



Supply Chain Strategies and Vessel Operational Efficiency: A Conceptual Review

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Abstract: *The internal operations, external environmental factors and some elements within the maritime supply chain increase disruption. Pressures have fueled a continuous change process within firms, impacting all the areas of supply chains, from rapid technological changes, to a much-shortened product life cycle. The study at this stage is conceptual and thus adopts a review of extant literature which adopts a desk research methodology. Previous findings from reviewed literature revealed that talent management significantly influences employee commitment. This means that talent management could be used to prevent competent employees from leaving the organization as this could have adverse effects on productivity and service delivery. Findings in extant literature show that supply chain management practices that include; supply chain integration supply chain relationship management and supply chain responsiveness significantly contribute to vessel operational efficiency. Hence it can be concluded that supply chain practices are important factors to achieve improvement in vessel operational efficiency of maritime companies in Nigeria. The study recommends that an empirical review be fully carried out to examine and validate the conceptual model developed in this study by using a cross sectional survey methodology to study maritime companies in Nigeria.*

Keywords: *Supply Chain Strategies, Vessel Operational Efficiency, Supply Chain Integration, Vessel Turnaround Time*

INTRODUCTION

A recent study by Amor and Ghorbel (2018) reveals that Nigeria maritime sector tops the lists of countries that outsource their products and supply process; thereby increasing her vulnerability to disruption risks. The internal operations, external environmental factors and some elements within the maritime supply chain increase disruption. Natural events, political crisis and global financial crises are examples of external environmental drivers of supply chain disruption. Internal operations, firm's capabilities, information quality and supply chain process visibility are potential sources of petroleum supply chain management pressure (Alexander, 2016). Operational risk refers to the disruptions engendered by problems within the organizational boundaries of a firm that affect its ability to produce and supply goods/services (Paul, et al, 2017).

Drivers within the supply chain include globalization, long lead-times, low product shelf life, increased outsourcing, and the rising call for agile, lean and green supply chain management (Paul et al., 2017). Knowledge of these drivers can serve as guidelines for managers to assess

the extent of their supply chain vulnerability. Managers are challenged to devise strategies or implement policies that can effectively and efficiently mitigate supply chain disruptions either by reducing the probability of occurrence, or limiting its impact on the supply process, or eliminating the risks altogether.

A vast approach to mitigating supply chain disruptions abound in the literature. Alexander (2016) argues that mitigation measures could incorporate either long-term planning or short-term planning that generates mitigation tactics and contingency plans. Yan and Nair (2016) suggest: increase in capacity, inventory, responsiveness, flexibility, aggregating demand, and keeping multiple and diversified supplier base.

Alexander (2016) cites examples of mitigation strategies to include contingent sourcing, expediting orders, rerouting deliveries and lateral and vertical emergency transshipments. Simona, (2016) suggests dual sourcing, increased product, volume, routing and delivery flexibility and information visibility and management. In Amor and Ghorbel's (2018) submission, having flexible supply base not only enables a firm to handle regular demand– supply variances, but helps to build organizational resilience when major disruption occurs.

Ahi and Searcy (2015) advocate in- house production of certain goods when facing potential supply disruptions while other products are outsourced. Nsikan, et al. (2018) reported that ensuring forecast accuracy through proper quantification, building trust in supplier collaboration, and investment in supply chain visibility or transparency reduces the probability of disruptions.

Danese and Romano (2011) submit that investment in appropriate information technology particularly radio frequency identification tags (RFID) is known to reduce the chances of disruptions by increasing inventory visibility, tracking shipment in transit and tracing inventory and orders across the entire system of oil supply chain (Nsikan, et al. 2018). Access to real time and transparent information reduces the bullwhip effect and provide accurate demand and supply information necessary to mitigate the disparities in product demand and supply. A prominent but unfortunate feature of the Nigerian petroleum industry is frequent petroleum product shortages. Nigeria has frequently experienced disruptions in the supply of petroleum products over the years. This shuts down business activities, leading to loss of revenue and underdevelopment since most business enterprise depends on petroleum products for survival (Aminu & Olawore, 2014).

There are practical evidences which may suggest the presence of some mechanisms to mitigate disruptions in Nigeria maritime industry supply chain. However, the effectiveness of these mechanisms appear doubtful given the numerous shortages of refined petroleum products, product adulteration, and the attendant socio-economic consequences. There is remarkable research interest in supply chain process disruptions in the oil and gas industry.

As modern supply chain management is in its infancy in the Nigeria maritime sector, it faces different challenges, compared to supply chains in other parts of the world, such as in Western

countries. In such Western countries supply chain management practices have evolved and developed through practice and study over recent decades. This study reveals through extant literature that supply chain management challenges in emerging supply chain management markets such as Nigeria, are not well understood and researched upon (Yawar & Seuring, 2015).

Production of goods and services and distribution logistics have been evolving rapidly over time, with suppliers, manufacturers, couriers, and customers all gaining competitive advantage from free trade agreements. Since firms continue to seek greater benefits and profit, supply chain management has become an essential part of managing business processes at national and regional levels, through improving different aspects of the supply chain, which can provide increasing strata of competitive advantage (Simba, et al., 2017).

However, the changing nature of different regions around Nigeria creates numerous ways of bringing about change, which can enhance supply chain performance. Differences of culture, organisational governance, and regulations have close connections to managing supply chains in diverse parts of the world (Paul, et al. 2017). One such area is the Maritime sector in Nigeria, which is one of the fastest growing regions presently, witnessing supply chain management growth, both in practice and in applications. In recognition of this changing position, Maritime sector in Nigeria, has formed organisation policy, specifically targeting supply chain (SC) growth and evolution in the petroleum sector since that is the area where petroleum products are produced.

The challenges in supply chain have also created problems such as increasing cost of product distribution by maritime companies and frequent transportation cost adjustments through demand and supply mechanism have even aggravated the situation by the government which oftentimes lead to industrial strikes by trade unions in the downstream sector. The supply and distribution chain thus presents a problem of product availability to consumers, problems of integration in practice, information sharing, culture, organizational structure and availability of data (Simona, 2016). The focus of this study to identify the major supply chain strategies affecting the vessel operational efficiency of maritime companies in Nigeria.

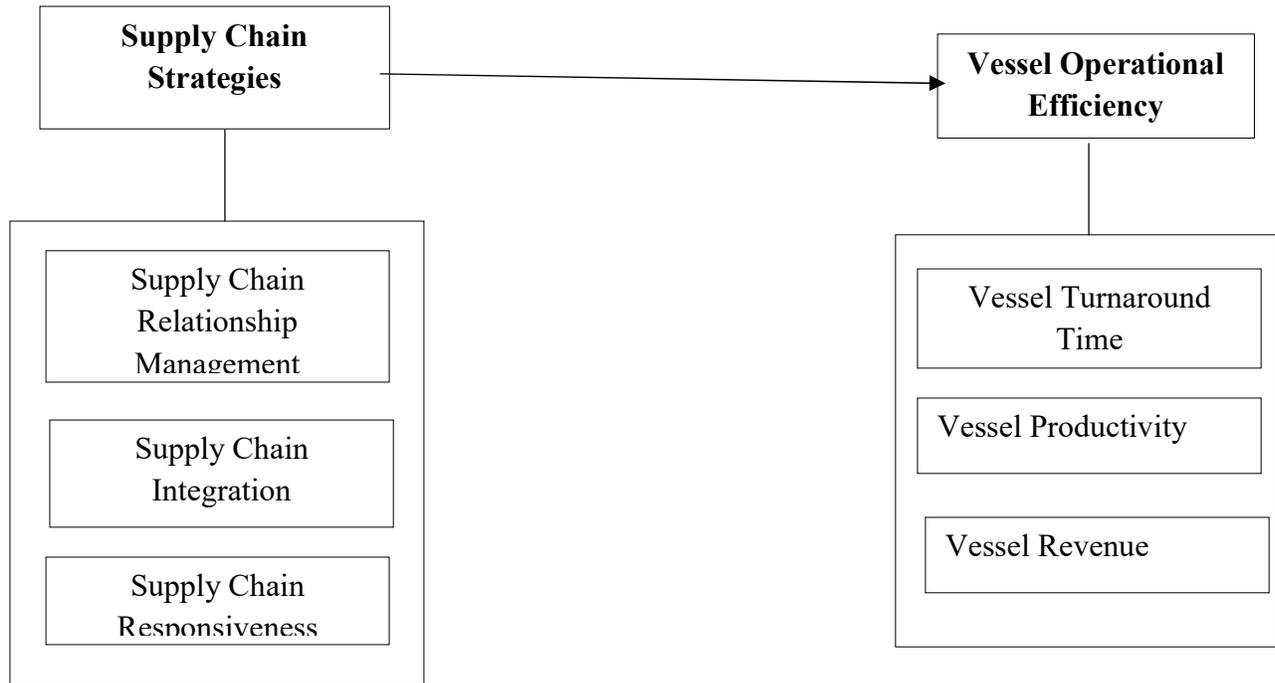


Figure 1.1: Conceptual Framework for Supply Chain Strategies and Vessel Operational Efficiency

Source: Desk Research (2022)

LITERATURE REVIEW

Theoretical Framework

SCOR Model (Supply Chain Operations Reference)

The Supply Chain Operations Reference model was introduced by the Supply Chain Council (SCC), an independent, not-for-profit, global corporation interested in applying and advancing the state-of-the-art in supply-chain management systems and practices. SCC was established in 1997, when 69 visionary supply chain practitioners from a variety of industry segments formed a cross-industry forum to discuss the issues related to supply chain management. The Supply Chain Operations Reference model (SCOR) is a management theory used as a tool to address, improve, and communicate supply chain management decisions within a company or supply chain environment and with suppliers and customers of a company (Tu, Vonderembse, Ragu-Nathan & Ragu-Nathan, 2004).

The model helps to explain the processes along the entire supply chain and provides a basis for how to improve those processes by measuring specific supply chain performance through defined metrics. The score model advocates for a lean supply chain where waste has been

eliminated and the metrics in the SCOR model entails measuring supply chain plans which include sale and operations planning, source which include upstream flow from supplier side, make whose main concern is at the transformation stage where there is manufacturing, assembly and kitting, deliver entails transportation optimization and lastly return where the measures entails shipping mistakes and product quality. The SCOR model has been described as the most promising model for supply chain strategic decision making (Tu *et al.*, 2004). The SCOR-model comprises five components: Plan, Source, Make, Deliver and Return. Each of these components is considered both an important intra-organisational function and a critical inter-organisation process. The five components of the model are integral part in modular manufacturing, supply chain relationship management, supply chain integration and supply chain responsiveness.

Supply Chain Relationship Management

Supply chain relationship management is defined as activities undertaken by an organization to promote effective management of supply chain engagements both in upstream flow and downstream flow (Lapide, 2013). We have relationships where the buyer and supplier do not have that closeness on one end and on the other end we have adversarial relationships which have single sourcing as an improved level within the spectrum as it is characterised by lack of mutuality in thought and in action. Donlon (1996) considered outsourcing, supplier partnership, information sharing, cycle time compression, and continuous process flow, as supply chain relationship elements. Further, he classified supply chain in three stages of strategic supplier partnerships, customer relationships and information sharing.

Strategic supplier partnerships defined as the long-term relationship between the organization and its suppliers within the relationship spectrum. It is designed to leverage the strategic and operational capabilities of individual participating organizations to help them achieve significant ongoing benefits (Li, Ragu-Nathan, Ragu-Nathan & Rao, 2006) assert that a strategic partnership emphasizes long-term relationship between trading partners and promotes mutual planning and problem-solving efforts (Li *et al.*, 2006). Strategic partnerships with suppliers facilitate organizations to work closely and effectively with a few suppliers thus giving the partners shared benefits (Thatte, 2007).

Customer relationship is seen as the entire spectrum of practices that are employed for the purpose of managing customer complaints, building long-term relationships with customers, and improving customer satisfaction (Li *et al.*, 2005). An organization's customer relationship practices can affect its success in supply chain management efforts as well as its performance. Successful supply chain management involves customer integration at the downstream and supplier integration at the upstream, considering that each entity in a supply chain is a supplier as well as a customer (Tan, Kannan, Handfield & Ghosh, 1999).

Supply Chain Integration

The concept of supply chain integration has recently gained widespread attention in supply chain literature (Zhang & Huo, 2013). Firms are now under increased pressure to integrate their supply chains to become more competitive in order to meet the challenges of current business needs (Danese & Romano, 2011). Flynn, Huo and Zhao (2010) defined supply chain integration as —the degree to which a manufacturer strategically collaborates with its supply chain partners and collaboratively manages intra- and inter-organisation processes. The goal is to achieve effective and efficient flow of products and services, information, money and decisions, to provide a maximum value to customer at low cost and high speed.

Supply chain integration can be seen at two broad levels; external integration and internal company integration. While external integration examines integration that occurs between the firm and its suppliers and customers, internal company integration is associated with the integration of the production and supporting functions within the organisation (Schoenherr & Swink, 2012). External integration refers to the integration of the company with its external environment including customers and suppliers. Internal integration refers to breaking down the functional barriers and working with the different divisions within the organisation as a single unit. The organisation functional divisions are viewed as an integrated process rather than functional silos based on traditional departmentalization and specialisation (Flynn *et al.*, 2010). Wright (2016) referred to internal integration as —the competency of linking internally performed work into a seamless process to support customer’s requirements|. Another type of integration highlighted in the literature is vertical integration. Vertical integration can be described as the overall scope of different business activities in a supply chain brought under the management of a single company. It can be realised through two approaches: vertical financial ownership; and vertical contracts (Huang, Yen & Liu, 2014). Vertical financial ownership eliminates company boundaries through mergers and acquisitions, while vertical contracting, which includes exclusive dealing, resale price maintenance, and exclusive territories, offers a viable alternative to vertical financial ownership (Ataseven & Nair, 2017).

Supply Chain Responsiveness

In recent times, the complexities and frequent changes experienced within the environment have necessitated managers to continuously strive for improvement in their product or service offerings. Such changes essentially call for renewal of operations and sustainable market positioning of goods and services. Incidentally, the changes could emanate from threats or shocks within the environment which may lead to organizational failures if not well managed. It is therefore expedient for organisational actors to understand and deal with the changes as they occur. Clearly, organisations are becoming more vulnerable to environmental threats and shocks, irrespective of their varied objectives or type. It is the duty of managers or heads of organisations to pursue the necessary means through which it can thrive and surmount pressures or changes prevalent in the environment taking into cognisance the nature of such change; be it sudden or otherwise (Coleman & Adim, 2019). The foregoing dynamic nature of the environment calls for supplychain responsiveness.

Supply chain responsiveness is defined as the capability of promptness and the degree to which the supply chain can address changes in customer demand (Koçoglu, İmamoğlu, İnce, & Keskin, 2011). In a rapidly changing competitive world, there is a need to develop organizations and supply chains that are significantly more flexible and responsive than the existing ones and in a very sustainable way. Firms should aptly respond to changing customer needs so as to succeed in today's uncertain business environment (Muhammad, Sule, Sucherly and Kaltum, 2016) as well as any disruptions in supply (Christopher & Peck, 2004). Supply chain responsiveness can be viewed in terms of operation system responsiveness, logistics process responsiveness and supply network responsiveness.

Operations system responsiveness is defined as the ability of a firm's manufacturing system to address changes in customer demand. Operations system responsiveness includes both manufacturing and service operations. Duclos, Vokurka and Lummus (2003) and Lummus *et al.*, (2003) in a conceptual study, emphasize that operation responsiveness at each node of the chain is an integral component of supply chain responsiveness. They further argue that in order to meet the end customer's needs, each entity in the supply chain must deliver the product or service in a timely and reliable manner (Prater, Biehl & Smith, 2001).

Logistics process responsiveness is defined as the ability of a firm's outbound transportation, distribution, and warehousing system to address changes in customer demand. The responsiveness in the logistic processes is a vital component in the success of a responsive supply chain strategy. Logistics and distribution management includes the activities of transportation of goods from suppliers to manufacturer to distribution centres to final point of consumption. These activities include warehousing, packing and shipping, transportation planning and management, inventory management, reverse logistics, and order tracking and delivery (Thatte & Agrawal, 2017). Responsiveness components in the logistics system include selecting logistics components that accommodate and respond to wide swings in demand over short periods, adjust warehouse capacity to address demand changes, handle a wide range of products, vary transportation carriers, have the ability to pack product-in-transit to suit discreet customers' requirements, and have the ability to customize products close to the customer; and do all of these speedily in order to gain a competitive performance (Mandal, 2015).

Supplier network responsiveness is defined as the ability of a firm's major suppliers to address changes in the firm's demand both in production and in downstream. A key to responsiveness is the presence of responsive and flexible partners upstream and downstream of the focal firm. The ability of firms to react quickly to customer demand is dependent on the reaction time of suppliers to make volume changes (Thatte, Rao, & Ragu-Nathan, 2013). Whenever disruptive causes such new technology, terrorist threats or cut-throat competition tend to throw the supply chain haywire, the supply chain networks must be ready to react to any ripple effect. Slack (1991) argues that supplier networks are the essential building blocks of a flexible system. Holweg and Pil (2001) argue that flexibility in the supplier network is an important ingredient of being responsive to changes in customer demand. Thus, supplier network responsiveness is believed to be a dimension of supply chain responsiveness in this study. In order to have a competitive performance, organizations need to meet the changing needs of customers by being able to rapidly supply products, including any demand changes in terms of product volume, mix, product variations, and new product introductions.

Vessel Operational Efficiency

Port efficiency operating objectives include the technical efficiency objective of maximizing port interchange service in the employment of a given level of resources (exhibited by the port's production function) and the cost efficiency objective of minimizing cost in the provision of a given level of port interchange service (exhibited by the port's cost function). In order for a port to be effective, it must be efficient. Specifically, it must be cost - efficient, which in turn requires that it must be technically efficient. That is to say, a necessary condition for a port to be cost efficient is that it be technically efficient. A necessary condition for a port to be effective is that it be cost-efficient. In view of technological, political and market changes in the environment of ports, efficiency and effectiveness can only be guaranteed through private sector management of terminal operation.

Vessel Turnaround Time

Oram and Baker, (2011) define vessel turnaround time as the process needed for loading, discharging and servicing a vessel from berthing until vessel's departure. This period starts from actual arrival of a vessel at berth to its actual departure from the berth. Hartmann, (2004) argues that container terminals are facing challenges of reaching turnaround time with more and larger vessel in the shortest possible time. Clark *et al.* (2004) elaborate further that port efficiency is directly affected turnaround time for vessel in wharf. And it varies widely from country to country and region to region. As being proven, Singapore and Hong Kong are the most efficient ports in the world, whereas, inefficient ports are located in developing and third world countries such as Ethiopia, Nigeria, Malawi for Africa continent, or in South America such as Colombia, Venezuela and Ecuador. Since port efficiency is highly correlated with handling cost, therefore, lower turnaround time for vessel means that particular container terminals are having higher handling costs. And the length of time spent by vessels in port represents a loss of revenue from economic point of view.

CONCLUSION AND RECOMMENDATION

Findings in extant literature show that supply chain management practices that include; supply chain integration supply chain relationship management and supply chain responsiveness significantly contribute to vessel operational efficiency. Hence it can be concluded that supply chain practices are important factors to achieve improvement in vessel operational efficiency of maritime companies in Nigeria.

The study recommends that an empirical review be fully carried out to examine and validate the conceptual model developed in this study by using a cross sectional survey methodology to study maritime companies in Nigeria.

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