Journal of
Value Creating in Business Management
https://www.jvcbm.ir

Volume 4, Issue 2, Summer 2024, Pages 42 to 70

Original Article (Mixed)

eISSN: 2980-8359

Designing a causal model of factors affecting the Lars supply chain

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Receive:
24 April 2023
Revise:
04 July 2023
Accept:
17 September 2023

Keywords:
Lars supply chain,
sustainable supply chain,
resilient supply chain,
agile supply chain,
lean supply chain

Abstract

The main goal of this research is to design a causal model of factors affecting the Lars supply chain (lean, agile, resilient and sustainable). This research is applicative-developmental in terms of purpose. In line with the purpose of the research, firstly, each of the supply chain paradigms was examined using the theme analysis method of the research literature, and then, by using which; the dimensions of sustainable supply chain, resilient supply chain, agile supply chain, lean supply chain, and 16 indicators were also specified. Their differences were also identified.

Dimtel method was used to determine the effectiveness of each of the indicators, and for this purpose, the Dimtel questionnaire was completed by professors and experts in this field, and finally, the relationships between the indicators were determined in the Cartesian coordinate system. The results of this stage showed that economic factors, agility, continuous improvement and flexibility are, respectively, the most influential, and on the other hand, supplier management is the most influential among the Lars supply chain indicators. Finally, in order to present a suitable conceptual model of the Lares supply chain, using the method of structural equations, the validity of the relationships of the model provided by 20 experts in this field was quantitatively evaluated.

Please cite this article as (APA): khalesi, M., Rabani, M., Dehghan Dahnavi, H., Sadeghian, A., & Honari, M. T. (2024). Designing a causal model of factors affecting the Lars supply chain. *Journal of value creating in Business Management*, *4*(2), 42-70.

https://doi.org/10.22034/jvcbm.2023.407735.1143

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Journal of
Value Creating in Business Management
https://www.jvcbm.ir
Volume 4, Issue 2, Summer 2024, Pages 42 to 70

Extended Abstract

Introduction

Lars supply chain is trying to bring lean, agile, resilient and sustainable approaches together in the supply chain in order to benefit from the advantages of each of them and cover their shortcomings at the same time. Agility in the supply chain allows business partners to react to changing markets with visibility into customized services and customized products. Unlike the "lean" paradigm, the "flexible" paradigm responds to unexpected disruptions to achieve competitive advantage. Although a resilient supply chain may not be the least expensive supply chain, it is efficient in unpredictable turbulence (Raut, Mangla, Narwane, Dora, & Liu, 2021). In lean supply chain management, the effort is to bring the inventory level to zero (Carvalho & Cruz-Machado, 2011), but it is noteworthy that the application of each of the paradigms alone will not lead to significant results for the organization in the current competitive environment, and many researchers have stated that the implementation of only one approach such as the lean approach is not the most appropriate supply chain because focusing on minimum inventory and more detailed planning and even only agile implementation may not be cost-effective for companies, and since in today's market, companies want to be flexible and responsive in a cost-effective way, they implement a combination of the most suitable paradigms as a hybrid strategy in accordance with the organization's strategy to improve the supply chain as much as possible (Ahmed & Huma, 2021). Also, implementing any combination of paradigms allows organizations to reduce costs and increase quality, flexibility, and responsiveness to customer demand (Ambe, 2009). Naylor, Naim and Berry (1999) introduced the concept of integrating each paradigm in a supply chain, that is, the acceptable supply chain paradigm. By implementing an acceptable paradigm, one can take advantage of the advantages of each different paradigm (Naylor, Naim, & Berry, 1999). Next, Azevedo et al. implemented agile and resilient paradigms in the supply chain, and this combination of paradigms influenced sustainability and promoted sustainability performance (Azevedo, Carvalho, & Cruz-Machado, 2016). Trade-offs between lean, agile, resilient, and sustainable management paradigms are real issues and help supply chains become more efficient, streamlined, and sustainable. Lean in the supply chain maximizes profits through cost reduction, while agility maximizes profits by providing exactly what the customer needs. Resilient supply chains may not be the least expensive, but they are more capable of dealing with an uncertain business environment. Also, to ensure the sustainability of the management system, the environmental measures should be paid attention.

Considering that the tile and ceramic industry is one of the main industries of Yazd province and has the potential to export its products to other countries, the design of the Lars supply chain model is of particular importance in this industry. Considering the importance of this issue, the current research aims to present the Lars model in the supply chain in the current industry so that lean, agile, resilient and sustainable approaches are used side by side in order to benefit from their advantages in supply chain management. Therefore, the researcher asked the main question: what is the design of the causal model of the factors affecting the Lars supply chain?

Literature

Lean supply chain

Lean management approach, developed by Ohno (1998) at Toyota Motor Corporation in Japan, forms the basis of Toyota's production system with two main pillars of "automation" and "just-in-time production". Lean manufacturing is described as the integration of

manufacturing systems to maximize capacity utilization while minimizing buffer stock by minimizing system variability (Swenseth & Olson, 2016).

Agile supply chain

Agility means using market and corporate knowledge to exploit profitable opportunities in an unstable market, which agility is the essential characteristic of the supply chain needed to survive in turbulent and unstable markets. Since customer needs are constantly changing, the supply chain must be adaptable to future changes to properly respond to market needs and changes. The agile paradigm aims to develop the ability to quickly respond effectively to unpredictable changes in markets and increasing levels of environmental turbulence, both in volume and variety (Agarwal, Shankar, & Tiwari, 2007).

Resilient supply chain

Resilient supply chain is a topic that has attracted the attention of researchers, especially when a trend such as globalization has increased risks for supply chains. Regarding the issue of globalization, the increasing complexity of the supply chain in the global world has caused more uncertainty (Tordecilla, Juan, Montoya-Torres, Quintero-Araujo, & Panadero, 2021). Resilient supply chain is related to the system's ability to return to the initial state or a new and more favorable state after disruption, and avoid failure states. In other words, the resilient supply chain is not only the system's ability to control performance changes when faced with disruption, but also the ability to adapt and sustainably respond to sudden and significant changes in the environment in the form of demand uncertainty (Kamalahmadi & Parast, 2016). Resilience strategies aim to reduce disruptions that threaten the continuity of operations in the supply chain. These strategies can be categorized as proactive or reactive, and from another perspective they can be strategies of flexibility, robustness or redundancy (Gholami-Zanjani, Klibi, Jabalameli, & Pishvaee, 2021).

Sustainable supply chain

The globalization of supply chains has increased the number of network units and transportation between them, and has led to more greenhouse gas emissions including carbon dioxide emissions, and energy consumption. Therefore, in order to design the supply chain in the future, some necessary measures must be taken, which include adopting a sustainable approach, efficient in energy consumption, reliable and resistant to disruption conditions (Lotfi, Mehrjerdi, Pishvaee, Sadeghieh, & Weber, 2021). Also, other objectives such as environmental impacts, including carbon dioxide emissions and energy consumption, and social welfare have been added to the literature to consider the sustainability problem more comprehensively (Kadambala, Subramanian, Tiwari, Abdulrahman, & Liu, 2017).

Research Methodology

This research is applicable-developmental in terms of purpose, because it seeks to design a suitable Lars model for the service supply chain. In this regard, by using the theme analysis method, the structure of the researches in each of the lean, agile, resilient and sustainable supply chain approaches were evaluated, and then the most important indicators were identified in accordance with the studies of the previous researches. After the evaluation, the influence nature of these indicators was determined using Dimtel method. Finally, structural equation modeling was used to present the Lars supply chain framework; so that this framework will show the implementation indicators of Lars supply chain and the great effect of these indicators. In the following, the steps of this research and the methods used were explained.

Research Findings

The findings showed that the Lars supply chain dimensions include the dimensions of sustainable supply chain, resilient supply chain, agile supply chain, lean supply chain, along with 16 indicators of supplier management, supporting suppliers, multiple distribution channels, waste elimination, timely production, logistics management, continuous improvement, flexibility, competence, speed, communication with customers, responsiveness, agility, economic, environmental, and social.

Conclusion

The aim of the current research is to design a causal model of factors affecting the Lars supply chain. In order to achieve the goal of the research, after reviewing the literature and the background of the research, 16 factors affecting the Lars supply chain were identified in the form of 4 dimensions. In the following, these indicators were evaluated using Dimtel's method to be effective or influential, and then the relationships of these indicators were drawn in the Cartesian coordinate system. Finally, the conceptual model of the Lares supply chain was modeled according to the different dimensions of this chain, and the indicators were evaluated as items in this conceptual model. Then the structural equation method was used to quantitatively evaluate this model. The results showed that sustainability is directly related to communication with the external environment and process and production management. Also, sustainability will directly and indirectly affect the supply chain design. The results of this research are aligned with the results of Khan et al, (2022), Aityassine et al, (2022), Piya et al, (2022), Kazancoglua et al, (2022), Juan, (2022), and Hung, Salehi & Ostvar (2022). The results of this research show that economic indicators, agility, continuous improvement, and flexibility are, respectively, the most influential indicators; and supplier management is the most influential indicator of the Lars supply chain. On the other hand, the multiple distribution channel index, speed, and economic factors are, respectively, the most influential index among the indicators that management decisions in other indicators will have the greatest impact on this aspect of the Lars supply chain, and the management and performance of this index will be in proportion to the performance and impact of other indicators, and the results of the above researches are in line with the confirmation of the results of the present research. Also, Shamout (2019) showed in his research that supply chain analysis has a significant effect on supply chain innovation, but does not have a significant effect on its strength. But supply chain innovation has a significant effect on robustness. In other words, supply chain innovation can play a mediating role in the relationship between supply chain analysis and robustness. Tarafdar & Qrunfleh (2017) showed that chain agility has a significant mediating role. The results of their research confirm the results of the present research. The evaluation of the indicators showed that indicators such as economic index, agility, continuous improvement and flexibility are the indicators that have the greatest impact on other indicators, so according to the obtained results, it is suggested that by managing these indicators, other indicators and their performance can be better evaluated and predicted. In other words, if the economic criteria are at a suitable point in the Lars supply chain, the agility of this supply chain will be maintained, and at the same time, continuous improvement will be created along the supply chain, and it can be hoped that other criteria and indicators of the supply chain Lars will operate well, and so the Lars supply chain will continue to operate with a good performance and will have a promising result. According to the factor loadings of the presented conceptual model, it can be concluded that the indicators of these criteria can play a significant role in the design of the Lars supply chain, and it is suggested that each of the criteria be properly managed and planned in order to achieve the goals. For future researches, it is suggested to use other methods such as fuzzy cognitive map, SD, or

interpretive structural modeling to draw the conceptual model of the research and examine how the variables influence each other and compare the results with the results of the current research. Also, researchers can implement in other industries.