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INVENTORY CONTROL STRATEGIES AND SUPPLY CHAIN VIABILITY OF DOWNSTREAM PETROLEUM INDUSTRY IN RIVERS STATE

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ABSTRACT:

The purpose of this study was to investigate the link existing between inventory control strategies and supply chain viabilityusing downstream petroleum firms in Rivers State, Nigeria. This study adopted cross-sectional survey design. Questionnaires were the key instrument for data generation. The respondents were 134downstream petroleum staff in Rivers State. The study adoptedcensus since the population was not large, thus there was no need of sampling. Cronbach's alpha test was adoptedto test the reliabilityof the instrument. The Pearson Moment Product Correlation Coefficient was used to test postulated hypotheses. The studyfinds out that, inventory control strategies significantly improve supply chain resilience and sustainable supply chain of downstream petroleum firms. Thus,by implementing inventory control strategies, thesefirms will improve their supply chain resilience and sustainable supply chain, and in turnthe attainable of their goal(s). It was recommended that, downstream petroleum firms should implement full inventory control strategies for effective and strong supply chain resilience and sustainable supply chain. Downstream petroleum firms should conduct regular assessment of their inventory control strategies in order to be updated with current realities for better supply chain resilience and sustainable supply chain.

KEYWORDS:

Inventory Control Strategies, Supply Chain Viability, Downstream Petroleum

Introduction

Downstream petroleum comprises of establishments or any of the operation related to the circulation of petroleum to end users. This sector rely heavily on viability of supply chain. According to Ivanov and Dolgui (2020) supply chain viability is the capability of a supply chain to move itself and persist in analtering environment via structural reformas well as performance anticipation. Viable supply chain is a energetically adaptive as well asarchitecturally changeable value network that is capable of respondingswiftly to positive changes, resilient to engross negative events as well asrecovering fromdistractions and survive in times of long-term globaldistraction by modifying capacities, jobs and their mappings to requirement in response to internal as well as external changes in line with defensible developments to safeguard the future (Ivanov, 2021). In the same vein, supply chain viability dependent on inventory control strategies.

With regard to Miller (2010) inventory control concerned all activities put in place to make sure that implied customers are satisfy with either services or products desired. It organizes the acquiring, production as well as dissemination functions to catch up with marketing desires and manufacturers wishes of making the products available to end users. Inventory control is largely involved with stipulating the size in addition to assigning stocked products. Inventory control is obligatory at diverse places within a facility or within manifold positions of a supply system to defend the frequent as well as premeditated course of manufacturing compared to the random commotion of going out of materials. The range of inventory control likewise comprisesof managing refill lead time, refill of merchandises, returns, substandard goods, demand prediction, inventory transporting costs, forthcoming inventory price prediction, quality controlling, demand forecasting, inventory visibility, inventory assessment, asset management and available physical space. Balancing of these requirements willfacilitate optimal inventory level, which is an on-going procedure as the business desires a shift and react to the broader environment (Ogbo et al, 2014). The different aspect of inventory controlling strategies practiced by most organizations for efficient and effective supply chain comprise of economic order quality model (EOQ), just in time (JIT), vendor manage inventory (VMI), collaborative planning (CP), material requirement planning, agile system, automatic replenishment, forecasting and replenishment etc.

Studies examining the effects inventory control strategies are mainly in the area of finance, procurement and economic performance and none on viability of supply chain. Majority of the evaluated studies focused on external inventory control practices. For instance, Auman, Muturi as well as Atambo (2017) studied the impact of inventory control approaches on the performance of procurement function in sugar manufacturing organizations in Western Kenya. Onchokeas well as Wanyoike (2016) studied the impact of inventory management practices on procurement performance of agrochemicals distributors in Nakuru Central Sub-County, Kenya. Mwachiruas well asDatche (2015) studied the effects of inventory controlling system on the performance of organizations. Mwangangy and Senelwa (2018) examined the impact of inventory management methods on service delivery in parastatals in Kenya.Mwangyin addition to Nyambura (2015) tested the function of inventory management in the performance of organizations involved in food processing. Thus, constituting a gap. This study thus, considering the role of inventory management in the downstream petroleum industry, will empirically test the effect of inventorystrategies on supply chainviability using supply chain resilience and sustainable supply chain to bridge this gap.

Thus, this study postulated, there is no link between inventory control strategies and supply chain resilience of downstream industry in Rivers State.There is no link between inventory control strategies and sustainable supply chain of downstream industry in Rivers State. Therefore, the aim of this study is to test the proposed hypotheses and come up with findings that can be generalized in order to curb disruption in petroleum products distribution. This study was structured in the following units: Unit 1: background as discussed above, Unit 2: review of literature on the variables. Unit 3: expression of methods and material used for analyzes. Unit 4: result and discussion. Unit 5 implication of the study and conclusion.

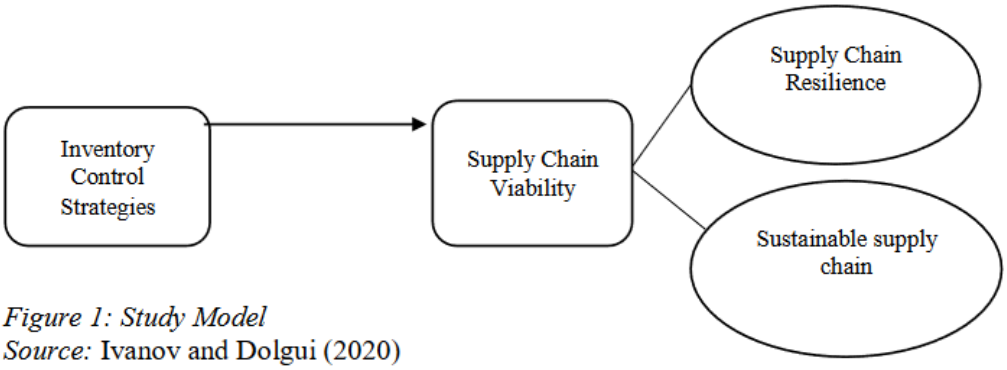

Figure 1: Study Model
Source: Ivanov and Dolgui (2020)

The study aim is to examine the effect of inventory control strategies on supply chain viability of downstream petroleum industries in Rivers State. Specifically, the study shall:

i. Find out the correlation between inventory control strategies and supply chain resilience
ii. Ascertain the link between inventory control strategies and sustainable supply chain

With regard to the mentioned objectives, the study is set to answer the subsequent questions:

i. What is the link between inventory control strategies and supply chain resilience downstream petroleum in Rivers State?
ii. What is the association between inventory control strategies and sustainable supply chain downstream petroleum in Rivers State?

Literature Review

Inventory control can be expressas a subset of logistics system that integrates all activities concerning developing and controlling inventory levels, to guaranteesatisfactory supplies, and inventory cost effectiveness (Kotler, 2000; Coyle, Langley, Novack & Gibson, 2016). Inventory control is aprogressionas well as decisions used in determining and regulatingmerchandises to order, when to order and quantity to be kept in stock (Stevenson, 2009:Toomey, 2000). Angel, Gomathi & Chitra, (2014) argue that inventory control administration is anall-inclusive process of organizing, planningas well as controlling of inventory to reduce cost while generating equilibrium between supply and demand. According toAin (2014) inventory control comprisesof methods used for organizing, holding as well as replenishing stock (Ain 2014). According to Odiri (2015) in conjunction with Ain (2014) inventory control is the application of administrative tools in making sure needed qualities and quantities of stock are available at the right time, right place and at the

lowest of cost. Inventory

Inventory control strategies onthe otherhand, is the processes of handling inventory in order to satisfy customer demand at a lower cost, with a minimum of investment (Byoungho, 2004). Anefficaciously executed inventory control program considered things as purchasing merchandises, commensurate demand, seasonal disparity, fluctuating usage patternsas well ascheckingof pilferage (Ellram, 1996). Inventory Control strategies are tremendously imperative for business functionality since all successesas well as cost reduction of a firm's expenditure necessitate enhanced supply chain performance and intellectual capacity of the employees (Lambert, 2008). These strategies are highly essential and desirable thus, management of organizations and procurement staff must be able to apply these strategies for the betterment of their organization (Fellows & Rottger, 2005). Inventory control strategies are incorporated by organizations within the outline of one of the rudimentary inventory models, which is Fixed Order Quantity Systems or Fixed Order Period System. Tungo (2014) identified some inventory control strategiesopen to organizations, as;Just In Time (JIT), Economic order quantity EOQ,Demand forecasting,Stock levels, ABC analysis, FIFO and LIFO, Strategic Supplier Partnership (SSP), EDI, EPOS, Bar coding, Lean Inventory System, MRP, ERP, VMI, Fixation of norms of inventory holdings, Safety Stock Inventory, Reorder point formula, Batch tracking, Consignment inventory, Drop shipping, Bulk shipments,Six Sigma, Lean Six Sigma, Cross-docking andPerpetual inventory management.

Economic order quantity (EOQ) is the optimal number of merchandises an organization is supposed to add to its current stock during re-order to accuratelylessen the total cost acquired for holding goods as well as ordering processes (Drury, 2013). According to Suresh, Nallan and Kay (2012) Just inTimeis an all-round waste eradication philosophy.Burcher (2015) sees MRP as a computer-based planning technique that applied the master production program to control inventory through input as well as output in production. In the same vein, ERP assist inaccomplishing and integrating office operation (Umble & Haft, 2003) while VMI method enableinfo sharing among partners and trading parties (Disney &Towill, 2003). These inventory controlstrategies result in continuous control and monitoring of both production and procuring procedures from source-to-end points, making sure smooth movement of material and value added activities within the entire supply chain (Gregor & Rawling, 2016). According to Zairi (2012) and Christopher (2016) inventory control enable planning performance of an organization. According to Drexl and Kimms (2013) an organization choice of inventory method depends on the nature of inventory at hand. It is likewise important to note that inventory control strategyguarantee best services to consumers as it enable conditions for healthier coordination of purchasing, production and disseminationof functions (Porter 2008).

Supply Chain Viability

Concept of system viability was initially introduced in ecology and biological systems and cybernetics (Aubin 1991). The Viable System Model by Beer (1981) and ecology modelling views from Aubin (1991) are stimuli for the development of supply chain viabilityconcept: they highpoint the capability of a system survival in a tempestuous environment. According to Ivanov and Dolgui (2020) supply chain viability is comparable to the multifaceted nature systems. They went further to assert that supply chain viability is the capability to uphold itself and survive in a fluctuating environment over a long period of time via a redesign of the structures as well as economic performance rescheduling with long-term effects. They categories supply chain viability into three major pillars such as; the viable supply chain scheme, a multi-structural understanding of supply chain viabilityas well as an

ecosystem of a viable supply chain. The viable supply chain scheme is based on enhancement of manifold, substituted structural network designs for supply–demand provisions during normal disrupting and super disrupting times and more significantly, the formation and controlling of adaptive devices for transitions among these structural designs. The multi-structural perspectiveclassified viable supply chain into process-functional technological and financial, organizational, informational, structures as well as resources, spanning numerous administrativeas well as managerialst and points. The ecosystem perspective of viable supply chain necessitates major feedback cycles in supply chain network interactions with environment.

Firms with supply chain viability could connect non-traditional supply markets for its prevailing goods, in order avoiddistraction induced surges in demand as well as recompense for unexpected shortages in its frequent supply chain. Supply chain viability provides avenue for long-term preservation of survivability under diverse and constant changing environmental circumstances. According to Ivano and Dolgui (2020) supply chain viability is measured using supply chain resilience and sustainable supply chain. Supply chain resilience on the other hand is the capability of a firm or firms to rapidly recover from supply network disruptions by integrating litheness in addition to redundancy. (Zsidisin& Wagne, 2010; Blackhurst et al., 2011). In the same vein, supply chain resilience can be seen according to Ponomarov and Holcomb (2009) and Ponomarov (2012) as the adaptive capabilityof getting ready for unforeseen events, reply to distractions, and recovering from them by upholding operations at the anticipated level of connectedness and controlling over scheme and function. Supply chain resilience can result to either failure or success of an organization (Ambulkar et al., 2015; Hohenstein et al., 2015).Its enable the immediate assessment of the influence of hazards onsupply chainand the levels of recovery that might be achievable during distractions (Soni et al., 2014). While, sustainable supply chain can be expressed as the administration of supply chain functions, resources, dataas well as financial assets to make best use of supply chain profitability while decreasing environmental influences and taking full advantage of social well-being (Panigrahi et al., 2019). Sustainable supply chain is anadministrativeprocedure that incorporates environmental contemplations, social performance, as well as economic support (Raut et al., 2015). A sustainable supply chain can likewise be seen as thecoordination, design, control and organization of a supply chain to make it actually sustainable, with the tiniestanticipation of attaining economic success while making sure that the environment and social systems are not damaged over time (Pagell& Shevchenko, 2014). The study of Liuu et al., (2018) stipulated that, supply chain resilience related to firm performance and risk management performance. Additionally, according to Liuu et al., (2018) a resilient supply chain can increase firm's competitive advantage in addition to performance by allowing firms to react to disrupting events quicker than its competitors, allowing firms to gain improved market share. Ambulkar et al., (2015) asserted that supply chain distraction orientation is not sufficient for firms to attain resilience; they must likewise be capable to reorganize as sets as well as risk controlling infrastructure.

Methodology

This study embraced cross sectional survey design to obtain responses from selected respondents of 11 downstream petroleum establishment in Rivers State, Nigeria. The study embracedTaro Yamane's formula to determine the sample size of the study. One hundred and thirty four (134) was then the sample size. The primary instrument for data collection was questionnaire. The singular firm sample size was scientifically ascertainand disseminated for each of the 11firms separately using Bowley (1964). The nature of the data was quantitative. Questionnaires was distributed to respondents of the

11 firm's understudy, 134 copies were recovered and usable for investigation. The reliability of the study instrument was confirmed by the use of Cronbach alpha. Pearson Moment Product Correlation Coefficient with the aid of SPSS was appliedto test proposedhypotheses.

Table 1: Result of Reliability Test

Variables	**No of Items**	**Alpha Value**
Inventory Control Strategies	4	0.844
Supply Chain Resilience	4	0.810
Sustainable Supply Chain	4	0.830

Bivariate Data Analyses

The upshots of bivariate analysis wasoffered with test conducted using the Pearson's Product Moment Correlation Coefficient at 99% confidence level which was acknowledged as a criteria for the probability for either acknowledging the null hypotheses at (p>O.O5) or declining the null hypotheses formulated at (p< 0.01.Salkind (2010) benchmark for interpreting correlation coefficient (r) was used.

Table 2: Correlation result of Inventory Control Strategiesand Supply Chain Resilience

Correlations

		Inventory Control Strategies	Supply Chain Resilience
Inventory Control Strategies	Pearson Correlation	1	.815**
	Sig. (2-tailed)		.000
	N	134	134
Supply Chain Resilience	Pearson Correlation	.815**	1
	Sig. (2-tailed)	.000	
	N	134	134

Table 2, indicated, there is link among inventory control strategies and supply chain resilience. The results stated anaffirmativeas well as significant link between the variables. The correlation statistic (r = .0.815, p < 0.001) signified that, inventory control strategies can explain 81.5% variation insupply chain resilience. This is an indication of a positive relationship between the variables. In term of intensity of the relationship, the result show that inventory control strategieswith (r = 0.665) is very

strongly related tosupply chain resilience. This implies, a unit increase in inventory control strategies has potential to make supply chain resilience stronger.

Based on this result, $\mathbf{H_1}$ as postulated was discarded, hence the alternative hypothesis accepted.

Table 3: Correlation result of Inventory Control Strategies and Supply Chain Resilience

Correlations

		Inventory Control Strategies	Sustainable Supply Chain
Inventory Control Strategies	Pearson Correlation	1	.743**
	Sig. (2-tailed)		.000
	N	134	134
Sustainable Supply Chain	Pearson Correlation	.743**	1
	Sig. (2-tailed)	.000	
	N	134	134

Table 3, indicated, there is link among inventory control strategies and sustainable supply chain. The results stated anaffirmativeas well as significant link between the variables. The correlation statistic (r = .0.743, p < 0.001) signified that, inventory control strategies can explain 74.3% variation insustainable supply chain. This is an indication of a positive relationship between the variables. In term of intensity of the relationship, the result show that inventory control strategieswith (r = 0.743) is strongly related tosustainable supply chain. This implies, a unit increase in inventory control strategieshas potential to improve sustainable supply chain.

Based on this result, $\mathbf{H_2}$ as postulated was discarded, hence the alternative hypothesis accepted.

Discussion of Findings

The findings from the test of hypotheses indicated that, there is correlation between inventory control strategies and the measures of the study (supply chain resilienceas well assustainable supply chain.). The results show a positive as well as significant relationship between the variables. The correlation statistic (r = .0.815, for test 1 and r = .0.743, for test 2, p < 0.001) signify that inventory control strategiescan explain 81.5% of variation insupply chain resilience and74.3% in sustainable supply chain. This is an indication of a positive relationship between the variables. In term of intensity of the relationship, the result show that human capital with (r = 0.815 and r = 0.743) is verystrongly related to supply chain resilience and strongly related to sustainable supply chain. This is very instructive to management of downstream petroleum industries, a unit upsurge in inventory control strategies has potential to increasesupply chain resilienceas well assustainable supply chain. The implication is that, there would be effective and efficient distribution of petroleum products with no disruption. Thus, the enhancement of overall performance and profitability of the organization.This is in conformity

withthe study of Mbugi and Lutego (2022) investigated effect of inventory control systems. The research employed Nuevo qualitative analysis software and the findings are that the organizations employed different types of inventory management systems ranging from economic order quantity, perpetual inventory control systems, barcode inventory control system etc. These system minimizes inventory total cost, gives information on the state of the firm's inventory on an ongoing basis respectively and brings about effectiveness, efficiency and profitability of the organization.Achevi, Juma and Otinga (2021) studied the influence of inventory control techniques. The study engaged multiple regression analysis and the findings of the study is that inventory control strategies significantly improves the performance of organization. The study specifically discovered that inventory control techniques such as just-in-time system, economic order quantity and ABC analysis significantly but relatively influence the performance.Mankazana, Silase and Molefe (2018) investigated influence of inventory management strategies and supply chain management on organizational performance of organization. The study made use of mixed research method and the findings of the study is that inventory management and supply chain have positive and noteworthyinfluence on the performance of organization.

Conclusion and Recommendations

The study investigated the link between inventory control strategies and supply chain viability of downstream petroleum industry. The study find that inventory control strategiesabsolutely related tosupply chain resilience and sustainable supply chain. These findings have important implications for downstream petroleum industry in Rivers State. By implementing these inventory control techniques, these firms can improve their supply chain resilience as well as sustainable supply chain, and in turnthe attainable of organizational goal(s).

i. Downstream petroleum firms should implement full inventory strategies to increase their supply chain resilience and sustainable supply chain.
ii. Downstream petroleum firms should conduct regular stock taking audits of inventory levels to ensure they identify and rectify any discrepancies that would undermined viability of supply chain.
iii. Downstream petroleum firms should conduct regular assessment of their inventory control strategies in order to be updated with current realities for betterment ofsupply chain resilience and sustainable supply chain.

THE STUDY RECORDED NO CONFLICT OF INTEREST.

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