alhassan et al. (2022) that inventory control has significant impact on financial performance of quoted manufacturing companies in Nigeria; and that automated inventory system has positive significant relationship with operational performance (Akinlabi, 2021). Similarly, the findings of this study support that of Hassan et al. (2020) that inventory management practices has significant positive effects on performance of food and beverage companies in Kwara State, Nigeria.

The current findings also support that of Kehinde et al. (2020) that inventory management practices reduce operational costs; and that of Nwamgbebu et al. (2019) that inventory management has positive significant impact on performance of hospitals. Relatedly, our findings align with the findings of Mishra et al. (2018) that implementation of JIT inventory technique enhance the success of firms. Our findings also agree with that of Sporta (2018) that inventory control techniques have positive impact on performance of Kenya's medical supplies agencies.

In addition, our findings cohere with the report that inventory management practices relates to competitiveness and performance of micro and small enterprises in Ethiopia (Balda, 2018); performance of listed manufacturing firms in Ghana (Bawa et al., 2018); operational efficiency, timely delivery, cost reduction and profitability of Colleges of Education in Akwanga (Agum et al., 2018); as well as organizational performance of food processing firms in Nigeria (Phebe & Njoku, 2018).

Conclusion and Recommendations

This study examined the correlation between JIT inventory technique and procurement performance of upstream multinational oil and gas companies in South-South Nigeria. Based on the results of the analyses conducted, the study concluded that JIT inventory technique has significant positive correlation with procurement performance upstream multinational oil and gas companies in South-South Nigeria, in terms of material availability, timeliness and cost reduction. Thus, the study recommends that:

- 1) Managers of upstream multinational oil and gas companies in South-South Nigeria should constantly evaluate current inventory practice to ensure constant application of JIT within the specific context of upstream oil and gas operations, this will boost their procurement performance.
- 2) Managers of upstream multinational oil and gas companies in South-South, Nigeria should integrate advanced demand forecasting techniques with the just-in-time system to improve material availability and timely delivery. This may involve using machine learning algorithms or advanced statistical methods to predict demand more accurately, which will automatically translate to improved procurement performance.

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