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The value-added model of the supply chain of petrochemical industries with a sustainable development approach

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Abstract

The purpose of this research is the value-added model of the supply chain of petrochemical industries with a sustainable development approach. According to its purpose, the research method is applicable, qualitative-quantitative in terms of implementation, and survey in nature. The statistical population of the research includes 25 managers and experts in the petrochemical industry, and the sampling was done as available judgment, and the interviews continued until theoretical saturation. The tool for gathering information is an interview. To collect and analyze data, Delphi technique was used to identify components. MATLAB software was used for data analysis. In the library analysis, 16 main components were identified and entered into the Delphi technique, and finally all were confirmed. These sixteen criteria are political factors, cultural factors, legal factors, financial factors, individual factors, management factors, information sources, implementation, review, feedback analysis, performance evaluation factors, risk concepts, identification of environmental issues, identification of health issues, learning Issues of safety, and added value in the supply chain of petrochemical industries with a sustainable development approach. These components were leveled based on interpretive structural technique, and they formed a model in 7 levels. The proposed model leads to the improvement of the economic and commercial performance of companies due to optimization of processes, reduction of wastage, improvement of product quality, and reduction of costs. Considering the variety of issues such as safety, health, environment, and social standards; this value-added model of the supply chain helps to realize sustainability and continuity.

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Extended Abstract

Introduction

The supply chain value-added model is an analytical tool used to measure the value that each element or process in the supply chain adds (Fernández-González et al, 2023). This model is especially used in operations management, production planning, and supply chain performance improvement. In this model, added value is measured by the amount that each activity or step in the production or supply process adds to the final product. By focusing on adding value at each stage, this model helps companies to identify their weak points and implement the necessary improvements in the production and supply processes. The benefits of using this model include improving efficiency and reducing waste in the supply chain, improving communication and coordination between supply chain members, and increasing the competitiveness of companies (Duncan et al, 2019). Considering the importance of establishing an efficient and optimal supply chain, it is vital to use the value-added model of the supply chain to improve performance and better manage processes (Baumgartner, 2014; Alamroshan et al, 2021; Jalil et al, 2021).

Its sustainability and performance have attracted the attention of the world (companies and researchers) since 1992, which coincides with the Rio de Janeiro summit (Figge et al, 2002). It has slowly but surely led to changes in global economies. It includes several aspects, including economic, social, environmental, and political, not only at the macro level, but also at the micro level (Mio et al, 2022). This issue forces companies to include sustainability in their strategies. To achieve and adapt goals related to sustainability requirements, companies usually rely on methods to formulate, implement, and monitor their systems in terms of environmental, social, and economic aspects (George et al, 2018; Bastas & Liyanage, 2018). One of the important aspects in this model is the assessment and control of environmental effects (He et al, 2021; Ghalandari et al, 2023). Considering the various processes of the petrochemical industry that may have many environmental impacts, the use of this model helps managers to reduce negative effects and identify opportunities for environmental optimization. In this approach, it is also important to pay attention to social values such as establishing appropriate work standards, maintaining the health and safety of workers, and supporting local communities (Jassem et al, 2021). This model helps companies embed social values in their supply chain and contribute to sustainable development through actions such as developing local skills or improving working conditions (Goli et al, 2022; Khan et al, 2022).

Theoretical Framework

Value added model

A value-added model is an analytical model used to measure the amount of value that each step of a process or a supply chain adds to a product or service (Salari, 2021).

Supply chain model

Supply chain is a strategic model that includes all the activities and processes required to supply raw materials, manufacture, distribute and provide products or services to customers (Sadeghi & Ghasemi, 2021). This model represents an organization or industry as a network consisting of suppliers, producers, distributors and customers (De & Giri, 2020).

Sustainable development approach

Development and sustainability is one of the relatively new concepts in the world development literature, and was first used in the United Nations Summit under the title of Human Environment in Stockholm in 1372. Sustainability is an effort to achieve the best results in human and natural environment programs carried out for the present and indefinitely for the future. Sustainability is a local, conscious, collaborative and balanced process

implemented in a balanced ecological environment without exporting its problems to the surrounding areas or leave it on the shoulders of future generations (Asadiyan, 2023).
Mirshekar et al, (2024) investigated the design of supply chain scenarios and how it affects the relevant variables in the National Company of South Oil-bearing Regions. The results of the investigations showed that the excessive increase in the sending capacity, the increase in the volume of orders, and the decrease in the time of sending the orders will have their own positive and negative results; which the creation of a favorable and optimal situation based on the various outputs of the model will be fruitful in the context of the organization's policy adopting.
Samiei et al, (2023) investigated the identification of financial benefits and costs of sustainable supply chain under conditions of uncertainty in manufacturing companies admitted to the Tehran Stock Exchange. The results showed that the number of 30 articles, 210 codes and 24 concepts were extracted from the selected articles, which include the capability of the order process management process, the capability of the customer relationship management process, the capability of the demand management process, the capacity and capability of the resource management process, time to market, buyer credit, electronic platforms, coordination and cooperation in the supply chain to improve service performance, synchronization of financial decisions, sharing of innovative information related to finance, supplier relationship management process capability, service performance management process capability, interdepartmental interaction of supply chain companies, inventory financing, product innovation, reverse factoring, cash flow incentive alignment, supply chain working capital, bank credit for supply chain financing, supplier integration, recycling management, supply chain disruption risk, supply chain transportation management, changes in estimates and their basis as sources and costs of the sustainable supply chain under conditions of uncertainty.

Research methodology

The research method is applicable in terms of its purpose, qualitative-quantitative in terms of implementation, and survey in nature. The statistical population of the research includes 25 managers and experts in the petrochemical industry, and the sampling was done as available judgment, and the interviews continued until theoretical saturation. The tool for gathering information is an interview. To collect and analyze data, Delphi technique was used to identify components.

Research findings

MATLAB software was used for data analysis. In the library analysis, 16 main components were identified and entered into the Delphi technique, and finally all were confirmed. These sixteen criteria are political factors, cultural factors, legal factors, financial factors, individual factors, management factors, information sources, implementation, review, feedback analysis, performance evaluation factors, risk concepts, identification of environmental issues, identification of health issues, learning Issues of safety, and added value in the supply chain of petrochemical industries with a sustainable development approach. These components were leveled based on interpretive structural technique, and they formed a model in 7 levels. The proposed model leads to the improvement of the economic and commercial performance of companies due to optimization of processes, reduction of wastage, improvement of product quality, and reduction of costs. Considering the variety of issues such as safety, health, environment, and social standards; this value-added model of the supply chain helps to realize sustainability and continuity.

Conclusion

The present research was carried out with the aim of the value-added model of the supply chain of petrochemical industries with a sustainable development approach. The results of this research corresponds with the results of Mirshekar et al, (2024), Samiei et al, (2023), Ghalandari et al, (2023), Karimi et al, (2022), Bayat et al, (2022), El-Sheikh & Lukman (2022), and Sangbor et al, (2022).

Ghalandari et al, (2024), showed that continuity of improvement processes, feedback analysis and performance evaluation focusing on sustainability indicators can help to achieve the best performance in the supply chain.

According to the results of the research, the following suggestions were presented:

Political factors: Analyzing and predicting political-economic developments in the countries of operation, communicating with government institutions, and determining strategies to deal with political developments can be helpful.

Cultural factors: Deep understanding of local culture in target countries and matching strategies and approaches with cultural values and beliefs can help improve performance and interactions.

Legal factors: following up and complying with local and international laws and regulations, creating solutions to adapt to legal changes, and maintaining compliance with standards and regulations can be efficient.