LOGISTICS CONFERENCE

2023

' From Value Creation to Value Network: The Role of Integrated Logistics '

E - JOURNAL

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"From Value Creation to Value Network: The Role of Integrated Logistics"

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MESSAGE OF THE GOVERNOR OF THE CENTRAL BANK OF SRI LANKA

It is a greatly satisfying experience in the current economic landscape of the country, for me to witness the holding of the Logistics Conference by the Naval & Maritime Academy (NMA).

Right identification of the precise role to be played by the participants in an industry of the need to connect themselves with people, ideas and information in their network in the current versatile and complex economic structures is vitally important. This connectivity in value networks between parties allows for greater collaboration between them as well as increased efficiency in achieving common as well as individual goals. Even though one can argue that there is very little or no difference between value chains and value networks literally, the practicality makes a remarkable variance between the two concepts. Whilst the value chain concept has been developed in order to reach new fields, the concept of a value network has supported designing and analysing businesses in the increasingly complex world of today. This evolution from value chain to value network is becoming increasingly useful in determining which instrument to be used to manage a company, whether to carry out a chosen business within a particular network and how to pursue a sustainable competitive advantage.

In this context, the theme of **'From Value Creation to Value Network: The Role of Integrated Logistics',** which will be elaborated at the Conference by NMA, the premier training institute of Sri Lanka Navy, is very timely for local and foreign logistics training institutions, universities, entrepreneurs involving in logistics, government institutions, and others in the field of Logistics.

My best wishes for every success of the Conference to be conducted by NMA, and I hope it would portent another milestone of a series of dialogues that is helpful in enhancing the efficiency of the industry, and thereby to pave the path for Sri Lanka to become a central logistics hub in the region.

Dr. P NANDALAL WEERASINGHE
Governor
Central Bank of Sri Lanka

MESSAGE OF THE COMMANDER OF THE NAVY

I take great pride and honour to pen down this message to the Journal of Logistics Conference 2023. Indeed, it is an immense pleasure for me to witness booming professional engagement among the naval personnel in their writing skills.

As the Commander of the Navy, I am honoured to share with you the experiences and insights on the theme of this year's conference: "From Value Creation to Value Network: The Role of Integrated Logistics." Logistics has always been a critical aspect of military operations, and the Navy is no exception. The ability to sustain operations at sea for extended periods of time is essential to our success. Therefore, we must constantly evaluate and improve our logistics processes to ensure we are providing the best possible support to our sailors and marines. At the heart of this year's conference theme is the concept of integrated logistics, which involves the coordination and collaboration of all stakeholders involved in the logistics process. This includes not only the military, but also government agencies, private companies, and other organisations. The success of integrated logistics requires more than just technology. It requires a culture of collaboration and communication between all stakeholders. The Navy has made significant strides in this area, partnering with private companies and government agencies to develop innovative solutions to logistics challenges.

Let me take this opportunity to extend my sincere appreciation and best wishes to the organisers of the Logistics Conference 2023 for their untiring efforts and wish them the best of luck in the execution of this conference at a very high standard.

I also take this opportunity to extend my heartfelt gratitude to the Editorial Board for their immense efforts and dedication in making this journal a success. Further, I would also like to praise the authors who contributed to this year's Journal and I firmly believe that this academic initiative would definitely broaden the horizons of the naval personnel on the various aspects of Logistics.

Finally, I express my sincere and profound thanks to the paper presenters at the Logistics Conference and the contributors to the Journal for their valuable insights.

I urge all concerned to continue with the good work and wish all the very best and success for the Logistics Conference 2023.

UVMP PERERA, RSP**, USP, ndu, psc, MMaritimePol, MSc (DS) Mgt, MSc (MS & NSSS), BA (DS) Hons, PWO
Vice Admiral
Commander of the Navy

MESSAGE FROM THE DIRECTOR GENERAL LOGISTICS

As the Director General Logistics in Sri Lanka Navy (SLN), I am honoured to submit this message to the 5th edition of Logistics Conference e-journal 2023 which is being organized by the 7th Long Logistics Management Course (LLMC).

The Logistics Conference inaugurated in the year 2015 and continued four chapters under the different contemporary themes in the field of logistics. The Logistics Conference - Trincomalee has being a well knowledge disseminating forum where conference series has immensely contributed to the existing knowledge and literature in the field of logistics. Specially, the forum has created platform for scholars, researchers and industry experts to share their knowledge and experiences with others while facilitating grooming logisticians to broaden their horizon in this evolving field. Further, SLN has achieved many developments in the logistics operations with exposure gained through this conference series.

I strongly believe that the Logistics Conference provides insights to policy makers in both military and corporate sector and explore logistics best practices of both fields and absorbed, tailor-made and executed as appropriately. Further, the theme of 5th edition of Logistics Conference e-journal 2023 "**From Value Creation to Value Network: The Role of Integrated Logistics**" is timely needed area to be researched and discussed since the rapid evolution of the industry in integration, channels of distribution and value creation to minimize cost to the product and maximizing stakeholders benefits. I sincerely hope that the conference will positively contribute to address theoretical, literature (empirical) and practice gaps while providing a unique forum for all participants to networking with professionals in the logistics domain.

I would like to express my heartfelt appreciation to the Commander of the Navy for his precious directives, guidance, inspirations and encouragement extended to make this 'Logistics Conference - 2023, Trincomalee' a remarkable one. Let me also congratulate the Commandant, Naval and Maritime Academy, Senior Course Coordinator LLMC, Directing Staff, Editorial board and Course Participants for their untiring efforts to make this great event a success.

Finally, I extend my best wishes to all participants, speakers, individuals and invited delegates and I hope that the 'Logistics Conference - 2023, Trincomalee' would be a well knowledge disseminating forum.

RACN RATHNAYAKE, USP, psc, MBA (LM), BA (DS), CMILT, LLMC
Rear Admiral
Director General Logistics

MESSAGE FROM THE COMMANDANT NAVAL & MARITIME ACADEMY

I am delighted and honored as the Commandant of the Naval and Maritime Academy to issue this message to the journal being published, coinciding with the Logistics conference 2023. This is the 5th conference of this nature and undoubtedly it will enhance the knowledge of all participants, in the diversified sectors of the logistics environment.

Logistics Conference Trincomalee - 2023 conducts with wider participation of logistics training institutions, Universities, entrepreneurs, government institutions, sister services and renowned scholars.

The theme of this year's conference "**From Value Creation to Value Network: The Role of Integrated Logistics**" will be well deliberated through presentations made by professionals in the field of logistics and by nearly 600 participants.

I wish to place on record my sincere gratitude to the presenters at the conference and the contributors of the Journal.

Finally, I would like to extend my heartfelt gratitude to Dr. P Nandalal Weerasinghe, the Governor of the Central Bank, and the Commander of the Navy for accepting our invitations and to be present at the conference. In addition, my appreciation goes to the Director General Logistics and his staff at NHQ and the staff at NMA for their guidance and commitment.

B LIYANAGAMAGE, RWP, RSP, USP, ndc, psc
Commodore
Commandant Naval & Maritime Academy

CONTENTS

INTEGRATED LOGISTICS AS A MEANS OF LOGISTICS RESILIENT

By

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Abstract

The SMAC is an approach that is being used by organisations to optimise their operations using the current technological facilities. Social, mobile, analytics, and cloud (SMAC) have become leading instruments that could be utilised to improve the efficiency and effectiveness of business functions. The SMAC approaches are being applied in many fields, including HR. The global market has always been susceptible to many technological influences. Business uses these new trends to outperform traditional approaches. In this context, it is important to know what the impact of SMAC technology is on supply chain management. The exploratory approach has been applied to generate insights for the study. A considerable number of researches were conducted to develop the paper. The SMAC approach helps businesses apply technology to manage supply chains in various aspects, identify trends and market opportunities, eliminate barriers like location, communicate real-time information, identify bottlenecks, calculate costs, increase flexibility, provide scalability to manage supply chains, and collaborate with stakeholders. Further SMAC approaches will offer many benefits to organisations by improving visibility into supply chain operations, which will help companies, identify potential problems and generate responses based on real-time data-driven decision-making processes. Further, the SMAC approach has several challenges despite its benefits. Data security, change management, and high implementation costs are a few challenges that organisations need to consider. However, the overall SMAC approach has created opportunities in the business environment, and the efficiency and effectiveness of managing SCM could be considered significant.

Keywords: Social, Mobile, Analyse and Cloud, SCM Productivity

Introduction

Technology plays an important role in the current business world. Most business entities expect to increase productivity in their operations using different strategies and approaches. In this context, the speed, accessibility, flexibility, and reliability of decisions are vital aspects of successful business models. Meanwhile, digitalization and the introduction of technology-driven systems into the business process have become trends and strategies for many organisations. Even service providers have introduced many opportunities for businesses to develop digitalization within their organisations. The current external and internal environments of the organisation have also created this business drive. Millennial, today's young workforce, has more tendencies to work with computers, software, and technology. This opportunity has become a competitive advantage for many organisations. The evolution of technology has taken place over a while, leading to the current era known as Web 4.0, and analytics have been identified as key differentiators. The supply chain of any company plays a significant role in its business strategy. Hence, managing the supply chain efficiently and effectively is important for businesses to stay competitive. Accordingly, many business organisations have introduced different approaches to improve their SCM functions. The SMAC approach to supply chain management is a relatively new concept that integrates social, mobile, analytics, and cloud technologies into the supply chain. The SMAC approach seeks to increase efficiency, reduce costs, and improve the customer experience. This paper aims to explore the SMAC approach to supply chain management and its impact on businesses.

Literature Review

Social, Mobility, Analytics, and Cloud (SMAC) are individual technologies whose use have risen during the past few years and have demonstrated gigantic growth (Gohel & Gondalia 2014). It is the newest version of ICT (information and communication technology). The subject of SMAC has been dominating debate across the world over the past 12–24 months (ASSOCHAM, 2014). The four pillows of SMAC technology are social media, mobility, analytics, and cloud computing (KPMG 2013). SMAC is the fifth wave of the IT model in the evaluation of the IT industry, and it is transforming the way businesses are done (Farugui et al., 2015). Communicating beyond the limitations of a permanent physical location or device is referred to as mobility. The mobile web has facilitated users and created opportunities for businesses to interact with their customers in much more easy and flexible ways (Dewan & Jena 2014). The growth in smart devices has accelerated this connectivity even further. Emerging trends and technologies such as peer-to-peer payments, mobile

payments, and mobile apps have enabled the use of mobile devices and helped to perform business functions in much more convenient ways (ASSOCHAM, 2014). Business Anilities (BA) refers to the skills, applications, and practices for continuous iterative investigation of past business performance and trends to gain business insight and drive corporate planning (Farugui et al. 2015). It also refers to the utilisation of raw data, inference rules, and analysis models to prove decision makers perform the necessary steps to improve real-time decision-taking and milestone activities. One of the primary applications of SMAC in SCM is the optimisation of inventory levels. (Dewan & Jena, 2014) proposed a SMAC technology that facilitates the fundamental way businesses manage the technology through an optimisation approach that combines SMAC with a deep network to optimise inventory levels in a multi-echelon supply chain. The objective function was a measure of the total cost, including inventory holding costs and ordering costs. The results showed that the proposed approach outperformed traditional optimisation techniques in terms of both efficiency and accuracy. Further, innovation will have a higher impact on supply chain performance. Supply chain innovation is important for any company of any size. Supply chain innovation is considered a way for a company to apply its assets, operating resources, and capabilities to develop new ways to satisfy customer needs (Hansen, 2006).

(Speranza, 2018) discussed other applications of SMAC in SCM as high-quality analysed data for data-driven decision making, such as production planning, optimisation, and better results in complex environments. Proposed a hybrid optimisation approach that combines SMAC with a genetic algorithm to optimise production planning in a complex environment. The objective was a measure of the total cost, including setup costs, production costs, and inventory holding costs. The results showed that the proposed approach outperformed traditional optimisation techniques in terms of both efficiency and accuracy. The SMAC can also be applied to the optimisation of innovation, competitiveness and capabilities in productivity for supply chain and logistics in SCM. (Verma et al 2016) proposed application of technology to business can increase performance in the Supply chain and logistics in SCM. Further the paper aims to develop a model to transform the business into a sustainable organization. More specifically SMAC capabilities have a positive impact on SCM in terms of productivity, competitiveness and innovation. The objectives were measured of total cost and service level, including transportation costs, inventory holding costs, and on-time delivery rate. The results showed that the proposed approach outperformed traditional optimisation techniques in terms of both efficiency and accuracy.

SMAC has several advantages over traditional optimisation techniques in SCM. Chen et al. (2012) proposed the application of SMAC in SCM and highlighted its advantages, including high efficiency, scalability, and robustness. The review also identified several challenges in the application of SMAC in SCM, including the need for large amounts of data and the difficulty in defining the objectives. In conclusion, the recent research on the application of SMAC to SCM has demonstrated its ability to optimise inventory levels, production planning, transportation, and logistics in a wide range of supply chain environments. SMAC has several advantages over traditional optimisation techniques, including high efficiency, scalability, and robustness. However, there are also several challenges in the application of SMAC in SCM, including the need for large amounts of data and the difficulty in defining the objective function. Future research in this area should focus on addressing these challenges and further exploring the potential of SMAC in SCM.

Methodology

- **The Research Problem**. The global market has always been susceptible to many technological influences. Over a period of time, technology has evolved and offered many opportunities to outperform the traditional approaches to business functions. Further, the business environment also created considerable challenges for the business. The competitors are a near threat, and how businesses manage their own resources has become a deciding factor in edging out their own competitors. In this ever-changing environment, it is important to understand the application of speed, flexibility, scalability, and real-time data-driven decisions to make better and more timely taken decisions. In this background, it is important to better understand the impact of SMAC technology on the efficiency, effectiveness, and agility of supply chain management in a business organisation.

- **The Research Objectives and Hypotheses**.

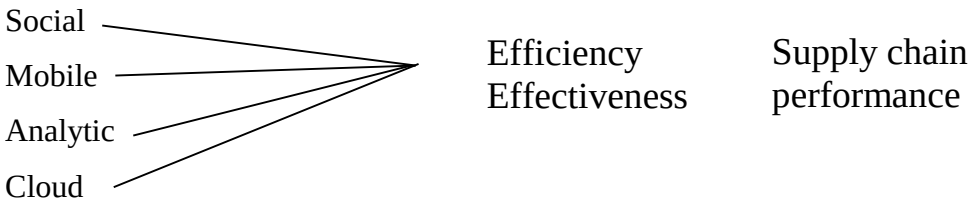
  - To evaluate the extent to which SMAC technology adaptation has impacted supply chain performance.

  - To examine the SMAC approach to supply chain efficiency and effectiveness.

- **Hypotheses**. The SMAC approach to managing supply chains will increase the performance level of SCM.

- **Research Design**. The exploratory approach has been used to conduct the study. The research on the impact of SMAC technology on SCM has been conducted through a selective review of the literature relating to the topic under consideration. The empirical literature review related to the topic consisted of a search for keywords in the articles written in English for the period from 2010 to the present with regard to SMAC technology. In the second phase, the articles contents and the subject of the research were identified. In the third phase, the articles were selected based on alignment with the research objective. In the last phase, the tabulation and evaluation were executed, and the major results were presented and discussed. The Google Scholar search engine has been used to locate and access a public journal and other publications.

- **The Conceptual Framework**. This is the foundation of the research. The independent and dependent variables are being used to understand the impact on SCM.



Analysis

- **SMAC Approach**. The SMAC approach is a strategy that combines the use of social media, mobile devices, data analytics, and cloud computing to optimise supply chain operations. It is a relatively new concept that has emerged in response to the increasing complexity and uncertainty of supply chain management in today's globalised business environment.

- **Social**. The social aspect of the SMAC approach involves the use of social media platforms to connect and communicate with customers, suppliers, and other stakeholders in the supply chain. Social media can be used to monitor customer feedback and sentiment, which can help companies identify emerging trends and respond to customer needs more effectively. Social media can also be used to collaborate with suppliers, share information, and coordinate activities across the supply chain. Social technology has changed the way businesses interact with

customers and suppliers. Social media in supply chain management integrates social technology into the supply chain to improve customer satisfaction, enhance brand loyalty, and increase sales. Social technology has helped businesses identify customer needs, preferences, and behaviours. This information can be used to improve product design, marketing, and sales. Additionally, social technology can help businesses identify trends, competitors, and market opportunities.

- **Mobile**. The mobile aspect of the SMAC approach involves the use of mobile devices such as smartphones and tablets to access supply chain data and communicate with stakeholders in real-time. Mobile devices can be used to monitor inventory levels, track shipments, and receive alerts about potential disruptions in the supply chain. Mobile devices can also be used to share information and collaborate with suppliers and customers, regardless of their location. Mobile technology has transformed the way businesses operate. The mobile application for supply chain management integrates mobile technology into the supply chain to improve communication by eliminating employee use of office hardware and location, increasing productivity, and enhancing customer service. The location becomes no longer a barrier for business functions with mobile connectivity. Additionally, mobile technology has enabled businesses to communicate with customers and suppliers in real-time. This has helped businesses respond to customer inquiries, resolve issues, and improve customer satisfaction.

- **Analytics**. The analytics aspect of the SMAC approach involves the use of data analytics tools to analyse large amounts of supply chain data and gain insights into supply chain performance. Data analytics can be used to identify trends, predict demand, and optimise inventory levels. It can also be used to monitor supplier performance, identify bottlenecks in the supply chain, and evaluate the impact of different supply chain strategies. Analytics has helped organisations make more informed decisions and improve supply chain performance. The analytics technology in the supply chain has improved decision-making, reduced costs, and increased efficiency. Analytics technology can help businesses identify inefficiencies, optimise processes, and reduce waste. Additionally, analytics technology can help businesses forecast demand, manage inventory, and monitor supplier performance. This

information can be used to improve planning, reduce lead times, and increase profitability.

- **Cloud**. The cloud aspect of the SMAC approach involves the use of cloud computing technologies to store and access supply chain data and applications. Cloud technology involves the use of remote servers to store, manage, and process data. Cloud computing can provide companies with the flexibility and scalability they need to manage complex supply chain operations. It can also help companies reduce IT costs, improve data security, and collaborate more effectively with suppliers and customers. Cloud-based supply chain management systems can be accessed from anywhere at any time, which can help improve supply chain visibility and responsiveness. Further, the SMAC approach to supply chain management integrates cloud technology into the supply chain to improve collaboration, increase flexibility, and reduce costs. Cloud technology can help businesses share information, collaborate with suppliers and partners, and access data from anywhere in the world. Additionally, cloud technology has helped businesses scale operations, reduce IT costs, and improve security.

Discussion

- **Impact of SMAC on Supply Chain Management**. The SMAC approach to supply chain management has several benefits for businesses. Firstly, the SMAC approach can improve customer satisfaction by enabling businesses to respond quickly to customer inquiries, resolve issues, and provide personalised service. This can lead to increased sales, repeat business, and improved brand loyalty. Secondly, the SMAC approach can improve efficiency by reducing lead times, optimising processes, and reducing waste. This can lead to lower costs, higher productivity, and improved profitability. Thirdly, the SMAC approach can improve collaboration by enabling businesses to share information, collaborate with suppliers and partners, and access data from anywhere in the world. This can lead to improved supplier performance, better risk management, and increased innovation.

SCM refers to the management of the flow of goods and services from the supplier to the customer. It involves a complex network of suppliers, manufacturers, distributors, and retailers, each with their own set of constraints and objectives. The goal of SCM is to optimise the flow of goods and services through the supply chain to meet customer demand

while minimising costs and maximising service levels. One of the primary applications of SMAC in SCM is the optimisation of inventory levels. Inventory optimisation is a critical aspect of SCM, as it affects both cost and service levels. Inventory is a significant cost driver in the supply chain, and holding too much inventory can lead to high carrying costs, while holding too little inventory can lead to stock outs and lost sales. SMAC can be used to determine the optimal inventory levels that balance the tradeoff between cost and service levels. The objective function for inventory optimisation can be a measure of total cost, such as the sum of holding costs and ordering costs, or a measure of service level, such as the probability of stock outs.

Another application of SMAC in SCM is in the optimisation of production planning. Production planning involves determining the optimal production schedule that meets customer demand while minimising costs and maximising the utilisation of resources without holding stocks of manufactured items. SMAC can be used to determine the optimal production schedule that balances the tradeoff between cost and service levels. Production planning can be a measure of total cost, such as the sum of setup costs, production costs, and inventory holding costs, or a measure of service level, such as the probability of meeting customer demand.

SMAC can also be applied to the optimisation of transportation and logistics in SCM. Transportation and logistics refer to the movement of goods and services from the supplier to the customer. It involves a complex network of transportation modes, routes, and carriers, each with their own set of constraints and objectives. The goal of transportation and logistics optimisation is to minimise transportation costs while maximising service levels. SMAC can be used to determine the optimal transportation and logistics configuration that balances the tradeoff between cost and service levels. The objective function for transportation and logistics optimisation can be a measure of total cost, such as the sum of transportation costs, inventory holding costs, and lost sales costs, or a measure of service level, such as the probability of on-time delivery.

- **Benefits of the SMAC Approach to SCM**. The SMAC approach to SCM offers several benefits to organisations, including improved visibility. The SMAC approach provides greater visibility into supply chain operations, which can help companies, identify potential problems and respond more quickly to disruptions.

- Enhanced collaboration: Social media and mobile devices can help facilitate collaboration across the supply chain, which can improve communication and coordination.
- Better decision-making: Data analytics tools can provide companies with the insights they need to make more informed decisions and optimise supply chain performance.
- Increased efficiency: Cloud computing can help streamline supply chain operations and reduce IT costs, which can increase efficiency and productivity.
- Competitive advantage: The SMAC approach can help organisations gain a competitive advantage by improving customer service, reducing costs, and increasing supply chain agility.

- **Challenges of the SMAC Approach to SCM**. Despite its many benefits, the SMAC approach to SCM also presents several challenges to organisations, including:

  - Data security: The use of social media, mobile devices, and cloud computing can increase the risk of data breaches and cyber-attacks, which can compromise sensitive supply chain information.
  - Integration: The SMAC approach requires the integration of multiple technologies and platforms, which can be complex and time-consuming.
  - Change management: The SMAC approach may require significant changes to supply chain processes and organisational culture, which can be difficult to manage.
  - Cost: The implementation of the SMAC approach can be expensive, especially for small and medium-sized enterprises (SMEs) with limited resources.

Conclusion

The SMAC approach to supply chain management is a new concept that integrates social, mobile, analytics, and cloud technologies into the supply chain. The application of SMAC to SCM is a promising field that seeks to optimise various aspects of supply chain operations. SMAC can be used to optimise inventory levels, production planning, transportation, and logistics in SCM. The use of SMAC in SCM can lead to significant improvements in supply chain performance, including reduced costs, improved service levels, and increased customer satisfaction. The SMAC approach

seeks to improve customer satisfaction, increase efficiency, and reduce costs. Social technology can help businesses identify customer needs and behaviours, while mobile technology can improve communication and productivity. Analytics technology can help businesses identify inefficiencies and optimise processes, while cloud technology can improve collaboration and reduce costs.

The SMAC approach has several benefits for businesses, including improved customer satisfaction, efficiency, and collaboration. In conclusion, the SMAC approach to supply chain management is a powerful tool that can help businesses improve their operations, increase profitability, and achieve a competitive advantage in the marketplace.

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GREEN LOGISTICS FOR SUSTAINABLE DEVELOPMENT OPERATIONAL EXCELLENCE

By

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Abstract

This paper discusses the concept of green logistics and its importance in enterprise. Further defines the concept of sustainable development, integrates green logistics into sustainable development, the purpose of this paper is to emphasise the importance of green logistics for the sustainable development of enterprises as well as the environment. The first objective of this paper is to introduce the concept of "green logistics" from previous literature. The second objective of this concept paper is to identify widely discussed dimensions of green logistics through a literature review. Finally, to analyse the contribution of green logistics for sustainable development in the literature, the methodology of this study is a comprehensive explanation of an in-depth systematic literature review. The study findings are the contribution of green procurement, green manufacturing, green distribution, reverse logistics, waste management, the managerial commitment to green logistics and its contribution towards sustainable development, and the limitations of the green practices.

Keywords: Green Logistics, Sustainable Development, Trade, Anthropocene

Introduction

"We are consuming the future." During the past few decades, with the technological and information revolutions, the entire world has faced endless human requirements. Human consumption of earth’s natural resources, such as fossil fuels, fish and seafood, minerals, forest products, meat, cereals, and land, is overshooting the previous consumption pattern, with one third of earth’s natural resources being used during the past two decades. Then the CO2 emissions and the dumping of industrial and domestic garbage into the environment The Earth is passing through the Anthropocene, the geological time period after the Cenozoic, Mesozoic, and Paleozoic earth periods

of the past 200 years. According to the scientists, it is being significantly vandalised by mankind with their negative footprint more than ever. Environment or trade is an ongoing dilemma in which two parties adversely behave towards each other. Environmental changes such as natural hazards or climate changes are detrimental to trade, and vice versa. Fulfilling infinite human needs with sacred resources means depreciating the natural resources. For the survivability of mankind, both the environment and trade are equally noteworthy. Finding the equilibrium between trade and the environment is an uphill battle. Tightening environmental policies with trade liberalisation is a wider solution for this than the individual's contribution to preserving the environment. Making use of trade itself for the betterment of the environment is a tactical as well as a powerful measure. Since sustainability is concerned, demand for green production is blooming all over the world. Consumers are ready to pay a higher amount for green production as a contribution towards preserving the environment. Mankind is at the right time to reverse its harmful activities towards the environment.

Green logistics is a new concept that is widely discussed in developed countries these days. The purpose of this paper is to educate readers on the importance of green logistics for the balanced and sustainable development of the industry as well as the environment. And to emphasise the widely discussed dimensions of green logistics through this paper is an in-depth study of previous literature to prove the contribution of green logistics to sustainable development.

Methodology

Step 1: Defining the green logistics through literature in the Sri Lankan context and globally Green logistics is a concept for the sustainable development of the environment as well as organisations. Practical examples of 100% green organisations are not real. As much as the importance of the green concept and applying it to enterprises is important for the sustainability of both enterprises and the environment,

Step 2: Defining sustainable development by using available literature. Sustainable development is defined in various aspects. This paper defines sustainable development as the most commonly used term in the literature.

Step 3: Identify the widely discussed dimensions of green logistics by using the previous literature. Although there are a huge number of dimensions in green logistics, it is visible that most of the authors have considered green procurement, green manufacturing, green distribution, reverse logistics, and managerial involvement as the major dimensions of the

Step 4: Elaborate on the contribution of green procurement, green manufacturing, green distribution, reverse logistics, and managerial involvement in green logistics through a comprehensive discussion of past studies.

Step 5: Concluding with an analysis of the sustainable development of green logistics and the contribution of the findings

Green Logistics

Other than the environmental policies Green Logistics (GL) is one of the best concepts from an environmental perspective. Green logistics can be simply derived as (Ahi, Payman, and Searcy, Cory, 2013): A comparative literature analysis of definitions for green and sustainable supply chain management: a flow of goods, materials, services, or information from the originator to the consumer in an efficient and effective manner by optimal utilisation of scarce resources without compromising the needs of future generations'. "Green logistics refers to the idea of assimilating sustainable environmental processes into the traditional logistics of the supply chain. Choosing suppliers, buying materials, marketing, and end-of-life management are all included in the design, production, assembly, and distribution of green products. The green supply chain includes value generation via all of the chain's processes rather than engaging in any environmental damage throughout supply chain operations. Without a doubt, the main goal of green logistics methods is to lessen air and water pollution. Additionally, employing green logistics techniques helps a business perform better in terms of product recycling and reuse, proper waste management, reverse logistics, increased asset efficiency, brand building, and higher levels of customer satisfaction. The goals of green logistics are to calculate the carbon footprint of logistics operations as a basis for thinking about sustainability measures and managing their outcomes. The influence of each logistical area, particularly those connected to transportation, should be examined in order to reduce air, soil, water, and noise pollution. Material utilisation by recycling packaging and reusing containers, or eco-logistics, which maintain sustainability throughout the supply chain, is also influenced by the appearance of items and their packaging. Both must be created with the least possible environmental impact.

Sustainable Development (SD)

*"Sustainable development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations' (*Andreas B.B., Panayaiotis H.K. (2011) SD Integrating economic growth so that it benefits all

economic sectors and transcends generational or geographic boundaries is the aim of sustainable development. In other words, decisions made today should be weighed against how they will impact the economy, the environment, and society in the future. The choices our civilization makes now will have a big effect on the environment and future generations.

Figure 1: Sustainable Development Diagram

Source: https://www.fdsd.org/the-challenge/what-is-sustainable-development/

Interaction of Environmental, social and economic aspects is the major considerations of SD. By overlapping environment and the social there exists sustainable natural and built environment. Social and economy together creates equitable social environment. Economy and environment responds for the sustainable economic growth. Sustainable natural and manmade environment, equitable social environment and sustainable economic growth all together defines sustainable development. Each generation born on the earth inherent natural resources for their survival.

Green Logistics for Sustainable Development

From the figure 1 Economy and environment sustainability includes green logistics in. According to M. Taube's description, *"Sustainable Development is a model for the future which should be accomplished in the whole World by two or four generations from now"* (Taube M.,Gibt E, (1994) The following requirements must be satisfied in order to achieve this goal: slowing the global population rise, the most significant matter streams should be kept in balance; outflows should have an equal impact, the free flow of energy should be constrained, and the energy obtained should be produced using renewable energy sources. Society should also conserve all species and types of ecosystems. In order to lessen the possibility of war and to equitably distribute the expenses of transition to a sustainable world for rich and poor, quality of life should rise along with the need to

develop the production of products and commodities. Scientific innovations, technological, and economic advancement are critical components of sustainable development. Any reforms that result in a more sustainable world should adhere to the democratic norms.

However, increasing commercial needs can also benefit social welfare, economic growth, and environmental management by supporting these aspects. More importantly, open markets can make it easier to acquire ground-breaking innovations that improve local production methods by requiring less energy, water, and other environmentally hazardous inputs. This suggests that by liberalizing trade and investment, companies could be incentivized to embrace tougher environmental policies. As an economy's export sector becomes increasingly linked into the global economy, environmental restrictions issued by the largest importers are more likely to be applied to it. Changes needed to meet those criteria then spread backwards through the supply chain, promoting the use of more environmentally friendly production methods and machinery.

Green Procurement

As per Benmamoun Z. (2017) Green Logistic Practices, Acquisition is the initial stage of the green supply chain process; supplier management is centered on coordinating corporate goals with suppliers. By using green procurement, all purchases are made in line with environmental standards. Choosing a supplier, enrolling up, buying, evaluating, etc. are all functional components of acquisition need to be done considering eco-friendly aspects. Environment-friendly procurement incorporates the environment into the purchasing process. Selecting the appropriate supplier to meet the environmental goals is the first step. It is crucial for suppliers to adhere to proper environmental standards within their organizations and achieving organizational financial goals. Some of the procedures used in green purchasing are, consideration of morality and human rights in the decision-making process, adhering to formal green procurement/purchasing policies, supplier evaluation, coaching and mentoring on their green procedures, alignment of supplier procedures with green, up keeping of an efficient network system among all suppliers, and information dissemination regarding the significance of green procedures.

Manufacturing enterprises that verify that supplies comply with environmental criteria have started to adopt integration tactics like forward and backward logistics. Customers of company are influenced by the supplier's interactions with buyers; during procurement by giving the provider the cost advantage is important in green procurement. Environmental supplier audits, certification of suppliers, backward integration, and additional procedures are some examples of green purchases

performed as part of the procurement process. The research's conclusions outlined various elements that contribute to sustainable developments of green logistics first step as green procurement.

Green Manufacturing

The cornerstone of the GLM is green manufacturing, where the majority of activities are in fact centered on environmental preservation. The creation of value occurs during the manufacturing process, which integrates materials, labor, and technology says the Benmamoun Z. (2017) Green Logistic Practices. The formal framework must establish rules on how the organization should carry out the process as a result of the reactive approaches. Regulatory organizations frequently appear to conduct compliance audits, assess the level of environmental contribution, and offer recommendations for development. The reactive process is based on how the operational level is founded by the management commitment. Organizations frequently implement 3R, Reduce, Reuse and Recycle, energy-saving methods, waste minimization strategies, environmentally friendly designs, co-products, etc. As a result, businesses embraced integrated product development, design, engineering, and management as potential strategies to lessen their negative effects on the environment. Green product design was recently identified as an emerging trend in green manufacturing. The integration of processes and products requires re- engineering.

Besides green design, green manufacturing is also influenced by green management standards like ISO 14001 and ISO 50001. Green marketing, green human resources, and green IT are examples of more practical green manufacturing practices. Consequently, some of the essential elements of green manufacturing include green production, packaging, and recycling. Green manufacturing (GM), green buying (GP), and green design are some of the topics covered by earlier academics instead of green manufacturing. Green design is the methodical process of developing an environmentally sustainable product taking into account the product life cycle.

Green Distribution

Green distribution primarily focuses on the product, Benmamoun Z. (2017) Green Logistic Practices, shows the way it is packaged, and the transportation of the goods. Utilizing biodegradable packaging materials and reducing transportation is one of the most recent environmentally conscious distribution techniques. Green packaging entails using biodegradable packing materials, cutting back on stuffing, and using less polyester. In order to reduce the influence on the environment, green marketing involves various distribution tactics that are environmentally friendly with regard to of the product, promotion, price, and location. In the words of Davari and Strutton (2014), the dimensions

of brand association, brand loyalty, and brand trust are related to the four elements of the "green" marketing strategy: green product, green promotion, green place, and green price. The supplier benefits financially from eco-friendly packaging and delivery. Environmental pollution is reduced via using methods of distribution which are environmentally friendly, planning transportation costs, and lowering those costs. By choosing specialized green distribution strategies and raising consumer awareness, enterprises nevertheless should implant the perceived value of the brand in the brains of customers.

Reverse Logistics

Retrieving a product from the end user at the end of the product life cycle in order to salvage value or properly dispose of it is known as reverse logistics. In order to Benmamoun Z. (2017) Green Logistic Practices,demonstrate the significance of reverse logistics, the goal of GL is to reduce or eliminate waste across the supply chain. Only a small number of companies, nevertheless, are aware of reverse logistics and have implemented it inside their structures.

Industries decide on reverse logistics at the designing stage, as it is explained in the green design that begins with a life cycle assessment of the product that is going to be manufactured, consider the processes of packing and transportation, product usage down to the disposal of waste. Reverse logistics are often included in the same process, adopting this could boost product costs with a 3R process, which stands for reuse, recycle, and reduce. To demonstrate the real effect of the life cycle in accordance with international standards, reverse logistics should be a required component of green supply chain management practices.

Waste management

Zero waste is the focus of GL. According to the practices of “Grand Hotel” Nuwara Eliya ,Sri Lanka, ”Nature Secret” – Sri Lanka, and “Kandalama”- Sri Lanka witnessed that they are continuing 12R concept, and a green bank. ”No Waste Day” like modern concepts to minimize their waste. Any organization can follow the same to direct their organizational behaviors into ecofriendly one.

Table 1: Generated through 12R concept of "Grand Hotel"- Nuwara Eliya

S.R	R	Description
1	Responsible	Continue staff training on environment and social training
2	Rethink	"NO BIN" day is introduced. Re think before generate waste
3	Refuse	Stop sing paper rolls, kitchen papers, no plastic usage
4	Reduce	Partnering with suppliers, Reduce non-degrade packaging, Introduction of show kitchen.
5	Re-use	Wet wastage use in pig farms
6	Repair	In house engineering team works on.
7	Reclaim	Purchase antiques via an auction.
8	Replace	Plastics by glass Polythene bags by re -usable bags
9	Refill	Shampoo bottles, Body lotions refill
10	Rot	Composting tea waste, coffee ground, garden waste
11	Recycle	Recycle solid waste, cardboard, metal, e-waste
12	Reward	Identify and reward the staff who contributes on 12R

Source: Developed by Author

Management Commitment

Above all, the most influential and powerful dimension of all green practices discussed is managerial commitment. Gonzalse C. et al. (2022), Green Supply Chain Practices, Vol. 5, Cleaner Logistics and Supply Chain Researchers have focused on management commitment as a mediator to the adoption of GLM in firms, such as top management support, employee support, and the green champion, who affects green operational performance and instills an eco-friendly culture. The implementation of all green management strategies in enterprises requires significant input from green management. Legislative and legal demands are implemented as a result of reactive challenges; however, the response from management should go beyond that by committing to an active effort to adopt green practices. Green logistics management demands the implementation of green practices by all company personnel.

Discussion

As per the study, there were a number of dimensions related to green logistic practices. Among all green procurement, green manufacturing, green distribution, reverse logistics, waste management, and managerial commitment, these were the areas repeatedly discussed by the authors over the years.

Table 2: Dimensions of Green Logistics

S/N	Dimensions of Green Logistics	References
01	Green Procurement	[1], [2],[3],[4],[5],[6],[7],[8],[9],[10],[12,[13]
02	Green Manufacturing	[1], [2],[3],[4],[5],[6],[7],[8],[9],[10],[12],[13]
03	Green Distribution	[1], [2],[3],[4],[5],[6],[7],[8],[9],
04	Reverse Logistics	[1], [2],[3],[4],[5],[6],[7],[8],[9]
05	Waste Management	[6],[7],[17],[18],[19]
06	Managerial Commitment	[20],[5],[6],[7]
07	Green Material Management	[4],[5],[8]
08	Green constructions	[18]
09	Government Regulations	[2],[3],[5]

Source: Developed by Author

Green procurement: by choosing environment-friendly suppliers, choosing environment-friendly materials in productions, optimising the utilisation of resources in the procurement process, and generating less waste, you contribute to sustainability through green procurement. Green manufacturing: according to the research findings, optimal utilisation of resources, minimum waste generation, innovating re-usable energies, promoting bio-degradable materials, and reselling waste are the major contributions of green manufacturing to sustainable development. Green distribution, which marks the minimum use of fossil fuel by minimising travel distances, minimising the number of runs, and using re-usable energies, is sustainable. Reverse logistics and waste management are the more significant dimensions of green logistics. Without spending, any organisation can implement reverse logistics and waste management concepts in their organisations for the betterment of the environment as well as the enterprise. Above all, consistency in management commitment is what makes all those green practices real. Figure 2 is the study finding on green logistics and its integration with the SD.

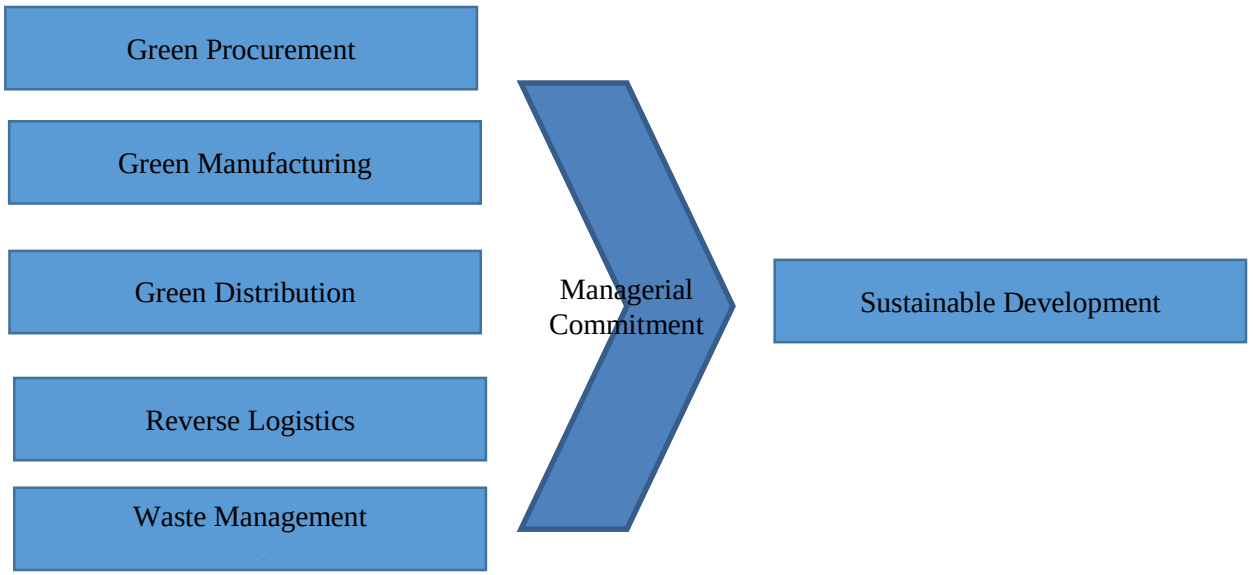

Figure 2: Developed through the Study Findings
Source: Developed by Author

GLM conducts green initiatives to increase both tangible and intangible advantages. GLM enhances brand reputation and "green" labelling. Integrating green techniques results in long-term cost savings. Reduced material use and energy use, improved participation of stakeholders, lower product costs, and improved product quality in relation to economic, social, and environmental variables are all positive effects of environmental-related business practices. Cost reduction, goodwill, and legality as environmental tactics are three competitive values that were explained by the natural resource base theory.

As per the definition in Figure 1, sustainable development might overlap with economic, social, and environmental equilibrium. Trade and enterprises are the parts and partners of economic sustainability. Trade and industry means none other than "Green Logistics," which is the way forward to the sustainable development of trade and the environment both. (Figure: 3)

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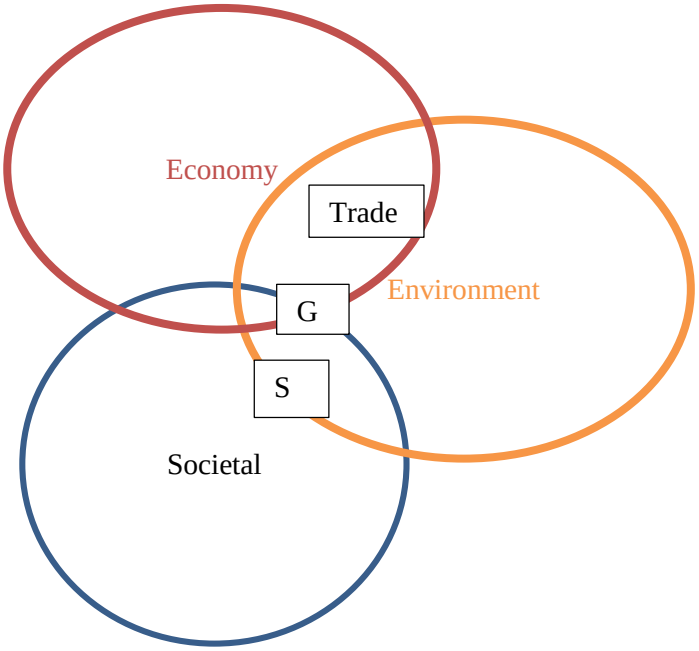

Figure 3: Derived from the Findings of the Study

Source: Developed by Author

Conclusion

Therefore, according to the findings of the above literature analysis, it is identified that green procurement, green manufacturing, green distribution, reverse logistics, and waste management are the major dimensions of green logistics. And all these green practices can depend on the managerial commitment of the decision-makers. The earth is depreciating swiftly. Mankind is at the right time to take corrective measures to preserve natural resources. A contemporary idea for considering environmental concerns in businesses is called "green logistics." Although it may appear that trade and the environment are at odds with one another, the green concept shows that trade can be used to preserve the environment and promote environmentally friendly aspects, which is more strategic and persuasive than individual participation in eco-friendly activities. Demand for green logistics is increasing globally on a daily basis. A large number of businesses have decided that investing in renewable energy, despite its high initial cost, is a superior long-term strategy. The environment and the organisation are both beneficial when businesses use green logistics. A useful method of detecting and regulating the access to and use of resources in firms is to establish the resource utilisation equilibrium of the environment and trading of each organisation, which will be beneficial and open for further studies.

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THE ROLE OF VALUE NETWORK ON SUPPLY CHAIN OPERATIONAL EXCELLENCE

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Abstract

The current study focuses to study on role of value network on supply chain (SC) operational excellence while identifying most important fundamentals for value networks and variables for SC operational excellence. The study was conducted as desk research by scrutinizing existing knowledge. Researcher reviewed about 75 papers/ articles and 28 papers/ articles were systematically scrutinized for the current study. The study formulated to answer four research questions and analysis was done mainly in two stages. In the first stage researcher found virtual integration, availability of SC Partners and logistics commitments as fundamentals of value network whereas customer service, resilience and value creation were derived as variables to measure SC operational excellence while answering first two research questions. The second stage of the study was designed to answer third and fourth research questions and it was found that virtual integration and logistics commitments impacts on SC operational excellence directly and indirectly where value network is partially mediating among them. Further, researcher found fully mediating effect of value network between SC partners/ actors and SC operational excellence where collaboration among SC partners/ actors creates basic necessities for the value network. The originality of the current study is the comprehensive conceptual model and offers a foundation for future researches to test proposed conceptual framework with empirical evidences for the validity of the results.

Keywords: Value Network, Supply Chain (SC), Operational Excellence, Virtual Integration, SC Partners, Logistics Commitments

Introduction

The technology has open up the entire world to the customer's finger tips whereas it has given access to any markets at the any corner of the world. It doesn't matter which country, which time zone or which territory the customer or the marketer is located. The availability of wider range of market accessibility and substitutes products has created more competitive rivals to all SC actors

whereas cost structure, branding, quality of product, distribution network, intellectual property and customer service of single actor has marginal impact on competitive advantage. Therefore, all contemporary SCs are to be more customers centric whereas actors of SCs to be more agile, responsive and collaborative to fulfill changing customer demands.

The globalized market along with the technological innovations has created integrated approach to the SC operations whereas distance between the Point of Origin (POO) and the Point of Consumption (POC) is negligible. The movement from traditional SC to integrated SC has created complexity on its operations while creating necessities for sophisticated information sharing, transportation, warehousing, online transactions and documentations. Facilitating of these emerged requirements has created many business opportunities within the traditional SC and internet providers, banks, insurance companies, third party logistics providers and many other actors have entered to the system and evolved SCs as value networks. Integration among the all actors in the value network mandatory to remain competitive since competition is between value networks in contemporary market.

Modern competition has pushed all SC Actors to integrated operations whereas both internal and network operations of an actor to be improved to enhance the overall performances of them (Zacharias and Boopathy, 2022) whereas they are to be sound enough to efficiently collaborate with their value network partners. The above explanation evidence the necessity of comprehensive studies focused on the value networks to understand its role within the modern SCs. Therefore, the current study focuses to identify the role of value network on SC operational excellence. Through the current study, researcher expected to answer following research questions;

RQ1: What are the fundamental necessities to establish effective value network?

RQ2: What are the most suitable variables to measure SC Operational Excellence?

RQ3: What is the interrelationship among fundamental necessities of value network and variables of SC Operational Excellence?

RQ4: What is the role of value network towards SC Operational Excellence?

Research Methodology

The current study totally conducted through a systematic literature review whereas researcher used existing knowledge. In order to conceptualize the current study, researcher reviewed 75 recently published and mostly cited research papers at publications and indexes such as ‘Elsevier’, ‘Emerald’,

'Scopus', 'Research Gate', 'Google scholar', 'Academia' and 'Web of science' and systematically scrutinized 28 most relevant studies for the current study. The analysis has been done under two stages whereas first stage was designed to identify and explore fundamental necessities to Value Network and variables for SC Operation Excellence. Having identified basic conceptual framework of the study through stage one, researcher identified interrelationships of derived factors and role of Value network through the analysis at stage two.

First Stage Literature Review

This section is aimed to conduct comprehensive literature survey to divulge existing knowledge and identify fundamental necessities to establish effective Value Network and variables to measure SC Operational Excellence. Then, at the end of the section researcher hopes formulate conceptual framework for current study.

In present context, the power of market has been shifted the from manufactures to retailers due to the globalization and technological developments where customers expect more benefits for less cost within short lead time (Noori-Daryan, Taleizadeh and Jolai, 2017). Along with these market behaviour changes, Supply Chain Management (SCM) has been surfaced by many scholars in both theoretical and empirical studies. Existing literature has evidenced that all SC actors have to collaborate closely to react and satisfy changing customer demand and retain customer with the business (Um and Kim, 2018; Allaoui, Guo and Sarkis, 2019; Alzoubi *et al.*, 2020). As described by Min, Zacharia and Smith (2019), SCM is the systemic, strategic coordination of the traditional business functions within a particular company and across businesses within the SC, for the purposes of improving the long-term performance of the individual companies and the SC as a whole.

According to the Noori-Daryan, Taleizadeh and Jolai (2017), none of SC actor can achieve excellence in their market performances individually whereas the SC collaboration is mandatory. Alzoubi *et al.*, (2020) has found that companies are formulating competitive strategies to in line with their SC competitive strategy in present market and Noori-Daryan, Taleizadeh and Jolai (2017) has explained that the current competition is not between firms where it is between SCs. As explored by Fu and Ma (2019) and Nürk (2019), profitability and sustainability of SCs depend on its operational excellence whereas secondary study conducted by Zacharias and Boopathy (2022) has proven that profitability of SC depend on operational excellence through the integration.

As explore by Moktadir *et al.*, (2020), operational excellence can be defined in different ways in different industries whereas many scholars have proposed and tested various frameworks to

measure operational excellence of SC. According to the Zacharias and Boopathy (2022), operational excellence of SC can be measured through Cost Efficiency, Flexibility and Customer Service whereas Um and Kim (2018) and Wieland and Durach (2021) stated Resilience of SC as influential factor of operational excellence of SC. As stated by Moktadir *et al.*, (2020) operational excellence associated with measures of expense, quality, resilience, interaction with customer, customer support and correct value creation.

A value network is seen as a set of roles and interactions in which organizations engage in both tangible and intangible value exchanges to achieve economic or social good (Evans *et al*., 2017). In particular, the competitiveness, sustainable initiatives, technological improvements and changes in customer awareness/ behaviour have created continuous evolving atmosphere for almost all SC Actors and firms continuously (Evans *et al*., 2017; Centobelli *et al*., 2019) whereas all actors need to adapt their value network to create value and accommodate customers changing requirements (Nagy *et al*., 2018; Kano, Tsang and Yeung., 2020). According to the literature, many scholars have explored that Virtual Integration (Wang *et al*., 2016; Zacharias and Boopathy, 2022), SC Actors (Adner, 2016; Pagani and Pardo, 2017) and Logistics Commitments (Idris and Mohezar, 2018; Zacharias and Boopathy, 2022) as fundamentals of Value Network.

Depending on the factors derived through initial literature review, researcher derived Virtual Integration, SC Actors and Logistics Commitments as fundamentals for Value Network whereas Customer Service, SC Resilience and Value Creation were derived as variables for SC Operational Excellence. Then, researcher formulated the conceptual framework for the study as at Figure 1.

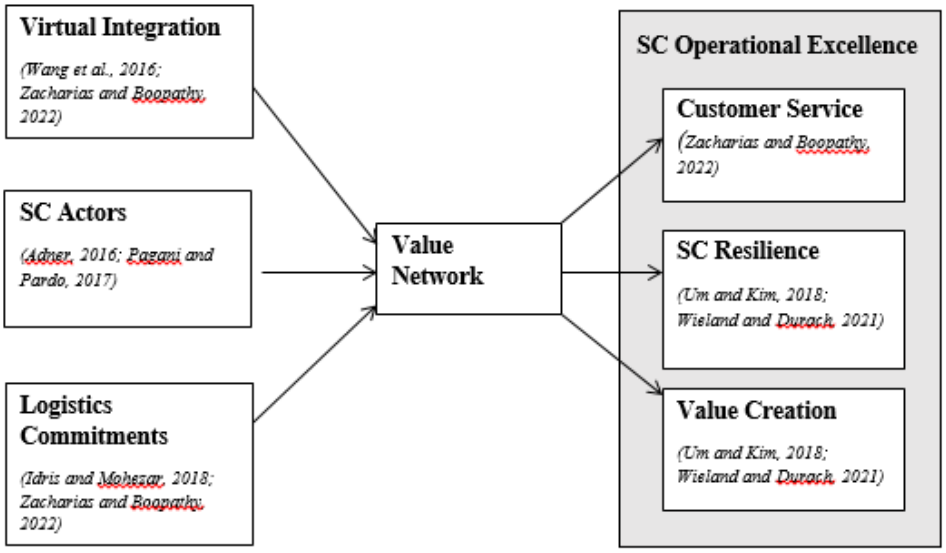

Figure 1: The Conceptual Framework of the Study

Source: Developed by Author

Second Stage Literature Review

In order to address above research questions, researcher critically analyzed and scrutinized research papers selected for the study under this section. Through this section researcher hope to identify interrelationships/ correlations of the selected factors.

According to the Wang, Tai and Wei (2006), Virtual Integration is combine set of SC partners through Information Technology (IT) solutions and extend the visibility of the SC partners whereas Wang *et al*., (2016) and Zacharias and Boopathy (2022), has stated that Virtual Integration is a mandatory fundamental in Value Network. Meanwhile, a recent empirical study conducted by Rita, Oliveira and Farisa (2019) has proven the significant positive impact of e-services on customer satisfaction whereas Raza and Anjum (2023) explored significant impact of Virtual Integration on customer services through their scientific study. Wang, Iqbal and Gong (2021) have deeply studied and explore the importance of Virtual Integration to maintain SC Resilience and many scholars have proven same through their studies.

According to the Adner (2016) and Pagani and Pardo (2017), SC Actors are essential element to for existence of Value Network whereas Alonso-Muñoz *et al*., (2021) also highlighted the necessity of SC Actors to Value Networks. When scrutinizing the existing knowledge and the empirical existences, different types of SC Actors are operating along with their core competencies from POO to POC in any SCs. As stated by Zacharias and Boopathy (2022), contemporary competition is not between businesses, it's between SCs whereas that evolution has expanded SC operations beyond the boundaries (Stallkamp and Schotter, 2021) and more resilient (Um and Kim, 2018; Wieland and Durach, 2021). SC Resilience is the capacity of a SC to persist, adapt, or transform in the face of change (Wieland and Durach, 2021).

Idris and Mohezar (2018) and Zacharias and Boopathy (2022) identified Logistics Commitments within SCs as a fundamental to create Value Network and Zacharias and Boopathy (2022) has described the Logistics Commitment as 'one party's desire to commit to maintaining the relationship / collaboration and enhancing its success in the context of the SC process. Alonso-Muñoz *et al*., (2021) explored that collaboration among SC Actors is positively impact to the SC Resilience. As per the Annosi *et al*., (2021), collaboration / Logistics Commitments among SC Actors leads to the better Customer Service whereas Blaschke *et al*., (2019) explored that multi actor collaboration through Virtual Integration co-create values for customers.

When scrutinizing the existing knowledge, the literature on the Internet on Things (IoT), Virtual Integration and SC Networking is rich and many scholars have done both theoretical and empirical studies in the knowledge span. Urbinati *et al*., (2018) explored the importance of stakeholder network to create value for the customer through their study whereas Lee (2019) stated that the networking among partners such as platform developers, partners, device suppliers and other enterprises impacts to the Value Creation for the end customers. Further, Lee (2019) has revealed IoT services in the Value Network can improve the business operations and Customer Services during their study.

Literature has proven that customer is most powerful in contemporary market whereas SCs should be more agile to accommodate changing customer requirements (Zacharias and Boopathy, 2022). As explored by Zhao *et al*., (2019), relationship/ collaboration among SC Actors formulate the Value Network and such a collaboration and network approach improve the Resilience of the SC operations.

By scrutinizing the existing knowledge, researcher evolves the basic conceptual framework of the study and identified interrelationships among derived factors of Value Network and SC Operation Excellence as indicated at Figure 2.

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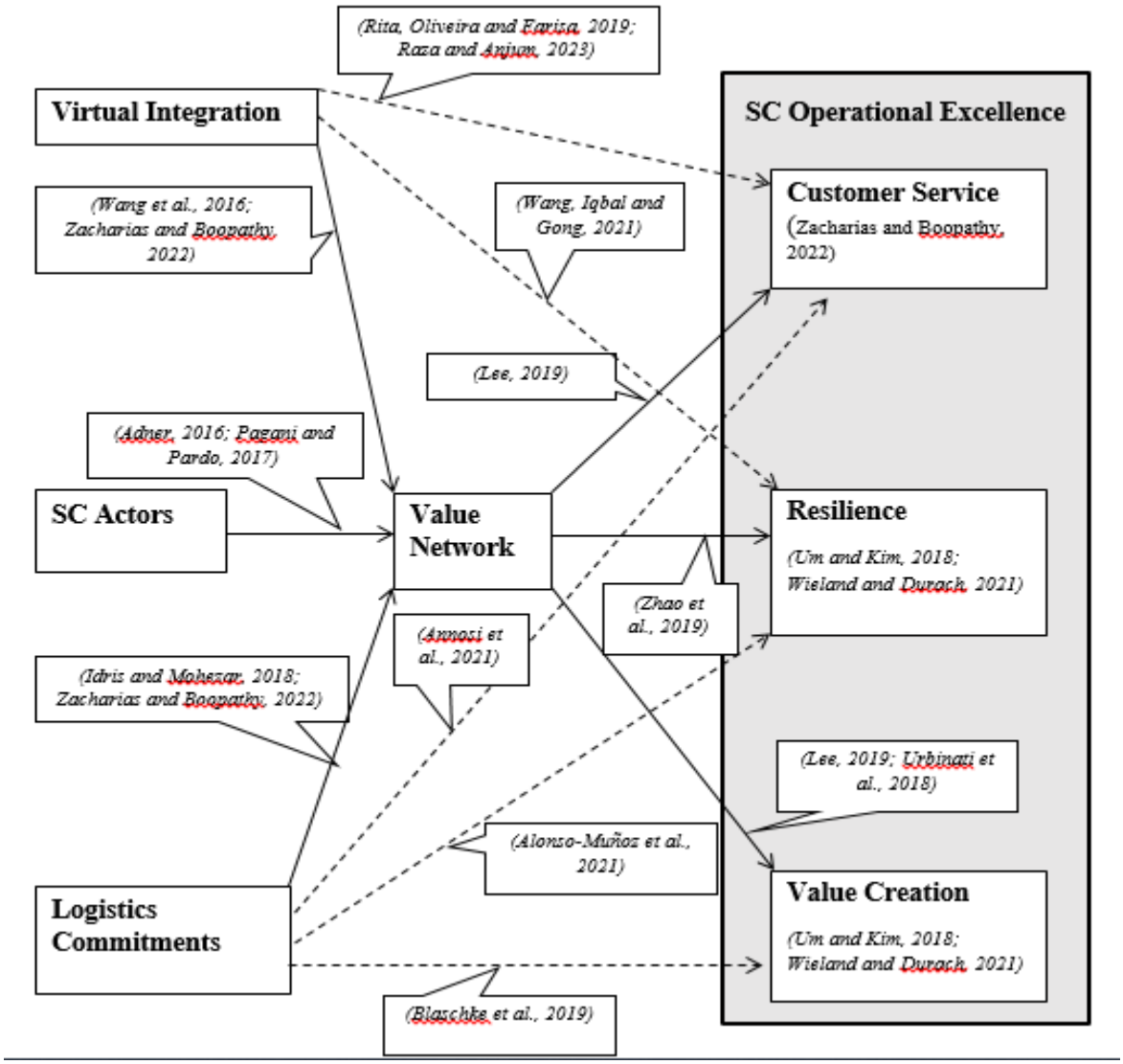

Figure 2: Validation and Conceptualization of the Conceptual Framework of the Study

Source: Developed by Author

Discussion and Implications

The current study was designed to answer four research questions. In order to answer first and second research questions, researcher derived Virtual Integration, SC Actors and Logistics Commitments as fundamentals of Value Network (**RQ1**) and Customer Service, Resilience and Value Creation as most representative variables to measure SC operational excellence (**RQ2**) by scrutinizing existing knowledge. Depending on the factors derived through the literature survey, researcher formulated and tested the conceptual framework of the current study to find answers for remaining research questions (**RQ3** and **RQ4**).

Literature proven that Value Network has strong impact on SC operational excellence (Urbinati *et al.,* 2018; Lee, 2019; Zhao *et al.,* 2019). The Virtual Integration is one of the basic fundamental to establish effective Value Network and many scholars have identified the role of Virtual Integration in Value Networks during their scientific studies. Further, literature has revealed that Virtual Integration directly impacts to the customer service (Rita, Oliveira and Farisa, 2019; Raza and Anjum, 2023) and SC Resilience (Wang, Iqbal and Gong, 2021). Therefore, it could be found that Virtual Integration directly and indirectly impact to the SC Performance Excellence where Value Network has partially mediating effect in between Virtual Integration and SC Operation Excellence.

Many scholars identified SC Partners/ Actors as a basic fundamental of Value Network whereas establishing of network is impossible without them. Further, inherent complexity of the SC has increased the number of actors in contemporary SCs whereas increased number of SC Actors created more complexity in SC operations. Further, existing knowledge has proven that availability of SC Partners / Actors impacts to the SC Operation Excellence through well-established Value Networks whereas Value Network is has full mediating effect between SC Actors and SC Operation Excellence.

According to the explored knowledge in the current study, only existence of SC Actors and Virtual Integration mechanisms is meaningless if those partners do not collaborate effectively among them. Partners/ Actors should effectively engage in Logistics Commitments to achieve value chain strategies and competition where Virtual Integration is the modern effective mechanism of collaboration whereas such integration gives visibility of SC to its partners and improve the availability of real time on line information for decision makings. According to the conceptualized framework at Figure 2, Logistics Commitments is a fundamental of Value Network (Idris and Mohezar, 2018; Zacharias and Boopathy, 2022) and directly impact to the all variables (Customer Service, Resilience and Value Creation) of SC Operational Excellence (Blaschke *et al.,* 2019; Annosi *et al.,* 2021; Muñoz *et al.,* 2021). Therefore, existing knowledge has proven both direct and indirect impact of Logistics Commitments on SC Operational Excellence and partial mediation effect of Value Network between Logistics Commitments and SC Operational Excellence.

When scrutinizing the conceptualized framework at Figure 2 and discussion made under this section, it can be found that fundamental necessities of Value Network and variables of SC Operational Excellence are interrelated directly and indirectly. Researcher found both direct and indirect impacts of Virtual Integration and Logistics Commitments on SC Operational Excellence

whereas SC Actors impact on SC Operational Excellence only through their Value Networks.

Finally, existing knowledge has explored that mediation of Value Network is much important to achieve maximum benefits of Virtual Integration, availability of SC partners and Logistics Commitments whereas direct impact of single factor is marginal with the absent of other factors. Further, literature has proven the necessity of Virtual Integration, availability of SC partners and Logistics Commitments to establish effective Value Network. Therefore, establishing of effective value network is much essential to retain in the contemporary market whereas Value Network is playing significant mediating role among the fundamental necessities of modern SCs and its Operational Excellence.

Conclusion

In the current study, researcher discussed the role of value network on SC operational excellence. Literature has explored virtual integration, availability of SC actors and logistics commitments as fundamental necessities of value network whereas customer service, SC resilience and value creation derived as variables to measure SC operational excellence. Findings of the current study reveal that virtual integration and logistics commitments impacts on SC operational excellence directly and indirectly where value network is partially mediating among them. Further, researcher found fully mediating effect of value network between SC partners/ actors and SC operational excellence where collaboration among SC partners/ actors creates basic necessities for the value network. In this regard, contemporary businesses should focus more towards virtual integration, SC actors and logistics commitments to establish SC operational excellence since better customer services, SC resilience and value creation are mandatory to be competitive and survive in globalized customer centric contemporary market. The study contributes to the literature in respective knowledge span and gives insight to future researchers and decision makers to develop their business operations.

Insights for Future Researches

The current study was totally conducted as exploratory research by scrutinizing existing knowledge. Researcher developed the conceptual framework depending on findings of existing studies conducted in different industries and different time frames. Hence, researcher suggests testing the formulated conceptual framework of current study with empirical evidence in different industries. Further, it was observed that most of the studies scrutinized during the current research have been

based on developed economies where applicability of same need to be re-studied in developing economies.

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LOGISTICS VALUE CREATION AND MEASUREMENT

By

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Abstract

In the past, transportation was primarily seen as an expense that needed to be cut. However, logistics is not just a field where expenses are going up; it is also a field where value is being created and increased. By way of logistical assistance activities in the supply chain produce the added value of the goods. In the value chain, logistics accounts for two of the top five main activities, standard logistic services, value-added logistic services, and specialised logistic solutions all contribute to the value of logistics. In the logistics industry, value is produced for both consumers and shareholders. However, many businesses are unaware of the opportunities that logistics can present for value development. The majority of businesses conceal millions of dollars in their logistical operations. Profitability would increase as a result of their discovery. In most actual systems, there is no measurement or monitoring of the value gained through logistic activity. The purpose of this work is to show comprehensive methods for developing and evaluating various values obtained in the field of logistics.

Keywords: Logistics Value, Logistics Services, Logistics Activities, Value-Added Logistics Services, Logistics Solutions.

Introduction

Global competition is a defining characteristic of today's marketplaces. The procedures have evolved into a crucial element in competitive struggles and differentiating oneself in a distinct and open market. Since product development technologies have been very similar or identical for a very long time, companies are vying to improve both the performance of their products and their services to give their customers more value for their money. Supply networks and logistics operations are significant areas for adding value to products. The shorter product life cycle necessitates a quick and effective market entry. This is not feasible with the current product deployment and consumption on the global market without effective and flexible logistics and supply chains.

When a production process is finished, a sizeable portion of it moves from traditional manufacturing plants more towards the market, where it is prepared for sale and added value, and into associated logistics centres and systems. Second, there are a lot of hidden values in logistic areas, and finding them will be extremely beneficial. Most logistics methods are effective with rising operational expenses and unused labour capital, which are crucial value-adding resources. Literature and practise should pay more attention to the value obtained through logistical activities and processes to conceptualise and utilise the possibilities that logistics has to offer. This research specifically addresses the problem of creating and quantifying value in logistics. The role of statistics in the value chain is the first topic covered in this research. The research also has something to do with creation. Thirdly, the measurement of the value of logistics is discussed.

The Value Chain's Place for Logistics

The value itself causes several misunderstandings, and it is frequently ambiguous as to what it means. It could be argued that understanding this word has always been one of the issues that call for a specific response. Socrates, along with his pupils Plato and Aristotle, established the fundamental definition of this word. They talked about how to understand worth as a fundamental characteristic of people (concerning souls and virtues). Later, this word took on additional meanings such as aesthetic value, economic value, and ethical or moral worth. Value theory is a specialised branch of science that looks at values and various methodologies for assessing various notions, ideas, goods, and products. Social and governmental ideologies, as well as the idea of value, have long been at the core of commercial and business marketing, where the main emphasis is on the monetary or material worth and services that goods provide to users and customers. The idea of the value chain, which was popularised by Michel Porter, was defined in Porter (1985). A value chain is an organised series of activities that a product goes through and gets value from one at a time.

Porter claims that, in a broad sense, the activities that add value to the supply chain can be divided into two categories: main activities and auxiliary activities, as shown in Figure 1. Inbound logistics, manufacturing, output logistics, marketing, and after-sales service are the key tasks in the value chain. Both the creation of the value of the product and a specific design include these activities. Procurement, technology development, HR management, and system infrastructure are examples of auxiliary tasks.

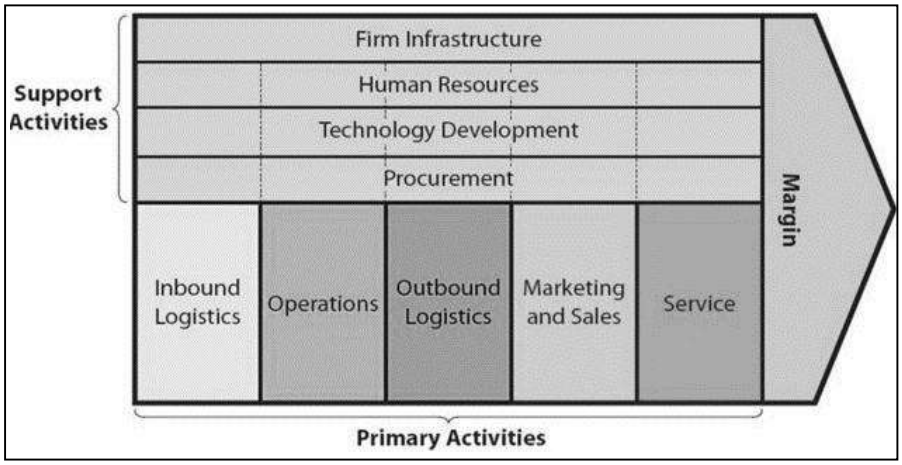

Figure 1: Porters Value Chain
Source: Porter (1985)

The fact that logistics and logistic services account for two out of every five main areas demonstrates the role and significance of logistics in generating final value. Output logistics refers to logistics activities like the distribution and disposal of finished goods within commercial markets, while inbound logistics refers to activities like supplying the business with raw materials, intermediate products, and production services.

Assessing the Logistics Value

There are many opportunities to add value in the transportation sector (Kilibarda and Andreji, 2012). Standard logistics services, supplemental logistics services, and specialised logistics solutions are all ways that logistics value can be produced (Figure 2). Standard logistics services, such as shipping, reloading, storage, and transportation, add time and spatial value to the goods. By moving the goods' locations, spatial value is produced. More specifically, a new product value is produced by addressing customers' needs to locate the products in places where they are available for purchase, use, and consumption. As a result, the finished goods, for instance, have three different values depending on where they are: in a factory warehouse, a shop, or a consumer apartment.

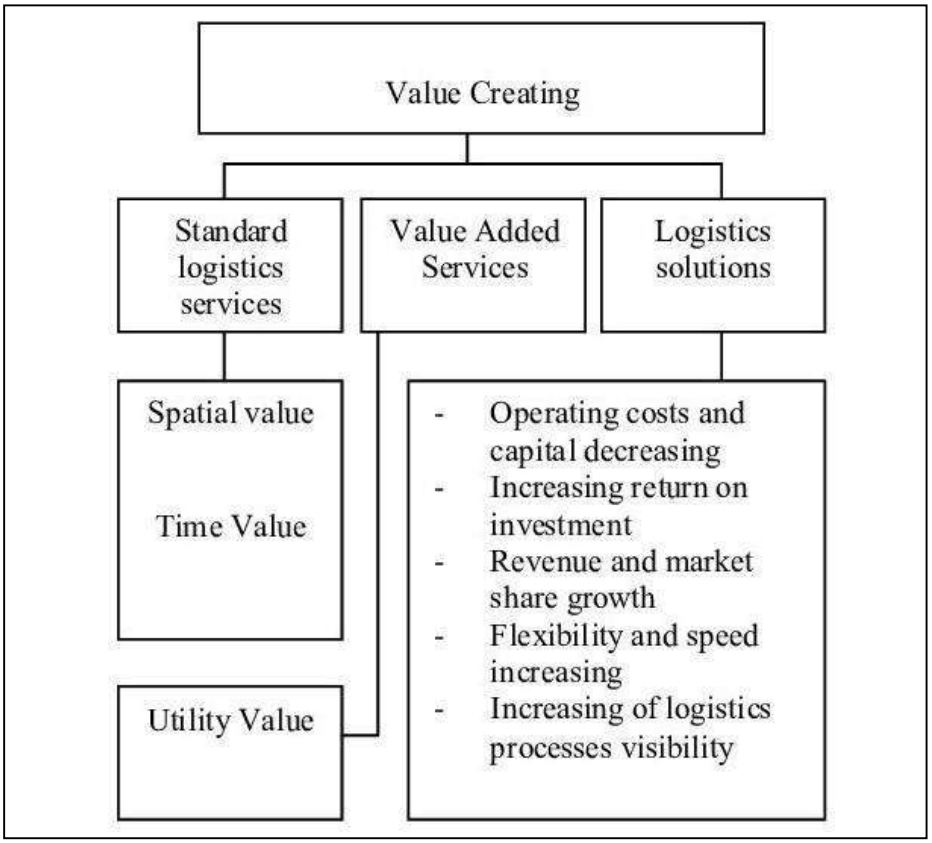

Figure 2: Different Ways of Creating Values in the Logistics Source: Developed by Author

By making the goods accessible at a particular location and time, a time value is created. Space change, or spatial adjustments to consumer demands, is not the only factor to consider; the timing of this process is also crucial. The key argument is that customers receive their purchases at the appropriate moment, which raises the item's overall value**.** Worth Added Logistics, or additional logistics services, help to create and raise a product's utility value. Logistics systems alter how goods are represented (packaging, repackaging, marking), how products are finished (finishing touches, assembling, installation), how products are refined, qualitative and quantitative transformations, and quality improvement, all of which have a significant impact on the overall value of the product. Logistics systems use a variety of processes, such as drying, ripening, cleaning, freezing, and product refrigeration, whose utilitarian value undoubtedly varies depending on the type of product.

Certain logistics options provided by logistics providers can considerably boost the value. By increasing revenue and market share, decreasing operational expenses and required working capital, increasing flexibility and the speed of the logistic process, and enhancing return on investment, execution, as well as by raising awareness about procedures in logistics. Transportation, storage,

inventory, transfer, and other operational costs can be greatly decreased through the improvement of logistical processes. Working capital requirements can be decreased by raising inventory turnover and lowering inventory safety levels, enhancing cycle times, and aiming for flawless deliveries. The company's main goal is to reduce its need for working capital because doing so will increase shareholder value. Directly enhancing the return on assets (ROA) is achievable through improved resource management, smooth logistics operations, and better capacity utilisation. Because businesses frequently have millions of dollars hidden in their logistics operations, this is very essential. To increase market share, income development, time value, and overall value, high-quality logistics services and flawless procurement and delivery realisation are essential. More than ever, the execution of logistics processes needs to be flexible, agile, and quick. The value greatly rises by enhancing these characteristics. Real-time completion of global visibility logistics processes is a powerful value creator because it lowers inventory, which lowers working capital and operational expenses, and raises customer satisfaction. Customers' and shareholders' views must be taken into consideration when creating the value of logistics.

- **Adding Value for Clients**. Differences between the perceived benefits of the purchase and the overall expenses associated with that purchase are the factors that determine what the customer-delivered value is. The evaluation of each component product, service, personnel, and real idea leads to the perception of the total value or benefits, whereas the total expenses also include time lost and the cost of logistics, resources, and energy. (Figure 3).

Logistics undoubtedly has a significant effect on both value components. Customers are immediately drawn to high-quality logistics services, and the benefits of purchases are perceived as being more favourable. Effective logistics strategies and technologies, on the other hand, result in a decrease in logistics costs, or total costs. For these reasons, logistics is regarded as a very powerful tool for developing and enhancing the value of the customer.

It should be remembered, though, that the perception of customer value is typically founded on services with added value and particular logistical solutions. Standard transportation services are, in theory, provided. For these reasons, businesses and providers of logistics services should strive to offer specialised transportation solutions and services that add value to products.

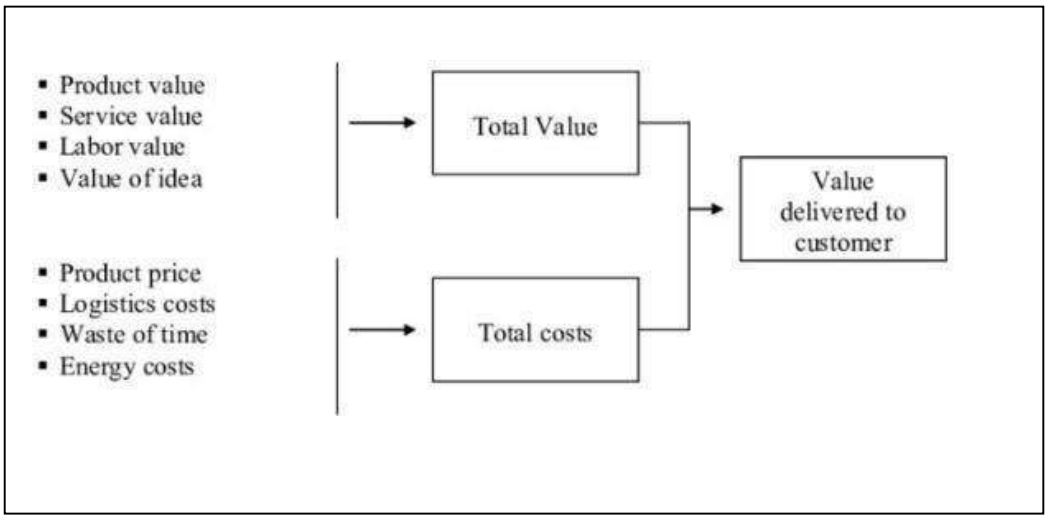

Figure 3: Different Ways of Creating Values in the Logistics

Source: Developed by Author

It should be remembered that real value embodies a dynamic idea that varies significantly over time. What is currently thought of as an added value may become a standard utility pack in the future. For these reasons, it is important to consider the service life when generating value within logistics services and solutions. (Figure 4). Until the offer remains unique—that is, until it is imitated and/or improved by competitors—new services, ideas, or solutions add significant value to the market. At that point, the logistic package or logistics solution takes on the characteristics of the standard offer and ceases to be the source of users' value perception.

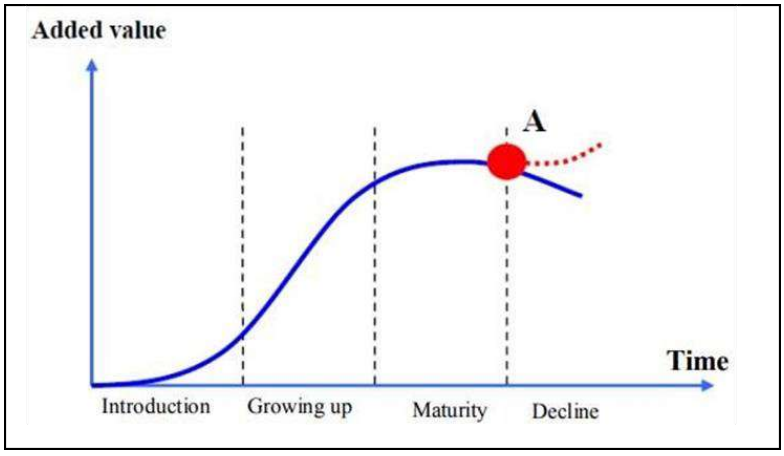

Figure 3: Creating an Added Value through Logistics Service and Solution Lifetime

Source: Dörnhöfer et al. (2016)

The stages of the introduction and development of novel services, concepts, and solutions are where added value is found. Due to the spread of the same in the maturation period, users query the

value of added value when presented with this or a comparable offer in the market. A provider will lose all potential to contribute value if they do not develop innovative concepts, logistics services, and solutions. Point A, for instance, in the line (Figure 4) marks the point at which a business must innovate its offering and concentrate its efforts on other services and solutions.

- **Generating Profit for the Shareholders**. The value that logistics and logistic services add to the company (shareholder value) in addition to creating and generating value for customers, it is possible to increase the value of a business by improving profitability or decreasing working capital. (Figure 5).

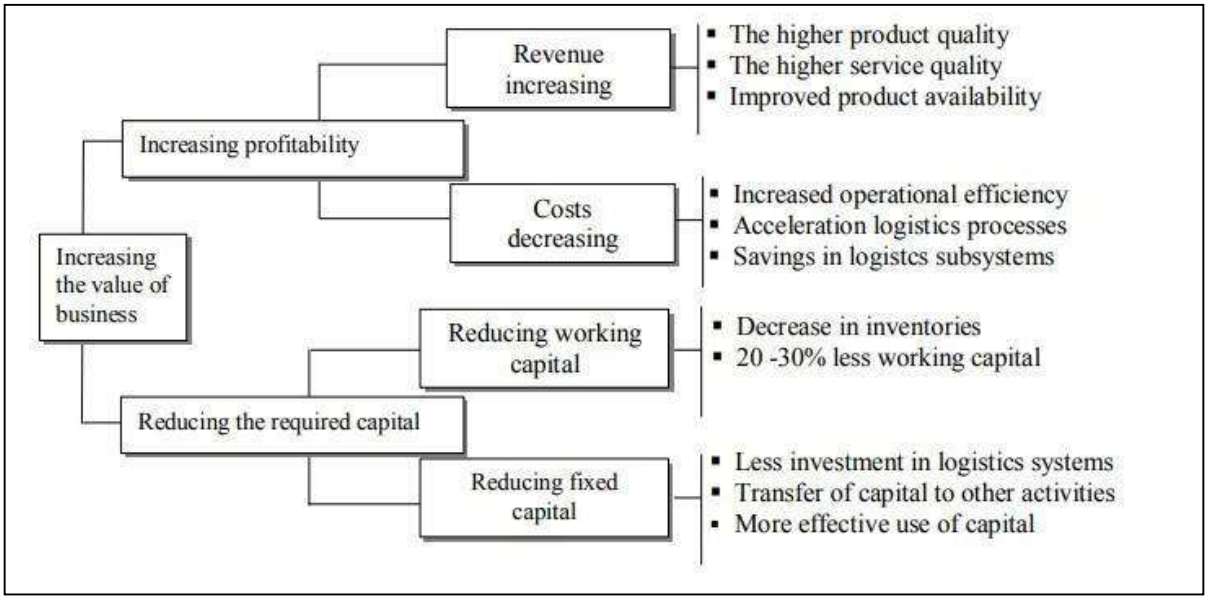

Figure 4: Improving Shareholder Value

Source: Altaf (2016)

Measurement of Value

For logistics companies to realise adequate profits, they must gauge the value they provide to their clients. Profitability, it is unrealistic to anticipate that customers will evaluate the offered value and be willing to pay for it. Not just listing the superior qualities of a product is sufficient; the superior logistical support must also result in a profit. The company's administration should be informed of the value realised in logistics, in addition to the customers. When the logistics are running smoothly, it is easy for the management to overlook and minimise the significance of certain logistical solutions. As a result of everything that has been said so far, the value produced in the field of logistics should be assessed both internally and externally, throughout the entire supply chain.

The measurement of worth is covered in various approaches and techniques in marketing literature. So, for instance, Lambert (1983) gives the following critical value measurements: shareholder value analysis, total cost analysis, profitability analysis, customer satisfaction, and customer value added (CVA). Increasing revenue and decreasing overall expenses will improve profitability. Better product availability and delivery services can increase revenues, and improved operational efficiency, the acceleration of the logistics process, and cost savings on logistical subsystems can decrease expenses. Reducing working capital (lower inventory levels, faster-working capital, etc.) and fixed capital (better capital utilisation, fewer investments in logistic systems, and capital transfer to other companies) allows for the reduction of required capital.

According to spotted value and costs, quality, price, and time; basic and added value; competition; and stockholder value, the value gained through logistical activities can be evaluated. Value is primarily described from the perspective of the customer as the ratio between spotted benefits and total costs. Gale (1994) mentioned that the worth of the customer can be expressed in the following ways:

$$\text{Customer Value} = \frac{\text{Benefits perception}}{\text{Total costs}} \quad \text{or} \quad \text{Value} = \frac{\text{Benefits}}{\text{Costs}}$$

$$\text{Value expected} = \frac{\text{Value perceived}}{\text{Costs}}$$

Where,

Value perceived = Product attributes + Customer service

attributesCosts = Transaction costs + product lifecycle costs =

Risks

Naumann makes the implication that the customer determines the utility and costs associated with the product and customer care (Naumann and Kordupieski, 1994). The value anticipated by the product or service user is calculated by dividing spotted utilities by spotted costs and risks from a business perspective, the value displays the proportion between actual and anticipated quality and can be displayed in the following ways:

$$\text{Value} = \frac{\text{Realized quality}}{\text{Expectation}} \quad \text{or} \quad \text{Value for customer} = \frac{\text{Quality X service}}{\text{Costs X time}}$$

Gale (1994) also links extraordinary value for the customer to market-perceived quality (both product and customer service quality), where value is described as a market-perceived quality that is in line with the product price. This author contends that value and quality are equivalent when compared to price, with quality including all characteristics other than price. Additionally, according to this author, there are differences in products and customer service's relative quality, cost, and worth.

According to Gronroos (2004), as shown below, "customer value" (CV) is the outcome of "core value" (CV) and additional value (AV).

CPV = CV +/- AV

According to Grönroos's (2004) findings, a core value is the benefit of a fundamental solution relative to its cost. One could say that a product or an offer at retail price has made the fundamental value tangible. Perceived consumer value (CVP) is described as a general customer estimate of benefits based on investments and profits from the product being provided (Zeithaml, 1988). The customer's estimate goes beyond the satisfaction that is directly felt after buying the good or service. The Grönroos (2004) assert that the client-provider relationship has a substantial and indirect impact on perceived value as a whole.

Depending on how fully integrated it is into the good or service, the added value may or may not influence how much the customer values it. The logistics perspective finds it especially interesting to measure the added value produced by the supply chain's activities. The mental definition of added value (AV) is derived by the authors (Goh,2010) as follows:

$$AV = \frac{U\ A}{C}$$

U - Utility
A -Access
C - Cost

The equation suggests that when a product is difficult to access when required, the added value for consumers is reduced (A). Even if the object has "perfect" utility (U = 100%) and/or when the previous scope is the same. According to some authors, like Womack and Jones, the added value is represented as the ratio between the price and the increased quality over time (Zeithaml, 1988).

Intriguingly, the realised value is also measured in terms of rivalry, given that value is the fundamental tool for competitiveness. The CVA can be stated in this situation as follows:

$$CVA = \frac{\text{Perceived value in the actual company}}{\text{Perceived value in a competitive company}}$$

The capacity to create value for shareholders is crucial for a business to survive. The shareholder value analysis (SVA), established by Venugopal et al.ss to survive. The shareholder value analysis (SVA), established by Venugopal et al. (2018), and the economic value-added (EVA), established by Stern (1990), are the two most widely accepted theories regarding how management links business success with creating shareholder values. The most complete measurements are thought to be shareholder values.

Improving the supply chain and logistical processes requires measuring the added value produced in the logistics industry. It's crucial to note that the measures and measurements can be created via an online logistic scorecarding system and reports, where the achieved results can also be

quickly and easily connected visually with the achieved values. The management and other important players in the logistical processes can now readily access the measurements and results.

Conclusion

In the field of logistics, there are numerous opportunities to contribute value. Businesses and logistics providers must be aware of this fact and continuously track, follow, and report on the value generated by logistical activities and processes. However, several issues and barriers in the actual systems affect the generation and calculation of value. These issues are most frequently caused by two truths.

The first truth is that a significant portion of businesses lack expertise and knowledge in value analysis. Employees frequently lack experience in introducing and using logistical solutions and measurements, or they have a restricted understanding of best logistics practices. The time needed for innovations, analyses, and improvements is frequently lacking in operations and logistic administration. Another reality is that consulting firms and seasoned professionals' outsourced services are time and money intensive; as a result, these businesses look for quicker and less expensive solutions. These solutions may have immediate results, but it is important to consider the additional value throughout the customer relationship as well as the life cycle of the particular logistic service or solution.

It is crucial to develop methodological practices for value discovery, creation, and evaluation that take into account the unique elements of each logistic system. It is preferable that consultants and logistic experts from the business collaborate to create the methodology. By doing so, the likelihood of its thorough application will rise, which will result in the achievement of the desired outcomes.

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HOW DIGITALIZATION ENHANCES THE PORT COMPETITIVENESS: FUTURE IMPLICATIONS FOR MARITIME TRADING VALUE NETWORK

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Abstract

Maritime trading is creating a critical transition to enhance the value network through digitalization in the global supply chain. As a node in this chain, ports should play their role effectively and efficiently in value creation with sustainable manner. Digitalization is adding a new version with considerable changes in the trading environment. These technological changes establish a more collaborative, innovative, and sustainable business. Many researchers have been more concerned with the usage of technological applications than the future trends for enhancing port competitiveness. Because competing abilities depend on well-thought-out planning and directing to achieve organizational goals while maximizing customer satisfaction. Therefore, this research objective is to identify the future implications of digitalization to strengthen the port's competitiveness. This objective is addressed using the systematic literature review (SLR) method, which makes the final results consider evaluated articles on the emerging digitalization and port competitiveness concepts. This research found the ten characteristics of emerging digitalization and seven of port competitiveness with a broader and more comprehensive understanding of the concepts. Their interrelationship guides to identify the prominent future requirements of maritime trading: enhancing stakeholders' connectivity; balancing port sustainability and commerciality; developing maritime institutions; and sharing real-time information. Finally, research has concluded that guiding to futuristic value network development in maritime trading through the supply chain, all parties need to pay attention to making a more customer-oriented, sustainable supply chain.

Keywords: Port Competitiveness, Digitalization, Value Network, Sustainability, Future Direction.

Introduction

In the eco-system, digitalization is not a single technology, and more than hundred technologies are working together to maximize the supply chain. Technology has spread throughout the entire process of maritime trading, making it very comprehensive and widespread over the global supply chain. It is challenged by the new business environment and digital transformation (Othman & El-gazzar, 2022). Maritime logistics entrust the importance of port management and the efficiency of maritime transportation (Monzon, Baeza, & Ortiz, 2022). Port supply chains play a pivotal role in the process of global economics (Liu et al., 2022). Also, sustainable development and competitive advantage entrust technology to provide solutions for the changing environment (Othman & El Gazzar, 2022).

The digital transformation produces recognition from the customers, improves efficiency, builds relationships with customers, and ensures sustainability (Kuo et al., 2022). It also facilitate to community play on a single platform, supporting each other through the sharing of real-time information (Caldeirinha & Nabais, 2022; Serra et al., 2022). Relationships among stakeholders (port authorities, ministry, harbormaster's offices, freight forwarders, agents, terminal operators) can be enhanced by adapting technology (Aksentijevi´c & Tijan, 2022; Cil et al., 2022; Jovi´c et al., 2022). And it helps with monitoring and traceability to identify the cargo movement (Zhou et al., 2022), ensuring the security of maritime trading (Serra et al., 2022), mitigate the human-related risks, threats, and vulnerabilities (Ibrahim, 2022) and it will reduce the manpower requirement and improve fuel consumption with efficient service (Farah et al., 2022). Port efficiency and competitiveness are interconnected terms (Li et al., 2022). Competitiveness is related to a port's performance in providing value-added goods and services to its customers (Gleser et al., 2023). It focuses on profit maximization and high service quality. Digital transformations improve port operations efficiency, customer relationships, and sustainability. This is facilitated by shipping professional organizations and associations and port authorities (Kuo et al., 2022).

Scientific and professional literature show the growing interest in the concepts of digitalization, smart ports, and determinants of port competitiveness. But no one could give the future direction to enhance competitiveness through digital technologies due to the uncertainty of the ecosystem. Therefore, this article presents a comprehensive review of the scientific literature on digitalization and port competitiveness and various directions to enhance port competitiveness. Accordingly, this paper is divided into five sections: description of the port's competitiveness and

importance of the study: a description of the systematic review methodology: synthesis and result analysis, making scenarios, and drawing conclusions.

Port Competition and Its Importance of the Study

Port competition is a critical topic in transportation economics. This is due not only to the large volumes of goods involved in port throughput a direct measure of a port's competitiveness but also to induced effects in terms of employment and investment (Meersman et al., 2010). Verhoeff (1981) defined port competition under four levels of seaport competition: competition between port undertakings, competition between ports, competition between port clusters (a group of ports in close proximity with common geographical characteristics), and competition between ranges (i.e., ports located along the same coastline or with a largely identical hinterland).

Productivity is one of the major factors in the port industry for developing competitiveness and market potential. Many factors of competitiveness are affected by this productivity enhancement (Kuo et al., 2020). According to Scaramelli (2010), competitiveness is related to a port's performance in providing value-added goods and services to its customers; in doing so, ports pursue not only economic values, such as profit maximization, but also non-economic values, such as improving service quality to secure customer loyalty. He has mentioned that competitiveness does not equal productivity, and neither does productivity equal competitiveness.

Currently, port competition is concerning from an economic, social, political, and business perspective. Therefore, the shipping industry has faced a complicated situation and accelerated competition for the hub port selection process (Kuo et al., 2022). Among these criteria is the indirect impact of technology on operational efficiency (Kavirathna et al., 2018). According to Kaburu (2022), they discovered that digitalization increases efficiency and shortens operations processes, implying that there is an indirect relationship between digital maturity level and port choice. For instance, Table 1 illustrates the current usage of technology in maritime shipping.

Table 1: Technology Usage for Maritime Trading

Author	Technology
Alamoush, et al., 2021	**Employment of paperless business and operations** (e.g. electronic data interchange (EDI), E-document program, RFIDs) Utilizing **digital connectivity technologies and data analytics** (e.g. Internet of Things (IoT), and big data cloud, and edge computing) **Utilizing block chains** (e.g. Digital Ledger Technology, electronic bill of lading (Bolero) **Cyber security measures**
Russo & Musolino, 2021	**Internet of Things** (IoT) – facilitate to information transition **Big Data** (BD) – facilitate to ensure security through real information **Block chain** (BC) – provide opportunity to financial transactions between stakeholders. **Artificial Intelligence** (AI) – Remotely identify the correct locations of the container allocations in the yard **Digital Twin** (DT) – give physical visualization with audio for interaction with port operation

Source: Developed by Author

Therefore, identifying the success of competitiveness is very important for future planning. Port authorities and terminal operators are required to identify this instead of shipping lines as the major customer (Kavirarthaa et al., 2018). In developed countries, the government is involved to enhance the port's competitiveness (Wahyuni et al., 2019). Supply chain optimization depends on efficient port operations. Large port users' influence depends on their agenda (Kuo et al., 2022). Therefore, government involvement is necessary to make the port sustainable by addressing the gaps between legislation and implementation (Wahyuni et al., 2019).

Methodology

This study aims to examine the literature on digitalization and port competitiveness. For it, researchers used a systematic approach following Denyer & Tranfiel (2009). They have proposed

five steps for the systematic review: (1) review and formulation of the research question; (2) location of studies; (3) selection and evaluation of studies; (4) analysis and synthesis; and (5) results presentation.

In the first step, the researcher identifies the port's competitiveness and digitalization. Second step: identify the previous studies and search scientific data bases. In this literature, article sources were MDPI, Springer, and Emerald Insight, which published during 2022–2023. Those have given open access and conducted peer review. As the third step, the researcher ensured the quality and transparency of the selection of the literature using a set of inclusion criteria mentioned in Table 2 and Figure 1.

Table 2: Criteria

Criteria	Definition of the Criteria	Criteria Included
Language	Internationally recognized article	English
Research period	Article identifying period	02nd to 05th of April 2023
Type of items	Aim for quality of published articles	Peer-reviewed scientific articles
Publication period of the articles	Period consider the concepts are emerged	January 2022 to April 2023

Source: Developed by Author

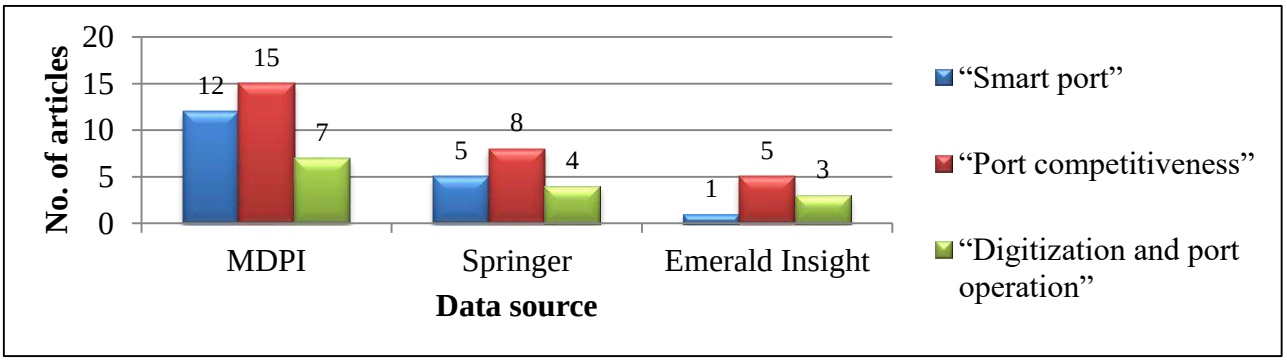

Figure 1: Data Source Wise, Distribution of Evaluated Article

Source: Developed by Author

According to key words "smart port", "port competitiveness" and "digitization and port operation", details of article selection are illustrated in Figure 2. The Web source indicated 2119 files, but only 144 had free access to download. Then the researcher analyzed the remaining 134

articles after removing the 10 duplicates. This analysis enabled him to select articles that aimed to provide an understanding of the digitalization and port competitiveness concepts based on the title of the article and the abstract. Finally, 60 articles were selected for this research for literature analysis.

The fourth step analyzes and synthesizes selected studies to highlight emerging digitalization and factors of competitiveness for an overall understanding of the concept, and finally classifies characteristics defined in the literature. Based on these characteristics, scenarios for future directions were identified.

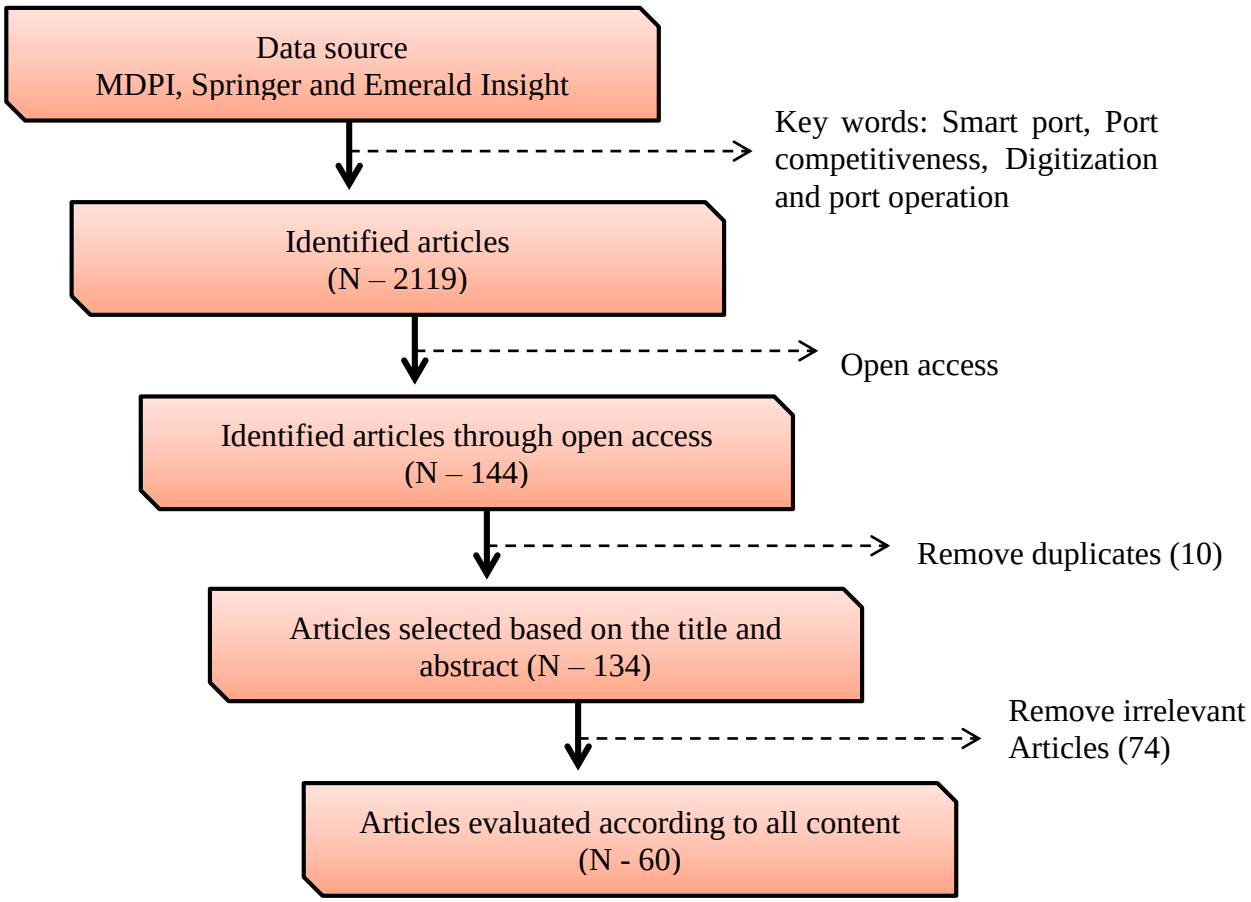

Figure 2: Identify, Selection and Evaluated Articles

Source: Developed by Author

Literature Reviews and Synthesis of Identified Articles

- **Digitalization**. Port supply chain plays a pivotal role in the process of global economy (Liu et al., 2022). The new business environment and digital transformation have been challenging the global supply chain, and adapting new technology can address these challenges (Othman & El-gazzar, 2022). Sustainable development and competitive advantage

trust the technology that provides solutions to the changing environment (Othman & El Gazzar, 2022).

Maritime logistics entrust the importance of port management and the efficiency of maritime transportation to decarburization (Monzon Baeza & Ortiz, 2022). Many research studies mentioned the rapid growth of technology during the past few years as part of maritime logistics (Iman et al., 2022). Therefore, smart planning, technology, and sustainable performance play an important role in addressing the issues in the current environment (Othman & El Gazzar, 2022).

Digital transformation gives many benefits to maritime shipping (Kuo et al., 2022). It produces recognition from the customers, improves efficiency, and builds relationships with customers and sustainability and digitalization facilitates community play on a single platform, supporting each other through the sharing of real-time information (Caldeirinha & Nabais, 2022; Serra et al., 2022). It helps monitor the visualization and audibility of terminal and yard operations (Cil et al., 2022 ; Zhou et al., 2022), and identify container movement in the global (Aksentijevi´c & Tijan, 2022), mitigate the human-related risks, threats, and vulnerabilities (Ibrahim, 2022), and ensure the security of maritime trading (Serra et al., 2022).

With this technology, key changes have been happening in maritime logistics. Such as innovations in port operation and shipping transportation (Farah et al., 2022; Tsvetkova & Hellström, 2022), complying with sustainability through smart port initiatives and digitalization (Farah et al., 2022; Hong et al., 2023; Othman & El-gazzar, 2022; Yang et al., 2022), and enhancing green port capabilities (Han, et al., 2022; Jugovi´c, 2022). It depends on organizational, technological, and environmental (TOE) factors (Jovi´c et al., 2022), while economic, socioeconomic, political, and environmental factors are influencing digitalization and sustainability (Belmoukari et al., 2023). Global institutions, professional organizations, and associations provide support to this transformation by providing consultation and funding (Clott & Hartman, 2022), and the social network has initiated the promotion of sustainability (Vitellaro et al., 2022).

- **Port Competitiveness**. Port and maritime transportation have a positive and significant relationship (Igemohia & Faghawari, 2022). Enhancing the efficiency and competitiveness of the port are critical concerns in maritime transport (Mouafo Nebot &

Wang, 2022). Competitiveness has always been used as a comparison to provide two or more things (Rozar et al., 2022). In this context, efficiency and competitiveness are more closely associated with maritime logistics. Economic development and proper management of the port realize the high efficiency of the port and its influence to direct the economic development of the hinterland and enhance the import and export trading competitiveness (Li et al., 2022).

In the current maritime trading scenario, factors affecting competitiveness vary according to the port users. Scholars and professionals have identified those factors in different ways. For instance, Tijan et al. (2022) have identified these determinants as geographic location, feeder connection, maritime connectivity, superstructure and infrastructure facilities of the container terminal and the port, length of the berth, depth, hinterland connectivity, reputation, cost, custom procedure, and ICT systems.

Wagner et al. (2022) have mentioned that the cost of the operation, the security of the chain, and the low carbon emissions through the chain are important attributes of the chain. The selection process may differ for perishable items such as fruits and vegetables (Mohseni et al., 2023). Also, governance practice (Gracia et al., 2022), new facilities and infrastructure (Wagner et al., 2022), consolidation of multiple terminals, terminal size, and low energy consumption and low pollution equipment handling (Jiang et al., 2023), cost reduction (Jiang et al., 2022), adaptation of port access infrastructure (Wagner et al., 2022), and efficient maritime container terminals enhance the port's competitiveness (Ambrosino & Xie, 2022).

Sufficient government funds, high tertiary commerce, good economic development, and openness of the market are critical conditions required to maintain high port competitiveness (Huang et al., 2022). Also, inter-ports (Bernacki & Lis, 2022) and relations between two countries play a predominant role in shaping competitiveness (Tsantis et al., 2022). Customer preferences influence maritime trading in various ways, creating an opportunity to expand the value network of maritime trading (Zhou et al., 2022). Maritime transport financing enhances the total trade flow to the country and the port (Matekenya & Ncwadi, 2022).

Port users and supply chain participants' roles are important to building the Port Community Systems (PCS). It determines productivity, efficiencies, and competitiveness

while improving the port's attractiveness through better connectivity (Mthembu & Chasomeris, 2022). The integration of the core players—ports with inland logistics providers and government intervention—and the integration of new technologies (Lin & Chang, 2022), green competitiveness (Kuang et al., 2023) and hinterland connectivity (Gleser et al., 2023) can improve the efficiency and resilience of the maritime supply chain.

New technology enhances the sustainable development and competitive advantage of the port business (Othman & El Gazzar, 2022). Digitalization will deliver the greatest benefits to maritime trading to improve the port's competitiveness: improved efficiency, relationships with the participants in the network, and sustainability (Kuo et al., 2022). Autonomous container truck help to minimize the energy consumption, level of manpower, reduce the cost, and improve the service efficiency (Farah et al., 2022); Hong et al., 2023). TOS (Terminal Operating System) can manage the real-time storage and flow of the cargo between the transport nodes (Ambrosino & Xie, 2022). Government-owned companies (GOCs), such as ports, make the strategies and policies considering port sustainability (Barreiro-Gen et al., 2022). The consideration of technology makes a difference when port size is different, which is important to maintain green competitiveness (Kuang et al., 2023). New mega containers require advanced port technology facilities, which create demand among these shipping owners (Wagner et al., 2022).

Results and Discussion

- **Digitalization**. Articles mentioned the benefits, characteristics, and applications of digitalized technology for port operations. Table 3 and figure illustrate 10 characteristics based on digitalization that were identified from 32 articles.

Table 3: Summary of the Grouped Digitalization Characteristics

Characteristics	Source
Operational efficiency	(Kuo, et al., 2022), (Gavalas, et al., 2022), (Tsvetkova & Hellström, 2022), (Serra, et al., 2022), (Farah , et al., 2022), (Othman & El-gazzar, 2022), (Othman & El Gazzar, 2022), (Han, et al., 2022)
Maritime logistics capabilities	(Iman, et al., 2022), (Serra, et al., 2022), (Tsvetkova &

	Hellström, 2022), (Zeng, et al., 2022)
Contribution of maritime institution	(Kuo, et al., 2022), (Vitellaro, et al., 2022), (Clott & Hartman, 2022)
Strategies for digitalization and port sustainability	(Kuo, et al., 2022), (Jugovi´c, et al., 2022), (Akkerman, et al., 2022), (Belmoukari , et al., 2023), (Heikkilä, et al., 2022), (Othman & El-gazzar, 2022), , (Othman & El Gazzar, 2022), (Clott & Hartman, 2022)
Stakeholder connectivity	(Iman, et al., 2022), (Serra, et al., 2022), (Caldeirinha & Nabais, 2022), (Jovi´c, et al., 2022), (Serra, et al., 2022), (Farah , et al., 2022), (Heikkilä, et al., 2022), (Othman & El Gazzar, 2022)
Efficient information flow	(Serra, et al., 2022), (Caldeirinha & Nabais, 2022), (Sahu , et al., 2022), (Serra, et al., 2022), (Li, et al., 2022), (Monzon Baeza & Ortiz, 2022), (Clott & Hartman, 2022)
Automation	(Yang, et al., 2022), (Heikkilä, et al., 2022)
Decarbonize	(Yang, et al., 2022), (Farah , et al., 2022), (Monzon Baeza & Ortiz, 2022)
Monitoring and traceability	(Caldeirinha & Nabais, 2022), (Zhou, et al., 2022), (Aksentijevi´c, et al., 2022), (Cil, et al., 2022), (Hake, et al., 2023), (Li, et al., 2022), (Monzon Baeza & Ortiz, 2022), (Sahu , et al., 2022)
Security	(Ibrahim, 2022), (Tsvetkova & Hellström, 2022), (Serra, et al., 2022), (Farah , et al., 2022), (Han, et al., 2022)

Source: Developed by Author

Mainly four characteristics are highlighted in the eight articles. Those who have mentioned the digitalization influence on port operations are: Operational efficiency, Strategies for digitalization and Sustainability, Stakeholder connectivity and monitoring and traceability. Efficient information flow, security, maritime logistics capabilities, the contribution of maritime institutions, decarburization, and automation are highlighted in 7, 5, 4, 3, and 2, no of articles respectively. However, these distinctions are considered in relation to the interrelationships of these, it is impacted by the strategies relevant to sustainability.

- **Port Competiveness**. All the articles relevant to port competitiveness give a new rather than traditional view of this concept. The term competitive has always been used as a comparison to provide a distinction between two or more things (Rozar et al., 2022). These characteristics can be considered as factors affecting the port's competitiveness, as illustrated in the table 4.

Table 4: Summary of the Grouped Port Competitiveness Characteristics

Characteristics	Source
Terminal operation	(Jiang, et al., 2022), (Mouafo Nebot & Wang, 2022), (Jiang, et al., 2023), (Ambrosino & Xie, 2022)
Digital transformation	(Jiang, et al., 2022), (Lin & Chang, 2022), (Othman & El Gazzar, 2022), (Kuang, et al., 2023), (Hong, et al., 2023), (Iman, et al., 2022), (Mthembu & Chasomeris, 2022), (Gracia , et al., 2022)
Operational efficiency	(Li, et al., 2022), (Lin & Chang, 2022), (Igemohia & Faghawari, 2022), (Rozar, et al., 2022), (Iman, et al., 2022), (Mohseni, et al., 2023)
Maritime shipping network	(Bernacki & Lis, 2022), (Zhou, et al., 2022), (Gracia , et al., 2022), (Notteboomand & Rodrigue, 2022), (SHI, et al., 2022)
Maritime logistics capabilities and service	(Wagner, et al., 2022), (Costa & Soares-Filho, 2022), (Igemohia & Faghawari, 2022), (Iman, et al., 2022), (Ambrosino & Xie, 2022), (Tsantis, et al., 2022), (Notteboomand & Rodrigue, 2022), (SHI, et al., 2022)
Low carbon emission	(Wagner, et al., 2022) (Jiang, et al., 2023), (Hong, et al., 2023)
Sustainable port performance	(Othman & El Gazzar, 2022), (Kuang, et al., 2023), (Barreiro-Gen, et al., 2022)

Source: Developed by Author

Eight articles out of 28 mentioned that both maritime logistics capabilities and services and digital transformation enhance port competitiveness. Operational efficiency and the maritime shipping network are highlighted in six articles. Terminal operation, sustainable performance, and low carbon emission are indicated on 4, 3, and 3 articles, respectively. Sustainable performance and low carbon emission factors are relevant to the sustainable practices of the port and, therefore, need to be considered for future planning and operation of the port. Meanwhile, high port competitiveness consisted of improving logistics capabilities and service, as well as undergoing digital transformation.

- **Scenarios: Future Directions**. According to research articles, researcher found the impact of digitalization on port competitiveness as figure 3. Characteristics of both concepts show the evolving of this relationship. It guides to create the future direction of the maritime transportation and discuss under 5 scenarios; innovation; enhancing stakeholders' connectivity; balancing port sustainability and commerciality; developing maritime institution and real time information flow.

  - **Innovation**. Port efficiency and competitiveness are interconnected terms (Jiang et al., 2022). Ten digital transformations improve port operations while also improving customer relationships and sustainability. This positive correlation impacts the need to invest in the digital infrastructure by adopting digital technology, empowering talents to get more benefits from the transformation (Kuo et al., 2022). Also, this technology facilitates the sustainable port's management of changing business requirements (Othman & El Gazzar, 2022) and, it will reduce the manpower requirement and improve fuel consumption with efficient service (Farah et al., 2022). For an illustration, (1) sophisticated cloud computing, (2) broadband internet connections, (3) enterprise resource planning, (4) customer relationship management, and (5) an e-commerce website create firm-level efficiency. Those promote efficiency across shipping firms and divisions (Gavalas et al., 2022). Further automation, big data, and artificial intelligence help to economically carry out port operations, and it needs better governance of the port (Lin & Chang, 2022).

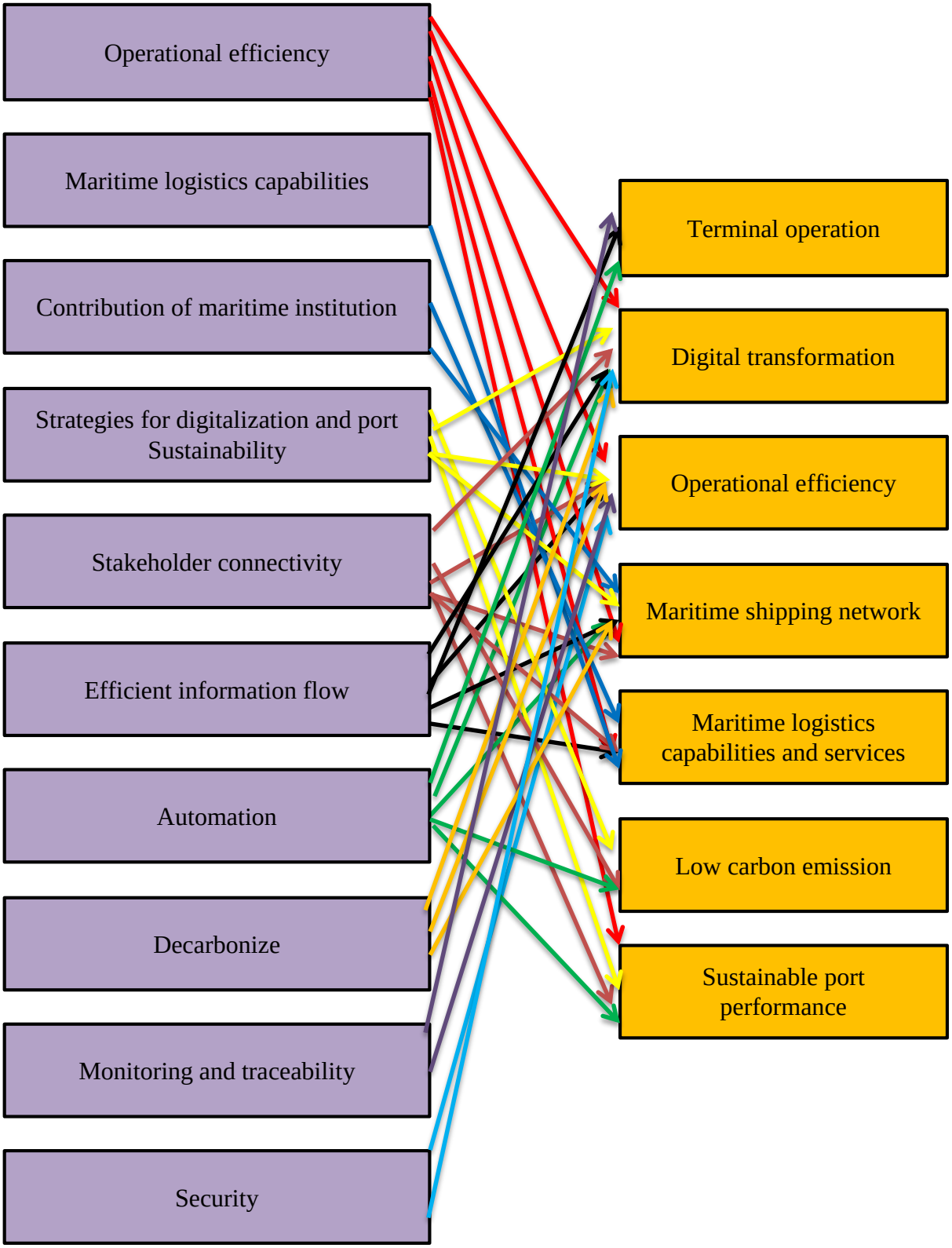

Figure 3: Relationship with Digitalization and Port Competitiveness
Source: Developed by Author

- **Enhancing Stakeholders' Connectivity**. Relationships among stakeholders (port authorities, ministry, harbormaster's offices, freight forwarders, agents, terminal operators) can be enhanced by adapting technology (Jovi´c et al., 2022). This integration is developed not only within a single port but also between the ports (Farah et al., 2022). It builds bridges among supply chains, and smart contracts reconstruct the business process of powered port supply chains (Liu et al., 2022). It will reduce costs and improve efficiency in the network (Gavalas et al., 2022; Liu et al., 2022). This connectivity will improve the logistics capabilities (international logistics capabilities, green logistics capabilities, and total logistics capabilities) in the port and increase the service through this digitalization (Iman et al., 2022; Zeng et al., 2022). As a result, throughout the network, stakeholders will create concrete new businesses, new services, and introduce new channels to generate additional revenue (Farah et al., 2022). And, achieve the win-win situation. Therefore, it creates a business opportunity for the stakeholders and the country by improving their customized service in the maritime field for the entire network (Shi et al., 2022). Every node of the chain is being collaborated through this technology.

- **Balancing Port Sustainability and Commerciality**. Sustainable initiatives are required for the maritime business, which is an emerging trend in the shipping industry. As a result, the port authority has been influenced to adapt this green governance practice in the port (Jugovi´c et al., 2022). Also, it is a part of the smart port and needs to consider operations, environment, energy, safety, and security for sustainable performance. For instance, Industry 4.0 and smart applications have been adopted by many companies and well-advanced ports. And digital innovation makes the difference between automation, sustainable development, and cooperation in the future (Othman & El-gazzar, 2022). Hydrogen energy in Automated Container Terminals (ACT) will become more popular as the low-carbon transmission in the port due to effective usage of clean energy (Yang et al., 2022). Therefore, smart ports, technology, and sustainable performance have been becoming necessities for sustainable port operations (Othman & El Gazzar, 2022).

According to the dictionary, commerciality means commercial quality or character; ability to produce a profit. One important thing is that the company should have a better understanding of the other parties in the network. They should have

better knowledge about the issues and problems and, ultimately, should provide advice to achieve their objectives and outcomes. Therefore, future ports will become more sustainable, and most of the companies and ports have been balancing commerciality and sustainability through their innovations.

- **Developing Maritime Institution**. Shipping professional organizations and associations are providing standards, guidelines, and recommendations for the shipping industry considering the new trend of the digital transformation (Kuo et al., 2022). Innovation centers also work to establish the world's "Blue Economy" by delivering programs and providing funding (Clott & Hartman, 2022). Social media also help to promote the CSR activities of the port industry (Vitellaro et al., 2022). Specially those issues related to CSR and sustainable development initiatives need to be carried out by the stakeholders. Therefore, third-party involvement can promote the usage of digital technologies and maritime capabilities in the countries. And entrust the port's sustainability. For instance, UNCTAD has been implementing trade facilitation programs around the world. Through this intervention, they increase knowledge, raise funds for the project, and guide the achievement of the sustainable development goals.

- **Real Time Information Flow**. The supply chain can enhance transparency and traceability through physical and informational flow (Caldeirinha & Nabais, 2022). Because there are multiple players in maritime transportation, they interact with different perspectives, creating conflict with each other. Accordingly, they are adapting technology for their port activities. As an example, many terminals are installing sensors in different locations to grab the data and become more intelligent (Li et al., 2022). Meanwhile, the best real-time information performance and a clear visual are given by the digital twin crane monitoring system (Zhou et al., 2022). Therefore, remote control of the software platform in the terminal operation is accurate and effective. Also, integrated container technologies overcome the inefficiency of the container identifications (Aksentijevi´c et al., 2022).

Maritime port security is another approach for mitigating threats and vulnerabilities in ports and port facilities (Ibrahim, 2022). Not only for efficiency but also for security purposes, information sharing is very important for the safety and

security of the sustainable network (Serra et al., 2022). For this purpose, monitoring and tracking can ensure the safety and security of the cargo, routes, and places. The Global Positioning System (GPS) and security through the Automatic Identification System (AIS) are sharing real-time data among the parties to ensure safety and security (Monzon Baeza & Ortiz, 2022). Those approaches that allow for automated, consistent, and complete damage detection (Farah et al., 2022). Precise monitoring and control of the system are vital to port logistics management. They can facilitate the establishment of a sustainable network (Cil et al., 2022). It accelerates the value generation fulfilling real time requirements.

Conclusion

Port competitiveness is evolving with globalization and digital transformation. These changes have been impacted by the technological applications used by the stakeholders. Currently, ports have become a more sensitive operational node in the global supply chain. It was backed by efficient informational flow, connectivity of the maritime trading, enhancing the logistics capabilities, and strategies relevant to digitalization and sustainability. As a result, port operations have become more sustainable, maximizing their returns through their efficiency. According to the systematic review, characteristics of the digitalization highly influence the port's competitiveness, both directly and indirectly, and those determinants are interdependent. While indicating this significant relationship, all characteristics indicate future directions. Authorities and users of the port as the main counterparts need attention about the future requirements of maritime trading. More than the value chain, these directions develop the value network through many initiatives. Such as innovative technology, more complex and collaborative connectivity among the stakeholders, recognizing the importance of profit maximization and sustainability, the fastest information flow, and the growing commitment of international institutions. Without any limitations, these directions enhance the customer-oriented maritime trading culture of the government and private organizations. Therefore, future research can pay more attention to this direction for the purpose of making better policies and strategic decisions.

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EXPLORATION OF THE FACTORS RELATED TO THE EFFICIENCY OF INTEGRATED LOGISTICS MANAGEMENT SYSTEM AT SRI LANKA NAVY

By

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Abstract

The investments in ILMS solution in logistics operation have become strategic decision which provides a wide range of advantages to SLN. The decision was taken to adaptation or investment in ILMS to seek the efficiency in the logistics operation. Efficiency of the system influenced by many factors. These factors influence on the management behaviour of ILMS and technology investment. Then, the research problem is the factors affecting the efficiency of ILMS in SLN. The objectives of the study are to identity the factors affecting the efficiency of ILMS by literature reviews and develop a conceptual framework to represent the efficiency of ILMS in Sri Lanka Navy. The literature survey was conducted comprehensively to identify the indicators for the study and identified 40 factors for developing the model. The Exploratory Factor Analysis (EFA) was performed to categorize the indicators. The research study items were grouped under 5 variables including the level of organization readiness for ILMS, development of information technology for ILMS, level of perceived accessibility for ILMS, reliability of the ILMS, and top management support for ILMS. Further, it developed the conceptual framework to represent the factors affecting the efficiency of ILMS in SLN.

Keywords: ILMS, SLN, Efficiency in Logistics Operation

Introduction

The term logistics defined as “The design and operation of the physical, managerial, and informational systems needed to allow goods to overcome time and space and the process of planning, implementing, and controlling the efficient, cost-effective flow and storage of raw

materials, in-process inventory, finished goods and related information from point of origin to point of consumption for the purpose of conforming to customer requirements" (Gardner,1999). Logistics management is vital not only to manufacturing and assembly industries, which are goods-oriented, but also to retailing, transport and other distribution or service-oriented industries.

Sri Lanka, located in the middle of the sea lanes of the Indian Ocean, was always an attraction for the sea farers. In 1937 the Ceylon Naval Volunteer Force (CNVF) was established. After independence from British rule, a nucleus of 100 Officers and Men prepared to form the Regular Navy step by step. On 9th December 1950 the Navy Act was enacted and Royal Ceylon Navy was formed. In 1972, with the beginning of new constitution Royal Ceylon Navy was renamed as the Sri Lanka Navy. During the past 72 years Sri Lanka Navy improved her capabilities in many ways. The Sri Lanka Navy is a well-balanced and cohesive force, capable of operating in waters around Sri Lanka effectively safeguarding our national interests. Navy's operational capability on land too was improved tremendously during the recent past.

Sri Lanka Navy has a multi-tiered and dispersed Logistics Management System with geographically dispersed storage facilities and a small number of decentralized operations. Due to the logistics system's ambiguity, it really was necessary to implement a computerized system capable of managing store management, purchasing, budgeting, and finance. As a consequence, the latest addition to the logistics field to handle was subtitled the Integrated Logistics Management System (ILMS) as the first step toward a future ERP (Enterprise Resource Planning) solution which should provide the command with increased flexibility and management information to exert effective, efficient, and promptly control over all forms of available resources. As a result, the computerized Integrated Logistics Management System was designed with the aim of improving the performance of the Logistics Management System. It is administered by improving and organizing officers. The core functions for the Store Management Module, which includes the victualing module, the health module, and the Naval Armament Department module, as well as the Purchase Management Module, which includes the procurement module, the repair module, and the budget module already have been enforced.

Objectives of the Study

The study aim is to explore the factors affecting the efficiency of ILMS in Logistics operation in SLN. In these sense, the main objective of the study is to

- Explore the factors affecting efficiency of ILMS in Logistics operation in SLN.
- The second objective aims to develop a conceptual framework to represent the factors affecting the efficiency of ILMS at Sri Lanka Navy. The development of conceptual model is highly useful for industry stakeholders.
- To develop a conceptual framework to represent the factors affecting the efficiency of ILMS at Sri Lanka Navy.

Significance of the Study

The research may yield valuable findings for decision makers in SLN. In 2007, an integrated logistics management system was implemented. However, it has yet to accomplish its initial objectives. One of the study's primary objectives is to identify the factors affecting the degree of effectiveness of the Integrated Logistics Management System (ILMS) at the Sri Lanka Navy and to pay appropriate attention to those factors in order to improve the SLN's logistic system's effectiveness and efficiency. Meanwhile, this study will assist in identifying ways to reduce unnecessary costs associated with the ILMS. This also helps to maximize the utilization of underutilized manpower and equipment. If an institution does not appropriately identify the causes of undesirable outcomes and address those difficulties, the organization can face significantly increased expenses in the future. That is the primary reason why is examining the causes of problems and developing solutions in order to improve the efficiency and effectiveness of the ILMS system in the logistics branch. This has an effect on the Sri Lanka Navy's ability to accomplish its objectives and goals. Thus, this will make an attempt to resolve the identified research problem in order to improve the ILMS of SLN's efficiency.

To Identity the Factors Affecting the Efficiency of ILMS by Literature Reviews

There are many factors affecting to efficiency of ILMS system. These factors are IT department capability, Communication among the implementation team members, Suitable IT legacy systems, Organizational structure, Cost of the investment, Organizational readiness for ILMS, Past experiences, Management willingness, Reliability of the system, Relative advantages, Management expectation, Attitudes of management, User acceptance, Team Work, Skills, knowledge of users, End user involvement, organizational culture, Technical issues, Organizational fit for ILMS, Compatibility of technology, Top management support and commitment, Adequate resources, Perceived usefulness, Investment and business type, Awareness of the management, Customer

supports, Technological development, Complexity technology adaptation and usage, IT infrastructure, Perceived Privacy & Security, Value delivery process, Risk and failure of system, Interdepartmental communication, Leadership behavior, On-going ILMS vendor support, Perceived ease of use, Clear vision, goals and objectives of the ILMS system, The use of ILMS implementation and Careful change management etc.

To Develop a Conceptual Framework to Represent the Efficiency of ILMS in, Sri Lanka Navy.

Through the factor analysis, items are grouped to 5 variables as shown below. Then, the study found five variables of the level of organization readiness for ILMS, level of organizational fit for ILMS, Level of investment and business type, level of risk and failure, organizational intention and change management. The factor grouping process is depicted below.

Table 1: Factor Grouping Process of Factor Analysis

Group	Number of Items
(a)	**(b)**
Group:1 **The level of Organization Readiness for ILMS**	(i) User attitudes affect (ii) User intentions (iii) User perceived usefulness (iv) User perceived privacy and security (v) Complexity of the technology (vi) Organizational factors (vii) Organizational readiness (viii) Reliability of the technology and system (ix) Management expectations on ILMS (x) Change management process in SLN (xi) Technical feasibility and issues (xii) Risk and failure of system (xiii) Resource adequacy (xiv) Privacy and security risks through ILMS (xv) Team work and acceptance of ILMS (xvi) Substantial perceived benefits affect (xvii) Culture of SLN affect to the efficiency

Group:2 **Development of Information Technology for ILMS**	(i) Availability of facility and infrastructure facilities (ii) Operational compatibility of ILMS (iii) Cost of the system (iv) Improvement of quality through ILMS (v) Employee IT knowledge and skills (vi) E-logistics capability Organizational fit for the technology
Group:3 **Level of Perceived Accessibility for ILMS**	(i) User perceived ease of use (ii) User awareness on computer technology (iii) Technological factors
Group:4 **Reliability of the ILM System**	(i) Factor of Firm Size affect (ii) Customer or supplier pressure (iii) Maintainability of the technology and system (iv) Software and supplementary support (v) Technology integration affect (vi) IT department capability affect (vii) Interdepartmental communication
Group:5 **Top Management Support for ILMS**	(i) Environmental factors (ii) Economic factors cost and benefits (iii) Top management support (iv) Competitive pressure from the management (v) Government and institutional support

Source: Developed by Author

Through the factor analysis, items are groups to 5 variables. Then, the study found five variables of the level of Organization Readiness for ILMS, Development of Information Technology for ILMS, Level of Perceived Accessibility for ILMS, Reliability of the ILM System and Top Management Support for ILMS .The factor grouping process in order to develop a conceptual framework to represent the efficiency of ILMS in Sri Lanka Navy shown in the figure 1.

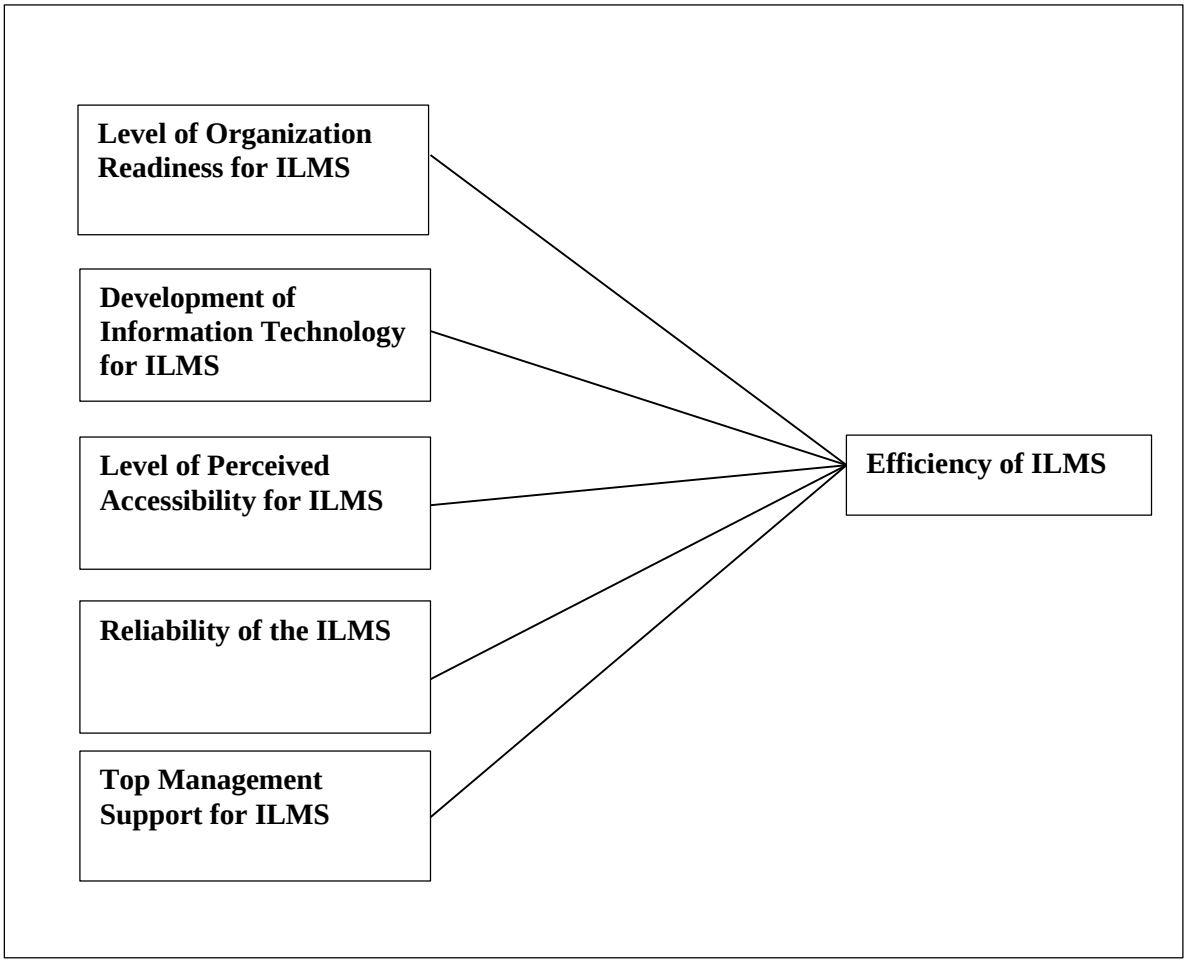

Figure:1: Proposed Concetual Framework for Efficiency of ILMS

Source: Constructed by Author

Conclusion

Based on the study findings, it is concluded that the technology has become the competitive force which provides the wide range of advantages to the ILMS including maximized end user satisfaction, operational competitiveness, increasing end user service, reduce costs, and streamlined supply chains, increasing the market competiveness, customer or supplier equity, brand loyalty. In addition to this, it is concluded that investment in ILMS resource planning is a strategic decision of

the firms and it has been influenced by many factors including IT department capability, communication among the implementation team members, suitable IT legacy systems, organizational structure, cost of the investment, organizational readiness for ILMS, past experiences, management willingness, reliability of the system, relative advantages, management expectation, attitudes of management, user acceptance, team work, skills, knowledge of users, end user involvement, organizational culture, technical issues, organizational fit for ILMS, compatibility of technology, top management support and commitment, adequate resources, perceived usefulness, business process re-engineering (BPR), investment and business type, awareness of the management, customer supports, technological development, complexity technology adaptation and usage, IT infrastructure, perceived privacy & security, value delivery process, risk and failure of system, interdepartmental communication, leadership behaviour, on-going ILMS vendor support, perceived ease of use, clear vision, goals and objectives of the ILMS system, the use of ILMS implementation and careful change management etc.

Based on the study findings, it is concluded that the development of proposed conceptual model needs to be further examined and this study proposed five variables including level of organizational readiness for ILMS, level of organizational fit for ILMS, level of investment and business type, level of risk and failure, organizational intention and change management also a crucial concern and the investment decision on ILMS needs to analyze the organizational intentions before the adaptation and implementation. It is recommended that change management and innovation is a critical forces and invention in adapting ILMS solution to the firms.

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INTRODUCTION OF EFFICIENT INVENTORY CONTROL MECHANISM FOR PHARMACEUTICALS OF SLN

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Abstract

A significant challenge face by the Sri Lanka Navy (SLN) medical service is continuous increase of expenditure associated with its pharmaceutical stock. Navy health budget provision has increased by more than 200 percent for purchase of pharmaceuticals in compare to years 2010 and 2016. Despite these facts, occasionally there are evidences that naval patients suffer from non-availability of prescribed pharmaceuticals or delay in receiving their pharmaceuticals. On the other hand, present navy carder of more than 48,000 active members with their immediate family members and annually growth of retired naval personnel alarms high demand for pharmaceuticals and it will rise steeply day by day. Therefore, this highlights the significant of introducing a scientific inventory control mechanism to Central Medical Stores (CMS) of SLN to save public money and enhance clinical efficiency. This study has identified excessive amount of some pharmaceuticals held by CMS owing to emphasis on equal attention for all pharmaceuticals. Eventually, it generates lack of space, more work load and freeze large amount of public money unnecessarily for non-critical drugs. Therefore, this study suggests to implement combination of ABC and VED matrix as best inventory control mechanism in order to identify most vulnerable and clinically important drugs. Moreover, by implementing ABC-VED matrix, logisticians and medical administrators will be able to maintain stocks in more economical way without harming clinical capability and saving public money.

Keywords: Inventory Control; Pharmaceuticals; ABC; VED; EOQ

Introduction

Government of Sri Lanka has spent approximately Rs.16,300.00 as health expenditure per person in year 2016 under recurrent expenditure (including medical staff salaries) and found that approximately 35 percent of that expenditure was spent on buying materials and supplies including medicines (Amarasinghe et al, 2018). When these figures relate with previous year of national health budget, it revealed that four percent increase of health expenditure.

Moreover, when national health expenditure compares with Sri Lanka Navy (SLN) health expenditure, it found approximately Rs. 7,550.00 has been spent per naval person in year 2016 under recurrent expenditure and that is 18 percent increase of health expenditure compare to previous year as per figure 1.

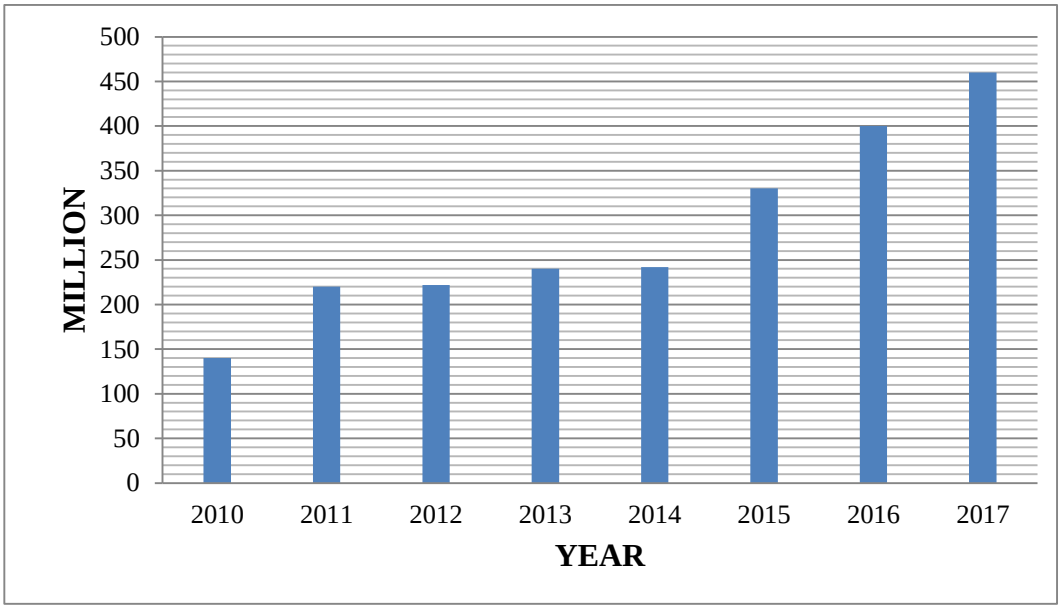

Figure 1: Sri Lanka Navy Annual Health Service Budget from 2010 to 2017

Source: Sri Lanka Navy Budget Department (2023)

As a consequence, these high fluctuations and increase of health budget highlight the requirement of effective and efficient management of medical inventory in SLN with necessitate of close supervision of important drugs, priority settings on purchase and prevention of pilferage and expiry of drugs.

The aim of inventory management is to hold inventories at the lowest possible cost, given the objectives to ensure uninterrupted supplies for ongoing operations. West (2009) defines inventory management as continuing process of planning, organising and controlling

inventory that aims at minimising the investment in inventory while balancing supply and demand. When this come into hospital sector, the goal of the hospital inventory system is to ensure that there is adequate stock of the required items so that an uninterrupted supply of all essential items is maintained (Doshi et al., 2007). This process usually involves controlling the transfer of items in order to prevent inventory from excess or stockout level that could place the operation of the organisation into risk.

Central Medical Stores of Sri Lanka Navy

The quality of care in hospitals is sensitive to the timely availability of drugs and medical equipment. In that scene, Central Medical Stores (CMS) of SLN performs vital role by purchasing, storing and distributing dugs, medical accessories and equipment where it requires by keeping naval persons physically and mentally fit for duties. Besides CMS of SLN is one of the most extensively used and one of the few areas where large amount of money is spent on purchases on a recurrent basis. The goal of CMS is to ensure that there is adequate stock of required pharmaceuticals so that an uninterrupted supply of all essential items is maintained.

Despite these facts, occasionally there are evidences that naval patients suffer from non-availability of prescribed pharmaceuticals or delay in receiving their pharmaceuticals even though SLN budget allocation has increased more than 200 percent compare to years 2010 with 2016 as per above figure 1. On the other hand, present navy carder of more than 48,000 active members with their immediate family members and annually growth of retired naval persons alarm high demand for pharmaceuticals which will rise steeply and continuously.

Various research studies have found that sound hospital inventory control measures for expensive drugs have resulted in 20 percent of savings (Gopalakrishnan and Sundaresan, 1985). Therefore, there is no denying that storing pharmaceuticals and supplies can be expensive and tie up a lot of money in freeze. Besides, Gill, Biger and Mathur (2010) argue that excess inventory is an additional liability because it uses valuable storage space and increases inventory costs.

Therefore, medical administrators must establish efficient inventory control policies for regular operating conditions that ensure clinical ability to meet emergency demand conditions (Duclos, 1993). Thus, it recognises the significance of introducing a scientific inventory control mechanism to CMS of SLN. Eventually, it emphasises the need for planning, designing and organising the medical stores in such a manner that result in cost saving and clinical efficiency.

Present Stock Management System

At present procurement staff place orders on 'fixed time period' model for all pharmaceuticals and pay attention on equal basis for all drugs. This has led to keep unnecessary consignment of pharmaceuticals in stocks due to equal focus. As a consequence, CMS holds excessive amount of some pharmaceuticals stock.

When discussed about fixed time period ordering method, CMS forwards next year annual requirements to the government Medical Supplies Division (MSD) on month of November and collects pharmaceuticals on months of January and February on next year. Then pharmaceuticals which are not available in MSD and branded pharmaceuticals are purchased through registered vendors by competitive tender calls. Usually this type of tender call is carried out on annual basis for non-fast-moving drugs and half yearly for fast moving drugs.

Therefore, tenders are called in mid of October for annual pharmaceutical requirement. Half yearly tenders are called in April and October. Moreover, CMS has authorised to purchase pharmaceuticals worth of three million per month from State Pharmaceutical Corporation (SPC) outlets situated in Colombo 07 and Colombo 01 on credit basis without tender calling.

Considering all these factors, medical administrators prepare annual pharmaceutical requirement based on past consumption pattern. They collect requirement of next year pharmaceuticals forecast from all naval hospitals. Then considering requirements and consumption pattern of past years they prepared annual pharmaceutical requirement by adding additionally 15- 20 percent as safety stock to face delay in tenders and supplying of goods.

Literature Review

The study of consumption pattern of pharmaceuticals helps in designing appropriate inventory control measures. For that ABC analysis is an imperative tool used worldwide in identifying items that need greater attention for control (Brown, 1977). ABC analysis popularly known as 'Always Better Control'. It is a very useful approach to material management based on Pareto's principle of 'Vital few and trivial many' (Gupta at el.,2007).

According to ABC theory 10 percent of items consume about 70 percent of expenditure called as category 'A'. The next 20 percent of items consume 20 percent of financial resources called as category 'B' and category 'C' is the remaining 70 percent items account for 10 percent of expenditure. The limitation of ABC analysis is that it based only on monetary value and rate of

consumption of units.

Sometimes, particularly in a medical sector, an item of low monetary value but consumption may be very vital or even lifesaving. Therefore, importance of drugs cannot be overlooked simply because items do not appear in category A of inventory. Therefore, another parameter needs for better evaluation of pharmaceuticals. This could be in item of the therapeutic value of a drug in achieving the objectives of the hospital sector (Doshi et al., 2007).

In order to add therapeutic value of pharmaceutical, best mechanism is to introduce VED analysis (Santhi and Karthikeyan, 2016). VED analysis is based on the criticality of an item as follows;

- Category V (Vital): pharmaceuticals which are critically needed as lifesaving and must be available at all times at hospital.
- Category E (Essential): pharmaceuticals which having lesser criticality needs and may be kept available on stock (not required to maintain large quantity).
- Category D (Desirable): pharmaceuticals which having lowest critically and shortage is not threat to the health of the patient. Therefore, these items could be purchase from outside as requirement arises.

Combining these two methods (ABC-VED matrix), medical administrators can identify most vulnerable and fast-moving drugs (Gupta at el., 2007). Then they can furnish more priority on vital pharmaceuticals and can be maintained stocks in more economical order without harming the clinical capability.

The concept of an Economic Order Quantity (EOQ) was developed by Ford and Harris in 1913 (Harris, 1990) and based in the logic of order quantity that minimize the total inventory, holding cost and ordering costs. It determines the order quantity that meets customer service level while maintaining total holding costs. That mean if the size of the order increases, the stock increases and the frequency of deliveries and setup are reduced. Therefore, the larger the order size, the lower the cost of order due to gains in scale. Conversely, the cost of stock is related to the money invested in stock and thus the greater the amount of stock, greater is cost (Hopp and Spearman, 2000).

Proposed Mechanism to Introduce Inventory Control Mechanism for CMS

In order to implement ABC-VED analysis in CMS, initially needs to categories all pharmaceuticals in ABC analysis as follows;

- Previous year consumption of all pharmaceuticals and calculate each item annual expenditure by multiplying unit cost with annual consumption.
- Arrange annual expenditure of each items in descending order and calculate cumulative cost of pharmaceuticals. Then arrange the cumulative percentage of expenditure as well as cumulative percentage of number of Pharmaceuticals.
- Then need to classify pharmaceuticals in to three categories namely A, B and C based on the cumulative cost percentages of 70, 20 and 10 respectively.

After that needs to categorise past consumption pharmaceuticals in to VED analysis. So that entails to appoint board with medical officers and hospital administrators to categorise pharmaceuticals on therapeutic value of a drugs and need categories into V, E and D as discussed in earlier.

Subsequently, prepare nine subgroups of pharmaceuticals belong to AV, AE, AD, BV, BE, BD, CV, CE and CD. Here first alphabet represents drugs belong to ABC analysis and second alphabet represents drugs belong to VED analysis. Eventually, to find out ABC-VED matrix, needs to categorise above findings in to groups of I, II and III based on pharmaceuticals subgroups as follows;

- Group I: belongs to subgroups of AV, AE, AD, BV and CV.
- Group II: belongs to subgroups of BE, CE and BD.
- Group III: only subgroup of CD.

Once CMS prepared pharmaceuticals as per ABC-VED analysis, it is suggested to implement comprehensive study with logistics officers and medical administrators to calculate economic order quantity for Group I pharmaceuticals considering factors like consumption pattern, lead time, safety stock, maximum level and minimum level in order to decide order quantity. Hence following strict control mechanism needs to introduce with assistance of logistics officers;

- **Group I**. Need close monitoring mechanism with hospital administrators. Ideal to introduce two bin inventory method. Needs to introduce economic order quantity on continue basis.

- **Group II**. Need moderate monitoring mechanism with hospital administrators. Need to introduce economic order quantity on fixed time period basis (quarterly or half yearly).

- **Group III**. No need close monitoring system. Able to introduce economic order quantity on fixed time period as annual basis. If shortage occurred able to purchase through SPC outlets directly.

By introducing this mechanism, CMS able furnish more priority on AV, AE, AD, BV and CV categories of pharmaceuticals rather than focusing all. Then ordinary pharmaceuticals like CD category can be purchased directly through SPC outlets. As a consequence, CMS able to save large space inside the warehouse and able to reduce unnecessarily freeze of money. Ultimately it direct to save reasonable portion of public money.

Conclusion

Central Medical Stores of the Sri Lanka Navy performs vital role by purchasing, storing and distributing pharmaceuticals where it requires by keeping naval persons physically and mentally fit for duties. In order to assist this goal Sri Lanka Navy health budget provision has already double within less than five years in compare to years 2010 and 2016. Even though navy allocate large amount of money, there are evidences that naval patients suffer from non-availability of prescribed pharmaceuticals or delay on receiving their pharmaceuticals.

Therefore, this highlight significant of introduce scientific inventory control mechanism to Central Medical Stores of SLN to save public money and enhance clinical efficiency. In the study, it has evident CMS hold excessive amount of some pharmaceuticals owing to emphasis on equal attention for all pharmaceuticals. Eventually, it generates lack of space, more work load and freeze of large amount of public money unnecessarily for non-critical drugs.

Therefore, this study suggests to implement combination of ABC and VED analysis as inventory control mechanism as it assists to identify most vulnerable and clinically important drugs. Then CMS able furnish more priority on vulnerable pharmaceuticals rather than focusing

all. Then ordinary pharmaceuticals can be purchased directly through SPC outlets as necessary. As a consequence, CMS able to save large space inside the warehouse and able to reduce unnecessarily freeze of money. Eventually navy gain more benefits in terms of availability of drugs and save of public money.

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WAREHOUSE VALUE CREATION IN THE INTEGRATED SUPPLY CHAIN

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Abstract

The integration of warehouse operations within the value chain can contribute to value creation by optimizing processes, reducing costs, and improving efficiency. Streamlining inventory management, implementing automation and robotics, and improving coordination with suppliers and customers, organizations can enhance their supply chain operations and deliver value to their stakeholders. Additionally, by leveraging data analytics tools and technologies, organizations can gain insights into their operations and make data-driven decisions to improve performance across the value chain. Overall, the integration of warehouse operations can be an important tool for value creation and competitive advantage in the modern business environment. Integrated logistics approach within the warehouse value network can contribute to the creation of value for all stakeholders through coordinating logistics activities across different functions and departments, organizations can improve process efficiency, reduce costs and lead times, and enhance customer satisfaction. Moreover, integration of logistics functions can provide greater visibility into the supply chain, enabling organizations to optimize inventory levels and make better-informed decisions. Furthermore, through data analytics and advanced technologies, organizations can identify opportunities for optimization and process improvement, resulting in increased value creation.

Keywords: Warehouse Operations, Value Chain, Integrated Logistics Approach

Introduction

Integrated logistics plays a crucial role in value chain management as it helps to optimize the flow of goods, services, and information across the entire supply chain. The integrated logistics is important in value chain management in many aspects, such as Cost optimization in view of reducing costs by eliminating redundancies and inefficiencies in the supply chain by streamlining processes, organizations can reduce transportation costs, inventory carrying costs, and other expenses, which translates into cost savings for the entire value chain. An integrated logistics system can help to improve customer satisfaction by ensuring that products are delivered on time and in good condition. This can build customer loyalty and help to increase sales and revenue. Through integrating logistics systems, organizations can gain greater visibility into their suppliers, production processes, and inventory levels. This allows them to respond quickly to changes in the market and customer demand, which in turn helps to improve efficiency and reduce costs. Integrated logistics system allows organizations to respond quickly to changes in the market and customer demand. By having a flexible and responsive supply chain, organizations can adapt to new challenges and seize opportunities as they arise. Integrated logistics systems can help organizations to better manage supply chain risks such as disruptions, delays, and quality issues. Having greater visibility into the supply chain, organizations can identify potential risks and take proactive measures to mitigate them. Overall, integrated logistics is essential for organizations that want to maximize the efficiency and effectiveness of their supply chain operations. Through adopting an integrated logistics approach, organizations can gain a competitive advantage and achieve long-term success in their respective markets.

There are several key components of integrated logistics that contribute to value chain efficiency and effectiveness. Transportation management is one of the main components involves managing the movement of goods between suppliers, manufacturers, distributors, and customers. Effective transportation management requires the optimization of routes, modes of transportation, and delivery schedules to minimize costs and improve delivery times. The next key component is Warehouse management which includes the physical storage and management of inventory. This component involves optimizing warehouse layouts, inventory levels, and order picking processes to improve efficiency and reduce costs: Effective inventory management involves balancing the optimal inventory levels with customer demand. This component involves managing stock levels, reorder points, safety stock levels, and lead times to prevent stockouts and overstocking.

The Integrated Warehouses Concept.

Warehouses are fundamental to a supply chain's value-added services and moderating changes in supply and demand (Sainathuni, et al., 2014). Integrated warehouses play a critical role in the integrated supply chain. An integrated warehouse is one that is connected to other parts of the supply chain, such as transportation, production, and distribution. Integrating the warehouse with other parts of the supply chain, organizations can achieve better coordination and visibility, which can help them make more informed decisions about inventory levels, production schedules, and transportation. For example, an integrated warehouse might use technology such as RFID tags, barcode scanning, and automated inventory tracking to keep track of inventory levels in real-time. This information can then be shared with other parts of the supply chain, such as the production team, to ensure that they have the materials they need to keep production running smoothly. Integrated warehouses can also help organizations optimize their transportation routes by ensuring that products are stored in the right place at the right time, reducing the need for costly and inefficient transportation backtracking. Additionally, integrated warehouses can help organizations reduce waste and operating costs by enabling more efficient use of storage space and reducing the risk of overstocking or stockouts.

The evolution of integrated warehouses in supply chain networks has been driven by various factors over the years. Historically, the focus was on optimizing warehouse and distribution center operations through manual labor and basic inventory management systems. With technological advancements in automation, the integration of warehouse systems became a crucial strategy in supply chain management, leading to further optimization of operations. Currently, the integration of technology such as IT, robotics, and big data in warehouse management systems is allowing for the creation of highly efficient and integrated warehousing facilities. The use of RFID technology and GPS tracking systems has enhanced inventory tracking, enabling real-time reporting of inventory levels from warehouse to transportation, and on to the customer, creating better tracking and forecasting processes. The integration of e-commerce systems into warehouse and distribution center capabilities is fast becoming a necessity, reinforcing the need for more sophisticated systems. Overall, the evolution of integrated warehouses is likely to continue as businesses increasingly see it as a critical piece of the supply chain puzzle. The future of these warehouses will be built on highly automated, data-driven systems that are focused on delivering quality products to customers at optimal costs. However, businesses will need to continue investment in new technology and employee upskilling to keep up with the fast-paced changes in supply chain management.

Integrated warehouses generate several benefits in the network of the supply chain connecting the warehouse with other parts of the supply chain, organizations can get real-time information about inventory levels, production schedules, and transportation, which can help optimize processes and make more informed decisions. Integrated warehouses streamline processes and reduce the risk of stockouts or overstocking, which can help reduce waste and operating costs. An integrated warehouse can help improve order accuracy, reduce lead times, and improve delivery times, which can result in high levels of customer satisfaction. Ensuring that products are stored in the right place at the right time, organizations can reduce the need for expensive and inefficient transportation backtracking. Integrated warehouse can help organizations gain a competitive edge by improving operational efficiencies and reducing costs. Overall, an integrated warehouse is an essential component of an integrated supply chain, which can help organizations achieve greater efficiency, coordination, profitability, and customer satisfaction.

Literature Review

The complexity of supply chain integration and management, particularly in information sharing and collaboration as well as operation agility, may increase as a result of highly dispersed warehouses and heterogeneous resources located at each link in the supply chain. (Yan, et al., 2014). With the real-time collection and analysis of condition data from the subsystems of intelligent perception and network access convergence, the developed system is able to assist users in managing each link of the supply chain. The effectiveness and efficiency of supply chains are improved through the use of cutting-edge information technology. The use of technologies like Enterprise Resource Planning (ERP), Electronic Data Interchange (EDI), Supply Chain Planning (SCP), and now RFID is assisting supply chain partners to combine their operations and strategies in order to reduce system costs and improve customer experience. (Chuang & Shaw, 2007).

The logistics chain, which creates the fundamental and technical needs for the storage system and establishes goals and standards for its ideal functioning, determines the terms of processing load. The warehouse itself is merely one component of the higher-level system. The warehouse should be viewed as a vital link in the supply chain rather than as a stand-alone entity. Only such a strategy can guarantee the efficient execution of a warehouse's fundamental functions and a high degree of profitability. Keep in mind that, depending on how these factors are related to one another, the warehouse system characteristics for each individual shop, as well as its components and structure, varies greatly from one another (Kondratjev, 2015). As Harper, (2010) describes better communication between all activities throughout supply chain tiers is made possible by the

relationship between communication technologies, the environment of the supply chain, and end-user requirements. Tight coordination between supply chain partners is essential for effective supply chain management. The entrance price to synchronization will be expected to include top-tier product quality, precise inventory tracking, efficient operations, customer-focused service, and a streamlined supplier base. Businesses looking to grasp these strategies have focused on assisting platform advancements in technology. Organizational Resource Planning Best-in-class software programs like transportation management systems and warehouse management systems are helping to define, standardize, and automate operational operations to a world-class level.

Findings of Mason, et al.,(2003) prove that, the expanded supply chain's physical flow of items is integrated through warehouse management. It is possible to build visibility of the warehouse with information on the past, present, and future locations of each supply chain asset over time by combining these two crucial technologies. A real-time decision support system that can plan, run, and adjust to the dynamic nature of the supply chain underpins the warehouse visibility. Despite being entirely conceptual, our simulation model showed how the Volkswagen paradigm may enhance customer service through increased efficiencies, decreased costs, and decreased lead-time unpredictability. As Nasiri, et al., (2016) pointed out the Integrated model for choosing a warehouse location, assigning merchants to newly opened warehouses, and selecting the best inventory control policy to manage order quantity and safety stock level. In order to satisfy all stochastic client requests, the best opening warehouse capacity, location, and inventory strategy must be chosen.

Analysis

The analysis based on the theoretical and empirical finding of the secondary data in order to obtain better outcome to generate knowledge. Automated technologies such as robotics, artificial intelligence, and machine learning are becoming increasingly common in integrated warehouses, allowing for more efficient sorting, packing, and shipping of goods. Further, Game-like elements such as point systems can be integrated into warehouse processes to track employees' performance, speed, and accuracy, increasing productivity and engagement. Real-time tracking technologies such as radio-frequency identification (RFID) and GPS can be used for enhanced visibility and tracking of inventory, allowing for better coordination within the supply chain. Sustainable practices in warehouse management, such as using renewable energy sources for power and implementing green warehouse design, can not only reduce environmental impact but also decrease costs. The growth of e-commerce has increased the demand for warehouse management systems that can handle omni-channel order fulfillment and returns processing, which requires greater integration of warehouse

operations with other parts of the supply chain. These trends are shaping the landscape of integrated warehouses in supply chain management, with the aim of making inventory management and product fulfillment more efficient and sustainable.

Challenges of Integrating Warehouses into a Supply Chain

Integrating warehouses with other parts of the supply chain can be complex and require significant investment in technology and infrastructure. With integration comes more data, which can be difficult to manage and interpret. It is essential to have advanced data management solutions to ensure efficient operations and maintain accurate information. Integrating warehouses may require additional staffing and training to effectively manage and coordinate the various elements of the supply chain. Integration efforts can be expensive, requiring investment in new infrastructure, technology, and procedures. Dependence on technology in warehouses creates the possibility of system disruptions, which can cause significant delays and problems in other parts of the supply chain while integrated warehouses can help optimize operations in the supply chain and they also come with their own set of challenges that require careful management and planning to overcome.

There are many examples of successful integrated warehouse supply chain networks, Walmart has an extensive supply chain network that is highly integrated and optimized for efficiency. Through initiatives like vendor-managed inventory (VMI), Walmart has been able to reduce inventory levels and improve in-stock positions, while also enabling suppliers to manage their own inventory. Further, Nike has invested heavily in its supply chain network to improve speed and flexibility, with a focus on integrating manufacturing operations and improving visibility across the supply chain. This has allowed Nike to respond quickly to changes in consumer demand and reduce lead times. Conversely, Toyota is known for its innovative supply chain practices, such as just-in-time (JIT) manufacturing and lean production principles. Through these initiatives, Toyota has been able to reduce waste and improve efficiency across its supply chain, resulting in cost savings and improved quality. Renowned brand of P&G has implemented a highly-automated supply chain network that is optimized for speed and flexibility. The company uses advanced analytics and data management tools to optimize inventory levels, reduce lead times, and improve delivery performance.

Future of the Integrated Warehouse Supply Chain

Based on the available information, the future of integrated warehouses in supply chain management looks promising. The increasing adoption and advancement of automation, real-time

tracking, sustainability, and integration with e-commerce in warehouse operations will help facilities to improve productivity, efficiency, and sustainability. Additionally, the growth of e-commerce has created a demand for better supply chain management systems that can handle omni-channel order fulfillment and returns processing, and integration of warehouses with other parts of the supply chain will be critical in achieving this. However, it's essential to note that there may be some challenges with the implementation of these advancements, including the high cost of implementation and the need to hire or upskill employees in new technology. Nonetheless, as the supply chain ecosystem evolves, the integration of warehouses as a crucial part of the supply chain will become even more important. Therefore, businesses need to invest in both new technologies and staff skills to keep pace with these trends and get the most out of their integrated warehouses.

The future of integrated warehouses in supply chain management looks promising, with increasing focus on automation, real-time tracking, sustainability, and integration with e-commerce. There is a growing interest in implementing automated technologies such as robotics and artificial intelligence to increase efficiency and productivity in warehouse operations. Additionally, real-time tracking technologies such as RFID and GPS can enhance inventory management and supply chain visibility. There is also a growing movement towards sustainable practices in warehouse management, with an awareness of the impact of warehouses on the environment. Moreover, the growth of e-commerce has increased the demand for robust warehouse management systems that can handle omni-channel order fulfillment and returns processing, which requires greater integration of warehouse operations with other parts of the supply chain. Overall, the future of integrated warehouses in supply chain management is set to be increasingly automated, connected and sustainable, with a focus on delivering high-quality service across various channels.

Conclusion

Warehouse integration is an important aspect of supply chain management that can improve value creation by optimizing processes, reducing costs, and improving productivity. Implementing custom integration services, managed services, warehouse robotics integration, AI systems, and end-to-end supply chain monitoring software can help organizations achieve these benefits and enhance their supply chain operations. Additionally, a strong governance structure and dedicated supply chain integration team can help ensure successful implementation and execution of these strategies.

Recommendations

Based on the evaluated secondary data, possible implementations for better warehouse integration in the value network within the integrated supply chain are as follows:-

- Use custom integration services for legacy, custom-built ERP systems in order to efficiently manage and automate tasks across different business and supply chain functions.
- Employ premium managed services with dedicated subject matter experts for B2B integration needs
- Accelerate warehouse robotics integration with a Platform as a Service (PaaS) solutions.
- Leverage the power of Artificial Intelligence (AI) systems to solve several warehouse issues more quickly and efficiently.
- Implement an end-to-end supply chain network monitoring software to improve supply chain performance.

Implementing these solutions can help improve warehouse integration within the value network in supply chain management, leading to cost savings, improved productivity, and optimized supply chain operations.

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STUDY ON KEY SUCCESS FACTORS OF CREATING A VALUE CHAIN BY IMPLEMENTING INTEGRATED LOGISTICS IN THE RETAIL INDUSTRY

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Abstract

This study is focused on finding the key success factors of integrated logistics which helps to create value in the retail industry. With the huge competition among the players in the retail industry, there are looking for different accepts to gain a competitive advantage. Integrated logistics involves managing all aspects of logistics activities, including transportation, warehousing, inventory management, and order fulfillment to optimize the supply chain and maximize customer satisfaction. It involves collaboration between different parties and the use of technology to improve visibility and control over the entire supply chain. Integrated logistics helps to optimize the various activities involved in the value chain, such as sourcing, production, and delivery, by providing a coordinated approach to logistics management. Companies rely on logistics service providers to move goods and services to a customer, which has led to an increased emphasis on the integration of supply chains. The retail FMCG industry is highly competitive, and integrated logistics can help retailers reduce costs, improve customer satisfaction, achieve faster time-to-market, and enhance supply chain visibility. In this study Cost Reduction, Fast time to market, Customer Satisfaction, and Supply chain visibility are considered the key success factors of value creation by implementing Integrated Logistics. The implementation of integrated logistics is essential for retailers as it can optimize their supply chain operations, reduce costs, improve customer satisfaction, and ultimately create value for their customers. This article examines the impact of integrated logistics on value creation in the retail industry by addressing four research questions. This study is only a Literature review on the above factors. Therefore there is a future opportunity to validate those factors by addressing a case study or a survey of targeted retail companies. Customer satisfaction, Supply chain visibility, Fast time to market.

Keywords: Value Creation, Integrated Logistics, Cost reduction,

Introduction

Integrated logistics refers to the coordinated management of all aspects of logistics activities, including transportation, warehousing, inventory management, and order fulfillment, to optimize the supply chain and maximize customer satisfaction. The goal of integrated logistics is to create a seamless flow of goods and information throughout the supply chain, from raw materials to the end customer, while minimizing costs and maximizing efficiency.

Integrated logistics involves collaboration between different parties, such as suppliers, manufacturers, distributors, and retailers, to ensure that products are delivered to the right place, at the right time, and in the right condition. It also involves the use of technology, such as transportation management systems and warehouse management systems, to improve visibility and control over the entire supply chain.

Overall, integrated logistics is a holistic approach to logistics management that seeks to optimize the flow of goods and information across the supply chain to enhance customer value and competitive advantage

Integrated logistics plays a crucial role in creating a value chain in an organization. A value chain is a series of activities that a company performs to create value for its customers. Integrated logistics helps to optimize the various activities involved in the value chain, such as sourcing, production, and delivery, by providing a coordinated approach to logistics management.

The retail industry is a fast-changing industry. There are many players who have continued the competition. With the fast-growing technology, retail companies are trying different strategies to gain a competitive advantage over the other players.

Literature Review

According to Zacharias and Boopathy (2022), In today's rapidly changing global marketplace, companies understand the importance of efficiently and effectively delivering goods and services through a coordinated supply chain distribution network. This has led to an increased emphasis on the integration of supply chains. The production and consumption of goods and services are necessary for most human activities and organizations, but there is often a physical distance between the two. This distance can make the process more complex, requiring producers to rely on equipment, transportation services, documentation services, and customs clearance services to move

raw materials and finished goods to meet customer demand. To meet these needs, companies rely on logistics service providers to physically move goods and services to the end customer.

The retail FMCG (Fast Moving Consumer Goods) industry is highly competitive, with consumers expecting high-quality products at affordable prices. This has put pressure on retailers to optimize their supply chain processes to reduce costs and improve operational efficiency while ensuring that products are delivered to customers in a timely and efficient manner.

Integrated logistics can play a critical role in achieving these goals by providing a coordinated approach to logistics management. Integrated logistics involves the integration of different functions such as procurement, warehousing, transportation, and customer service, to create a seamless flow of goods and information throughout the supply chain. (Abdullahi, A. et al., 2016). Here are some ways integrated logistics can help to create value in an organization's value chain:

- **Reduced costs**. Integrated logistics can help to streamline logistics processes, reduce waste, and improve efficiency, leading to cost savings for the organization. By reducing logistics costs, an organization can offer more competitive prices to its customers, which can increase customer loyalty and revenue. (Gligor, D. M., & Holcomb, M. C. (2012).

- **Improved customer satisfaction**. Integrated logistics can help to ensure that products are delivered to customers in a timely and efficient manner, with the right quality and quantity. This can lead to increased customer satisfaction, repeat business, and positive word-of-mouth recommendations. (Abdullahi, A. et al., 2016).

- **Faster time-to-market**: Integrated logistics can help to reduce lead times and improve the speed of delivery, which can enable an organization to launch new products faster and respond more quickly to changes in market demand. In today's fast-paced and highly competitive business landscape, being the first to market can provide a significant advantage. This can lead to greater brand recognition and customer loyalty, as your products are established in the market before similar offerings from competitors (Enkonix. 2022).

- **Enhanced supply chain visibility**. Integrated logistics can provide real-time visibility into the supply chain, enabling organizations to track inventory levels, monitor shipments, and identify potential bottlenecks. This can help to reduce inventory holding costs, prevent stock-outs, and improve overall supply chain performance. Nowadays, real-

time visibility is an essential requirement in supply chain and logistics. It pertains to the logistics operations that enable the tracking and monitoring of the movement of goods and packages from suppliers, manufacturers, warehouses, and distribution centers to the end customer in real-time.

Real-time visibility in the supply chain utilizes GPS-tracking and advanced software to enable companies to plan, schedule, and monitor their logistics process at every stage. It provides supply officers with access to real-time trackable information such as order receipts, the status of raw materials, shipping details, regulatory information, and the exact order status. By effectively managing various aspects of this intricate process, businesses can achieve a competitive advantage, improve productivity, increase transparency and customer satisfaction, and also lower transportation costs. (Fareye. (n.d.).

Overall, integrated logistics can help organizations to create value by improving efficiency, reducing costs, and enhancing customer satisfaction, leading to a more competitive and profitable business.

Research Methodology

Integrated logistics plays a critical role in the value chain of the retail industry. It enables retailers to optimize their supply chain operations, reduce costs, enhance customer satisfaction, and ultimately create value for their customers. However, the success of implementing integrated logistics in the retail industry is dependent on several key factors. In this section, we will elaborate on some of the key success factors that help create a value chain by implementing integrated logistics in the retail industry.

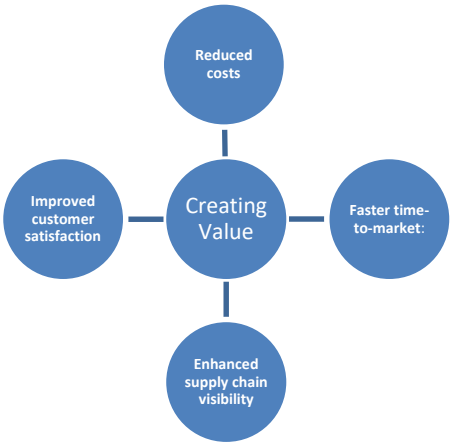

Figure: Factors Affecting to Create Value

Source: Developed by Author

Below questions are addressed in this study:

- How integrated logistics helps to reduce cost and then how it impacts value creation
- How integrated logistics helps to Faster time to market and then how it impacts value creation
- How integrated logistics helps to Improve customer satisfaction and then how it impacts value creation
- How integrated logistics help to Enhance supply chain visibility and then how it impacts value creation

In this study, the previous literature was used for identifying the above-identified success factors.

How Integrated Logistics Helps to Reduce Cost and then How it Impacts Value Creation:

Integrated logistics can help companies to reduce costs by optimizing the entire supply chain to eliminate waste, reduce inventory, and improve operational efficiency (Christopher & Holweg, 2011). By leveraging technology such as real-time tracking and analytics, companies can gain greater visibility into their supply chains, which can help to identify inefficiencies and areas for improvement. By reducing costs in these areas, companies can improve their bottom line and create value for their customers.

One way that integrated logistics can help to reduce costs is by eliminating waste in the supply chain. This can include reducing excess inventory, minimizing the number of suppliers, and improving production efficiency (Christopher & Holweg, 2011). By implementing lean manufacturing principles and just-in-time (JIT) inventory systems, companies can reduce inventory carrying costs and improve the efficiency of their operations (McKinsey & Company, 2018).

Another way that integrated logistics can help to reduce costs is by optimizing transportation and distribution processes. By consolidating shipments, improving route planning, and utilizing more efficient transportation modes, companies can reduce transportation costs and improve delivery times (Christopher & Holweg, 2011). Additionally, by leveraging technology such as GPS tracking and real-time analytics, companies can optimize delivery routes and improve driver productivity, further reducing transportation costs (McKinsey & Company, 2018).

By reducing costs in these areas, companies can create value for their customers by offering competitive pricing and better service. According to a study by McKinsey & Company, companies that implement integrated logistics strategies can achieve cost reductions of up to 10% and service improvements of up to 20% (McKinsey & Company, 2018). Bypassing these cost savings on to their customers, companies can increase their competitiveness and create greater value for their customers.

Furthermore, reducing costs through integrated logistics can also lead to greater innovation and value creation. By optimizing supply chain processes and reducing costs, companies can invest in research and development, develop new products and services, and expand into new markets (Christopher & Holweg, 2011). By doing so, companies can create new value for their customers and differentiate themselves from their competitors.

How integrated logistics help to faster time to market and then how it impacts value creation:

Integrated logistics can help companies to reduce time to market by optimizing the entire supply chain to improve coordination and communication between suppliers, manufacturers, and distributors (Christopher & Holweg, 2011). By leveraging technology such as real-time tracking and analytics, companies can gain greater visibility into their supply chains, which can help to identify bottlenecks and delays. By reducing lead times in these areas, companies can improve their speed to market and gain a competitive advantage.

One way that integrated logistics can help to reduce time to market is by improving coordination between suppliers and manufacturers. By implementing just-in-time (JIT) inventory systems and other lean manufacturing principles, companies can reduce lead times and improve the efficiency of their production processes (Christopher & Holweg, 2011). Additionally, by improving communication and collaboration between suppliers and manufacturers, companies can reduce the time it takes to get raw materials and components to the factory, further reducing lead times (McKinsey & Company, 2018).

Another way that integrated logistics can help to reduce time to market is by optimizing transportation and distribution processes. By improving transportation efficiency and reducing transit times, companies can reduce the time it takes to get products to market (Christopher & Holweg, 2011). Additionally, by leveraging technology such as GPS tracking and real-time analytics, companies can optimize delivery routes and improve driver productivity, further reducing transportation lead times (McKinsey & Company, 2018).

By reducing lead times in these areas, companies can improve their speed to market and gain a competitive advantage. According to a study by McKinsey & Company, companies that implement integrated logistics strategies can achieve lead time reductions of up to 50% (McKinsey & Company, 2018). By getting products to market faster, companies can capture market share, increase revenue, and improve customer satisfaction.

Furthermore, faster time to market through integrated logistics can also lead to greater innovation and value creation. By getting products to market faster, companies can more quickly respond to changing customer needs and market trends, and develop new products and services (Christopher & Holweg, 2011). By doing so, companies can create new value for their customers and differentiate themselves from their competitors.

How Integrated Logistics Helps to Improve Customer Satisfaction and How it Impacts Value Creation:

Integrated logistics can help to improve customer satisfaction by optimizing the entire supply chain to deliver products or services that meet or exceed customer expectations (Christopher & Holweg, 2011). By improving product quality, reducing lead times, and enhancing communication and visibility across the supply chain, companies can increase customer loyalty and retention, which can ultimately lead to increased revenue and profitability.

One way that integrated logistics can improve customer satisfaction is by enhancing product quality. By implementing quality control processes throughout the supply chain, companies can ensure that products meet or exceed customer expectations (McKinsey & Company, 2018). Additionally, by leveraging technology such as real-time tracking and analytics, companies can identify quality issues more quickly and proactively address them before they impact the customer.

Another way that integrated logistics can improve customer satisfaction is by reducing lead times. By streamlining the supply chain and optimizing transportation and distribution processes, companies can reduce the time it takes to get products from the factory to the customer (Christopher & Holweg, 2011). This can include utilizing just-in-time delivery, consolidating shipments, and optimizing transportation routes. Additionally, by leveraging warehouse automation and advanced inventory management systems, companies can improve order fulfillment times and reduce the time it takes to process and ship orders.

In addition to improving product quality and reducing lead times, integrated logistics can also enhance communication and visibility across the supply chain. By sharing information and coordinating activities, companies can better understand customer needs and preferences, anticipate demand, and respond more quickly to changes in the market (McKinsey & Company, 2018). This can include using technology such as cloud-based collaboration tools and real-time tracking and analytics to improve communication and collaboration among suppliers, manufacturers, distributors, and retailers.

The benefits of improved customer satisfaction can be significant for companies in competitive industries. According to a study by Bain & Company, increasing customer retention rates by 5% can increase profits by up to 95% (Bain & Company, 2018). Additionally, satisfied customers are more likely to recommend products or services to others, which can help to increase market share and improve brand reputation.

How Integrated Logistics Helps to Enhance Supply Chain Visibility and How it Impacts Value Creation:

Integrated logistics can help enhance supply chain visibility by providing real-time tracking and analytics of products and inventory throughout the supply chain (Christopher & Peck, 2004). This increased visibility enables companies to better anticipate and respond to disruptions, optimize inventory management, and improve overall supply chain efficiency.

One way that integrated logistics can enhance supply chain visibility is through the use of RFID technology. RFID tags can be used to track products and inventory as they move through the supply chain, providing real-time data on location, condition, and movement (Christopher & Peck, 2004). This data can be used to identify bottlenecks and delays in the supply chain, enabling companies to take corrective action and improve overall efficiency.

Another way that integrated logistics can enhance supply chain visibility is through the use of advanced analytics. By collecting and analyzing data from across the supply chain, companies can gain greater insight into their operations and identify opportunities for improvement (Christopher & Peck, 2004). For example, analytics can be used to optimize inventory levels, predict demand, and improve transportation routes.

In addition, integrated logistics can help enhance supply chain visibility by improving collaboration and communication between suppliers, manufacturers, and distributors. By implementing collaborative planning, forecasting, and replenishment (CPFR) processes, companies can improve coordination and information sharing, reducing the risk of disruptions and delays (Christopher & Peck, 2004).

By enhancing supply chain visibility, companies can improve overall supply chain efficiency, reduce costs, and improve customer satisfaction. According to a survey by Geodis (2018), 80% of companies reported that increased supply chain visibility had a positive impact on their operations, with 49% reporting improved customer satisfaction and 47% reporting reduced costs.

Furthermore, enhanced supply chain visibility can also help companies to mitigate risk and improve sustainability. By better understanding their supply chains, companies can identify potential risks such as environmental or social issues, and take steps to mitigate them (Christopher & Peck, 2004). Additionally, increased visibility can help companies to reduce waste and improve sustainability by optimizing inventory levels and reducing transportation emissions (Geodis, 2018).

Conclusion

Integrated logistics can help companies to reduce costs by optimizing the supply chain and improving operational efficiency. By doing so, companies can create greater value for their customers by offering competitive pricing, better service, and innovative new products and services. By implementing integrated logistics strategies, companies can gain a competitive edge in the marketplace and improve their bottom line.

Integrated logistics can help companies to reduce time to market by optimizing the supply chain and improving coordination and communication between suppliers, manufacturers, and distributors. By reducing lead times in key areas such as production and transportation, companies can gain a competitive advantage and improve their bottom line. By implementing integrated logistics strategies, companies can improve their speed to market, capture market share, and create greater value for their customer.

Integrated logistics can help companies to improve customer satisfaction by enhancing product quality, reducing lead times, and enhancing communication and visibility across the supply chain. By improving customer satisfaction and loyalty, companies can increase revenue, profitability, and market share, while also improving brand reputation and customer retention.

Integrated logistics can help enhance supply chain visibility by providing real-time tracking and analytics, improving collaboration and communication, and using advanced analytics. By enhancing supply chain visibility, companies can improve overall supply chain efficiency, reduce costs, improve customer satisfaction, mitigate risk, and improve sustainability.

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INTEGRATED LOGISTICS AS A MEANS OF LOGISTICS RESILIENT

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Abstract

The impact of globalisation has created competition among industries, which is an eye-opener for identifying inherent capabilities within the organisation. In order to succeed in the competition, organisations try their level best to keep a customer base while proving satisfactory goods and services. Therefore, every organisation always tries to identify customer wants and needs at a given time and address contemporary challenges. In order to address the customer's wants and needs, the value creation of the goods and services plays a considerable role. Moreover, customers are always gathered around the more value-created goods and services, considering various factors. On the other hand, organisations need networks to find the required ingredients or raw materials to find the best out of the best in order to create value for products. Therefore, integration among the various organisations at different stages is much needed to face contemporary challenges as well as meet customer expectations. In the modern world, concept integration among organisations is more important than ever to find the most suitable solutions for logistics problems.

Keywords: Value, Value Creation, Value Network, Integrated Logistics, Logistics Resilient

The Inception of Logistics to Integrated Logistics

In the modern contemporary world land boundaries not concerning to business activities. The major reason for that is world business organizations have interlinked due to globalization. Therefore, organizations have to play a collaborative role while focusing to augment own business activity. The early stages of logistics were constrained due to land boundaries and scope also a limited. In basic words, logistics is the process of planning and executing the efficient transportation and storage of goods from the point of origin to the point of consumption. The goal of logistics is to meet customer requirements in a timely, cost-effective manner. Accordingly, logistics were able to cater to the limited requirements as the only function within the limited area. Moreover, due to the

small scope, they were not compared among the organizations in the industry. Due to the limited availability of industries customers only had a limited selection variety. Due to the regular customer base industries were not focused to uplift organizational capacities.

When long-run new organizations entered the market and competition among organizations was created. Therefore, organizations focus on producing the best products in order to remain in the market and keep the market share. Producing the best products was not an easy task for the organization. In order to produce the best products organizations needs to collaborate with parallel industries to share not available capabilities. Since every organization does not available the required raw materials for production, collaboration is a must with other related organizations to make reliable products. This combination of organizations is known as supply chain management and it can be achieved by optimizing various activities such as sourcing, production, transportation, and distribution. When interlink organizations collaborate with other organizations able to make value to the productions.

To create value, supply chain managers focus on improving the speed, quality, and reliability of the supply chain, while minimizing costs and risks. This involves working closely with suppliers, manufacturers, distributors, and retailers to streamline processes, reduce waste, and enhance overall efficiency. In summary, value creation in supply chain management is the process of delivering high-quality products or services to customers while minimizing costs and improving efficiency throughout the supply chain.

When a single organization has expertise in its respective fields automatically gets into the network. Due to the expertise ability and unique value of a particular product, within the network create a comparative valve among the other products. A value network in supply chain management refers to the interconnected group of organizations and stakeholders that work together to create, produce, distribute, and deliver a product or service to the end customer. The value network includes suppliers, manufacturers, distributors, retailers, logistics providers, and other stakeholders who contribute to the creation and delivery of value to the end customer.

Unlike a traditional supply chain that is linear, a value network is a more complex and dynamic system of relationships that involves multiple interactions and feedback loops. It is a collaborative network that emphasizes mutual benefit, joint problem-solving, and continuous improvement. The concept of a value network recognizes that value is created not only within a single organization but also through the interactions and relationships between organizations in the

network. The success of the network depends on the ability of each organization to contribute to the creation and delivery of value while also benefiting from the value created by others in the network. In summary, a value network in supply chain management is a complex and collaborative system of relationships and interactions between organizations that work together to create, produce, distribute, and deliver value to the end customer. It emphasizes the importance of collaboration, mutual benefit, and continuous improvement in creating value.

When networking is existing that network is required to interlink with each organization to share individual values among the network. Therefore, integration among the network provides many benefits to each individual in the network. Supply chain integration is the process of coordinating and connecting different activities and systems within a supply chain to improve overall efficiency, effectiveness, and responsiveness. It involves bringing together various elements of the supply chain, such as suppliers, manufacturers, distributors, retailers, and customers, and integrating them into a cohesive and well-functioning system.

Value Creation within the Industry

By simple means creating value is providing customers fully satisfied product at a low cost and still recovering the profit from the particular product. When providing such a product at an affordable price respective customer network will be delighted. In order to make such a product combination within the resource sources is much required. Further, it can be elaborated through the porters' value chain how to value crate the unit while a combination of other sources.

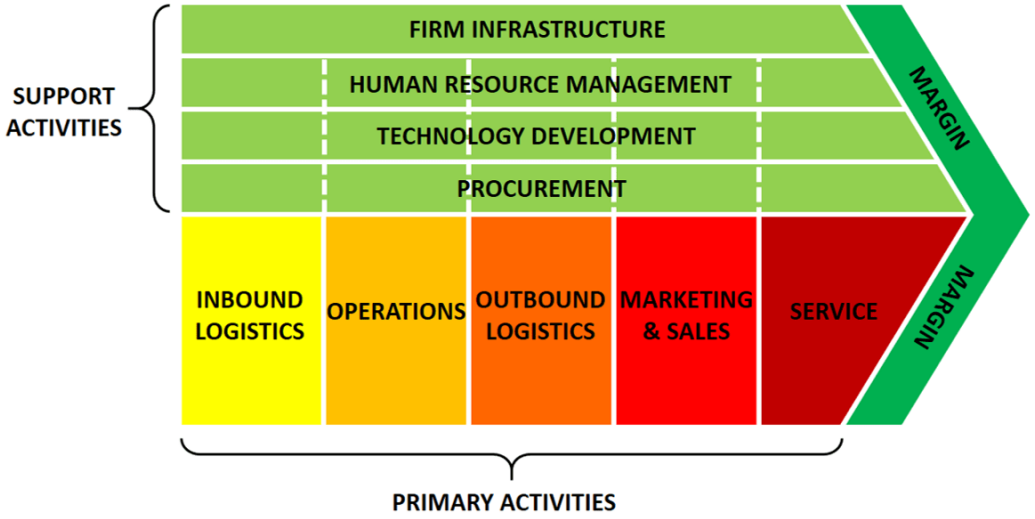

Figure 1: Porter's Value Chain
Source: Porter (1985)

Industries have to consider two activities in order to create value for the product or service according to porters' value theory. Primary activities are in-house activities that directly impact the nature of a particular product. When those factors are able to manage at a low cost the final outcome of monetary value will become low. With the use of one single industry, porters' value chains can be elaborated more and able to provide deep understanding. As an example, the MASS holdings apparel industry focuses much on primary activities such as inbound logistics, operation, outbound logistics, marketing & sales, and finally services. Inbound logistics means obtaining the required raw materials for the organization considering various factors. Quality and the cost are main factors that need to consider when dealing with inbound logistics. Obtaining the right quality raw materials in-house ensure the quality of final production.

The Second factor is conducting a proper operation in order to ensure the final outcome and customer expectations. The MASS holdings control their production using various controlling methods such as line quality control, final production quality controlling and etc. During the operation process, industries focus on cost-reduction factors and effective manpower utilization techniques. An example MASS provides transport facilities for work in order to obtain a better outcome as expected by the organization.

Next part of the primary activity is outbound logistics. Simply outbound logistics means delivering products or services to your customer. These are things like collection, storage, and distribution systems, and they may be internal or external to the organization. MASS production has various outbound logistics hubs within the country and outside as well. The next stage of the primary activity is conducting a marketing campaign to introduce items to the market and capture the items. The MASS appeal sector not using single-brand marketing since there are among the top appeals. They use brand marketing by using the Sri Lankan cricket team and trying to expose more in the world market. Finally, they conducted CSR projects with stakeholders in order to get an optimistic reputation among the general public as well as customers.

As per Porter's value chain support activities go across the primary activities and aim to coordinate and support their functions as best as possible with each other by providing purchased inputs, technology, human resources, and various firm-wide managing functions. The support activities can therefore be divided into *procurement*, *technology development* (R&D), *human resource management,* and *firm infrastructure.* The dotted lines reflect the fact that procurement, technology development, and human resource management can be associated with specific primary activities as well as support the entire value chain. Firm infrastructure means making all

infrastructure and other facilities suit the organization. As an example MASS industry has a fully-fledged working environment that has all facilities to work. Therefore, employees boost to work with maximum productivity. The outcome of the product automatically will rise up and product quality will over to the price tag.

Organizations are required to have a working mindset employer in order to achieve production targets. Therefore, need to enlist target-oriented working staff to the organization. In MASS apparel they have a set of interview progress to enlist manager-level works and line works as well. Organizations' friendly working staff will directly impact to improvement of primary-level activities. Technology development also plays a vital role in supporting activity components. Technology support means procedures or technology embodied in process equipment. The array of technology used in most companies is very broad. Technology development activities can be grouped into efforts to improve the product and the process. Examples are telecommunication technology, accounting automation software, product design research, and customer servicing procedures. Typically, Research & Development departments can also be classified.

MASS has a particular unit for procurement supporting items to the operation such as Juki machines, cutting machines and etc. Moreover, purchasing expertise conducted various analyses in different aspects to purchase requirements in order to achieve organizational goals. In a basic sense when an organization achieves both primary and support activity expectations, the organization is able to make a quality product at a low cost. Then the products can be released to the market at a low price which customers are willing to pay more than the price tag. When consumers believe they paid less amount than the benefit, automatically the value will have been generated for the product. Moreover, a proper combination of primary and support activities helps to make delivering high-quality products or services to customers while minimizing costs and improving efficiency throughout the supply chain.

Value Creation to Value Network

Each individual organization adheres to Porter's value chain and try to improve quality and reduce production cost. Later introduce those products to market at a comparatively low cost while achieving considerable profit. Consumers are wondering whether to purchase those items at the tag price even organizations are able to cover profit from it. When each individual value-created organizations get together will create a network among the organizations and consumers will receive more advantages. Simply means a value network in supply chain management refers to the

interconnected group of organizations and stakeholders that work together to create, produce, distribute, and deliver a product or service to the end customer. The value network includes suppliers, manufacturers, distributors, retailers, logistics providers, and other stakeholders who contribute to the creation and delivery of value to the end customer.

Unlike a traditional supply chain that is linear, a value network is a more complex and dynamic system of relationships that involves multiple interactions and feedback loops. It is a collaborative network that emphasizes mutual benefit, joint problem-solving, and continuous improvement. The concept of a value network recognizes that value is created not only within a single organization but also through the interactions and relationships between organizations in the network. The success of the network depends on the ability of each organization to contribute to the creation and delivery of value while also benefiting from the value created by others in the network.

As an example, the hospitality industry can be identified as the final stage of the Value network among the respective industries. Because the industry itself provides final productions to customers. Moreover, the industry links with other industries such as ingredients providers, transport and etc. When ingredients producers create more value by improving quality and reducing the price will impact the betterment of the hospitality industry. Accordingly, the hospitality industry is able to obtain quality items at a low cost and be able to customer delight in both aspects of price and quality. Therefore, networking of each value of the organization will augment the final outcome of the product.

Integrated Logistics in the Supply Chain

Supply chain integration is the process of coordinating and connecting different activities and systems within a supply chain to improve overall efficiency, effectiveness, and responsiveness. It involves bringing together various elements of the supply chain, such as suppliers, manufacturers, distributors, retailers, and customers, and integrating them into a cohesive and well-functioning system. Collaboration among different level suppliers are mandatory in order to obtain better outcome and simultaneously it will impact sustainment in the market in the long run. In simple means Logistics integration is a process that represents challenges that do not impact only at the moment of their appearance, they do in all the links of the chain, causing fragmentation, particularly in points of time, communication, visibility, and demand coverage. Leaving the only option for brand consolidation in this industry, the integration of the supply chain.

Logistics integration is not an easy task due to the combination of different organizations in the market. Basically, organizations have different perspectives and various targets to achieve. Whenever able to achieve those individual targets organizations willing to integrate with each other. When integrating different organizations together following key points need to be considered.

- **Single Platform to Integrate Information**. Information plays a vital role in the integration process due to a lack of awareness of individual industries. As an example, third-party logistics institutes are practicing a single platform of information where the production industry finalize the product the message will receive by the transporting third party and take immediate action to distribute as necessary. In this line, a single information platform becomes a pillar for the integration of the logistics chain.

- **Flexibility with Situations**. Flexibility means the ability to respond and adapt to a new situation at the lowest cost, time, effort, and loss of possible results. Due to contemporary challenges, some supply rules may distract and be unable to provide continuous flow to make final products. Therefore, each link organization is responsible to find alternative means to continue the business process without getting hindrance to the process.

- **Agility to Predict Customer Tendencies and Adopt Inventories**. Customer tendencies need to predict each institute that is interlinked together. As an example when MASS predict customer expectation in the next quarter able to maintain sufficient stock as required to cater to the demand. Meanwhile, raw material suppliers predict main customer demand and ensure supply links will run smoothly.

Moreover, organizations get into different levels of integrated layers considering the nature of the production. In order to meet successful goals organizations, have to be in the undermentioned layers as necessary.

- **Vertical Integration**. Organizations have to deal with mega-level supply chains, such as suppliers, manufacturers, and distributors, to ensure a smooth and seamless flow of goods and services. As an example, small-level raw material manufacturers have to deal with large production organizations to cater own requirements.

- **Horizontal Integration**. This involves the integration of different companies at the same level of the supply chain, such as retailers or distributors, to improve coordination and collaboration.

- **IT Integration**. This involves the use of technology to integrate various systems within the supply chain, such as inventory management, order processing, and logistics, to improve overall visibility and control.

Contemporary Challenges in Logistics

All organizations face different types of challenges when engaging in business activities. Mainly due to the limitation of required resources organizations are stacking their production at an expected level. Moreover, the following challenges critically impact to organization's operation in various aspects.

- **Improving Delivery Service while Cutting Transport Cost**. The most creative logistics managers often worry about fuel costs and adjust their route planning. Customer satisfaction, a desired outcome of the whole supply chain, is a key objective of transportation management. Keep delivery delays to a minimum so that clients may swiftly and easily identify competition the next time.

- **Strength Communication at All Levels**. Preparing for logistical problems and how to solve them is a crucial part of keeping a firm alive. You should include improving communication with the participants in your global supply chain in your planning. Even if your company is local, you could still wish to network with far-off logistics providers to broaden your marketing reach. It's crucial to be in constant contact with suppliers in order to stay informed about the state of the resources supporting your goods and market.

- **Establish Standards for Suppliers and Partners**. Some businesses must plan numerous deliveries per day with various supply chain managers, which creates complexity if businesses adhere to various standards. When all services adhere to the same loading and unloading standards, logistics processes become considerably more efficient and integrated. Using integrated electronic networks and advanced technology, this collaboration aims to increase supply chain visibility for all participants.

- **Invest in the Right Technology**. Business technology is still evolving quickly, which leads many companies to overinvest in current electronic hardware and software developments. Spending on technology may be decreased while boosting efficiency thanks to the cloud. The most affordable options for corporate operations on a restricted budget are cloud services. A warehouse might think about working with logistics industry specialists if it requires greater adaptability, scalability, or experience.

- **Reduce Warehouse Management Errors**. The less risk of mistakes, either through automation or improved access to pertinent real-time data, the more digitally advanced an infrastructure becomes. Errors in warehouse management were far more prevalent in the 20th century. The use of warehouse management software that combines with cutting-edge technologies like AI, IoT, and 5G has become crucial in this century. These clever technologies simplify the process of gathering and storing vast amounts of priceless data.

Conclusion

In the contemporary logistics world organizations are facing numerous questions and struggling to way move forward. Especially due to the lack of required resources in-house, most of the organizations are unable to proceed as a way of expected. Meanwhile, organizations depend on each other from obtaining raw materials to transporting items to the end customer. Therefore, creating value for each organization is much needed to remain in the competitive business field. Each individual value adds to the network and within the network can be interchanged. These integrations among the organization are required to sustain at meet logistics resilient.

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ENHANCING SUSTAINABLE SUPPLY CHAIN COLLABORATION IN SRI LANKA: CHALLENGES, OPPORTUNITIES, AND SOLUTIONS

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Abstract

Sustainable supply chain collaboration in Sri Lanka presents both challenges and opportunities for businesses. With its impressive industrial potential, especially in the agricultural sector, there is a great opportunity to develop sustainable forms of production with environmental considerations at their core. These models can include promoting better conservation practices and making use of renewable energy sources such as solar panels or wind turbines wherever possible in order to reduce emissions and protect the health of local people and ecosystems. Additionally, transparency throughout all stages of the supply chain should be prioritised through greater communication between stakeholders, including suppliers, manufacturers, and retailers; this could also involve synchronising different processes so that they mutually benefit one another while reducing complexities within each stage. Nevertheless, these efforts must become more widespread amongst industry players if tangible results are to be achieved; coordinating initiatives across various sectors requires some level of government intervention alongside meaningful corporate engagement. Doing so positively accelerates economic development—something beneficial to all parties concerned—while nurturing an atmosphere whereby stakeholders work together towards creating responsible business environments that will provide long-term prosperity for everybody involved.

Keywords: Supply Chain, Sustainable Supply Chain Collaboration, Supply Chain Collaboration in Sri Lanka

Introduction

Collaboration between companies in Sri Lanka's supply chain is essential for the nation to move towards a more sustainable future. Sri Lanka is home to a variety of industries, from manufacturing to agriculture, and understanding the needs of each can help organisations work together towards a more sustainable approach. By collaborating and sharing resources, companies in the Sri Lankan supply chain can reduce their costs and create opportunities for stakeholders such as investors, customers, suppliers, and employees. By creating a collaborative and sustainable supply chain, organisations can align their objectives with wider environmental and social objectives, aiming to reduce their environmental footprint while providing better and more sustainable services to all stakeholders.

Companies in the Sri Lankan supply chain can collaborate to reduce their energy usage, develop and implement energy-saving technologies, and rethink their manufacturing processes to reduce waste and pollution. This could include exploring opportunities for renewable energy sources to power factories, incorporating sustainable materials into products and services, and using data to become more efficient. By working together, companies in Sri Lanka's supply chain can also develop more efficient and cost-effective logistics. Sharing information, resources, and knowledge through collaboration will help companies reduce inefficiencies in their systems and processes and use their resources more effectively. The collaboration between companies in Sri Lanka's supply chain will help build meaningful relationships and encourage mutual trust between organisations. By creating a supportive environment, organisations can share their experiences, insights, and knowledge, creating new opportunities for innovation and growth.

Challenges for Sustainable Supply Chain Collaboration in Sri Lanka

Sri Lanka is facing a unique set of challenges when it comes to sustainable supply chain collaboration. Due to its economic crisis, unethical politics, and poor infrastructure, it can be difficult for companies to ensure their supply chains are environmentally friendly and ethical. The biggest challenge is obtaining trustworthy suppliers who can be relied upon to uphold ethical and environmental standards. This is particularly difficult in a country where the infrastructure is weak and businesses are often less transparent than in wealthier nations. Companies have to be extra careful when selecting their suppliers and should not rely solely on low prices and quick turnaround times. Another challenge is getting accurate and up-to-date information about the suppliers. Without access to reliable sources, it can be hard to monitor supplier performance and be sure that they are

meeting environmental and ethical standards. It is essential to have a comprehensive system in place to audit suppliers and hold them accountable for their actions. transferring data among the company and suppliers efficient and securely, poor infrastructure and data security risks make it difficult for companies to trust their suppliers, which is a challenge for sustainable supply chain collaboration in Sri Lanka. Companies must ensure their data is secure and that suppliers comply with any data privacy regulations. Sri Lanka's unique economic, political, and infrastructure challenges mean that companies must take extra care when it comes to sustainable supply chain collaboration. Ethically sourcing from suppliers and ensuring data privacy are key steps in setting up a successful and sustainable supply chain. A descriptive analysis of each identified challenge is as follows:

- **Lack of a Sustainability Framework across Supply Chains.** Sri Lanka is facing a challenge when it comes to sustainable supply chain collaboration: the lack of a sustainability framework across its supply chains. As the country continues to develop its industrial infrastructure, so must its efforts to maintain the integrity of its supply chains. This means developing effective sustainability frameworks that ensure all actors involved are held accountable for their environmental, social, and economic responsibilities. The key to effective sustainability collaboration requires an integrated approach that takes into account a range of elements, including the cost of implementation, the training of personnel, and the implementation of relevant regulations. The development of a sustainability framework should include industry-wide standards, data tracking, and industry-wide reporting. Such a framework should also encourage collaboration between various stakeholders, including suppliers, producers, and retailers.

  In addition, the development of a sustainability framework should also account for the needs of local communities. This includes creating opportunities for their economic growth, such as by providing jobs and encouraging local entrepreneurship. Furthermore, the framework should build upon existing measures to protect the environment, prevent pollution, and promote responsible water, energy, and waste management practices. The framework should be reviewed and updated regularly in order to ensure it remains in line with the needs of the industry and the environment.

- **Poor Infrastructure**. Sri Lanka faces a significant challenge in terms of sustainable supply chain collaboration due to its poor infrastructure. Poor infrastructure prevents the establishment of efficient, scalable, and reliable supply chain networks, leading to an inability to meet customer demands.

The country has been struggling with the challenge of creating sustainable supply chain collaboration due to its poor infrastructure. Poor infrastructure in Sri Lanka includes a limited highway and road network, unreliable public transportation, a lack of port and shipping services, and inadequate airports and airfreight industries. Without a reliable transport system, it is difficult to collaborate effectively to manage a sustainable and secure supply chain. The limited road network leads to traffic congestion and a lack of access to remote areas, while unreliable public transportation makes it difficult to organise deliveries and shipments. The lack of ports and shipping services further reduces the possibilities for efficient supply chain solutions and collaborations. As the country's infrastructure has not been updated for some time and the existing infrastructure is significantly outdated, the country is competing in a global economy with a major disadvantage. Inadequate airports and airfreight activities limit the country's ability to fully participate in global supply chains. Furthermore, the lack of a modern sea freight industry reduces Sri Lanka's potential for efficient trade and collaboration.

As transport volumes are rising rapidly, energy demand has remarkably increased, and the communication network is reaching its optimum capacity. Being home to over 4,200 km of lengthy A-graded national highways, the sad state is that most highways are just two lanes or even less. The design of the highway is a matter of great importance since only a properly structured highway can withstand the pressure originating from the movement of heavy vehicles. Apart from being narrow, due to high traffic congestion, freight transportation gets disturbed.

Much can be achieved if there is better infrastructure and the ability to scale up to get products to less developed areas. There will be a huge opportunity once infrastructure bottlenecks are removed. Sri Lanka has the potential to emerge as a supply chain centre for the excellence of the region. The key infrastructural challenges involve the active role of roads and the road freight industry. These, in turn, are supported by power, energy, and ICT infrastructure. Although the Sri Lankan government has been taking steps to improve the country's physical infrastructure, there is still much ground to cover. Many years of underinvestment are now taking their toll on competitiveness as Sri Lanka still compares unfavourably to other emerging economies. In addition, structural inefficiencies in the financial system, coupled with global credit, have left the country with a shortfall in financing key infrastructure projects.

- **Lack of Managing Standard Environmental Control Policies**. Sri Lanka faces a unique challenge when it comes to sustainable supply chain collaboration: the lack of standard environmental control policies. Without these policies in place, companies are unable to make informed decisions about the sustainability of their supply chain operations, resulting in potential environmental hazards, economic losses, and social impacts. This issue is further compounded by the fact that environmental protection is not always a priority in Sri Lanka. The lack of adequate infrastructure and political will can contribute to the lack of standard environmental control policies. Despite this, there are still a number of initiatives that companies can undertake to ensure sustainable supply chain operations in Sri Lanka. Companies can first work to raise awareness of environmental issues by engaging stakeholders, such as industry associations, local communities, and government institutions. This will encourage stakeholders to prioritise environmental protection and understand the importance of managing standard environmental control policies. In addition to raising awareness, companies can also focus on developing and implementing their own environmental control policies. This will ensure that their operations are compliant with both local and international regulations and that their supply chain partners are held accountable for their sustainability practices.

- **Fragmented Supplier Base**. The challenge of sustainable supply chain collaboration in Sri Lanka is also attributed to its fragmented supplier base. This is mainly due to the various levels of cultural diversification among diverse suppliers located across different regions. The presence of different cultures requires companies to make unique efforts to build lasting relationships with each supplier in order to maintain a stable supply chain.

- **In General, a Lack of Knowledge and Experience**. In Sri Lanka, the lack of knowledge and experience in general logistics practises is proving to be a challenge for sustainable supply chain collaboration. Many companies do not yet have any policies or procedures in place to manage the complexity of their supply chain operations. This lack of understanding means that many organisations are uncertain about the best way to go about managing their supply chain collaborations, leading to delays in communication and delays in expected delivery. In order to successfully collaborate, it is crucial that companies have access to reliable and up-to-date information about their supply chain partners, as well as current trends and challenges in the industry. Understanding the complexities and nuances of managing supply chains is key to making sure that all members of the supply chain are

working together in sync. Companies should focus on building a culture of collaboration and understanding the challenges in their supply chain if they want to succeed.

Furthermore, in order to ensure that Sri Lanka is able to upskill in this area, it is important to provide resources and tools that help businesses easily manage and work towards their supply chain goals. This means that businesses should focus on providing training and knowledge programmes to their staff and using appropriate technology in order to manage their supply chain operations. By taking these steps, companies can ensure that they are well prepared and confident in their ability to successfully collaborate with their partners.

- **Lack of Process Expertise**. One of the key challenges to sustainable supply chain collaboration in Sri Lanka is the lack of process expertise. Despite the high potential of the region's supply chain to enable organisations to simultaneously reduce their environmental impact and build robust, reliable supply chains, a lack of experience and expertise in quality management practices can prevent organisations from achieving their sustainability goals. Organisations can mitigate this challenge by taking a systematic approach to process development and optimisation. Quality Management practices should be adopted to ensure that processes are conducted efficiently, consistently, and to the highest standards. Furthermore, organisations should focus on training and developing their teams to develop a shared understanding of quality management practices and enhance their process knowledge. It is also important to identify and utilise the right tools and technologies to enable efficient process execution and optimisation. Automation, artificial intelligence, and machine learning can be used to establish efficient processes that are tailored to the specific needs of the organisation and to the environment and context. This can help ensure that process implementation and optimisation are conducted in the most efficient and effective manner.

Moreover, it is important to build a culture of collaboration and knowledge sharing. Organisations should focus on developing a workplace environment that encourages and rewards team members for sharing their knowledge and expertise with each other. This will help organisations create an environment that is conducive to sustainable supply chain collaboration, as it will enable organisations to benefit from the collective knowledge and expertise of the team.

- **Complex System of Taxes and Government Regulations**. Sri Lanka's complex system of taxes and government regulations presents a significant challenge to sustainable supply chain collaboration. With constantly changing corporate tax rates and ever-shifting

political instability, it's increasingly difficult for businesses to build successful supply chain relationships. In addition, there is a lack of transparency surrounding Sri Lanka's tax policies, leading to difficulties when attempting to forecast the future of the country's economic and social environment. Therefore, it is essential for businesses engaging in sustainable supply chain collaboration in Sri Lanka to have a clear understanding of the country's taxation and government regulations. This requires robust research into the relevant tax policies as well as an understanding of how those policies may be impacted by political instability. Companies should also be aware of the need to monitor the country's economic and social climate on an ongoing basis and incorporate any necessary changes into their supply chain collaborations.

Furthermore, businesses must prioritise risk management both with respect to their own operations and those of their partners. To achieve this, companies should consider establishing sound procedural processes for all parties, including the development of effective tax plans and the implementation of clear communication procedures.

- **Operationalizing Sustainable Development Concept**. Sri Lanka, with its vibrant economy, is an ideal setting for companies to test out new approaches to sustainable supply chain collaboration. From its abundant natural resources to its dynamic workforce, Sri Lanka provides a dynamic ecosystem to allow companies to innovate and hone their approach to supply chain operations. However, while the country's potential is immense, it also poses a unique set of challenges. In order to fully harness the potential of sustainable supply chain collaboration in Sri Lanka, companies must recognise the importance of operationalizing sustainable development. Companies need to develop a comprehensive plan that accounts for all components of their supply chain, including input material sourcing and ethical labour practices. They must also ensure that their operations are built on the pillars of reduce, reuse, and recycle to keep their operations as sustainable as possible.

Furthermore, companies ought to focus on developing a sustainable supply chain culture by empowering local governments and promoting education opportunities. Companies need to ensure that they are actively invested in the local community in order to create a sustainable, equitable, and resilient supply chain environment.

Sustainable Supply Chain Collaboration Opportunities in Sri Lanka

When it comes to developing a sustainable supply chain in Sri Lanka, there are numerous opportunities to collaborate with businesses and organisations to meet environmental, social, and overall standards and demands. Utilising a green, ethical, and responsible supply chain can be immensely beneficial to businesses operating in this region. Consumer and investor demands for environmentally sustainable goods and services continue to rise, and as more companies strive to be green, increasing legislation and regulations around sustainability often follow. In order to build a resilient and compliant supply chain in Sri Lanka, collaborating with other entities is the best solution. This could include partnering with other businesses or organisations to ensure the goods and services they provide meet the required standards and legislation.

Due to Sri Lanka’s geographical location, the country is well positioned to take advantage of the various resources that are abundant in the region. By collaborating with local suppliers and businesses to source materials and goods, this could significantly reduce the carbon footprint of the supply chain and contribute to a cleaner and greener end product. Supply chain collaboration can also benefit overall social standards, allowing for improved working conditions for all staff and leading to businesses being more profitable and ethical. Working together to develop a sustainable, responsible and ethical supply chain in Sri Lanka can lead to increased investor confidence, improved employee job satisfaction, and increased customer satisfaction.

Solutions for Sustainable Supply Chain Collaboration in Sri Lanka

Sri Lanka's supply chain sector is poised for sustainable growth. To achieve this, the country's logistics industry must begin to embrace the concept of collaboration. Collaboration within the supply chain between vendors, customers, and stakeholders will increase efficiency and reduce costs, ultimately leading to better performance and improved sustainability. Integrated logistics is a key component of sustainable supply chain collaboration. By connecting stakeholders across the supply chain, the logistics process can become much simpler, faster, and more reliable. This will help Sri Lanka's supply chain become more efficient, allowing for stronger customer service and improved transparency.

To effectively achieve integrated logistics, Sri Lanka must focus on solutions that offer automated processes that remove manual processes from the supply chain. Automated solutions should be flexible, allowing for scaling upwards or downwards based on demand and using modern

tools such as AI, machine learning, blockchain, and digital platforms. These solutions should enable collaboration across the supply chain and encourage broader engagement between stakeholders.

Sri Lanka should also focus on creating solutions that enable collaboration for a broad range of stakeholders, including delivery companies, warehouses, vendors, retailers, and other supply chain participants. These solutions should be tailored to the specific needs of each stakeholder and should make it easy to monitor, analyse, and improve operations. By leveraging modern technology, such as cloud-based solutions and mobile-focused applications, Sri Lanka's supply chain should be able to deliver better customer service and improve performance.

Conclusion

Sri Lanka is a country that has a rich heritage and diverse economy. However, in recent years, sustainability has become a crucial topic in the country's economic and environmental development. One of the major challenges for Sri Lanka is developing and enhancing sustainable supply chain collaboration. Sri Lanka's supply chain can have a significant impact on the environment, economy, and society if collaborative efforts are not put in place. As a result, there is a critical need for different forms of collaboration and partnerships within the supply chain, including collaboration between stakeholders and government agencies. Enhancing sustainable supply chain collaboration in Sri Lanka will improve the country's economic growth while ensuring environmental sustainability and social well-being.

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HOW VALUE NETWORK EFFECT TO SUPPLY CHAIN

By

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Abstract

Building supply chain network evolution models may be useful to comprehend it is development law. However, current evolution models frequently overlook certain traits and aspects of actual supply chains. This article suggests a brand-new supply chain evolution modelcentered on manufacturers that is driven by external market demand and internal competition and cooperation and value network. The evolution model, which makes the assumption that the external market environment is largely steady, takes into account a number of variables, such as the supply chain's precise topology, external market demand, ecological growth, and flow preservation. The simulation results imply that the networks generated by our model contain structures that are similar to those of actual supply chains. In the meantime, the effects of internal rivalry and cooperation on network evolution are being studied.

Keywords: Value Network, Supply Chain

Introduction

Here, network economics plays a significant role. A company's capacity to utilize lowercosts and global logistics may deteriorate over time if its business strategy does not call for a transition into an industry-based network. The ultimate objective of the firm is to deliver the best possible customer service through all channels at the lowest possible landed cost, while maintaining the highest standards of quality and minimizing any negative effects on the environment. This is accomplished using a network. Companies will use network effects to boost their growth rates, which is an important point to keep in mind while thinking about network economics. And with considerable increases in market share, they will have a tendencyto maintain their lead once they get it. As their network footprint increases.

Value Network

A value network is a collection of links between businesses and/or people who interact with one another for the good of the whole group. A value network enables its users to share knowledge as well as purchase and sell goods. These networks can be seen using a straightforward mapping tool that displays the nodes (members) and connectors (relationships). The Clayton Christensen network, the Fjeldstad and Stabells network, the Normann and Ramirez constellations, and Verna Allee's networks are among the principal varieties of value networks.

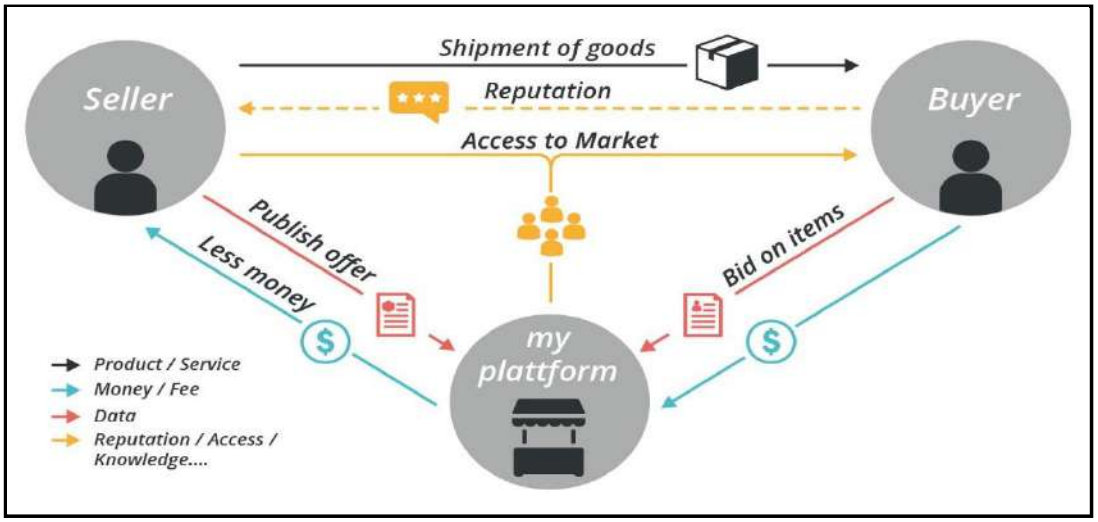

Figure 1. The Diagram of Value Network Business Module
Source: https://bmtoolbox.net/tools/value-network

Benefits of a Value Network

A firm or individual applying the resources, influence, and insight of people to whom they are connected is how a value network benefits them. For example, a startup may rely on its contacts outside of the company, such as its mentors and investors, to offer knowledgeable advice on how to approach the development and expansion of the company. While many founders have a thorough understanding of the product or service they create, it's possible that they are unfamiliar with the marketing, customer acquisition, and business growth processes. They may consult dependable parties with relevant experience to make up for this deficiency, which is regarded as an intangible advantage of their partnership. They may also look to organizations that.

Supply Chain

The supply chain network is made up of a sizable number of businesses and their mutually beneficial alliances, whereby the businesses directly or indirectly collaborate with thecore businesses. Businesses act as nodes in such a network, while relationships between them defined as supply-demand relationships in this work act as links. The supply chain network with manufacturers at its center, as regulates the movement of materials, information,and value from the process of purchasing raw materials, through the processes of processing semi-finished products, manufacturing, warehousing, and distribution, and finally to the retail process that sells products to customers. It shares many traits with other complex networks including their size, sparse connections, small world, lack of scale, dynamic nature, self-similarity, and superfamily. The most particular quality.

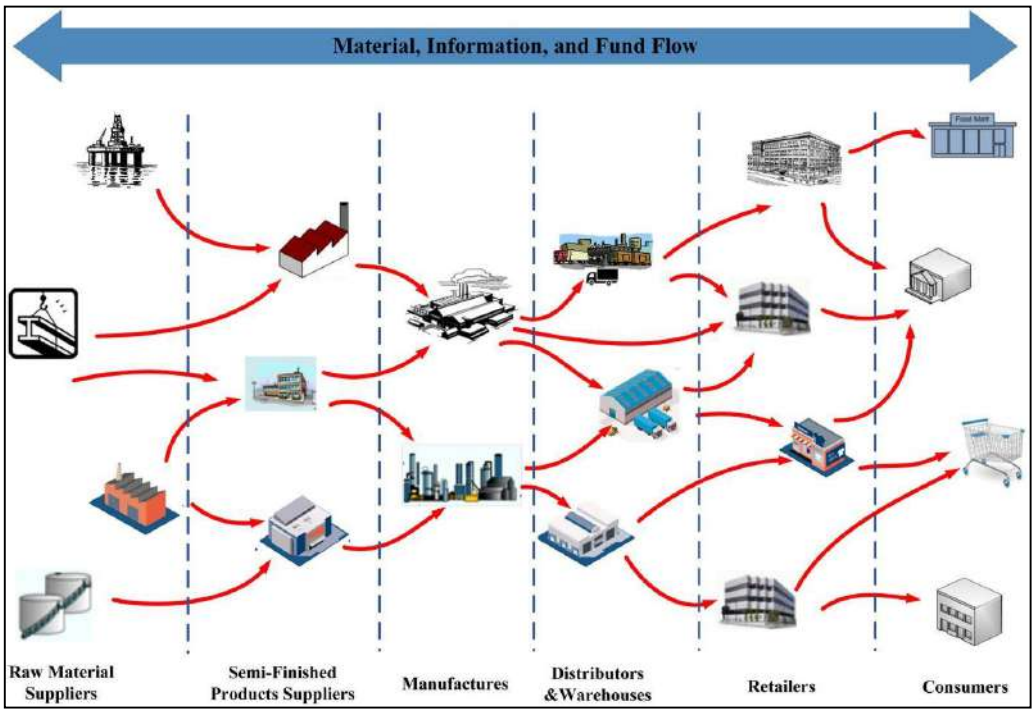

Figure 2. The Schematic Diagram of Supply Chain Network, Which is a Network with Manufactures as the Core

Source: https://bmtoolbox.net/tools/value-network

We can better manage and regulate the supply chain network by being aware of its evolution law. The supply chain is an example of a typical complex adaptive system, according to Surya D. Pathak. He investigated the dynamic formation and expansion of the supply and demand network and explored the possibility that it is governed by some straightforward rules.Real supply chain networks that are undergoing evolution have had their scale-free property quantitatively studied by H.-J. and J.-J. Wu . The complexity of the supply chain, according to Dirk Helbing, cannot be explained by

conventional algorithms or models, and he came to the conclusion that the topology and macro nature of the network that makes up the supply chain have a direct impact on its micro modifications. Additionally, internal competitiveness and cooperation play a significant impact.

The SCM is defined as the management of a network of relationships within an organization and between mutually dependent organizations, including material suppliers, procurements, manufacturing capabilities, logistics, advertising, and related systems thatsmooth out future progress and turn around the flow of materials, money, and information fromthe innovative manufacturer to the final consumer with the benefits of adding value and maximizing profitability. The monitoring of executive actions by supply chain management ensures that commodities continue to move in a linear fashion from suppliers to producers to distributors and retailers. The industrial sector is being powerfully twisted into the focus of SCM. The client must desire the value if it is to be added.

The theory of value chains has contributed useful knowledge to the research community, but it has a limitation that restricts its application to controlling a sequential, controllable chain of events. Therefore, value chain theory is unable to explain the dynamics and unforeseen occurrences that organizations encounter in real-world situations. (Peppard andRylander 2006; Sherer 2005). Thus, the theory of value networks arose together with the development of value chain theory. As a result, the notion of value networks evolved concurrently with the creation of value chain theory. This viewpoint gives understanding of crucial elements like process change and trust mechanisms. (Sherer 2005). Since networks canprovide access to resources that the company would not otherwise have, the idea of networks is also crucial (Birley). If value is to be added, the client must then want the goods. As a result,the client should be the information's basis in honesty. The representative of that range will need to be reevaluated in cases when demand management has insufficient data of qualifying ranges. (Boon-itt & Pongpanarat, 2011). The primary criteria used to represent SCM methods are outlined in Level 2. For measuring SCM, four specific criteria have been chosen: demand management, integration, collaboration, and inventory management. The sub-criteria for eachof the four chosen criteria make up Level 3.

Many distinct meanings of "supply chain management" may be found in the pertinent literature, and there is no single definition that is universally accepted. For instance: "A conceptwhose primary goal is to integrate and manage the sourcing, flow, and control of materials across multiple functions and multiple tiers of suppliers using a total systems perspective." Masters and La Londe (1994).The goal of managing the supply chain is to balance what are frequently perceived as competing goals of good customer service, poor inventory management, and cheap unit cost. To do this, one must synchronize the client's demand with the flow of materials from suppliers. As can be

seen from these definitions, supply chain management contains the following characteristics:

- Coordinating and overseeing the sourcing, movement, and management of materials.
- Supply chain management includes the movement of goods from suppliers to customers.
- Possibly a large number of clients and suppliers.
- Coordinating the receipt, processing, and delivery of materials to customers.
- Achieving high levels of customer satisfaction while keeping expenses down for thebusiness.

According to the analogy of material moving down a river, supply chains are frequentlysplit into upstream and downstream operations, entering and then leaving operations as the flow of materials into the organization is known as upstream. Downstream - the movement of materials from an organization to its clients. Although materials can often be delivered directlyfrom supplier to client, with the organization serving as the flow coordinator, these terms mayoccasionally need to be defined broadly. The following value chain activities will be considered to be a part of the upstream supply chain for companies who produce their own goods:

- Procurement is the buying of inputs like supplies, materials, and machinery.
- Receiving raw supplies, maintaining inventories, and distributing to production processes as needed.

Supply Chain Push-Pull ODEL

A push model of the supply chain focuses on manufacturers pushing out products to distributors and customers in accordance with past demand trends. The holding of inventory serves as a safety net in case of unforeseen demand or manufacturing delays. In contrast, a pullmodel drives production and delivery in response to demand. Because orders from customers are what drive ordering and production, just-in-time inventory control is essentially a pull model. Before there is downstream demand, neither orders nor manufacturing are initiated. Thedemand for a product would never force a supply chain to start mining iron ore and creating steel, hence pure push or pull models only exist in theory. A push model won't ensure that thegoods produced will be purchased either.

Every supply chain will eventually reach a point where demand push and demand pull collide, and inventory will start to build up. Keep in mind that pull systems are more challenging to

organise when there are great distances between suppliers and buyers or when there are lengthy procedures. Yet, if all stakeholders in the supply chain can be better synchronized and have short response times, inventory can be reduced and customer service can be enhanced. As an illustration, a conventional methodology for refilling inventory in supermarkets would entail each shop issuing an order to suppliers, most likely using electronic data interchange (EDI), once inventory falls below reorder level. Orders, however, then appear "out of the blue" at suppliers, who must either have adequate production capacity or have stockpiles to react swiftly. Giving suppliers extranet access to supermarket inventory information so they may track inventory levels and rates of change is a better solution. Even without waiting for an order, supplies can be sent.

Information technology greatly aids in the transition to a pull model by influencing the downstream supply chain through the six pillars of e-business:

- Intelligence - for instance, websites can monitor user activity and utilize that information to analyze which products are gaining or losing popularity.

- Direct information input into a data warehouse is possible for later analysis and data mining.

- Interactivity: Online shoppers have the option to customize their purchases. For instance, several computer manufacturers provide custom builds that let customers choose from a variety of hardware and software setups.

- Integration - building on interactivity, the pull process can start by arranging the ordering, production, and shipment of component parts after an order has been placed.

- Individualization - each consumer may receive offers that are pertinent to them. If a specific item has been purchased.

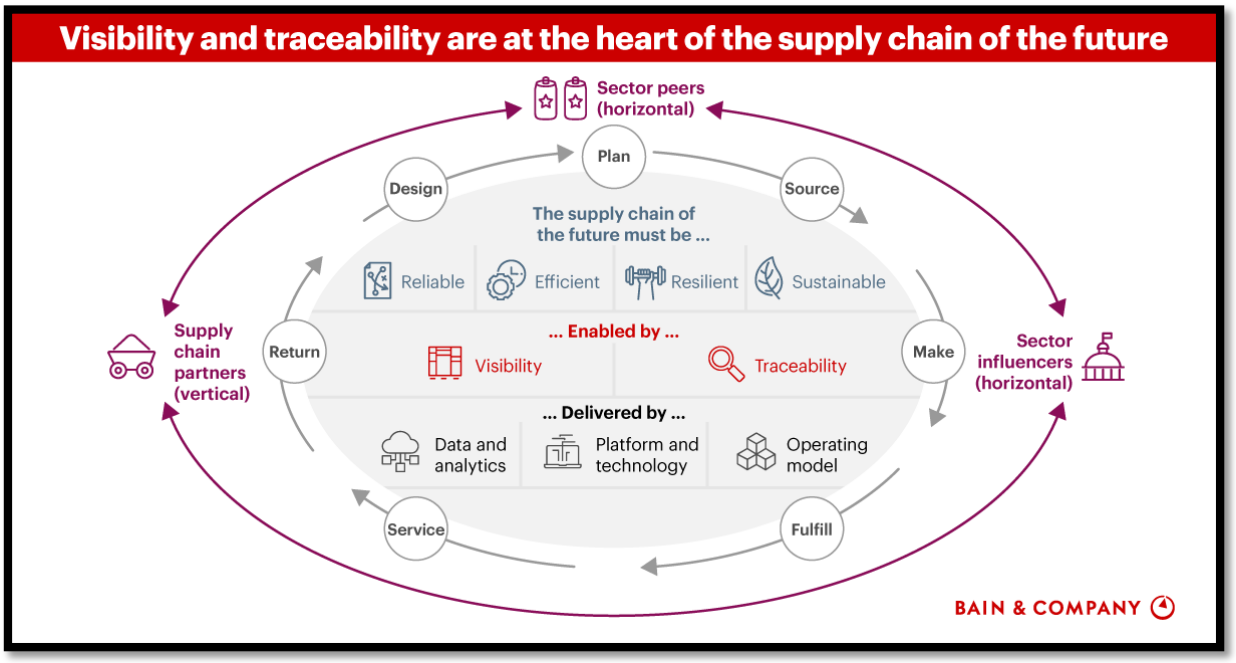

Figure 2. The Diagram of Supply Chain Pathway
Source: https://bmtoolbox.net/tools/value-network

The components of the downstream supply chain will be taken for granted, outbound logistics, or the storage and delivery of finished items. Marketing and sales—finding out what customers want and making sales. According to the research's conclusions, SMEs may have less successful ongoing supply chain networks if they are not strategically linked to improve performance. This shows that in order to further strengthen and expand SMEs' collaborative network skills, it is necessary to develop their existing networking relationships through a planned intervention approach. This will improve SMEs' customer and supplier integration strategies and might persuade them to see the value of supply chain networks. In order to better understand and implement supply chain network and business performance, the intervention approach may start by creating groups of supply chain networking SMEs within the Southern Gauteng subregion. In these groups, important information on effective business managementstrategy challenges is shared. SMEs networking competition awarding programmes.

Conclusion

The development of information technology applications that support the terminology that has been used to describe the area has, in our opinion, followed the history of SCM. Furthermore, we have proposed that a broader interpretation of the term, shifting from a focus

on SCM to value network advocacy, more truly reflects the future requirements of businesses. Yet, we argue that due to flaws in trust processes and metrics, information technology solutionsthat support this idea won't be widely used. We have argued that the development of supply chain management (SCM) concepts has been matched by the information systems that supportthe supply chain. Effective fulfillment through supply chain linear linkages has been emphasized in the language of SCM. The applications of technology.

We have argued that the evolution of information technology applications that support the terminology that has been used to describe the area has paralleled the history of SCM. Also, we have recommended that a larger conception of the language, shifting from emphasis on SCM to value network advocacy, more truly reflects the future requirements of businesses. We contend, however, that the lack of adequate trust mechanisms and measurements will prevent the widespread adoption of information technology applications that support this idea. We haveargued that the development of supply chain management information systems has followed the concept's development. Effective fulfillment through linear supply chain relationships has been the focus of the language of SCM the applications of information technology.

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VALUE CREATION TO VALUE NETWORK IN GREEN PROCUREMENT

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Abstract

Sustainable procurement (Green Procurement) can help businesses ensure that they are sourcing products and materials in a responsible and ethical manner. This can help to protect human rights, promote fair labour practices, and support local communities, which can help to create a positive impact on society. Customers who are socially and environmentally conscious are more likely to support businesses that prioritize sustainable procurement, which can help to build customer loyalty and enhance brand reputation.

Further, sustainable procurement can help businesses reduce their environmental footprint by sourcing products and materials that are produced using sustainable practices. This can help to reduce greenhouse gas emissions, conserve natural resources, and protect biodiversity. By promoting sustainability, businesses can help to create a cleaner and healthier environment for their customers and future generations.

Keywords: Value Creation, Green Procurement

Introduction

Green procurement refers to the process of purchasing goods and services that have a minimum environmental impact. In this context, value creation in green procurement refers to the creation of economic, social, and environmental value through the procurement process.

Value creation in Green procurement can be achieved by selecting suppliers that are committed to sustainable practices, reducing the use of materials and energy in the production process, and choosing products that are recyclable or biodegradable. These actions can help to reduce the overall carbon footprint of an organization, increase resource efficiency, and enhance the reputation of the organization as a responsible corporate citizen. However, to fully realize the benefits of Green procurement, organizations must also focus on building a value network that supports sustainable practices. A value network refers to the interconnected set of organizations, individuals,

and institutions that collaborate to deliver value to customers. In the context of Green procurement, a value network would include suppliers, customers, regulators, and other stakeholders who are committed to sustainable practices.

Creating a strong value network in Green procurement requires collaboration and communication among all stakeholders. This includes engaging with suppliers to identify opportunities for sustainable improvements, working with customers to promote sustainable products and practices, and partnering with regulators to ensure compliance with environmental regulations.

Ultimately, the creation of a strong value network in green procurement can help to drive innovation, reduce costs, and enhance the overall sustainability of an organization. By working together to promote sustainable practices, organizations can create a more resilient and environmentally responsible supply chain, which will benefit both the organization and society as a whole.

Sustainable Procurement is Now Solidly Entrenched in Procurement Priorities

Sustainable procurement has become increasingly important in recent years and is now solidly entrenched in procurement priorities for many organizations. This is due to a growing awareness of the impact that supply chain activities can have on the environment, society, and the economy. Sustainable procurement involves the integration of environmental, social, and economic considerations into the procurement process, with the goal of promoting sustainable outcomes.

There are several factors that have contributed to the growing importance of sustainable procurement. First, there is increasing pressure from stakeholders, including customers, investors, and regulators, for organizations to operate in a sustainable manner. This has led many organizations to prioritize sustainable procurement as a way to demonstrate their commitment to sustainability and to meet stakeholder expectations.

Second, there is growing recognition of the potential risks associated with unsustainable procurement practices, such as reputational damage, legal liability, and supply chain disruptions. By prioritizing sustainable procurement, organizations can mitigate these risks and create a more resilient and sustainable supply chain.

Third, sustainable procurement can also offer significant economic benefits, including cost savings through increased resource efficiency and reduced waste, as well as the creation of new business opportunities through the development of sustainable products and services.

Sustainable procurement is now solidly entrenched in procurement priorities for many

organizations and is viewed as a critical component of a sustainable and responsible business strategy. As sustainability continues to gain importance as a business imperative, it is likely that the importance of sustainable procurement will only continue to grow

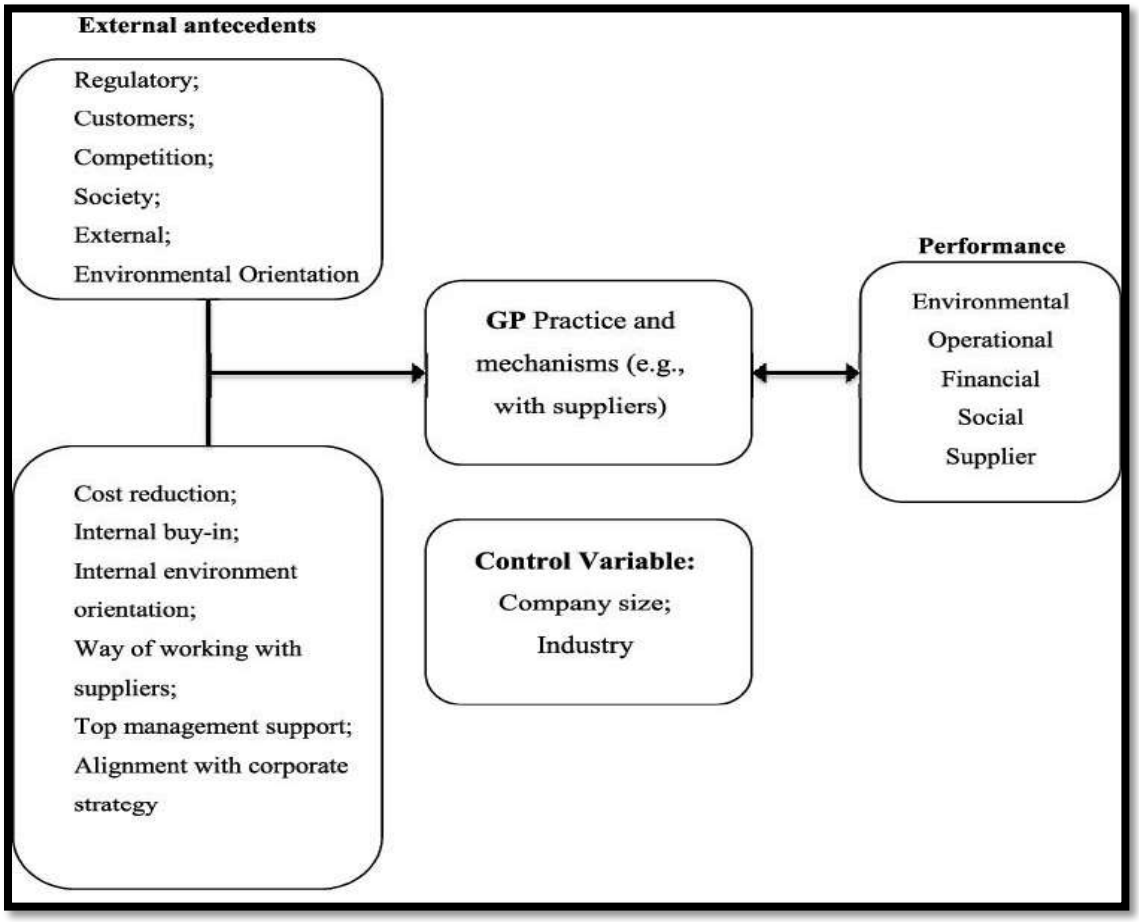

Figure 1: Conceptual Model of Green Procurement
Source: Developed by Author

Importance of Value Creation to Sustainable Procurement

Value creation is an essential component of sustainable procurement because it helps organizations to achieve their sustainability goals while also creating economic, social, and environmental benefits. By prioritizing value creation in sustainable procurement, organizations can achieve the following:

- **Economic Value**. Sustainable procurement can help organizations to reduce costs, increase efficiency, and create new business opportunities. By selecting suppliers that offer environmentally sustainable products and services, organizations can reduce the costs associated with waste disposal, energy consumption, and raw material procurement. Additionally, by promoting sustainable practices throughout the supply chain, organizations

can enhance their brand reputation, attract new customers, and create new business opportunities.

- **Social Value**. Sustainable procurement can also create social value by promoting the well-being of employees, suppliers, and communities. By choosing suppliers that are committed to sustainable practices, organizations can support the health and safety of workers, promote fair labor practices, and improve working conditions. Additionally, by reducing the environmental impact of their operations, organizations can contribute to the overall health and well-being of local communities.

- **Environmental Value:** Sustainable procurement can have a significant impact on the environment. By selecting products and services that have minimum environmental impact, organizations can help to reduce carbon emissions, conserve natural resources, and protect biodiversity. Additionally, by promoting sustainable practices throughout the supply chain, organizations can help to address global environmental challenges, such as climate change and deforestation.

By focusing on value creation in sustainable procurement, organizations can achieve their sustainability goals while also creating economic, social, and environmental benefits. This can help to enhance the overall sustainability of the organization, while also contributing to a more sustainable and responsible global economy.

Relationship of Value Creation to Value Network

Value creation and value networks are closely related concepts in business. Value creation refers to the process of generating economic, social, or environmental value for an organization, while a value network refers to the network of relationships and interactions among the various stakeholders involved in the creation and delivery of value.

In a value network, value is created through the collaborative efforts of various stakeholders, such as suppliers, customers, distributors, and other partners. Each stakeholder contributes to the value-creation process in a unique way, and the network as a whole is responsible for the creation and delivery of value to customers.

Value creation and value network are interdependent because value creation is only possible through the effective collaboration and coordination of stakeholders within the value network. By

creating value together, stakeholders can achieve common goals, improve efficiency, and create economic, social, and environmental benefits for all parties involved. For example, a company may create value by adopting sustainable procurement practices that reduce its environmental impact and create economic benefits through cost savings and increased efficiency. This value creation may also benefit suppliers and customers within the value network, who may also see cost savings and other benefits from sustainable procurement practices.

The relationship between value creation and value networks is critical for organizations seeking to create sustainable and responsible business practices. By understanding the relationships and interactions within the value network, organizations can identify opportunities for value creation, enhance collaboration among stakeholders, and create economic, social, and environmental benefits for all parties involved.

Impact of the Stakeholders in Green Procurement

Stakeholders play a crucial role in green procurement, as they have a significant impact on the sustainability and social responsibility of an organization's procurement practices. Stakeholders can include a range of actors, such as customers, suppliers, employees, investors, regulators, and civil society organizations. The impact of stakeholders in green procurement can be understood in the following ways:

- **Customer Impact**. Customers are increasingly concerned about the environmental and social impact of the products and services they purchase. By prioritizing green procurement, organizations can meet customer expectations and improve their brand reputation. Customers can influence an organization's procurement practices by demanding eco-friendly products and services and supporting companies that adopt sustainable practices.

- **Supplier Impact**. Suppliers are critical stakeholders in green procurement as they can provide sustainable products and services, and influence an organization's procurement practices. Organizations can work with suppliers to adopt sustainable practices, and in turn, suppliers can offer eco-friendly products and services that meet the organization's procurement needs.

- **Employee Impact**. Employees play a vital role in green procurement, as they can drive sustainable practices throughout the organization. Organizations can create a culture of sustainability by engaging employees in sustainable procurement practices and providing

training on environmental and social responsibility. Employees can also offer innovative ideas and solutions to improve an organization's procurement practices.

- **Investor Impact**. Investors are increasingly interested in sustainability and social responsibility, and can influence an organization's procurement practices by investing in companies that prioritize sustainable practices. Organizations can attract investment by adopting green procurement practices and demonstrating their commitment to sustainability and social responsibility.

- **Regulator Impact**. Regulators can also influence an organization's procurement practices through laws and regulations that promote sustainability and social responsibility. Organizations that adopt green procurement practices can comply with regulations and avoid legal and reputational risks associated with non-compliance.

- **Civil Society Impact**. Civil society organizations can influence an organization's procurement practices through advocacy and public pressure. By engaging with civil society organizations and responding to stakeholder concerns, organizations can build trust and enhance their reputation.

Overall, stakeholders play a critical role in green procurement, and their impact can be significant in driving sustainable and responsible procurement practices. Organizations that prioritize stakeholder engagement and respond to stakeholder concerns can create economic, social, and environmental value while enhancing their brand reputation and competitiveness.

Concept of Creating Values for the End-users through Green Procurement

Green procurement can create value for end-users, such as consumers or individuals who use products or services, in several ways:

- **Environmental Benefits**. Green procurement can result in products or services that have less environmental impact, such as reduced greenhouse gas emissions, reduced pollution, and conservation of natural resources. End-users who are environmentally conscious may be more likely to choose products or services that are produced sustainably.

- **Health Benefits**. Green procurement can result in products or services that are healthier for end-users. For example, using eco-friendly cleaning products can reduce

exposure to harmful chemicals, and organic food can reduce exposure to pesticides. End-users who are health-conscious may be more likely to choose products or services that are produced sustainably.

- **Cost Savings**. Green procurement can result in cost savings that can be passed on to end- users. For example, using energy-efficient appliances can reduce electricity bills, and using public transportation can reduce transportation costs. End-users who are cost- conscious may be more likely to choose products or services that are produced sustainably.

- **Improved Quality**. Green procurement can result in products or services that are of higher quality, such as products that are more durable, reliable, or perform better. End-users who prioritize quality may be more likely to choose products or services that are produced sustainably.

- **Brand Reputation**. Green procurement can enhance the brand reputation of companies, which can positively influence the buying decisions of end-users. End-users who are loyal to environmentally responsible brands may be more likely to choose products or services that are produced sustainably.

Considering the above facts green procurement can create value for end-users by providing environmentally responsible products or services that are of high quality, cost-effective, and aligned with their values and preferences. By adopting green procurement practices, companies can enhance their competitiveness, create economic, social, and environmental value, and meet the needs and preferences of end-users.

Green Procurement is an Impact on Integrated Logistics

Green procurement can have a significant impact on integrated logistics, which involves the coordination and integration of various activities involved in the movement of goods and services from suppliers to customers. Some ways in which green procurement can impact integrated logistics include:

- **Supplier Selection**. Green procurement involves selecting suppliers based on their sustainability and environmental performance. This can influence the selection of logistics providers who are also committed to sustainability and have established green logistics practices, such as using fuel-efficient vehicles, optimizing delivery routes, and

minimizing packaging waste.

- **Packaging and Transportation**. Green procurement can also impact the packaging and transportation of goods. Sustainable packaging materials and practices can be used to minimize waste and reduce the environmental impact of logistics operations. In addition, green procurement can promote the use of alternative transportation modes, such as rail or water transport, which can be more fuel-efficient and emit fewer greenhouse gas emissions.

- **Inventory Management**. Green procurement can also impact inventory management practices. By purchasing only what is needed and avoiding overstocking, companies can minimize waste and reduce the need for unnecessary transportation and storage, leading to a more efficient and sustainable logistics system.

- **Collaboration and Communication**. Green procurement requires collaboration and communication between different stakeholders in the supply chain, including suppliers, logistics providers, and customers. By establishing a sustainable procurement policy and engaging with suppliers and logistics providers on sustainability issues, companies can promote the adoption of sustainable logistics practices and create a more integrated and sustainable supply chain.

Green procurement can have a positive impact on integrated logistics by promoting the adoption of sustainable logistics practices, minimizing waste and emissions, and creating a more integrated and collaborative supply chain. By adopting green procurement practices, companies can improve their sustainability performance, enhance their competitiveness, and create economic, social, and environmental value.

Conclusion

Value creation of consumer goods through green procurement can indeed create a value network and benefit end-users through collaboration. When companies adopt green procurement practices to source raw materials, manufacture products, and distribute them to customers, they can create a value network that includes suppliers, logistics providers, and customers. This value network can create value for end-users in several ways, such as:

- Lower environmental impact
- Healthier products

- Cost savings
- Improved quality
- Brand reputation

By creating a value network that includes suppliers, logistics providers, and customers, companies can create economic, social, and environmental value, enhance their competitiveness, and promote sustainability. Through collaboration, companies can establish sustainable procurement policies, engage with suppliers and logistics providers on sustainability issues, and create products and services that meet the needs and preferences of end-users. Overall, the value creation of consumer goods through green procurement can benefit end-users and create a sustainable and profitable business model.

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PROCUREMENT AND SOURCING IN INTEGRATED SUPPLY CHAINS

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Abstract

Procurement and sourcing play a critical role in the success of integrated supply chains. With the rise of globalization and complex supply chains, procurement professionals must adapt to new challenges and opportunities. Effective procurement and sourcing strategies can help organizations optimize their supply chains, reduce costs, and improve quality. This paper will explore the key concepts and benefits of procurement and sourcing in integrated supply chains, including the strategic impact of sourcing, stages of value process, gaining strategic supplier preference, co-creation of value through procurement and sourcing, benefits of procurement and sourcing and the use of technology and data analytics. Additionally, this paper will discuss best practices for procurement and sourcing in integrated supply chains, such as collaboration with suppliers, strategic sourcing, and risk mitigation strategies. Ultimately, this paper will provide a comprehensive overview of procurement and sourcing in integrated supply chains, highlighting the critical role they play in driving supply chain performance and organizational success.

Keywords: Procurement, Sourcing, Strategic Impact, Value Creation, Value Process, Integrated Supply Chain

Introduction

In today's highly competitive business environment, creating value through procurement and sourcing efforts is crucial for organizations to remain profitable and sustainable. Procurement and sourcing are critical components of the supply chain management process that involves identifying, evaluating, selecting, and managing suppliers to ensure the timely and cost-effective delivery of goods and services. Effective procurement and sourcing strategies can help organizations achieve cost savings, improve supply chain efficiency, reduce risk, and enhance customer satisfaction. However, creating value through procurement and sourcing efforts is not just about selecting the right

suppliers, but it also involves developing strong relationships with suppliers, fostering innovation, and ensuring compliance with ethical and sustainability standards. For supply chain professionals, especially those with procurement and sourcing responsibility, the nature of value has changed over time. This essay will explore how procurement and sourcing efforts can create value in integrated supply chains.

As shown in Figure 1, the focus has shifted from how to obtain the lowest unit price through negotiation and "win-lose" approaches toward a more general value approach. This shift started when firms began to recognize that focusing on the lowest unit price created not ideal decisions when, for example, the lowest price supplier produced a poor-quality product or the cost of transportation and additional inventory outweighed the unit price savings. As such, firms began to focus more on understanding supply chain cost compromises and looking for lowest total landed or ownership cost. Now, some supply chain focuses on best value arrangements understanding that total cost does not always reflect the real picture the value.

Figure 1: Evolving Performance Focus
Source: Developed by Author

Value is in the eye of the perceiver and still defined by the ability to generate cost savings or mitigate cost increases, such as considering ways to contain commodity price fluctuations. While cost reduction strategies are important, they are not the only approach for generating value. Further, sourcing strategies, such as off-shoring versus near-shoring, Impact inventory levels which affects not just inventory carrying costs, but also inventory utilization. As shown in Figure 2, value is a multi-dimensional concept that provides procurement and sourcing professionals with a wide range of options for contributing to a firm's goals and objectives.

Figure 2: Financial Impact
Source: Developed by Author

Strategic Impact of Sourcing

The strategic impact of sourcing refers to the long-term effects and benefits that effective sourcing practices can have on a company's overall procurement strategy and its ability to achieve its goals. Sourcing refers to the process of identifying, evaluating, selecting, and managing suppliers who provide goods or services to a company. By implementing effective sourcing strategies, a company can achieve several benefits, such as cost savings, improved quality of goods and services, and reduced supply chain risks. The challenge for many supply chain organizations is understanding and defining value and creating strategic impact. Connecting supplier capabilities to customer requirements and developing value propositions that are unique and compelling is critical.

The importance of understanding future value highlights the demand for more strategic sourcing in procurement. Strategic sourcing needs understanding current and projected supplier capabilities and putting special emphasis on matching capabilities with customer need. It is crucial to comprehend how supplier relationships can impact business in this scenario. Impact the growth of the buying firm as well as its global footprint. As an example, the strategic suppliers need to understand the buying firm’s plans in different global markets and associate that with the supplier capabilities needed in various regions. In some cases, when suppliers’ skills do not match what is needed in a particular region, it means new suppliers must be qualified. Therefore, engaging with critical suppliers to comprehend and take advantage of their special expertise and capabilities helps improve the company's value proposition. Further, it emphasizes that the firms should be looking for suppliers with the skills and researching providers with the knowledge that the firm lack.

The Businesses must link customers and suppliers in the integrated supply chain in order to have a strategic influence. So, the supply chain organization is now more concerned with providing consumers with the innovation they require and want rather than merely achieving a general cost reduction objective and managing internal and external connections more effectively. The Using various inventory management systems, such as vendor managed inventory, and efficient information technology or systems, such as enterprise resource planning (ERP), expedited demand planning processes that gave suppliers information sooner. Therefore, everything really runs more smoothly with the improved vision. Not only lower inventory, but also that of our suppliers. In this respect, supplier, firms' collaboration, and integration in much needed for creating ultimate strategic influence in order to gain the strategic impact of the sourcing of a firm.

Stages of Value Process

An integrated supply chain is a comprehensive system that encompasses various processes and stakeholders involved in the production, distribution, and delivery of goods or services. One of the interesting challenges for procurement and sourcing organizations is how to expand the relevant scope of responsibility in order to provide more opportunity for value creation and strategic impact. When supply chain professionals remain locked in functional silos with functional metrics and limited visibility or responsibility for end-to-end integrative processes, the value potential is limited, and often results in a focus on lowest price. An integrated supply chain includes three processes related to value as value creation, value delivery, and value maintenance (Madhani, 2012).

The figure 3, shows the link between the three components of the value process. These processes aim to ensure that the final product or service meets the customer's needs and expectations while optimizing efficiency and reducing costs. By integrating these processes, companies can achieve a seamless and effective supply chain that maximizes value for all stakeholders involved. The value creation process is the first step in an integrated supply chain. It involves designing and developing products and services that meet the needs and desires of customers. This requires a deep understanding of customer needs and preferences, as well as the ability to anticipate and respond to changes in the market. Companies must also balance the desire for innovation with the need to maintain consistency and reliability in their products and services. Once value has been created, the focus shifts to the value delivery process. This involves the physical movement of products and services from the manufacturer to the end-user. It requires careful planning and coordination to ensure that products are delivered on time, in the right quantity, and at the lowest possible cost. This process involves a range of activities, including transportation, warehousing, inventory management,

and order fulfillment.

Finally, value maintenance is the process of ensuring that customers continue to receive value from the products and services they have purchased. This involves ongoing customer support, product maintenance and repair, and the development of new products and services that meet changing customer needs. By maintaining a focus on value creation, delivery, and maintenance, companies can create a competitive advantage that sets them apart from their competitors. An integrated supply chain is critical to achieving this advantage and building a successful business that delivers value to customers while maximizing profitability.

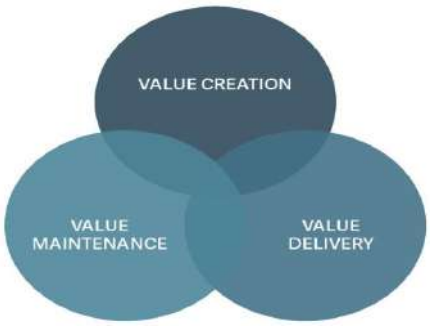

Figure 3: Evolving performance focus
Source: Developed by Author

Gaining Strategic Supplier Preference

Becoming a "customer of choice" for your suppliers is a strategic approach for creating value that involves building strong relationships with your suppliers and positioning your organization as a preferred customer. This approach recognizes that suppliers play a critical role in the success of a business and that strong supplier relationships can lead to increased value, including better pricing, faster delivery times, higher quality products, and access to innovative technologies and ideas.

To become a customer of choice, organizations need to focus on several key factors. First, they need to establish clear and open communication channels with their suppliers, which allows for better collaboration and problem-solving. Second, they need to treat their suppliers fairly and with respect, which helps to build trust and credibility. Third, they need to provide their suppliers with a stable and predictable demand for their products or services, which helps to ensure a steady stream of supply and encourages suppliers to invest in improving their offerings. Finally, they need to work with their suppliers to develop mutually beneficial agreements that align incentives and promote long-term success for both parties. Overall, the goal of becoming a customer of choice is to create a win-win situation for both the organization and its suppliers. By building strong relationships and

providing value to its suppliers, an organization can gain access to better products and services at a lower cost, which can help to improve its competitive position and create value for its customers.

Co-creation of Value through Procurement and Sourcing

The co-creation is a collaborative process where different stakeholders come together to create something that delivers value to all parties involved. In the context of procurement and sourcing efforts in integrated supply chains, co-creation involves working closely with suppliers and other partners to identify opportunities for innovation and improvement throughout the supply chain. Through co-creation, organizations can leverage the expertise and resources of their suppliers to create more value for their customers. This process involves identifying and addressing inefficiencies in the supply chain, developing new products and services, and improving existing processes and systems. By working together, organizations and their suppliers can create more efficient, effective, and sustainable supply chains that benefit everyone involved.

Co-creation also involves a shift in mindset from a transactional approach to a more collaborative and long-term perspective. Instead of viewing suppliers as purely transactional partners, organizations can work with them as strategic partners who can help them achieve their goals and objectives. By doing so, organizations can create a more agile and resilient supply chain that can adapt to changing market conditions and customer needs. The co-creation is a powerful tool for creating value in procurement and sourcing efforts in integrated supply chains. By working together, organizations and their suppliers can create more innovative, efficient, and sustainable supply chains that deliver value to all stakeholders involved.

Benefits of Procurement and Sourcing in Creating Value in Integrated Supply Chains

Procurement and sourcing play a crucial role in creating value in integrated supply chains. Here are some of the key benefits of procurement and sourcing in this context:

- **Cost Reduction**. Procurement and sourcing help to identify the best suppliers and negotiate the best prices, which can result in significant cost savings. By leveraging the buying power of the organization and optimizing the supply chain, procurement and sourcing can help to reduce costs at every stage of the process.

- **Improved Quality**. By selecting the right suppliers, procurement and sourcing can help to ensure that the materials and products being sourced meet the organization's quality

standards. This can help to reduce defects, improve product reliability, and ultimately enhance customer satisfaction.

- **Increased Efficiency**. Effective procurement and sourcing can help to streamline the supply chain and reduce the time it takes to bring products to market. This can help to improve the organization's competitiveness and responsiveness to changing customer needs.

- **Innovation.** By working closely with suppliers, procurement and sourcing can help to identify new technologies, materials, and processes that can improve products and reduce costs. This can lead to new products and services that create value for customers and differentiate the organization in the marketplace.

Role of Technology on Creating Value through Procurement and Sourcing Efforts

Technology has played a significant role in creating value through procurement and sourcing efforts. With the increasing use of digital technologies, organizations can now automate their procurement processes, track supplier performance, analyze spend data, and optimize their sourcing strategies. One of the main ways technologies have enabled value creation in procurement is through e-procurement systems. These systems allow organizations to streamline their purchasing processes by automating tasks such as supplier selection, purchase order creation, and invoice processing. This not only saves time but also reduces errors and helps control costs.

Another way technology adds value to procurement and sourcing is using analytics and data-driven decision-making. Procurement teams can now leverage data analytics tools to gain insights into supplier performance, track market trends, and identify cost-saving opportunities. By analyzing spend data, organizations can optimize their purchasing strategies and negotiate better contracts with suppliers. Technology has also made it easier for organizations to manage their supplier relationships. Supplier relationship management (SRM) platforms allow organizations to track supplier performance, communicate with suppliers, and manage contracts. This helps build stronger relationships with suppliers and ensures that they deliver quality products and services (Wang et al., 2016). Therefore, it’s emphasized that the technology has enabled procurement and sourcing teams to become more efficient, strategic, and effective in creating value for their organizations. By automating processes, analyzing data, and managing supplier relationships, organizations can optimize their procurement and sourcing efforts, reduce costs, and drive growth.

Conclusion

It is evident that creating value through procurement and sourcing efforts is a critical component of organizational success. Effective procurement and sourcing can help organizations to optimize their operations, reduce costs, improve product quality, and ultimately enhance customer satisfaction. By implementing best practices in procurement and sourcing, organizations can drive innovation, increase supply chain transparency, and foster collaboration with suppliers. One of the key takeaways from this discussion is that procurement and sourcing should be viewed as strategic functions that can deliver significant value to an organization. By aligning procurement and sourcing efforts with business objectives, organizations can ensure that they are sourcing the right products, from the right suppliers, at the right price. This can help to create a competitive advantage, drive growth, and enhance profitability.

The other important consideration is the role of technology in modern procurement and sourcing practices. Digital transformation has enabled organizations to streamline procurement and sourcing processes, automate routine tasks, and gain greater visibility into supplier performance. By leveraging technologies such as artificial intelligence, machine learning, and blockchain, organizations can optimize their procurement and sourcing efforts and unlock new sources of value.

Finally, it is important to recognize that effective procurement and sourcing is a continuous process that requires ongoing evaluation and improvement. Organizations should regularly review their procurement and sourcing strategies, identify areas for improvement, and implement changes as necessary. By embracing a culture of continuous improvement, organizations can stay ahead of the curve and drive sustainable success.

In conclusion, creating value through procurement and sourcing efforts is a critical component of organizational success. By implementing best practices in procurement and sourcing, leveraging technology, and embracing a culture of continuous improvement, organizations can optimize their operations, reduce costs, and enhance customer satisfaction. Ultimately, effective procurement and sourcing can help organizations to achieve their strategic objectives, drive growth, and maximize value for all stakeholders.

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VALUE CREATION THROUGH INTEGRATED LOGISTICS

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Abstract

This study is focused on finding out how to use company-oriented Porter's model for the integration of important business activities from end users through original suppliers that produce products, services, and information that add value for clients and other stakeholders. Supply chain management (SCM) refers to all the procedures, tools, and techniques that provide the framework for utilising both internal and external sources of supply. According to that, with the help of Porter's company-oriented model, all business activities can be identified under two main categories: support activities (firm infrastructure, human resource management, technology and development, and procurement) and core activities (inbound logistics, operations, outbound logistics, marketing, sales, and services). The efficiency of production along the value chain would likely increase if companies took this approach of concentrating on their core businesses and outsourcing other tasks to businesses that specialise in those tasks. While doing that, it is important to integrate all the activities across the supply chain in order to achieve efficient results. If successful and competitive integrated value chain systems are to be realised, it can be believed that an all-encompassing approach is essential. In the future, we intend to use the proposed process-oriented value chain model as a foundation and guideline to analyse further general scenarios or, to put it another way, this value chain approach will be a component of the management model and processes that are being developed for merchant value chains. This study is only a literature review of the above factors. Therefore, there is a future opportunity to validate those factors by addressing a case study or a survey of targeted companies.

Keywords: Value Creation, Integrated Logistics, Supply Chain Management

Introduction

According to the definition of a supply chain, it is "the integration of important business activities from end users through original suppliers that produces products, services, and information that adds value for clients and other stakeholders" (Lambert et al., 1998). In this context, "supply chain" refers to the entire value chain, from suppliers to end customers. Each participant in the supply chain must significantly improve the chain's value from the viewpoint of the final consumer. This is predicated on the value chain's integration of both supply- and demand-side operations. The term "supply chain management" (SCM) refers to all the procedures, tools, and techniques that provide the framework for utilising both internal and external sources of supply. The purpose of SCM is the integration of supply (such as logistics and operations) and demand (such as marketing) management within and across organisations, according to the Council of Supply Chain Management Professionals (CSCMP). So, rather than concentrating exclusively on SCM decisions, it is imperative to comprehend the marketing perspective as well. SCM and marketing frequently function as autonomous, self-improving entities. SCM often aims to maximise supply, whereas marketing generally aims to maximise demand. Integration of logistics activities offers more flexibility to meet consumer demand, depending on each customer's demands and value to a business. Integrated logistics system is to reduce production and transaction costs throughout a value chain, resulting in a reduced price and improved customer service.

The businesses' actions can all be recognised and categorised. We can classify each company's operations into primary and support activities in collaboration with the companies, using Porter's value chain model [9] as a foundation. The company-oriented Porter's model can be applied to each of the participating enterprises for this purpose. Figure 1 provides an illustration of the Porter model.

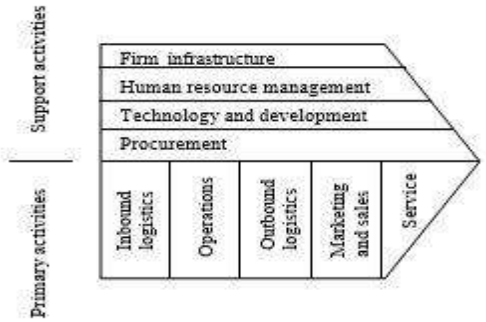

Figure 1 – Porter's Model
Source: Developed by Author

One presumption is that a firm's main business is more efficient than other company activities. A second presumption is that a company's core activity is more efficient than the comparable (but not core) activity in another company. Knowledge, expertise, and abilities are the main business. In other words, it is the company's distinctive key differentiator and identity. So, shifting a non-core activity from one company to another, which has the same activity as their core business, could result in increased efficiency within a value chain. Redefining non-core operations as support activities would be more appropriate for each participating organisation in this process. As seen in the following figure 2, we ultimately classify activities as either core activities or support activities while maintaining a business-oriented view of the activities.

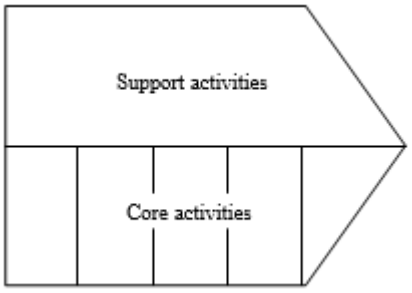

Figure 2. Identifying and Classifying the Core and Support Activities for Each Company Source: Developed by Author

Due to the fact that some of the project participants listed comparable activities as their core competencies, they may be rivals rather than complementary to one another. Hence, cooperation in a value chain is less important. The core business was split into new, more constrained core activities as a result of discussions with the companies and additional assessments. The parallels then were much smaller. This conversation lasted a while, though, because it had an impact on the strategies of the various businesses regarding what they ought to carry out themselves and what they ought to delegate to other participants in the value chain. Nevertheless, it should be noted that businesses have occasionally chosen to carry out fundamental functions that were delegated to other participants. This is due to the fact that those businesses, when faced with situations involving other clients, choose to continue working with them in the same manner as before. This is not part of the integrated value chain that I am trying to analyse.

The efficiency of production along the value chain would likely increase if companies took this approach of concentrating on their core businesses and outsourcing other tasks to businesses that specialise in those tasks. On the other hand, such a plan would boost business between the firms as well, making them more reliant on one another. Because of this, it's critical to understand that, within

the value chain, transaction costs may rise more than production prices do. Prior to implementing the model of concentration on core businesses, it is critical to analyse the costs of transfers. These expenses, which include transaction costs as well as logistical costs, are those incurred at the tactical and operational levels of business management. On a strategic level, it is a question of market circumstances and the nature of the companies' cooperation, or simply transaction costs.

The next thing to be considered is how the companies should interact with one another. Frequency, opportunism, specificity, and risk are crucial components when transaction costs are to be calculated, in accordance with Transaction Costs Theory. The relationship between the companies should be closer the more prevalent these elements are. By reducing opportunism and risk in the connection between the organisations, a written contract, for example, could lower the transaction costs. Frequency, opportunism, specificity, and risk are crucial factors in transactions, according to Transaction Costs Theory.

The components of transaction costs are further discussed using agency theory and tools for process analysis. One way to do a deeper investigation of the two primary components of the transaction cost theory, opportunism and risk, is through agency theory. In this regard, the terms concealed information and hidden acts from agency theory are crucial. If there are value chain actors who conceal knowledge or act in ways that under-optimise the benefit to other expenses, the risk is higher and the potential for opportunism is greater. The degree of covert behaviour and information depends on the state of the market. The possibility of concealed information and hidden acts increases with the degree of market imperfections. A closer connection between the players in the value chain could lower transaction costs in such a scenario. By identifying and analysing processes in the value chain, it is possible to discuss the Transaction Cost Theory's elements' frequency and specificity. The ordering process and the distribution process are the two key procedures identified. Among these two, the logistical procedures are virtually always product-focused. So, it is necessary to categorise products for both the distribution process and the order process. The most suitable form of transaction is typically determined by the conditions, norms, and type of product. The degree of technology used for various aspects of the transaction is crucial in that regard. As previously indicated, these process analyses serve as inputs for calculating the Transaction Cost Theory's two variables, specificity and transaction frequency.

We might follow the principles of transaction cost theory with input from agency theory and process analysis. Whether interactions in a value chain should only be handled by gentleman agreements, agreements made through the use of formal contracts, partner agreements, joint

ventures, or perhaps integration done internally is the best option. As a preliminary conclusion, the integrated logistics system is a way to minimise:

- Logistics expenses by focusing on core businesses
- The transaction expenses are reduced by obtaining the finest cooperation and relationships.

What effects does this have on the design of value chain processes? This is the next issue to consider. Porter gave the producing company his full attention. Textbooks on value chain models appear to place more emphasis on the core (typically production) company and less attention on the other value chain members. We can build a Porter-like model of the value chain based on a process viewpoint if we temporarily suppress this central company-oriented perspective and just study the processes of the value chain. The following image serves as an illustration of this:

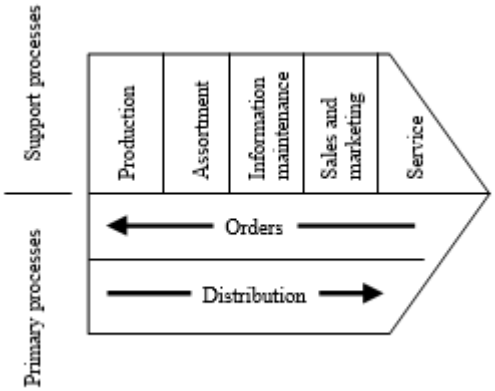

Figure 3. A Process Oriented Value Chain Model
Source: Developed by Author

We can choose logistics procedures involving each member of the integrated value chain as the main processes for the construction and identification of this model. When logistical functions are the focus, it is fair to see transfers and transactions of goods and information as core processes. The participants identify the support processes as additional pertinent procedures. The fundamental action Orders can be thought of as information flows. Information about demands and deliveries is provided by the customer to the production, the transport company, and the distributor. The information may not always proceed in the same manner as the tangible goods. A logistic function should coordinate the information process in a value chain by gathering various inputs from suppliers, producers, transport providers, and customers. This information input from the many participants could be seen as a component of the main activity of providing accurate order information to the appropriate participant. Then, the principal activity is that the participants in the

value chain work together to construct the orders or flow of information, with the exception of one participant per support activity. That is the rationale for the support activities' small boxes and the primary activity's arrow, which extend beyond all other sectors and activities (Figure 3), just the opposite of Porter's value chain model (Figure 1).

The principal activity of distribution, or the movement of commodities in the other direction, faces the same dilemma. Products are distributed by a variety of value chain players' actions, including transport and inventory management. This allows the distribution to be seen as a comprehensive process that includes all parties.

Conclusion

Following the discussions that resulted in this new value chain approach, the following intriguing results that are consistent with this model were found:

- According to the value chain perspective, it appears that every process (or activity) in this model is a core activity for one of the organisations.
- In a traditional sense, outsourcing is probably not a relevant topic for one of the processes because, in that case, the new players will by definition be members of the value chain and provide a product as part of their primary business.
- By building and identifying this model, we can determine that the main processes involve all of the partners in the integrated value chain. The participants identify the support processes as additional pertinent procedures.
- The optimal overall strategy for the entire value chain may be in contradiction to the strategic decisions made by each member. According to our expertise, this region needs a lot of attention.
- The transaction costs associated with this construction must receive significant attention during deployment since they may outweigh the benefits of this strategy. High specialisation can result in expensive transactions.

From my perspective, Porter's value chain model is not in conflict with the suggested method for modelling a value chain. Porter views the value chain as a collection of independent, autonomous enterprises; however, we present an integration focus on the value chain and, as a result, need to view the companies from a sort of extended enterprise perspective. If successful and competitive integrated value chain systems are to be realised, we believe that an all-encompassing approach is

essential. In the future, we intend to use the proposed process-oriented value chain model as a foundation and guideline as we analyse further general scenarios. Otherwise, to put it another way, this value chain approach will be a component of the management model and process that are being developed for merchant value chains.

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CONCEPTUAL PAPER ON THE ROLE OF COORDINATED LOGISTICS MANAGEMENT

By

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Abstract

Coordinated Logistics Management (CLM) is an essential aspect of supply chain management that involves the integration and coordination of various logistics activities such as transportation, warehousing, inventory management, and information management. The aim of CLM is to optimize the flow of goods and services from the point of origin to the point of consumption while minimizing costs and maximizing customer satisfaction. This research article discusses the role of coordinated logistics in the success of modern businesses, including its impact on customer service, inventory management, cost optimization, and environmental sustainability. It also highlights some of the challenges faced by businesses in implementing CLM and suggests some strategies to overcome these challenges.

Keywords: Coordinated Logistic Management, Challengers, Strategies

Introduction

Coordinated logistics management (CLM) is a crucial aspect of supply chain management that involves the integration and coordination of various logistics activities such as transportation, warehousing, inventory management, and information management. The aim of CLM is to optimize the flow of goods and services from the point of origin to the point of consumption while minimizing costs and maximizing customer satisfaction. Coordinated logistics is becoming increasingly important for businesses in the modern era as they strive to gain a competitive advantage in the global marketplace.

Role of Coordinated Logistics in the Success of Modern Businesses

In today's fast-paced business environment, the role of coordinated logistics has become increasingly important for the success of modern businesses. Coordinated logistics refers to the management of all logistics activities across the supply chain in a coordinated and integrated manner to ensure the seamless flow of goods and information.

Firstly, coordinated logistics can help to reduce costs and improve efficiency in the supply chain. According to a study by De Toni and Tonchia (2001), coordinated logistics can help to reduce costs by eliminating redundancies, improving inventory management, optimizing transportation routes, and enhancing communication among supply chain partners. By reducing costs and improving efficiency, businesses can gain a competitive advantage and increase their profitability.

Secondly, coordinated logistics can help to improve customer satisfaction by providing faster and more reliable delivery of products. According to a study by Chen and Paulraj (2004), coordinated logistics can help to improve customer satisfaction by reducing delivery times, improving order accuracy, and enhancing communication with customers. By improving customer satisfaction, businesses can build customer loyalty and increase their market share.

Thirdly, coordinated logistics can help to enhance supply chain visibility and transparency. According to a study by Chopra and Meindl (2016), coordinated logistics can help to improve supply chain visibility and transparency by providing real-time information on inventory levels, transportation status, and supplier performance. By enhancing supply chain visibility and transparency, businesses can make better-informed decisions and reduce the risk of supply chain disruptions.

Fourthly, coordinated logistics can help to promote sustainability in the supply chain. According to a study by Chiarini et al. (2020), coordinated logistics can help to reduce environmental impacts by minimizing waste and resource consumption, promoting sustainable product development, and reducing transportation-related emissions. By promoting sustainability in the supply chain, businesses can demonstrate their social responsibility and meet the increasing demands of environmentally-conscious consumers.

Impact of Coordinated Logistics on Customer Service

One of the primary goals of coordinated logistics is to improve customer service. By integrating various logistics activities such as transportation, warehousing, and inventory management, CLM enables businesses to meet their customers' expectations regarding timely delivery, product availability, and quality. For instance, companies such as Amazon and Walmart have revolutionized the retail industry by leveraging their advanced logistics networks to offer customers fast and reliable delivery options. According to a survey by McKinsey, over 80% of customers consider fast delivery as a critical factor in their online shopping experience (McKinsey, 2019). Therefore, businesses that invest in coordinated logistics are likely to gain a competitive advantage over their peers in terms of customer satisfaction.

Coordinated logistics can help reduce order cycle times and improve order accuracy. According to a study by Lee and Billington (1992), coordinated logistics practices such as collaborative planning, forecasting, and replenishment (CPFR) can help reduce order cycle times and improve order accuracy. The study found that CPFR helps to increase inventory visibility and reduce inventory levels, which in turn helps to reduce lead times and improve order accuracy.

Coordinated logistics can also help enhance communication and collaboration among supply chain partners, leading to improved customer service. According to a study by Kannan and Tan (2005), coordinated logistics practices such as information sharing and collaboration among supply chain partners can help improve communication and collaboration, which can lead to improved customer service. The study found that information sharing and collaboration can help to reduce lead times, improve product availability, and increase customer satisfaction.

Furthermore, coordinated logistics can help to improve the quality of products and services delivered to customers. According to a study by Bowersox and Closs (2019), coordinated logistics practices such as quality management and continuous improvement can help to improve the quality of products and services delivered to customers. The study found that quality management practices such as quality control and quality assurance can help to improve the quality of products, reduce defects, and improve customer satisfaction.

Impact of Coordinated Logistics on Inventory Management

Effective inventory management is essential for businesses to optimize their operations and meet customer demand. Coordinated logistics practices can significantly impact inventory management by improving inventory visibility, reducing inventory carrying costs, and minimizing stockouts.

According to a study by Chopra and Meindl (2016), coordinated logistics practices such as collaborative planning, forecasting, and replenishment (CPFR) can help to improve inventory management by reducing inventory carrying costs and minimizing stockouts. The study found that CPFR helps to increase inventory visibility and accuracy, reduce inventory levels, and improve order fulfillment rates, leading to reduced inventory carrying costs and improved inventory management.

In addition, coordinated logistics can help to improve order lead times, which can help businesses manage inventory more effectively. According to a study by Zhang and Li (2017), coordinated logistics practices such as information sharing and collaboration among supply chain partners can help to reduce order lead times, which in turn can help businesses manage inventory more effectively. The study found that reducing order lead times can help to reduce safety stock levels, improve order fulfillment rates, and reduce inventory carrying costs.

Furthermore, coordinated logistics can help to improve inventory accuracy, which is essential for effective inventory management. According to a study by Mentzer et al. (2008), coordinated logistics practices such as quality management and continuous improvement can help to improve inventory accuracy. The study found that quality management practices such as quality control and quality assurance can help to reduce errors in inventory records, improve the accuracy of inventory levels, and reduce inventory carrying costs.

Moreover, coordinated logistics can help to improve demand forecasting, which is essential for effective inventory management. According to a study by Bektas et al. (2019), coordinated logistics practices such as demand forecasting and planning can help to improve demand forecasting accuracy, which in turn can help businesses manage inventory more effectively. The study found that improving demand forecasting accuracy can help to reduce safety stock levels, improve order fulfillment rates, and reduce inventory carrying costs.

Impact of Coordinated Logistics on Cost Optimization

Coordinated logistics practices can help businesses optimize their costs by improving efficiency, reducing waste, and minimizing expenses across the supply chain. Coordinated logistics can help businesses achieve cost optimization in various ways, including reducing transportation costs, minimizing inventory carrying costs, and improving process efficiencies.

According to a study by Cooper et al. (1997), coordinated logistics practices such as route optimization and consolidation can help to reduce transportation costs. The study found that route optimization and consolidation can reduce transportation distances, lower fuel costs, and reduce transportation-related emissions. Additionally, coordinated logistics practices such as collaborative planning, forecasting, and replenishment (CPFR) can help to reduce inventory carrying costs by improving inventory visibility and accuracy, reducing safety stock levels, and improving order fulfillment rates.

Furthermore, coordinated logistics can help to improve process efficiencies and reduce waste, leading to cost optimization. According to a study by Ellinger et al. (2000), coordinated logistics practices such as lean management and continuous improvement can help to identify and eliminate waste in the supply chain, leading to cost savings. The study found that lean management practices such as value stream mapping, standardized work, and pull systems can help to reduce waste, improve process efficiencies, and optimize costs.

Moreover, coordinated logistics can help to improve supplier management and reduce costs associated with supplier relationships. According to a study by Lee and Billington (1992), coordinated logistics practices such as supplier collaboration and performance management can help to reduce costs associated with supplier relationships. The study found that supplier collaboration and performance management can help to improve supplier relationships, reduce lead times, and reduce costs associated with supplier relationships.

In addition, coordinated logistics can help to improve product quality and reduce costs associated with quality defects. According to a study by Bowersox and Closs (2019), coordinated logistics practices such as quality management and continuous improvement can help to reduce costs associated with quality defects. The study found that quality management practices such as quality control and quality assurance can help to improve product quality, reduce defects, and reduce costs associated with quality defects.

Impact of Coordinated Logistics on Environmental Sustainability

The impact of coordinated logistics on environmental sustainability has become a significant concern for businesses worldwide. Coordinated logistics can help to reduce the negative impact of logistics activities on the environment by improving efficiency, reducing waste, and minimizing emissions across the supply chain.

One way in which coordinated logistics practices can improve environmental sustainability is by reducing transportation-related emissions. According to a study by Alemi et al. (2018), coordinated logistics practices such as route optimization, consolidation, and mode shifting can help to reduce transportation-related emissions. The study found that these practices can reduce vehicle miles traveled, lower fuel consumption, and minimize greenhouse gas emissions.

Furthermore, coordinated logistics practices can help to reduce waste and minimize the use of resources such as energy and materials. According to a study by Seuring and Muller (2008), coordinated logistics practices such as lean management and closed-loop supply chains can help to reduce waste and minimize the use of resources. The study found that these practices can reduce material consumption, improve energy efficiency, and minimize waste generation.

Moreover, coordinated logistics practices can help to improve product sustainability by reducing the environmental impact of products throughout their lifecycle. According to a study by Linton et al. (2007), coordinated logistics practices such as sustainable procurement, product design for sustainability, and end-of-life management can help to improve product sustainability. The study found that these practices can reduce the environmental impact of products by minimizing raw material consumption, reducing waste generation, and improving product recyclability.

In addition, coordinated logistics practices can help to improve the sustainability of supplier relationships by promoting sustainability practices among suppliers. According to a study by Sarkis et al. (2021), coordinated logistics practices such as supplier sustainability assessment and supplier collaboration can help to improve the sustainability of supplier relationships. The study found that these practices can encourage suppliers to adopt sustainability practices, improve supply chain transparency, and promote sustainable product development.

Strategies to Overcome Challenges Faced by Businesses in Implementing Coordinated Logistics

Coordinated logistics is an essential component of a modern supply chain. However, implementing coordinated logistics can be challenging for businesses due to various factors, such as a lack of resources, skilled personnel, and a unified information system.

The first challenge faced by businesses in implementing coordinated logistics is the lack of a unified information system. According to a study by Sari et al. (2018), the lack of a unified information system can lead to inefficiencies in communication and decision-making, which can ultimately lead to delays in the supply chain. A unified information system can provide real-time visibility across the supply chain, enable seamless communication, and support informed decision-making. By investing in a unified information system, businesses can address this challenge and streamline their logistics operations.

The second challenge faced by businesses in implementing coordinated logistics is the lack of trust and cooperation in the supply chain. According to a study by Li et al. (2019), a lack of trust and cooperation can lead to delays in decision-making, which can ultimately lead to delays in the supply chain. Businesses need to build trust and cooperation among supply chain partners by sharing information, collaborating on projects, and developing long-term relationships. This can be achieved through regular communication, joint planning, and the development of mutual goals and objectives.

The third challenge faced by businesses in implementing coordinated logistics is the lack of skilled personnel. According to a study by Qiao and Capaldo (2022), the lack of skilled personnel can lead to inefficiencies in logistics operations, which can ultimately lead to delays in the supply chain. By investing in training programs, businesses can develop the skills of their personnel and ensure that they have the necessary knowledge and expertise to manage logistics operations effectively. This can include training in areas such as inventory management, transportation planning, and technology use.

The fourth challenge faced by businesses in implementing coordinated logistics is the lack of resources. According to a study by Chen and Paulraj (2004), the lack of resources can lead to inefficiencies in logistics operations, which can ultimately lead to delays in the supply chain. Businesses need to invest in resources to ensure that they have the necessary infrastructure and equipment to manage logistics operations effectively. This can include investments in technology

such as automation and robotics to enhance efficiency and productivity.

The fifth strategy is to foster a culture of continuous improvement. According to a study by Gunasekaran et al. (2019), the lack of a culture of continuous improvement can lead to complacency and stagnation in logistics operations, which can ultimately lead to delays in the supply chain. Businesses need to foster a culture of continuous improvement by encouraging innovation, rewarding performance, and providing opportunities for feedback and improvement. This can include regular performance evaluations, employee recognition programs, and feedback mechanisms to identify areas for improvement.

Conclusion

The role of integrated logistics in supply chain management has become increasingly important for businesses to achieve their goals of efficiency, cost-effectiveness, and customer satisfaction.

One way in which integrated logistics can improve supply chain management is by reducing costs. Moreover, integrated logistics can help to improve customer satisfaction by improving delivery times, reducing order errors, and enhancing communication between supply chain partners. Furthermore, integrated logistics can help to improve supply chain visibility and transparency, which is critical for effective supply chain management. Additionally, integrated logistics can help to improve sustainability in the supply chain by reducing environmental impacts and promoting sustainable practices.

Implementing coordinated logistics can be challenging for businesses. However, by adopting strategies such as investing in a unified information system, building trust and cooperation among supply chain partners, investing in training programmes, investing in resources, and fostering a culture of continuous improvement, businesses can overcome these challenges and reap the benefits of a coordinated logistics system. By streamlining their logistics operations, businesses can improve efficiency, reduce costs, and enhance customer satisfaction, ultimately leading to increased competitiveness and success in the modern business landscape.

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