Supply Chain Innovation towards Economic Sustainability: Study on Supply Chain in Malaysia Automotive Industry

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Abstract: This study aims to achieve economic sustainability in supply chain innovation. In addition, the study explores the changes that supply chain innovation has brought to Malaysia's automotive industry. The researchers also aim to understand the challenges faced in the automotive industry and the problems and methods that need to be overcome.

***Keywords*:** supply chain innovation; economic sustainability; sustainable performance; Industry 4.0

1. Introduction

In evolving supply chain management (SCM), companies prioritise innovation to achieve sustainable growth by reducing inventory, shortening product lifecycles, minimising delivery issues, reducing costs, and increasing customer satisfaction. The automotive industry is the world's largest supply chain system (SCS) and a key economic driver, and as such, it faces significant competitive pressures.

This study explores how supply chain innovations (SCI)in the Malaysian automotive industry contribute to economic sustainability and examines the practicality of these innovations in the Malaysian context. [3].

2. Problem statement

The Malaysian automotive industry, comprising 27 automobile manufacturers and over 640 auto parts manufacturers, accounts for 4% of the GDP or approximately RM40 billion and supports over 700,000 jobs. Ranked third in Southeast Asia and 23rd globally, it produces more than 500,000 vehicles annually (May 2017). Although the industry attaches great importance to R&D, it overlooks the key role of SCI, which is a fundamental link in the manufacturing process. This neglect can lead to inefficiencies and jeopardize the sustainability of the supply chain. Therefore, the problem statement focuses on the following:

(1) What are the innovation strategies that drive the economic sustainability of automotive supply chains?

(2) How do these innovations impact the economic sustainability of the industry's supply chain?

The technology has been advancing over time and more alternatives have yet to be explored and applied to the supply chain.

2.1 Objective

This study aims to identify supply chain innovations (SCI) in the Malaysian automotive industry to improve the efficiency of the entire supply chain, reduce production problems (such as downtime and delayed deliveries), and understand the challenges faced by the industry in developing economic sustainability. Its goal is to provide feasible recommendations for SCI in the Malaysian automotive industry.

2.2 Significant of research

This study examines how supply chain innovation can lead to an effective and potentially sustainable supply chain through timely product delivery, cost savings, and profitability. The paper provides a comprehensive overview of the various innovative approaches automotive companies use to sustain their supply chains, emphasising these networks' holistic and interconnected nature.

2.3 Scope and research design

This study assesses how the implementation of the SCI model or Efficient Transport System can transform the supply chain into an efficient and innovative network, focusing on the processes necessary to promote the sustainable development of the sector and to bridge the development gap of the Malaysian automotive supply chain and improve its economic sustainability through innovative practices.

3. Literature review

This paper investigates how established Malaysian automotive companies already implementing supply chain innovation (SCI) models or efficient transport systems can enhance their supply chain efficiency and innovation. Additionally, this study addresses the existing gaps in supply chain development and explores opportunities for fostering sustainable economic growth through SCI within the Malaysian automotive sector [7].

3.1 Reconciling open innovation and supply chain collaboration.

Open innovation enhances internal innovation and expands market opportunities by fostering learning capabilities and strategically managing stakeholder knowledge flows. It focuses on analysing the strategic elements of trust, risk-sharing, and reciprocity in collaboration, as well as the dynamic capabilities required to implement these tactics to bridge the gap between open innovation and collaborative efforts.

3.2 Green Supply Chain Management (GSCM)

GSCM aims to address economic and environmental sustainability by optimising the use of resources in product development, sourcing and distribution while integrating product innovation and technological advances into the supply chain to increase the value of local production and promote sustainable economic development. For example, as the main technological advances in hybrid vehicles are in developed countries, while traditional manufacturing is concentrated in developing countries, adopting a dual production strategy could help manufacturers achieve higher profit margins.

3.3 Blockchain

Blockchain technology (BT) advances supply chain management in the automotive industry by enhancing product quality assurance and consumer trust. In the automotive industry, it facilitates full integration as a single source of information for all critical activities, such as supply chain, thus increasing the visibility and transparency of transactions. Most importantly, BT aligns with the production supply chain management needs of the Malaysian automotive industry by providing scalability, audibility and real-time monitoring capabilities that are critical to the growth of the industry (Raja et al., 2022)

3.4 Cross-docking

In the automotive industry, cross-docking technology streamlines the supply chain by bypassing traditional warehousing and moving spare parts directly from manufacturing plants to service centres. This approach connects assembly plants with first-tier suppliers, facilitating efficient planning and internal communication and improving economic sustainability. For example, the logistics of tyre deliveries can be coordinated directly within the company. This approach reduces handling, storage and time, speeds up inventory replenishment, and improves service efficiency (Akkerman et al., 2022).

3.5 Intramodality

Multimodal transport simplifies the transfer of goods between different modes of transport through a single transport document, thereby increasing efficiency and reducing direct and indirect costs. One example is "roll-on/roll-off" transport, used mainly for wheeled vehicles such as trucks and buses, which arrive at ports and can be disembarked directly on wheels or in self-propelled modular transporters (SPMTs) [6]. This approach effectively mixes different modes of transport, facilitates inventory management in the automotive industry supply chain, and avoids traffic congestion and customs-induced delays.

3.6 Methodology

This study conducted a systematic literature review to gain insight into the issues in the research area. The study gathered the latest research findings from academia on SCI and economic sustainability, and the methodological approach taken will be presented.

3.7 Locating Material

This study used Google Scholar and Scopus as the main data repositories as they provide comprehensive coverage of the latest relevant peer-reviewed articles. These two search engines were chosen because of their wide access to the latest papers and coverage. The search was therefore restricted to articles and article reviews from 2021 to 2022 to ensure the timeliness and credibility of the information.

Table 1. Keywords

No.	Keyword	Retrieved Paper
1	Economic Sustainability AND Supply Chain Innovation	90
2	Economic Sustainability AND Green Supply Chain	24

No.	Keyword	Retrieved Paper
3	Economic Sustainability AND Supply Chain Collaboration	19
4	Economic Sustainability AND Industry 4.0	47
5	Economic Sustainability AND Blockchain	15
6	Economic Sustainability AND Open Innovation	23
7	Economic Sustainability AND Lead Production	23
8	Economic Sustainability AND JIT	17
9	Economic Sustainability AND Cross- docking	27
10	Economic Sustainability AND Intramodality	33

3.8 Filtering

At the screening stage, articles were accepted or rejected based on the abstracts obtained from the database. All abstracts from the initial sample of 318 articles were consulted. Articles that dealt with aspects of economics within the SCI framework were considered. The researchers read the abstracts themselves and then compared the findings. A more subjective approach based on judgment was used as the literature on SCI is very comprehensive. At the same time, the broader topic of this research identified many papers that should have explicitly included economic sustainability in SCI. As a result, we found many unrelated articles.

3.9 Sample Characteristics.

Figure 1 illustrates the breakdown of publications according to the annual year in which they were released. The discussion of economic sustainability elements in SCI literature that we collected started in the period of 2018 to 2022.

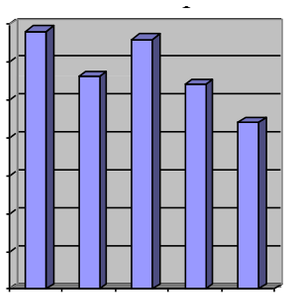

Figure 1. Year of publication

4. Discussions

While the pandemic posed certain challenges to the supply chain during COVID-19, this study explores the Malaysian automotive industry's efforts to improve economic sustainability through supply chain innovation. For example, by creating demand volatility and supply chain disruptions, such as delays in raw material deliveries and production stoppages due to health and safety measures, global light vehicle sales fell by 14.14 % (Statistica, 2022).

From a strategic perspective, supply chain innovations are helping to increase overall industry efficiency and improve ministry planning and collaboration. For example, technological advances such as blockchain have improved data sharing and process efficiencies, and manufacturers and distributors have benefited from improved logistics and distribution models to meet new market demands effectively[4].

This study suggests that supply chain innovation should focus on operational improvements and investment in innovative tools, prioritize customer needs, and develop leads, which is essential for the continued growth of the industry [2].

5. Conclusion

In the automotive industry, the complexity of the supply chain can undermine the profitability of automotive companies. Therefore, innovativeness is needed to promote economic sustainability. This paper, therefore, demonstrates the relationship between supply chain innovativeness and economic sustainability. In turn, the automotive industry may require inventory management and production layout reorganization to ensure the effectiveness of supply chain innovation to achieve growth and a strong competitive position in the market.

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