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Impact of Innovation Tools in Supply Chain Management and Operations

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Abstract

The desire of every organization is to have effective and efficient supply chain management and operations. Evidence has shown that the traditional approach in the use of manual tools has become outdated. Modern supply chain management and operations entails adoption or acquisition and deployment of modern technology driven innovation tools to remain competitive in business. The objective of this paper is to discuss the impact of innovation tools in supply chain management and operations. Theoretically, the paper is predicated on contingency theory, and methodically, the sources of data are secondary. While the research design is descriptive, the paper uses content and documentary analysis. One key recommendation of the paper is organization should employ innovation tools in their supply chain management operations to remain sustainable and competitive in business.

Keywords: Innovation Tools, Supply Chain Management, Operations.

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1. Introduction

The place of innovation in *supply* chain management and operations cannot be over explained. This is because according to Mejabi (2017) innovation helps in having workable solution that helps to achieve fresh supplies and implicit needs, and most times better offering to the need of the existing market. Mecalux (2023) observes that innovation in supply chain is all about the automation approaches to solving the challenges of supply chain management and operation through the use of robotics and electronic software in warehousing, manufacturing, storage and transportation.

Moreira, Ferreira and Zimmermann (2018) explain that for an organization to enjoy competitiveness in its supply chain and operations, innovation is a tool that is central. This is because innovation stands out to achieve effective product and process both at the organizational and marketing sphere. He way the organization segments its innovation processes is factor contributory to its supply chain and the internal operations.

Global supply chain operations have witnessed a tremendous improvement with application of innovation tools through technology as individuals and organization begin to adopt them. The objective of this paper is to discuss how these innovation tools can impact on supply chain management and operations.

2.Methods

Paper solely depends on secondary data with the application of descriptive research design. While data analysis hinges on content and documentary evidences relevant to achieving the research objective, the theoretical, conceptual and empirical reviews.

3.Theoretical Review: Contingency Theory

In order to theoretically situate the relationship between supply chain management and innovation, this paper relies on contingency theory. The central argument of contingency theory is that that “a leader's effectiveness is contingent on how well the leader's style matches a specific setting or situation” (Wolinksi, 2010, p.183). The specific setting or situation comes as result of uncertainties. The theory according to Drazin and Van de Ven (1985) argue that the distinctiveness of an organisation‘s internal and external environments is considered in its design to improve its performance, which can be achieved through environment-structure-strategy fit.

Sousa and Voss (2008) explain contingencies as activities that affect a firm, which the firm does not have direct control over them. The contingencies a firm may have in its supply chain management are but not limited to climate change, lack of access to raw materials, advancement in technology, government new regulations, unbudgeted cost of doing business. These contingencies bring disruption in supply chain.

For example, lack of climate change can affect suppliers of raw materials; this invariably will limit the volume of raw materials available for production. In the same case, advancement in technology can disrupt the processing of the raw materials when available, so will the government regulation (e.g. fiscal and monetary policies) will limit the easy in doing business etc. (Smith, 2013; Haverkort & Verhagen, 2008; Busch & Hoffmann, 2007; Plambeck, 2012; Aben et al., 2010; Jeswani et al., 2008; Choi et al., 2013; Hitchcock, 2012; Lo, 2010; Burritt et al., 2011).

4. Conceptualisation of Innovation of Supply Chain Innovation

Sandvik (2017) defines innovation as creating or finding insightful ideas and bringing them successfully to the market. Schumpeter (1939) defines innovation as the process of developing new products and new forms of organisational structure, opening up new markets, creating new production functions and finding new sources of raw material. In collaboration with this definition, Bessant and Tidd (2007, p. 32) opine that "innovation is the ability to create new ideas of a product, process or other parts of the business."

In Roger's (1998) view point, innovation is an activity and changes applied in the cause of producing new product or service by improving on the already existing one. Christensen (1997) states that when such innovation alter ignites growth and creates new market, it is said to be disruptive. The entire purpose of innovation according to Jörtsö and Westphal (2016, p. 5) "is strategically to develop new products, market approaches, processes, technologies, competencies, organization and management systems that can satisfy the customer needs for tomorrow."

Supply chain innovation according to Lavastre, Ageron and Spalanzani (2011):

> Is when a set of methods and tools that are previously inexistent in companies or their subsidiaries that will be generated, developed and deployed within supply chains to tackle different supply chain issues such as quality, costs and lead-time. Some of the supply chain innovations include: logistics network reconfiguration, Just in Time (JIT), mass customization, reverse logistics, integration and outsourcing (p. 90).

Supply chain innovation relates to "the implementation of automated solutions, from robotics to warehouse management software to stages such as manufacturing, storage and internal product transport" (Mecalux, 2023, p. 1). There are many types of innovation. However, for the purpose of this paper our attention was drawn to Guillaume Coudert's four types of innovation an organization can acquire or adopt, which include incremental innovation, adjacent innovation, disruptive innovation, and radical innovation (Coudert, 2022).

Carleton (2019), observes that the incremental innovation is low-cost improvement that helps a firm to further differentiates itself in the marketplace have a competitive advantage while building on current offerings. The three key three benefits of incremental innovation to a firm are diversification in its product or service portfolio, customer retention and opportunity of the firm remain in business. A good example of an incremental innovation is the iPhone going from the iPhone 13 to the 14 and beyond. Coudert, (2022) refers incremental innovation as an improvement on already existing product and service of a firm, which brings some sort of transformation within the firm. Incremental innovation does not really disrupt the already system in place; it rather comes inform of renovation of alteration within the firm, though may be noticed in the marketplace.

Adjacent innovation comes as expansion where a firm uses its existing capabilities that is inform of technology and knowledge for the purpose of appealing its new audience or when it wants to enter into a new market (Coudert, 2022). Loreto (2015, p. 9) defines adjacent as "the set of possibilities available to individuals, communities, institutions, organisms, productive processes, etc., at a given point in time during their evolution." The advantages of adjacent innovation according to Dieffenbacher (2023) include helping firms remain competitive, grow revenue, expand business and achieve long-term sustainability. Another importance of this innovation is that it gives a firm a high rating in its market share, which helps to implement product or service differentiation (Coudert, 2022).

Disruptive innovation has to do with actions a firm takes in an attempt to shake up an industry entirely whereby it targets its large existing competitors' segments. The outcome of disruptive innovation is that the firm takes over the variable segments of its competitors in the industry. For example, Netfix through its disruptive innovation took over the Blockbuster segments of the rental DVD for video streaming (Coudert, 2022). Disruptive innovation has come in technological form such as artificial intelligence (AI) and blockchain.

Radical innovation is a combination comes to be when a new technology is merged with new business strategy, which is to replace the entire existing market or businesses. A good example of radical innovation is iPhone that merged new technology with easy-to-use features to eventually replace the existing cellphone market. According to Wright and Pratt (2023), radical innovation is all about new technology and new business or market strategy. Another example of radical innovation is what Amazon did. Amazon has produced two notable radical innovations namely its data-driven e-commerce-only business model and its Amazon Web Services (AWS) platform.

Radical innovation can simply be explained as new technology, new business or market strategy.

5 Innovation Tools and how they improve Supply Chain Management

In recent time, there has been tremendous advancement in supply chain management innovation tools through technology. The trend in which these innovation tools are emerging is unsettling. It is no longer business as usual. For the purpose of this paper, some of these supply chain technological driven innovation tools are being discussed here.

5.1 Automatic sorting and retrieval systems (AS/RS technology)

According to Romaine (2023, p. 1), "a fully automated storage and retrieval system (AS/RS) also called AS-RS, AS RS, or ASRS is a type or genre of warehouse automation technology specifically designed to buffer, store, and retrieve product and inventory on demand." This innovation technology is relatively new in supply chain operations. Before now what was been used were traditional conveyer, forklifts, and rack, which were used in the movement of item from one corner of the warehouse to another. They used a single and cubic system. Bur with the introduction of automatic sorting and retrieval systems (AS/RS technology) items in the warehouse are being retrieved and moved automatically (Kulezak, 2022).

There are three main varieties of AS/RS available for use in supply chain management and operations, though they come in various styles. The three varieties are Unit-Load AS/RS (primarily pallets), Mid-Load AS/RS (inventory requiring custom handling requirements), and Mini-Load AS/RS (each or split case picking) (Romaine, 2023).

Key impact of AS/RS on supply chain management and operation to include: Compact footprint, reduced labor requirements, improved pick accuracy, greater inventory control, and improved safety & ergonomics (Dube, 2023; River System, 2023). The success of this innovation tool can be explained from the story of Siemen in 2029 when it acquired and applied AS/RS for production and distribution of its products in Germany. Siemen was able to realise about 60% decrease in its warehouse space, which also reduced staffing cost by 40% (Kulezak, 2022).

5.2 Sourcing software with market intelligence

This supply chain management innovation technological tool is for raw material sourcing and supplier management. The tool helps firms to find the right raw materials and their suppliers, which helps to procure the right quantity and allows the procurement team to act more

strategically (Kulezak, 2022). Murphy (2023) explains market intelligence as a term used to describe the process of keeping tabs on firm‘s competition and how the industry operates.

This innovation software is all about gathering and analyzing data about raw materials and suppliers in order to aid in making risks, have better negotiation with suppliers and ensuring that customers remain satisfied. The software further helps to find cost saving approach and a firm gains a competitive advantage in the marketplace (Britt, 2021). “The application of sourcing software with market intelligence is applicable in supply chain management because it enables purchasing and procurement managers to update their market dynamics pricing, lead times, and regional and raw material trends” (Kulezak, 2022, p. 5).

5.3 Intra-logistics robots

Intralogistics robots are another technological driven innovation tools in supply chain management and operations. Intralogistics, according to Arnold (2006, p. 1) is “the process where firms in supply chain management organize, control, implement and optimize its internal flow of materials, the flow of information and the handling of goods.”Kulezak (2022), in describing the intralogistics robots state that they are automatic, reprogrammable and serves multipurpose and can be used at different applications in the supply chain hat management and operations, which can also be programmed in three or more axis. The robots operate in limited warehouse floor while reaching shelves, pallets machines, conveyors for the purpose of loading and unloading items.

Intralogistics robots belong to the family of autonomous mobile robots (AMR). Fragapane et al. (2020) explain the robots can be applied in intralogistics operations such as megaships, manufacturing, warehousing, cross-docks, terminals, and hospitals. The robot has been applied by Amazon since 2018, which has facilitated the firm to make what it calls _next-day and second-day delivery come true. The impact of the intralogistics robots applied by Amazon was quiet disruptive in the global supply chain management that made Wallmart acquired the same robots in 2019 (Kulezak, 2022).

5.4 Internet of Things (IoT)

The Internet of Things (IoT) is an innovation software (tool) that carries proactive field services as a step up from the already existing field service (Kulezak, 2022). The World Economic Forum (2015) defines the IoT as a network of physical objects that contain embedded technology to communicate and sense, or interact with their internal states or the external environment.‖ For the purpose of supply chain management, IoT is impactful especial as it facilitates ordering without a rush through the supply chain (Kulezak, 2022).

5.5 Artificial Intelligence (AI) Enabled software

Artificial Intelligence (AI) is a computer science based tool that is used to perform tasks that usually have to do with human intelligence in the areas of speech recognition, machine learning, logical thinking, computer vision etc. (Rickardo&Gladson, 2023). For Correa (2019), artificial intelligence allows machines to learn from data and the technology helps to identify patterns of data and use algorithms in decision making. Kulezak (2022) states that AI software enable for inventory optimization for safety stock levels, which automates, streamlines and controls the inand outbound inventory flows, while at the same time improves the process.

Mecalux (2023) state that one of the impacts of AI as an innovation tool in supply chain management and operations is that it has the ability to forecast consumer trends, while leveraging on big data to make deduction on the intent of customer consumption pattern,

which invariably helps to predict customer demand behaviour. AI functions in such a way that it assists to apply logistics strategy to avoid stock-outs and overstock, while finally helps firms to optimise customer satisfaction

6. Conclusion and recommendations.

This paper has discussed the impact of innovation tools in supply chain management and operations. There are various innovation tools in supply chain management and operation, but the pape has been able to identify some of them which include but not limited to automatic sorting and retrieval systems (AS/RS technology), sourcing software with market intelligence, Intralogistics robots, Internet of Things (IoT), and artificial Intelligence (AI) enabled software. These innovation tools are technology driven.

The paper recommends that firms should employ these innovation tools to take care of their supply chain management operations for efficient service delivery, customer care and satisfaction and more importantly to achieve high performance for business profitability and sustainability.

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