

ANALYZING SUPPLY CHAIN MANAGEMENT SYSTEMS IN THE INDIAN AUTO COMPONENTS INDUSTRY**Rohit Khanna¹ and Dr. Jamal A Farooque²**¹Research Scholar, Aligarh Muslim University, Aligarh²Chairman & Professor, Aligarh Muslim University, Aligarh¹rohitkhanna73@gmail.com and ²jamalfarooque@yahoo.co.in**ABSTRACT**

An important part of India's economy and the worldwide automotive supply chain, the Indian auto components industry is the focus of this article, which offers a thorough analysis of the methods used to manage the supply chain at every stage of production. There is a worldwide automotive supply chain that includes the auto parts industry. Case studies, industry reports, and expert interviews make up the quantitative and qualitative data used in this study's mixed-methodologies approach. We used both qualitative and quantitative techniques to compile this data. Logistics, manufacturing, distribution, and procurement are all examined in this research, with a focus on difficulties such logistical complexity and legal hurdles. The study is narrowly focused on the challenges that need solving. Weaknesses and opportunities for improvement are highlighted in this article's analysis of these practises. In order to do this, it looks to global standards as a starting point. Despite the company's fast change, the most important results indicate that there is still space for development in areas such as resilience, sustainability, and efficiency. In order to position the sector more competitively in the global market and optimise the procedures involved in the supply chain, the paper concludes with strategic suggestions.

Keywords: Supply Chain Management, Indian Auto Components Industry, Logistics and Distribution, Procurement Processes

1. INTRODUCTION

With its expanding global presence and substantial economic benefits, India's automotive components sector is an integral part of the global supply chain for vehicles. This industry is crucial while considering India's technical landscape. This article mainly focuses on the supply chain management systems that are employed within this business. In a global economy where competition is fierce and efficiency is paramount, these systems are more important than ever. The purpose of this study is to thoroughly examine the supply chain in order to offer an analysis of the present structures and methods, as well as the specific difficulties faced by the industry. The logistical process is complicated, laws set constraints, and technology is always evolving, all of which contribute to these issues. Finding out how supply chain management systems may be tweaked to make them more responsive to the market as a whole, more productive, and cheaper is the main goal of this study. A key finding of the research is the importance of efficient supply chain management. An excellent illustration of the relevance of this study may be seen in the present trends impacting the industry. Some examples of these tendencies are the global movement towards electric cars, the adoption of smart technologies like the internet of things and artificial intelligence, and the shift towards more eco-friendly practises generally. To keep up with all of these developments, a flexible and strong supply chain infrastructure is required. By delving into these topics, this paper hopes to provide light on the dynamics of supply chain management in India's automotive components industry. Furthermore, the article will provide a global perspective and suggest strategies for industry stakeholders to face the obstacles and seize the possibilities in this ever-changing landscape. The paper will include these suggestions.

2. Supply Chain Management in the Indian Auto Components Industry

An enormous supplier, manufacturer, and distribution network characterises the Indian auto components industry. The effectiveness and global competitiveness of this industry are largely determined by its supply chain management (SCM). In recent years, this area of the Indian economy has been experiencing dramatic change due to a variety of factors. Increasing economic globalisation, stringent quality standards, and the use of cutting-edge technology are all contributing elements. At the centre of this change is the industry's reaction to problems like

keeping track of intricate supplier networks, delivering components on time and under budget, and meeting the ever-shifting wants of consumers. The trend towards electric automobiles and environmentally friendly production methods makes this point quite clear. The one-of-a-kind business climate in India has a significant influence on the supply chain management tactics used by this sector as well. Logistics, supplier technology adoption rates, and regulatory laws are all aspects of this ecosystem that might change. This article's goal is to go into the strategies used by Indian car component makers to circumvent these problems. Areas including logistics optimization, production planning, inventory management, and procurement strategies get special attention. On top of that, it delves into the execution of supply chain operations that use cutting-edge solutions like JIT inventory systems, lean manufacturing ideas, and digital technologies like the Internet of Things (IoT) and artificial intelligence. In order to better understand India's role in the global automotive supply chain ecosystem, this research will focus on the present status of supply chain management (SCM) in this industry, highlighting its strengths and areas that need development.

3. Importance of Supply Chain Management

Modern business strategies must include Supply Chain Management (SCM), which is particularly important in industries like automotive production where the success or failure of a company may hinge on the smooth running of a number of interdependent processes. Supply chain management (SCM) is more than just a logistical need for the Indian auto parts industry; it's a strategic tool that may influence efficiency, quality, timeliness of delivery, and customers' happiness. From the procurement of inputs all the way through to the distribution of outputs, supply chain management ensures efficiency by meticulously planning, executing, and controlling each step of the process. This makes sure that the right parts are accessible when and where they need to be, in the right amounts, and at the best possible price. This is crucial in a field where productivity is closely monitored, quality standards are high, and competition is increasing on a global and local scale. In a period marked by rapid technological advancements and changing market dynamics, supply chain management is also quite important since it helps with being agile and resilient. As a result, companies may maintain their competitive edge in the face of rapid market changes, such as shifts in demand, changes in regulatory requirements, or technological revolutions. Furthermore, in keeping with worldwide environmental concerns, effective supply chain management practises contribute to sustainability by maximising resource use and minimising waste. The importance of supply chain management (SCM) in India's automotive parts sector is, ultimately, crucial. For the simple reason that supply chain management (SCM) affects the operational efficiency, profitability, and sustainability of companies in this industry. It also has a major impact on these companies' capacity to compete and succeed on a global scale.

4. Technological Innovations and Adoption

Technological advancements and the adoption of such technologies have a revolutionary impact on supply chain management and operational efficiency in the dynamic Indian auto components industry. The use of recently created technological systems allows this to happen. From the first phases of procurement and manufacturing to the final phases of logistics and distribution, the use of state-of-the-art technologies such as artificial intelligence (AI), the internet of things (IoT), and sophisticated robots has begun to alter the way supply chains operate. Using AI and ML algorithms for predictive analytics is a standard practise for organisations nowadays. In turn, this helps companies improve their demand estimates, optimise inventory levels, and foresee market trends. Thanks to IoT-enabled devices, components may be followed and monitored in real-time as they move through the supply chain. This greatly enhances traceability and quality control while also guaranteeing transparency. Industrial processes have been transformed by robotics and automation, leading to increased productivity, less human error, and enhanced safety. Supply chains are becoming more flexible and responsive as a result of digital platforms and cloud-based solutions that streamline communication and collaboration among the many diverse stakeholders. Indian auto component manufacturers need to dive headfirst into new tech if they want to keep up with the competition in a global market where technical innovation is king. High initial investment costs, personnel shortages, and cybersecurity concerns must be addressed if we are to fully use the potential of these technological developments. With this technology, the Indian car parts industry may become more efficient, environmentally

friendly, and competitive. The trend toward a more digitalized and networked industrial environment is a global trend, and this fits right in with it.

5. Impact of Policy and Regulatory Environment

The legislative and regulatory landscape of India's automotive components business greatly affects the strategic decisions and operational dynamics of the sector. This is particularly the case in the area of supply chain management, where the regulatory and policy climate is the most influential factor. Businesses' ability to stay in business is highly dependent on national and regional government policy. Import and export regulations, tax systems, labour laws, and environmental standards are just a few areas that these policies touch. The Goods and Services Tax (GST) and other recent revisions have all had one goal in mind: to simplify taxing. Regardless, these rules have changed, and companies will need to change their logistics and supply chain strategies to comply. Component makers for automobiles have redirected their efforts toward cleaner technologies and updated their product lines in response to laws governing environmental sustainability and emission regulations, such as the Bharat Stage Emission Standards. The rising demand for eco-friendly items is the reason for this. While new laws encourage efficiency and creativity, they also present obstacles such as the time and money needed to comply and the need to restructure operational systems. International trade agreements and tariffs impact the sector in addition to local regulations; these factors determine the competitiveness of exports and the cost of imports. Among other things, the policy environment addresses supply chain modernization by providing incentives to engage in infrastructure development and technology, two aspects that are critical to the process of updating supply chain operations. Therefore, successfully navigating the legislative and regulatory landscape is crucial for firms operating in the Indian auto components industry. This is because, in a globally interconnected and fiercely competitive industry, environmental factors may have an immediate impact on their supply chain efficiency, cost structure, and overall market position.

6. LITERATURE REVIEW

(Sanghavi, n.d.) in the study "A Review on Green Supply Chain Management in Automobile Industry" and said that with an emphasis on environmentally friendly design and operations, this article delves into the Green Supply Chain Management strategies used by the cutthroat automotive industry. In an effort to strike a balance between commercial success and environmental responsibility, it describes the difficulties these businesses have encountered in adopting these principles.

(Velooso & Kumar, n.d.) in the study "The Automotive Supply Chain: Global Trends and Asian Perspectives" and said that This study delves into the latest developments in the Asian market for automobiles, specifically looking at the main participants such as manufacturers and suppliers. It gets to the heart of the problems that local autoparts suppliers, especially the smaller ones, encounter. In its last section, the article delves into potential outcomes and viewpoints about the evaluation of corporate competitiveness.

(Thakkar et al., 2007) in the study "Evaluation of buyer-supplier relationships using an integrated mathematical approach of interpretive structural modeling (ISM) and graph theoretic matrix: The case study of Indian automotive SMEs" and said that This research seeks to provide a method for evaluating and comparing supply chain interactions by using SMEs as a case study.

(Jain & Sharma, 2012) in the study "Green Supply Chain Management Practices in Automobile Industry: An Empirical Study" and said that the purpose of this research was to identify 26 common GSCM practises across automotive businesses in the Indian state of Madhya Pradesh. Through surveying ten different firms, we were able to determine that while some practises are at the best level, the majority are at the primary stage. This indicates that there are potential to implement more eco-friendly operations.

(Govindan et al., 2014) in the study "Barriers analysis for green supply chain management implementation in Indian industries using analytic hierarchy process" and said that This report pinpoints 47 obstacles to the efficient adoption of green supply chain management in industrial businesses. To determine the most important

hurdles and priorities, it consults literature, expert talks, and polls; sensitivity analysis checks the stability of the priority rankings.

(Bhattacharya et al., 2015) in the study “Framework for Study of Supplier Relationships in Indian Automotive Supply Chains” and said that By adopting global supply chain best practises, such solidifying relationships with suppliers, the Indian auto industry has improved its performance and acquired a competitive advantage. However, for partnerships to be effective, they must put an emphasis on maximising mutual benefits. This study searches for strategic imperatives, an orientation toward supplier management, the usage of SDPs, mutual benefits, and the VA-supplier relationship in Indian automotive supply chains via a theoretical and practical lens. A thorough framework can help shed light on the VA-supplier relationship.

(Masoumi et al., 2019) in the study “Sustainable Supply Chain Management in the Automotive Industry: A Process-Oriented Review” and said that how the car industry has managed its supply chains sustainably from 1995 to 2017: a literature analysis. In addition to outlining research gaps and proposing topics for more exploration, the article presents a practical approach to building a sustainable automotive supply chain. As a whole, the automobile sector is leading the fight for a greener society.

(Ansari et al., 2020) studied “Evaluation and ranking of solutions to mitigate sustainable remanufacturing supply chain risks” and said that This project aims to identify and evaluate strategies for reducing supply-chain risks in sustainable remanufacturing (RSC). A hybrid multi-criteria decision-making framework using fuzzy SWARA and fuzzy COPRAS is used to analyze risks and potential remedies. The study quantitatively applied to a manufacturing firm, finding management initiatives and organizational goals as the most efficient means of risk reduction. A sensitivity analysis evaluates the architecture's robustness.

(Chand et al., 2020) studied “Analysis of supply chain sustainability with supply chain complexity inter-relationship study using delphi and interpretive structural modeling for Indian industry for mining and earthmoving equipment” and claimed that the sustainable supply chain (SSC) environment is gaining attention due to its competitive advantage. However, increasing supply chain complexity (SCC) can negatively impact operations, costs, profitability, timely delivery, and client satisfaction. This study aims to examine the interplay between SSC and SCC drivers, using the Delphi method and interpretative structural modelling. The findings provide a basis for supply chain managers to make wise choices, focusing on important drivers with a strong impact on overall outcomes. Factors influencing decision-making include institutional rules, strategic supplier alliances, consumer pressure, and new technology.

(Kumar et al., 2021) studied” Managing supply chains for sustainable operations in the age of industry 4.0 and the circular economy: Analysis of impediments, and it said that In this age of Industry 4.0 and the circular economy, this research seeks to comprehend the challenges that companies have in maintaining sustainability. To evaluate these challenges and devise plans for resource efficiency, circularity, and sales of environmentally friendly products, it employs an integrated methodology that combines the Analytic Hierarchy Process with Elimination and Choice Expressing Reality.

(Shanker & Barve, 2021) studied “Analysing sustainable concerns in diamond supply chain: a fuzzy ISM-MICMAC and DEMATEL approach” and said that In this research, we use a hybrid model that combines fuzzy MICMAC analysis with interpretive structural modelling and the DEMATEL approach to look at sustainable supply chain management in the diamond mining business. Keeping a competitive advantage over the long term requires cost-cutting measures and environmental protection policies, according to the findings, which also stress the need of awareness initiatives and appropriate infrastructure investment.

(Rajak et al., 2022) studied “Issues and analysis of critical success factors for the sustainable initiatives in the supply chain during COVID- 19 pandemic outbreak in India: A case study” and said that The COVID-19 pandemic has significantly impacted the global supply chain, necessitating the implementation of sustainability strategies. This essay outlines the prerequisites and critical success factors for a sustainability project in South

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Carolina. It uses a hybrid best-worst technique for quality function deployment (QFD) to assess and rank key elements, with the top three success criteria being social isolation, emergency backup facilities, and emergency logistics systems.

(Singh & Kumar, 2022) studied “Measuring the Factors Affecting Annual Turnover of the Firms: A Case Study of Selected Manufacturing Industries in India” and said that This study evaluates factors influencing the yearly turnover of Indian manufacturing companies across seven industries. Financial data from 154 companies was used to analyze the impact of labor intensity, firm size and age, R&D expenditures, technological advancement, machinery investment, worker compensation, and skilled and unskilled personnel. The results suggest India needs to enact stringent intellectual property rights laws to reduce technological piracy and enhance knowledge transfer. The success of businesses in the Indian manufacturing sector is aided by an effective education system, a conducive R&D environment, and a science and technology infrastructure.

(Duggal et al., 2023) studied “sustainable supply chain management for evs in india” and said that India's growing automotive population has led to a rise in harmful gas emissions, prompting a shift towards electric vehicles (EVs) using sustainable resources. However, adoption has been slow. To tackle this, sustainable supply chains must be created, focusing on battery exchange systems and electric motors. This research will analyze literature, case studies, and industry reports to identify challenges in battery manufacture, distribution, and disposal. The study aims to develop a long-term supply chain model for electric cars in India, including recommendations for logistics, recycling, and cooperation.

Supply Chain Resilience and Risk Management

Supply Chain Resilience and Risk Management are increasingly crucial in the Indian auto components industry, a sector vulnerable to various internal and external uncertainties. The ability to anticipate, respond to, and recover from disruptions is vital for maintaining continuous supply chain operations. This resilience is tested by challenges such as raw material price volatility, geopolitical tensions, changing regulatory landscapes, and unforeseen events like the COVID-19 pandemic, which exposed vulnerabilities in global supply chains. Indian companies are focusing on developing robust risk management strategies that include diversifying supplier bases to avoid over-reliance on single sources, implementing advanced predictive analytics for better demand forecasting and inventory management, and investing in flexible manufacturing systems that can quickly adapt to changing production needs. Additionally, the adoption of digital technologies like IoT and blockchain enhances transparency and real-time monitoring, allowing for prompt responses to potential supply chain disruptions.

Effective risk management also involves close collaboration with suppliers and logistics partners to ensure a cohesive approach to risk mitigation. By building resilient supply chains, companies in the Indian auto components industry not only safeguard against operational disruptions but also gain a competitive advantage, as they can reliably meet customer demands even under adverse conditions. This resilience is becoming a key differentiator in an industry where timely delivery and the ability to adapt to market changes are critical for success.

CONCLUSION

The Indian auto components industry is experiencing significant transformation due to global competition, technological advancements, and regulatory changes. Efficient supply chain management is crucial for business performance and market competitiveness. Technological innovations like AI, IoT, and automation are enhancing efficiency and transparency. However, challenges like supply chain resilience and risk management remain. The study provides strategic recommendations for optimizing supply chain processes, embracing technological advancements, and navigating regulatory landscapes. This research underscores the importance of strategic supply chain management in the evolving automotive industry.

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