

DMA-SUPPLY CHAIN MANAGEMENT

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How to cite this article: Ali, F., Z. (2019). DMA-Supply Chain Management. *Edith Cowan Journal of Entrepreneurship and Project Management*, 3(1), 1-12

ARTICLE INFO

Article history:

Received Date: 2nd
June 2019

Revised Date: 7th
June 2019

Accepted Date: 10th
June 2019

Keywords:

Supply Chain
Management

ECJEP Classification:
G20, O40

ABSTRACT

The term "DMA-Supply Chain Management" refers to a comprehensive approach to managing the intricate processes and interactions within supply chains, utilizing the principles of Demand-Driven Material Requirements Planning (DDMRP), a methodology that focuses on synchronizing supply with actual demand while minimizing the negative effects of variability. DMA-Supply Chain Management aims to enhance the efficiency, agility, and responsiveness of supply chains by applying dynamic and adaptive strategies that address the challenges posed by unpredictable demand patterns and supply disruptions. This abstract offers a concise overview of the concept and its core principles, highlighting its potential to revolutionize traditional supply chain practices and enable organizations to achieve greater supply chain resilience and customer satisfaction.

Introduction

Supply chain management (SCM) stands as a critical cornerstone of modern business operations, facilitating the seamless flow of goods, services, and information from suppliers to end consumers. In an era marked by globalization, technological advancements, and heightened customer expectations, the landscape of supply chain management has evolved, necessitating innovative approaches to enhance efficiency, reduce costs, and deliver sustainable value. One such approach gaining prominence is the application of Data Mining and Analytics (DMA) within supply chain management, commonly referred to as DMA-Supply Chain Management.

The convergence of data mining and analytics with supply chain management has ushered in a new era of strategic decision-making and operational optimization. Data mining involves the discovery of patterns, correlations, and insights from vast datasets, while analytics leverages these insights to predict trends, make informed choices, and drive continuous improvements. DMA-Supply Chain Management amalgamates these methodologies to extract actionable intelligence from supply chain data, thereby enabling organizations to make more informed decisions, enhance forecasting accuracy, mitigate risks, and achieve superior supply chain performance.

Significance and Relevance

In an increasingly complex and dynamic business environment, DMA-Supply Chain Management holds significant relevance. As organizations grapple with challenges such as demand volatility, supply disruptions, and evolving consumer preferences, the ability to harness data-driven insights becomes paramount. By applying DMA techniques to supply chain processes, companies can gain a competitive edge by optimizing inventory levels, streamlining distribution networks, enhancing demand forecasting, and identifying cost-saving opportunities.

Moreover, the digital transformation sweeping across industries has generated a deluge of data, providing a rich repository for organizations to tap into. DMA-Supply Chain Management empowers businesses to unlock the hidden potential within this data, unveiling actionable insights that were previously obscured. This, in turn, aids in the creation of responsive and agile supply chains that can swiftly adapt to changes, capitalize on emerging opportunities, and proactively address challenges.

Statement of the Problem: Enhancing Supply Chain Resilience in Developing Countries

Supply Chain Management (SCM) serves as a critical conduit for economic growth, trade, and development, particularly in developing countries where efficient and robust supply chains are essential for addressing challenges such as poverty alleviation, access to healthcare, and overall socio-economic progress. However, developing countries often grapple with unique complexities that present significant challenges to achieving effective supply chain management. Among these challenges, a prominent issue is the need to enhance supply chain resilience.

Context and Significance

In developing countries, supply chains are frequently characterized by intricate networks spanning diverse geographical regions, inadequate infrastructure, limited technological advancements, and a heightened susceptibility to various risks, including political instability, natural disasters, and economic volatility. These challenges compound the difficulties of ensuring the seamless flow of goods, services, and information from suppliers to end consumers, consequently impeding socio-economic development and obstructing efforts to address pressing societal needs.

The significance of addressing supply chain resilience in developing countries lies in its potential to catalyze broader development objectives. Robust and resilient supply chains can ensure the consistent availability of essential goods, such as food, medicine, and clean water, even in the face of disruptive events. Moreover, supply chain resilience can act as a catalyst for economic growth, trade, and investment, attracting both domestic and foreign stakeholders to participate in local markets and value chains. By mitigating risks and uncertainties, supply chain resilience enables developing countries to create a conducive environment for sustainable development, poverty reduction, and improved livelihoods.

Key Challenges

Infrastructure Deficiencies: Inadequate transportation networks, lack of reliable energy sources, and limited technological infrastructure often hinder the smooth movement of goods and information within supply chains. This results in inefficiencies, increased costs, and delayed deliveries, ultimately impacting the accessibility and availability of essential products.

Fragmented Supply Chains: Developing countries frequently encounter fragmented supply chain networks with multiple intermediaries, each introducing complexities and potential bottlenecks. The lack of coordination and integration among these stakeholders can lead to information asymmetry, reduced visibility, and inefficiencies.

Risk Management and Preparedness: Developing countries are disproportionately vulnerable to various risks, including natural disasters, political instability, and economic fluctuations. The absence of robust risk management strategies and disaster preparedness measures leaves supply chains susceptible to disruptions that can have severe humanitarian and economic consequences.

Information and Data Challenges: Effective supply chain management relies on accurate and timely data. However, developing countries often face challenges related to data collection, accuracy, and accessibility, hindering informed decision-making and strategic planning.

Capacity Building and Skill Gaps: Developing countries may lack skilled human resources and expertise in supply chain management practices. The absence of training programs and educational initiatives tailored to supply chain management hinders the adoption of best practices and innovative approaches.

Research Focus and Objectives:

The primary focus of this research is to examine strategies for enhancing supply chain resilience in developing countries. The research aims to:

Analyze Supply Chain Resilience: Investigate the current state of supply chain resilience in developing countries, identifying vulnerabilities, strengths, and gaps.

Identify Best Practices: Explore successful case studies and best practices from both developing and developed countries that can be adapted to enhance supply chain resilience in the context of developing nations.

Technology and Innovation: Examine the role of technology, such as blockchain, Internet of Things (IoT), and data analytics, in enhancing supply chain visibility, transparency, and resilience.

Policy and Institutional Frameworks: Evaluate the impact of policy initiatives, regulatory frameworks, and public-private partnerships in fostering supply chain resilience.

Capacity Building: Explore strategies for building local capacity and fostering skill development in supply chain management practices within developing countries.

By addressing these objectives, the research seeks to contribute to the understanding of how supply chain resilience can be effectively enhanced in developing countries, thereby advancing socio-economic development, promoting stability, and ensuring the consistent availability of essential goods and services.

Activities Entailed in Marketing Logistics that aim to provide products to customers on a timely basis

Proper production Planning. This is usually a critical step in any logistical plan of a supplier. The supplier needs to be well aware of the goods to be procured, their storage plan put in place, how they will be transported and how they will be delivered to the customer upon placement of an order. The supplier needs to be aware of unforeseen conditions and set a contingency plan for it. This will facilitate the whole process and make it smooth. It is out of a good plan that the right amount of quantity will be produced by linking the right amount of inventory calculated through a good inventory management. It will determine the warehouse size for proper holding of the inventory and hence facilitate the entire transport mechanism (Barcik & Jakubiec, 2013).

Information. The power of information grows relies on the technological advancement where it can be shared/spread, on a timely basis at low cost, which can lead to high levels of responsiveness. For instance, use of WhatsApp has made it convenient to share photos (on a personal level) of the product prior ordering. Information is the anchor of all the activities since it facilitates the chain from ordering to the delivery at the end of the chain (Barcik & Jakubiec, 2013).

Inventory Management. A good management of the stock of a firm provides a better opportunity for the management to forecast seasonal demand. The firm is thus able to improve on the ordering process since lead time is significantly reduced due to responsive deliveries. That is, the customers will prefer the suppliers who will be able to deliver their orders in due time from the time they placed an order. E.g. when a customer orders goods that are stacked in a warehouse, the goods need to be delivered on time without interfering with the other items (Barcik & Jakubiec, 2013). For an inventory to be properly managed a combination of activities are necessary since the supplier will require the right information from the customer and under a good management plan will be able to supply the right quantity. This will ultimately imply that the good will need an efficient transport system for delivery.

Warehouse Management. In warehouse management, products such as raw materials, parts, goods in process, finished goods are stored that is to hold inventories. It is integral since it buffers the supply which in turn is able to meet customer demands at any point in time. It ensures order picking, shipment preparation, sorting, packing and assembly of goods so that they can be availed to the customers upon ordering. For example to avoid rusting of the motor parts, the warehouse needs to be free from leakages (Barcik & Jakubiec, 2013). Warehouse management apart from relying on good information system, will also require a good inventory plan and management in place in order to facilitate the health of the warehouse in terms of space, and general condition.

Efficient Transportation. The main drive of timely deliveries to customers is through transportation of the goods. The transport managers are advised to reduce the logistics expenses of the firm. This can be analysed by finding the best and shortest routes to ensure low transportation costs and quality maintenance of fragile goods. In addition, optimized packaging is paramount to minimize the volume and reduce weight of the package (Kondratjev, 2015).

Packaging which is important especially to avoid the damage of the products which means a huge cost to the firm. Packaging rides along transportation and the product is expected to be of the right quality on delivery. For instance books need to be properly wrapped to avoid tearing of papers (Barcik & Jakubiec, 2013; Akdoğan, & Durak, 2016). Packaging as well is a determinant of quality of the item being held or ordered by the customer. The item quality needs to be properly maintained through proper packaging. A good plan and inventory management will also facilitate the right amount of quantity to be packaged and properly labelled to prevent mistaken identity. An efficient transport mechanism will facilitate the transportation of the commodity to the intended customer.

How increase in cost in one area might reduce the cost of the entire system.

Administration of activities and processes has much in common with the logistics management and refers to activities such as transportation management, inventory, warehousing and order management, which are the responsibility of the logistics function. Increase in cost ideally is an unacceptable approach to improve the revenue of a particular firm since the firm will run at a

negative profit. However, a certain strategy might be improved at a cost in order to improve the efficiency of the other systems and thus improve the entire system (Surowiec, 2013).

In the supply chain, since the activities are dependent, one system failure can result to the detrimental breakdown of others. However, an improvement in such activities as the transportation or IT can serve the chain efficiently. A firm might require to improve the technological structures of the warehouse management system which involves a lot of automation. This is costly since the purchase of advanced structures are at a higher cost. However, with an advanced automated system, comes along the efficiency in operation of a warehouse where breakages and quality deterioration are minimized. This implies that the customers will be able to appreciate the quality and pay for it. For example, a supplier intending to supply flowers to a customer in Mombasa from Nakuru will require a faster mean of transport and better cooling facilities in order to maintain the quality of the flowers since they are perishable in nature. This will come at a higher cost than normal but he will be able to avoid total loss of the value of the flowers if he did not use the cooling systems (Badillo, 2018).

In another instance, an owner of a warehouse would benefit more from implementing the use of electronic inventory management systems by minimizing the waste of storage space and save on lead time as well as maintaining the quality of the goods for instance fertilizer bags being stored by their nutrient capacity (CAN, DAP, etc.). The temperature of the warehouse could be regulated in order to maintain the quality of goods such as cooking fat. All these procedures would lead to an increase in certain expenses. In the long run however, the customers would be satisfied with the quality of the product and thus the supplier will benefit from the reliable market and possible expansion of customer base through referees (Surowiec, 2013).

Factors that drive competitiveness in logistic management

Information Technological. The rapid development of the e-commerce in the corporate world has necessitated the convergence of digital and physical supply chains. In achieving this objective, a supplier is able to serve customers across different geographical locations conveniently. For instance, by use of the electronic order system (Varma & Khan, 2017).

Transport management. A good managed transport system is the one that will help the supplier reduce on freight expenses, streamline billing procedures and improve on supply chain visibility (Naku, 2011).

Customer service. This implies a means by which firms differentiate their product, keep customers loyal, increase sales, and improve profits. The firm needs to be more responsive to customer's unique product requirements with short-notice production flexibility. The general handling of the customer will determine whether the customer will purchase the product or not (Naku, 2011).

Improving Product and Service Quality. Since logistic management involves holding inventory and transporting the products to customers in different but specific locations, the supplier needs to be extra careful in the warehouse management and transportation in order to

maintain quality of the goods for them to be acceptable at the stated prices. E.g. a car needs to be shipped properly to avoid scratched on the car (Sandberg & Abrahamsson, 2011).

Lead time management. This is very basic since Lead time is customer specific. A supplier needs to be very ready to deliver the product to the customer in the due stated delivery time. This opens room for customer loyalty. For instance if a client orders a good today, he/she needs to get the delivery as per the stated time to avoid increase in holding costs and as well for the benefit of customer preference (Owino, 2013).

Value Advantage. The sale of a product will tend to go to the cheapest supplier unless the product or service offered could be distinguished in some way from its competitors. It is recommended that the supplier to add additional value along the value chain in order to attract the customers and to stand out in the competition (Sandberg & Abrahamsson, 2011).

Change Management. The downfall of any given organization is caused by one of the factors such as the mentality of not accepting change. Changes within organizations stretches over a long time period, to increase the probability of success and reach the desired outcome, the plan for change is important. The supplier needs to be able to be flexible to changes that come along his way and brace himself with new processes and ideas in order to cope with the change (Mäkinen & Broström, 2016).

Factors to consider in setting up a Private warehouse

Fixed expenses incurred on the acquisition of land and building, normally which are very high. Expenses, incurred on ensuring that warehouses are properly equipped with Motorized Handling Equipment (MHEs) like fork lifts, conveyors, semiautomatic trucks, storage racks and bins, and mezzanine floors, etc., Fixed expenses incurred on the acquisition of land and building, normally which

are very high

2. Expenses, incurred on ensuring that warehouses are properly equipped with

Automation. Motorized Handling Equipment (MHEs) like fork lifts, conveyors, semiautomatic trucks, storage racks and bins, and mezzanine floors, etc.

Wage The cost of wages for staff required for peak activity periods like over time, which can be very high since retrenchment during slack periods may not be possible.

Extra payment like over time wage to be made for work on Saturdays, Sundays, and holidays.

Other service charges which are required in the maintenance of warehouse operations have to be taken into account.

Budgets have to be allocated for office and record keeping equipment for successful warehouse operations.

The cost of regular maintenance and repairs and the cost of such items as fire extinguishers, fuel, air-conditioning, power and light have to be taken into account.

Maintenance cost. The cost of maintaining insurance records of premiums paid for fire, theft, and also for workmen's compensation

Set up cost. Since it is owned privately, the company/firm needs to consider the cost of setting up the warehouse for it to sustain the production process and be able to hold enough to minimise low supply.

Factors to consider in determining the level of customer service

Customer needs and expectations. The firm has to know exactly what a specific customer wants and what their expectations in the product delivered are. Close interpersonal relationship can be an avenue to get to know the customer on a personal basis. For instance by use of social media platforms where feedbacks can be addressed in real time (Jezuíta, 2017).

Customer diversity. The firm needs to differentiate different types of customers across different platforms. This can be facilitated by the process of customer segmentation according to homogenous characteristics. A supplier serving farmers needs to understand the needs of the customers and how they prefer their agricultural products delivered since they are mostly perishable (Jezuíta, 2017).

Preference of the customers. Besides what customers expect, they also prefer certain types of services and products and a loyal relationship will be able to disclose the preference of a customer to the firm products. The firm thus can address their issues with clearer view point of the customer's perspective. For instance for instance some customers ordering cars might prefer them delivered and fully assembled as opposed to look for other dealer to assemble. Therefore, the supplier might need to go that extra mile to provide the service (Jezuíta, 2017).

Quick and timely communication is an aspect that allows to know and read the mind of a customer prior to effecting the service delivery. Customers would prefer their messages to the company replied real-time for a quick assurance of the product status. This way the company is able to set a strong loyal customer base

How to determine the right amount of inventory to carry

Inventory is a stock or store of goods or services, kept for use or sale in the future. Inventory level (IL) is the quantity on hand, which is equal to inventory on-hand plus quantity on order minus backorder (if any).the maximum inventory is Q (Aro-Gordon, & Gupte, 2016). This amount is derived by an Economic Order Quantity model:

$$\text{Annual holding cost} = \text{Average inventory} \times \text{Annual holding cost per unit} = Q/2 C_h$$

$$\text{Annual ordering cost} = \text{Number of orders per year} \times \text{cost per order} = D/Q C_o$$

$$\text{Therefore: total annual cost} = \text{Annual holding cost} + \text{Annual ordering cost}$$

$$\text{I.e. } TC = Q/2 C_h + D/Q C_o$$

Therefore, the optimal order quantity is achieved at the point where the two costs meet. Where
annual ordering cost = annual holding cost

$$Q^* = \sqrt{\frac{2Dc_o}{c_h}}$$

Where:

- TC is the total annual inventory cost.
- D is the total number of units purchased in a year.
- Co is the ordering cost per unit per year.
- Ch. is the holding cost per unit per year.
- Q* is the optimum quantity ordered each time an order is placed.

Factors influencing the choice of a public warehouse

Physical access. This depends on the need of the supply chain, for instance large quantities of product require the warehouse closer to the firm in order to avoid transportation costs. Accessibility comprises of such factors as the availability, level of qualification as well as wage level which means that it needs to be to the proximal access of social amenities (Owino, 2013).

Flexibility calls in the even there is a sudden need to increase or reduce inventory in the warehouse the warehouse should thus be open to any such instances of abrupt shift in operations (Mwangi, 2013).

Storage requirements will necessitate the need for a warehouse to be designed in a manner that accommodates the inventories of the firm and to meet the needs of the customers both in the short and long run. A warehouse operating aerospace equipment or jewellery for instance, needs high level security (Owino, 2013).

Technology. This is currently a prerequisite in the corporate world for businesses to operate efficiently, compete effectively and maintain/improve profits. For example Electronic Order System, Electronic Purchase Order System and Electronic Purchase Order System, Electronic Data Interchange (EDI) (Varma & Khan, 2017).

Expansion Potential is necessary for a public warehouse because of futuristic goals of expansion. In the event the firm operates on a much larger scale, there should be an opportunity for the warehouse to be expanded for accommodation of more products (Owino, 2013).

Conclusions: Enhancing Supply Chain Resilience in Developing Countries

In conclusion, the intricate landscape of supply chain management in developing countries presents a compelling case for prioritizing the enhancement of supply chain resilience. This research has illuminated the multifaceted challenges that impede the efficient flow of goods, services, and information within these supply chains. The significance of addressing supply chain

resilience lies not only in mitigating risks but also in leveraging resilient supply chains as catalysts for broader socio-economic development.

The analysis of key challenges underscores the imperative for targeted and holistic strategies. Inadequate infrastructure, fragmented networks, risk vulnerabilities, information gaps, and capacity limitations collectively emphasize the urgent need for comprehensive interventions. Enhancing supply chain resilience in developing countries is not only a pragmatic necessity but a strategic endeavor that can unlock opportunities for progress and prosperity.

Contributions and Recommendations

Investment in Infrastructure: Prioritize substantial investments in transportation, energy, and technological infrastructure to establish a sturdy foundation for resilient supply chains.

Stakeholder Collaboration: Foster collaborative partnerships among supply chain stakeholders to promote seamless integration, transparent communication, and coordinated efforts.

Risk Management and Preparedness: Develop robust risk assessment frameworks and disaster preparedness plans that encompass a wide range of potential disruptions.

Data and Information Sharing: Embrace digitalization and data-sharing platforms to enhance supply chain visibility, enabling informed decision-making and rapid response.

Technology Integration: Embrace emerging technologies such as blockchain and IoT to fortify supply chain transparency, traceability, and real-time monitoring.

Capacity Enhancement: Establish targeted capacity-building initiatives and training programs to nurture a skilled workforce proficient in modern supply chain practices.

Policy Formulation: Enact and enforce policies that incentivize the adoption of resilient supply chain practices, aligning governmental and organizational efforts.

Global Knowledge Exchange: Facilitate cross-border knowledge exchange to learn from successful resilience initiatives globally and adapt them to local contexts.

Sustainability Synergy: Align supply chain resilience strategies with broader sustainability objectives, ensuring environmental responsibility and societal progress.

Continuous Improvement: Establish mechanisms for ongoing evaluation, feedback, and refinement of supply chain resilience strategies to ensure adaptive and sustainable practices.

As developing countries confront the challenges of supply chain management, they must seize the opportunity to transform adversity into advantage. By embracing these recommendations, stakeholders can usher in a new era of supply chain resilience, characterized by adaptability,

efficiency, and positive socio-economic impact. The journey toward enhanced supply chain resilience is not solely about fortifying logistical networks; it is a strategic maneuver that holds the potential to uplift economies, empower communities, and pave the way for sustainable progress.

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