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Analysis of Supply Chain Management in the Automotive Industry

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Abstract

Over the years, there has been a plethora of changes in the international automotive world. The advancement in production and management systems have revolutionized the automobile industry. Several marketplaces have opened up and grown since the industry started. Now, the auto industry is facing new and crucial problems. The industry is changing because of globalisation, digitalization, and more competition in the market. The purpose of this study is to understand the development of supply chain management in the automotive industry. This study analyses the developments and the problems faced by the automotive industry from the year 1995 to 2022 in supply chain management. We see it develop from using traditional techniques such as built to stock method to transitioning to build to order technique using advanced technology, planning systems and operations research techniques. The industry uses a wide array of methods to create an integrated pipeline to streamline the flow of goods. They also incorporate Sustainable Supply Chain Management (SSCM) procedures and green supply chain management techniques into the conventional supply chain to create a sustainable supply chain and reduce the carbon footprint. This review paper contributes to the literature by analysing existing research, identifying existing research gaps and proposing new future research opportunities in the area of supply chain management in the automotive industry.

Keywords: Supply Chain Management, Automotive Industry, Sustainable, Blockchain, Automotive Industry

1. Introduction

1.1 Importance of Automotive Industry

Among the various industries across the world, the automotive industry is said to be one the most considerable industry (Orsato & Wells, 2007).

The industry is a significant socioeconomic sector that contributes significantly to global growth, with a turnover that is comparable to the sixth largest global economy.
The Indian automobile industry was silent until the end of the 1940s during which almost all the vehicles or parts of vehicles were imported (Piplai, 2001). The Indian market could gain access to around 20,000

vehicles during this time which were imported by companies such as General Motors and Ford (Piplai, 2001). The boom in the automotive industry was evident after the establishment of manufacturing units by Hindustan Motors in 1942 and Premeir Auto in 1944. A steady growth was ignited in the 1960s by the entry of new manufacturers like TELCO, Bajaj Tempo, and Mahindra & Mahindra into the industry (Piplai, 2001).

The importance of the automotive industry cannot be ignored. As of 2022, India's automobile industry contributes to 7.1% of the country's GDP and about 49% of the manufacturing GDP. Moreover, the automotive industry provides work to almost 35 million people and makes up 4.3% of the country's exports(Mathivathanan et al., 2018). The main reason behind a slack in the figures is the outbreak of Covid-19. As we see in Figure 1 a decrease in the number of automobiles produced in India decreased post-2019. However, looking at it through a positive lens suggests to us that there hasn't been a drastic decrease in the production of automobiles despite the imposition of lockdown and disruptions in the supply chain. According to Ibef, in India, the market for automobiles is projected to reach US$ 54.84 billion by 2027, with a CAGR of just under 9%, up from an estimated US$ 32.70 billion in 2021. This suggests that even though the industry has been hit with the difficulties caused by lockdown and other restrictions, the industry has been able to lift itself and get back on track.

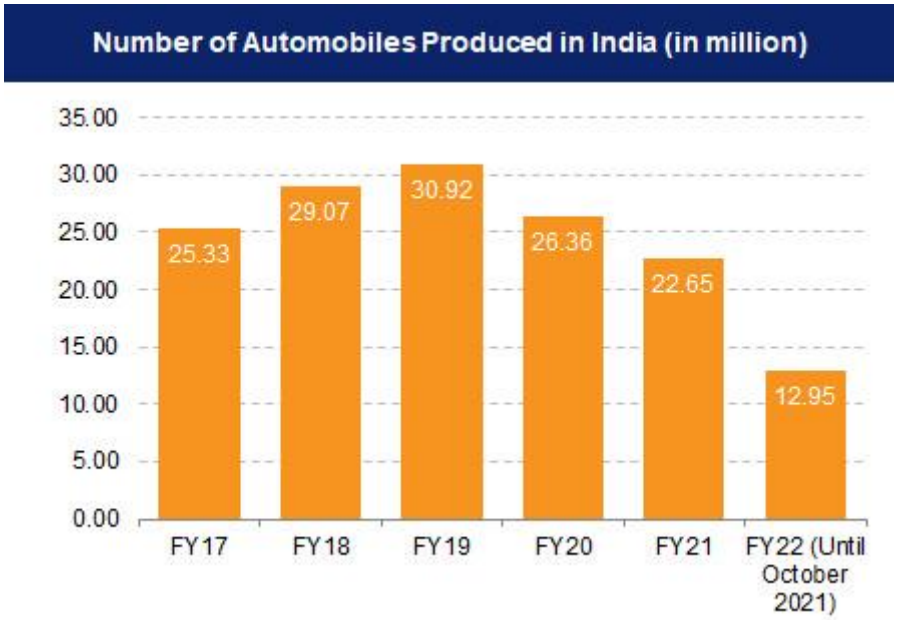

Figure 1

1.2 Reasons For Major Shift in The Industry

An increase in the number of automobiles is observed as a result of the industry's expansion and increased production rate, which each contribute to a distinct challenge for society. During their lifetime, cars have a variety of environmental effects. Before they are ready to be driven, all cars consume a lot of resources, including plastics, rubber, glass, steel, and many more that are difficult to recycle or expensive to dispose of. But burning more fuel causes air pollution, which deteriorates air quality and hastens global warming.

Keeping in mind all the harmful effects caused by the activities of this industry on the environment, society and economy companies and manufacturers have begun to be considerate about sustainability (Zhu et al., 2013).

The society has become more aware of the problem of climate change during the last ten years. Consumers worldwide are more concerned about climate change and global warming than ever before. Top management in a broad range of industries has recognized that climate change and carbon management are now clearly a business reality, according to a McKinsey global study (2008) (Enkvist & Vanthournout, 2008).

By (Wiedmann & Minx, 2007), who stated that "carbon footprint is a measure of the entire quantity of CO2 emissions that is directly and indirectly induced by an activity or is accumulated over the life phases of a product,"

The concept of sustainability is becoming mainstream(Corbett & Klassen, 2006) in the present business world. Even though the roots of sustainability were found in 1713 in the agricultural sector, its accentuation started only from 1990 onwards(Halldórsson et al., 2009). The core objective of sustainable development (SD) is ‘a development that meets the needs of the present without compromising the ability of future generations to meet their own needs(Keeble, 1988),(Gopal & Thakkar, 2015).

1.3 Shift to A Sustainable Model

During the calculation of the carbon footprint of business operations, they emphasized the significance of all direct (on-ground, internal) and indirect (off-ground, external, upstream, and downstream) emissions. The first step in reducing supply chain risks is the identification and assessment of direct and indirect carbon footprints. Second, defining the measurement system boundaries is crucial in incorporating the carbon footprint issue into supply chain management. Third, identifying and measuring carbon emissions across the supply chain is made more accessible by creating a product's carbon footprint map. The common goal of carbon footprint analysis is to disclose indirect effects generated by the supply chain of a company (upstream) or by the usage and disposal of its products rather than reporting direct effects from on-site procedures (downstream). Integrating environmental factors into supply management has become a crucial strategic concern for many businesses. Identifying significant sources of carbon impacts in supply chains by integrating carbon footprint into supply chain management. The need to develop sustainable operations with reduced carbon footprints is driven by awareness of the carbon footprint in the supply chain (Lee, 2011).

Manufacturers and suppliers are under increasing legal pressure to adopt sustainable business practices and improve their economic and environmental performance. Furthermore, incorporating sustainable operations necessitates businesses use supply chain management techniques, whereby focal organizations assess the performance and risk of suppliers using environmental criteria (Seuring & Müller, 2008).

Many companies in the automobile industry have adopted Sustainable Supply Chain Management (SSCM) procedures. SSCM techniques are certain procedures that are incorporated into the conventional supply chain and assist a sector in transitioning to a sustainable supply chain. Efficient supply chain integration may play a more critical role in sustainable SCM competitiveness(Huo et al., 2014). Therefore, in order to enhance or maximise performance, managers must choose how to combine initiatives for fast supply network structure and supplier integration (Danese et al., 2013)

Due to the expansion of product varieties and the increased volatility of the global marketplace, responsiveness to customer requests is today a crucial competitive factor in the business environment (He et al., 2016).

Patrick Penfield, Whiteman School of Management explains Green Supply Chain Management as "the process of using environmentally friendly inputs and transforming these inputs into outputs that can be reclaimed and re-used at the end of their lifecycle thus, creating a sustainable supply chain"(Mishra, 2012). A supply chain is referred to as "green" if best practices for lowering carbon emissions are applied throughout the chain, from the procurement of raw materials to product design, production, distribution, and delivery, and finally to end-of-life recycling (Gardas & Narkhede, 2013) (Kajal, 2015).

Supply chain management (SCM) was formerly thought of as a process involving extracting and utilizing natural resources to transform raw materials into finished goods before delivering them to the final consumer(Srivastava, 2007). However, in the twenty-first century, environmental sustainability has become crucial. Thus, it is vital for businesses to incorporate "green" supply chain methods. This 'green' component addresses the concerns and balances the relationship between SCM and the environment. Therefore, "Green" has become a magical big word, which should be attached to all the technologies, to sustain the environmental system (Kajal, 2015).

The current study aims to analyse the research published how supply chain management in the automobile industry has developed and what are its future prospects. The first aspect of the study searched the literature that allows us to understand the series of events that has led to the growth of it till now. The second stream of literature focuses on growth of sustainability, green supply chain, blockchain and the ease of operations with new technological developments.

We mapped the literature to understand the event that led to its growth along with setbacks along the way and discuss the possible future scenario and finally provide a future agenda.

2. Literature Review

2.1 Brief History of the Industry

From 1880s till 1990s, the production in automobile industries took place in small volumes and only supplied to the rich. The low level of customers helped the sellers to maintain close relationships with consumers. As the automobile industry started growing at a rapid rate, firms developed strategies to handle supplier relationships. Early in the 1980s, new ways of organizing and controlling supply that originated in

Japan and growing competitive pressures drove Western auto assemblers to reassess their relationship with their suppliers and move back toward a more personal one (Ali et al., 1997).

2.2 Changes in the Automotive Industry 1990-2010

Customers have become more demanding with higher preferences as a result of fierce competition, fluctuating market demand, and expanding customer expectations (Zhang & Chen, 2006).

The automotive industry had gone through a massive change from the 1990s to 2010s (Benko & Mcfarlan, 2003). A completely integrated, lean materials flow pipeline was necessary for the traditional approach to developing an automotive supply chain, and specific design constructs and its activities had to be included into the supply chain. The sector has traditionally implemented a "push" paradigm. The design, engineering, financial, and manufacturing teams in this model use these estimates to establish make and/or model production numbers after marketing and sales make their best estimate of the market demand (Ambe & Badenhorst-Weiss, 2010). The growth of the Internet had greatly increased both manufacturers' and customers' access to data (Tang & Qian, 2008).

Companies in this era had to deal with problems which ranged from globalisation and economic uncertainty during the great recession, to adaptation of new technologies and rising consumer demands as a result of the vast changes made to the business conditions of the 21st century. As automakers design and produce vehicles all over the world, their supply chains become more complex, posing problems that frequently prevent profits and high shareholder value, like lengthy order-to-delivery delays, erratic production schedules all throughout the supply chain, protracted inventory control cycles, and a dearth of supplier access are some of the problems that exist. The need for automotive executives increased as a result of the worldwide economic crisis to choose wisely regarding their supply chain in order to improve performance. For automotive manufacturers and their component manufacturers, an efficient and effective supply chain strategy is an essential in the highly challenging and competitive environment of today, where supply chain is a popular tool for improving organisational competitiveness, in order to meet shifting consumer demands (Ambe & Badenhorst-Weiss, 2010).

The management of physical distribution and supply chains are crucial aspects of the automotive industry. The supply chain for the sector runs from the manufacturers of raw materials through the assembly of the most advanced electronic and computing technology (Tang & Qian, 2008).

The supply chain's main players include suppliers (tier 1–3), distribution centres, dealers, OEMs and customers. Suppliers sold complete subassemblies to manufacturers, including doors, powertrains, and electronics. In order to support the manufacturers' design, procurement, and logistics operations, a completely new infrastructure had been created in response to the demand to collaborate with partners to outsource subassemblies (Benko & Mcfarlan, 2003).

The industry placed a strong emphasis on lean, "Just-In-Time" manufacturing methods and the technologies that supported them. To accommodate a demand-driven approach, OEMs and suppliers reengineered processes and technologies at a cost of millions of dollars and millions of man hours. Reengineering initiatives were restricted to OEMs and their Tier 1 suppliers due to the unacceptably high cost of

reengineering and supporting technology, such as ERP. The "commonization" of process and technology within the "four walls" made significant progress, but the gap between OEMs, Tier 1s, and the remainder of the automotive supply chain in terms of process and technology was growing(Ambe & Badenhorst-Weiss, 2010). Competition demands increased tremendously as the Internet became a commonplace fixture in automobile business-to-business (B2B) (Tang & Qian, 2008).

Many automakers changed to a build-to-order (BTO) production from a built-to-stock oriented manufacturing of standardised cars to a customised as a result of the evolution in the computer industry. In the computer sector, the move to BTO resulted in a restructuring of planning procedures and a rise in the usage of "Advanced Planning Systems," or computer-based decision support systems, which, at least in part, rely on advanced operations research techniques (OR) (Meyr, 2004).

2.3 Recent Challenges faced by the automotive industry

Lack of traceability and transparency in supply chain activities and logistics. The inadequacy of real-time data sharing which causes inventory obsolescence. Inefficiency in sharing real-time data related to inventory, demand, transactions, etc., with supply chain members (Raj Kumar Reddy et al., 2021).

According to the empirical analysis, supply chains are primarily regarded as vulnerable. According to the literature, one reason could be the relatively low level of implementation of supply chain risk management instruments. Furthermore, factors increasing complications, such as globalisation and product variants on the one hand, and factors increasing efficiency, such as outsourcing or supplier reduction on the other, have been identified as key developments driving supply chain risks and this results in the increase in supply chain vulnerability. Globalization increases the risk for supply chain because the resulting dependencies may pose risks on both the supply and demand sides. Furthermore, many product variants cause supply chain risks because they increase supply chain uncertainty (Thun & Hoenig, 2011).

Due to cultural resistance, firms fail to implement green/sustainable initiatives, such as ineffective and improper communication among SC members, institutional rules and internal politics, and so on (*Surprising Supply Chain Disruptions_ Mitigation Effects of Operational Slack and Supply Redundancy*, n.d.).

2.4 Recent Models used by Manufacturers to Optimise SCM

Social sustainability initiatives in supply chains at various stages are significant and have the potential to have a significant impact on the organization's overall sustainability (Mani et al., 2018). It is not sufficient to consider anymore that only the CO2 saved when driving a vehicle. Consider the CO2 emissions linked with material production, manufacturing, and disposal. If this is not included, a lighter vehicle may emit more CO2 over its entire life than a previous heavier design of vehicle. One example is the use of magnesium alloys, where the CO2 'cost' of production can be 10-20 times that of steel (Bhattacharyya, 2015).

There are many models used to optimise supply chain management some of them are:

1. Stakeholders' theory
2. The Lean Manufacturing model is a generic term for a production system that originated with Toyota and is now used in all industrial sectors around the world. The fundamental principle of this philosophy is defined as a systematic approach to identifying and eliminating all waste (non-value-added activities) in order to achieve industrial excellence through continuous improvement (Yahiaoui et al., 2019a).
3. The Global EVALOG (Global MMOG / LE) model - it was developed in 1999 in collaboration with the Automotive Industry Action Group and Odette International Limited and through its use, it has been possible to highlight the organization's weaknesses, better integrate its processes, and thus improve the internal interfaces (between supply and production, between production and distribution) in order to increase its rate on duty. A comprehensive set of measures designed to increase the company's profitability (Yahiaoui et al., 2019b).
4. The MCDM method begins with the DM selecting the best and worst items based on the fewest pairwise comparisons among criteria. This method was used in several studies to determine the significance of each criterion: evaluation of urban sewage sludge technologies evaluation of the quality of public transportation nodes ranking edible oil suppliers (Hosseini Dehshiri et al., 2022).

Overall, an improved supply chain in the Automobile industry is very vital for the companies. Companies that do not have tight supply chain and logistics management practises can quickly fall behind on experience costly delays, orders and may lead in dissatisfying their customers.

2.4 Blockchain Technology

In the recent years, blockchain technology has been trending for operations research. Blockchain is a digital, decentralized, distributed ledger technology used that provides a method for digital information to be recorded, shared, and stored by any community.

A robust traceability system which helps organizations in optimization of inventory and improve customer service. In the automobile industry, overspending is a problem which affects the overall efficiency of the supply chain (Ada et al., 2021) .

A case study was found for developing and implementing the blockchain architecture in a manufacturing environment and it is found that the total time required for the transaction process is significantly reduced (Li et al., 2018).

A wide variety of factories and machineries can be bought together using blockchain technologies to enable automated value adding processes. After a huge data is generated, devices can be analysed by connected partners for gaining detailed insights which can enhance quality and improve risk management.

For the implementation of blockchain, IBM Hyperledger is used. Hyperledger Fabric is an open-source blockchain infrastructure, this offers a modular architecture to develop various distributed systems, and

focuses on the improvement in the reliability and performance of these distributed systems (Ada et al., 2021).

Blockchain ensures that trust and transparency is taken care of in the supply chain. Since a large number of the ledger are created within the network, tampering of the records can be identified with ease.

The non-mediated factor is what makes the effective use of Blockchain technology in the automobile sector possible through organization-to-organization trust. Inter-organizational trust plays vital roles on improving inter-organizational relationships. Inter-organizational relationships, it should be noted, have a detrimental effect on the uptake of blockchain technology. An excellent level of cooperation between the organizations participating in the processes from the initial manufacturing of the initial raw materials to the final delivery of the products to the final consumers is required for the optimal supply chain process management of Blockchain adoption in the automobile sector. Therefore, in the architectural design of the Blockchain technology system for the supply chain process in the digital age integrating among organizations, automobile parts manufacturers and automobile retailers must take the needs of different users and the nature of operating systems involved into consideration (Supranee et al., 2017).

3. Research Methodology

We have researched extensively on the supply chain management practices and development in the automobile industry. We have used 'Google Scholar', 'Science Direct', 'Research Gate' and several other websites to find over 250 papers for our analysis. To perform the search, we used the key words 'Supply Chain Management' and 'automotive industry' or 'Automobile Industry'.

This systematic literature review (SLR) is done for the years starting from 1995 till the current year 2022, which allows us to cover some brief history of the traditional practices of the industry, the early stages of supply chain management practices in the world and its growth as a centre piece in the industry in itself in today's world.

The papers talk about how supply chain management has grown from using traditional practices to meet its requirements to incorporating sophisticated technologies, practices and adopting sustainable practices to meet the everchanging needs of the consumers due to ease of trade between countries and corporations venturing out to global markets to get a larger consumer base and also to increase profitability by cutting costs by setting up the operations in countries which favour cheap labour and has greater accessibility to resources.

Along with this the industry has also faced a lot of challenges like transitioning from brick and mortar to both online and offline stores. With the access of internet information became available on consumers fingertips, and the industry had to use online marketing methods to reach the consumer.

The industry is now on the way to tackle the problem of consumers demanding carbon efficient products by adopting methods of sustainability. Current trends show that the industry is also adopting blockchain

technology for better efficiency. The papers also give a brief overview of different practices used in different countries and by companies with the help of case studies.

4. Bibliometric Analysis

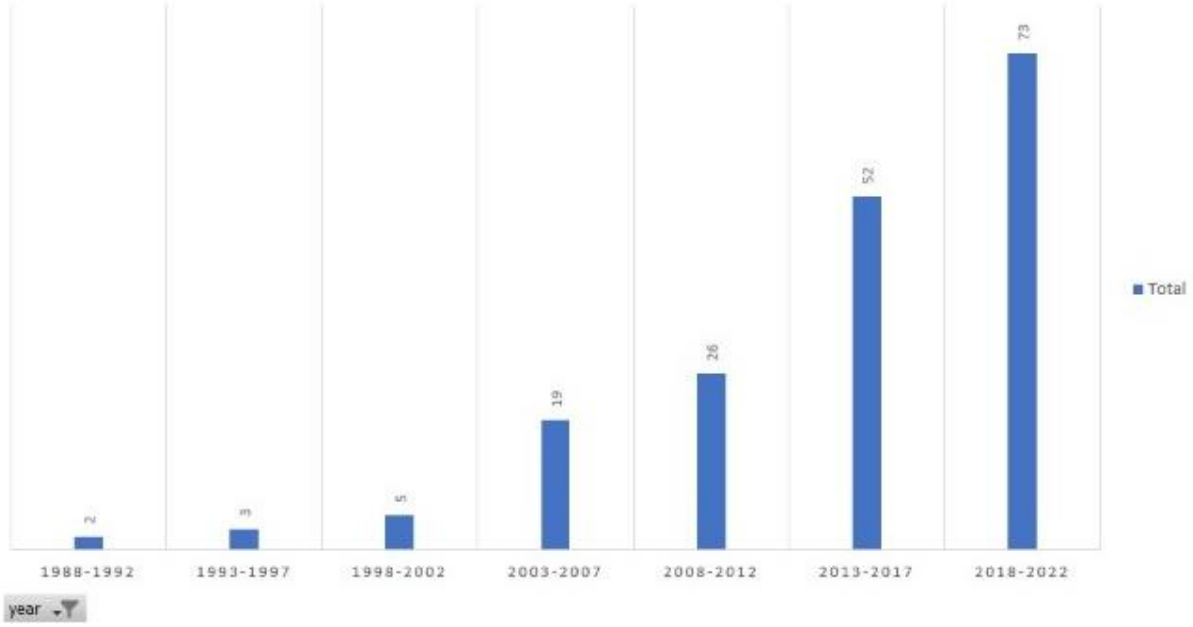

Figure 2. Number of articles published from 1988 – 2022

Through figure 2 one can interpret the number of articles published in the respective time frame for the research area of supply chain management in the automotive industry. The time frame taken is 5 years intervals. The highest number of articles published is in the time frame of 2018 to 2022 with 73 articles followed by 2013-2017 with 52 articles published. Similarly, 2008-2012, 2003-2007, 1998-2002, 1993-1997, and 1988-1992 have 26, 19, 5, 3, and 2 articles published.

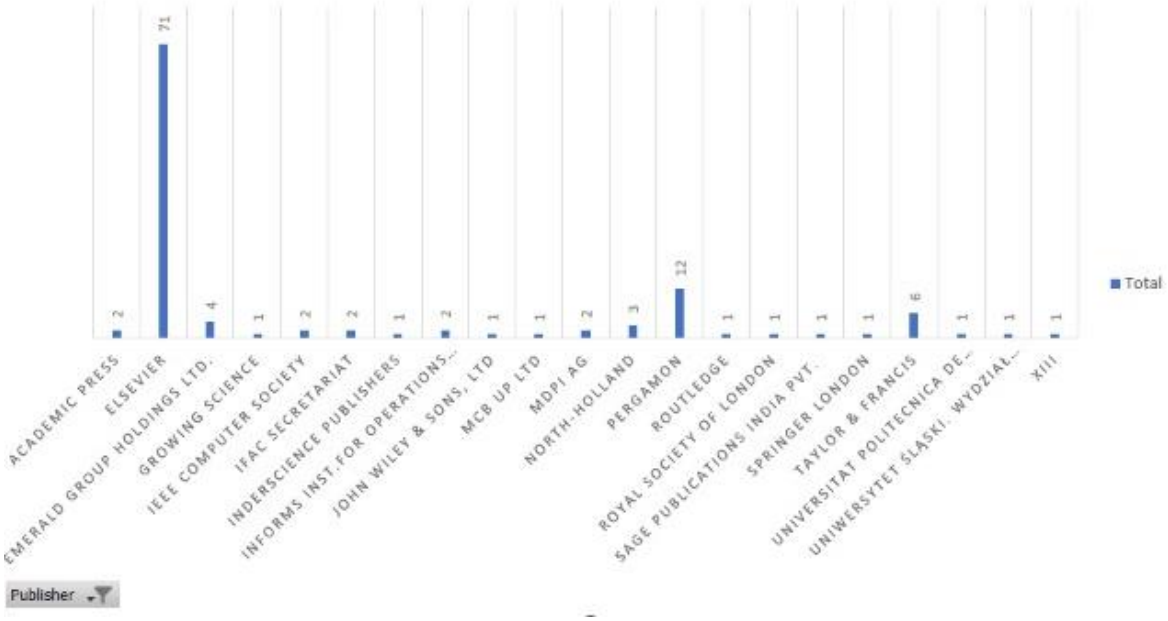

Figure 3. Number of articles published in different publications.

The above graph (figure 3) represents the articles related to supply chain management in the automotive industry, published by different publishers. Elsevier has published the highest number of articles, 71. This suggests that one can find a good number of articles related to this topic under this publisher. Pergamon and Taylor & Francis also have 12 and 6 articles published respectively.

Figure 4 represents the various authors who have written on this topic and the various authors they have cited in their papers. As can be seen Gunasekaran Angappa and Bourlakis Michael are some of the most cited authors.

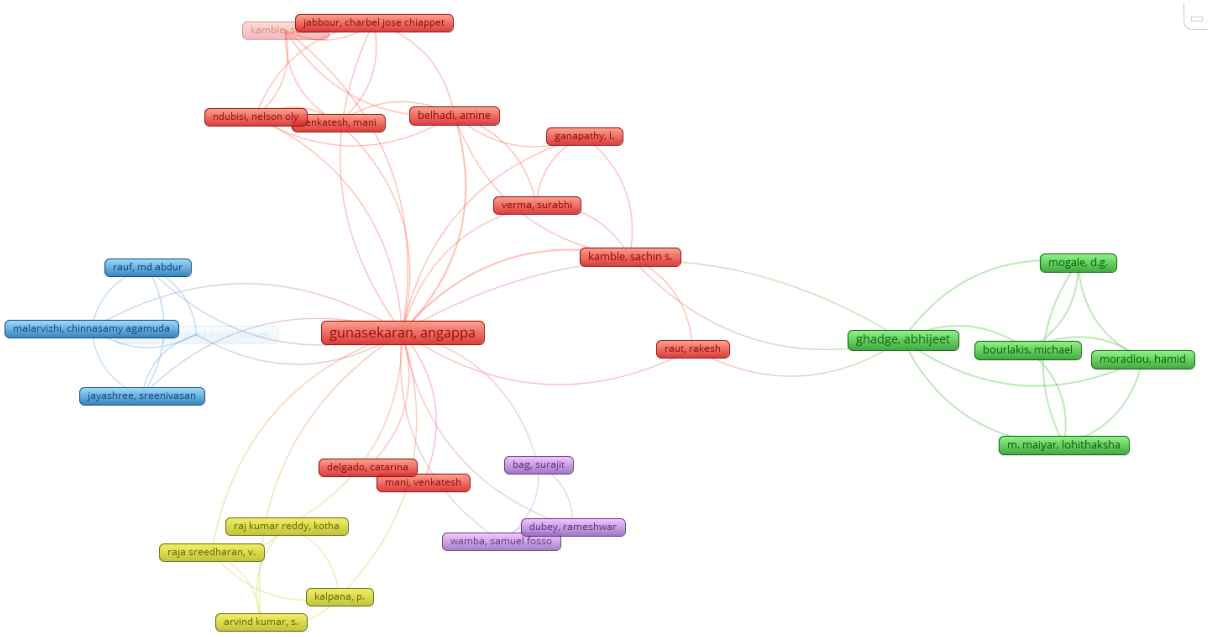

Figure 4. Co-occurrence of citations of authors from the articles. (Source: VOS viewer)

Figure 5 presents the title and abstract words used in the various contributing papers.

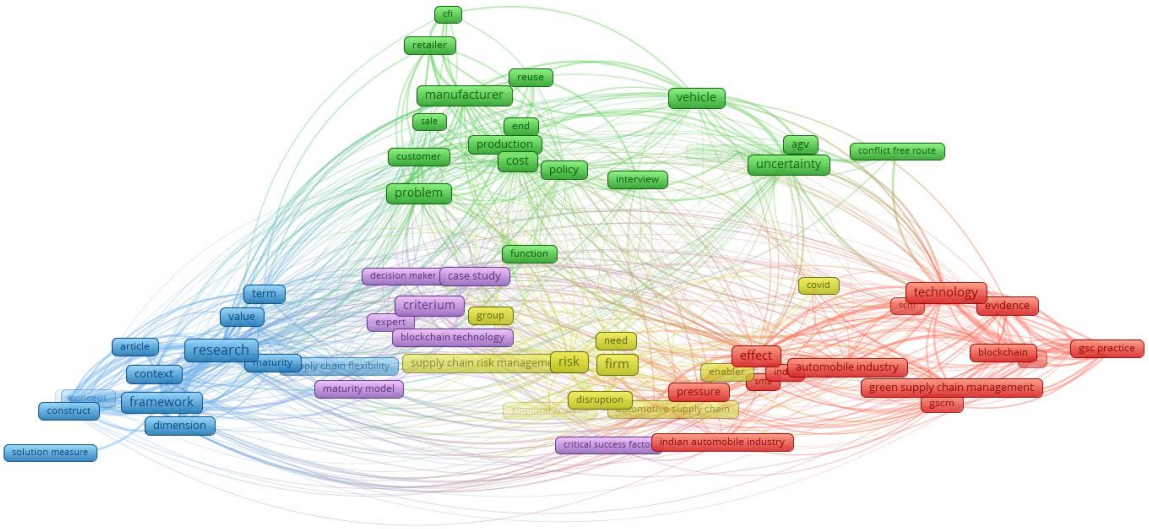

Figure 5. - Co-occurrence of title and abstract words from the various contributing papers. (Source: VOS viewer)

Figure 6 represents the keyword network that is drawn from the keywords used in the selected article. It is noticeable that automotive industry, supply chain management, barriers, sustainability and circular economy are the most used keywords.

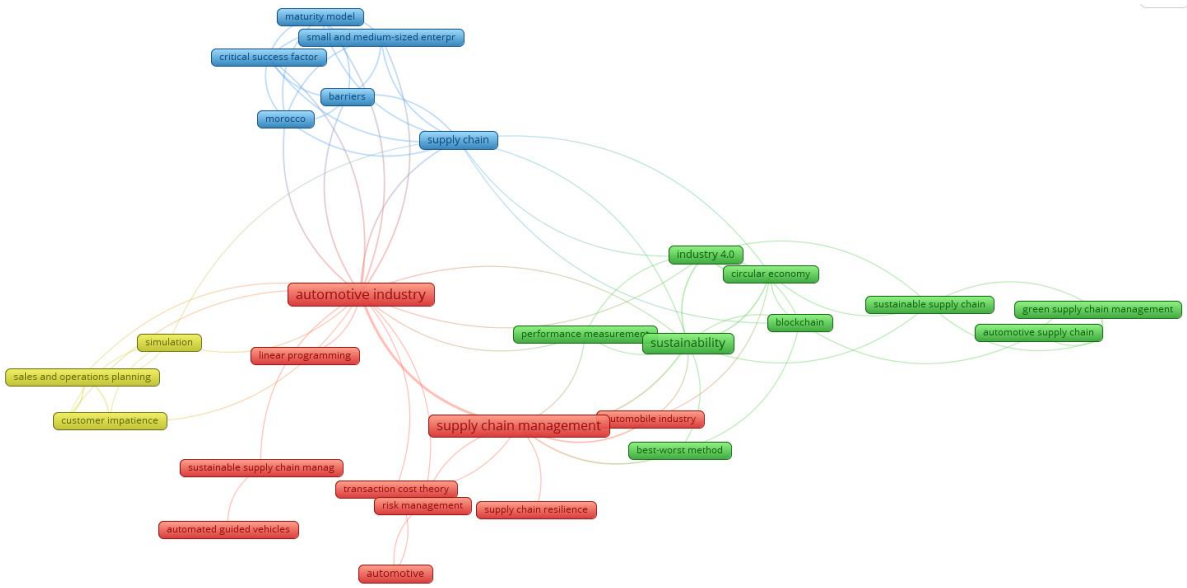

Figure. 6 - Co-occurrence of keywords that were used in the contributing papers. (Source: VOS viewer)

5. Summary of the Review

"If you don't have an auto industry you will not be secure as a nation because you won't have a backbone like manufacturing to be able to put people to work in producing the means to keep you secure." Jennifer Granholm, the U.S. security of energy rightly talks about the importance of the automobile industry in the world. In India the industry alone contributes to almost 7% of the GDP.

In the 1880's the industry was in its nascent stages of production while the 1990's saw a new phase for the industry to grow. (Ali et al., 1997). In the 1990's the industry shifted to an integrated lean materials flow pipeline (Benko & Mcfarlan, 2003). When the internet and globalisation came into picture manufacturers had to adopt to new technologies to meet rising consumer demands. After the great recession, number of automotive executives increased (Ambe & Badenhorst-Weiss, 2010). The outsourcing of subassemblies started to happen (Benko & Mcfarlan, 2003). The shift from built-to-stock to build-to-order production happened with the help of "Advanced Planning Systems" (Meyr, 2004).

The current challenges the industry faces ranges from inventory management to supply chain management and logistics (Raj Kumar Reddy et al., 2021). Also green sustainable goals need to be adopted as that is what consumers are preferring now. (*Surprising Supply Chain Disruptions_ Mitigation Effects of Operational Slack and Supply Redundancy*, n.d.).

Manufacturers have used various models to optimise the SCM - Stakeholders' theory, the Lean Manufacturing model (Yahiaoui et al., 2019a) , the Global EVALOG (Yahiaoui et al., 2019a), The MCDM method (Hosseini Dehshiri et al., 2022).

Currently the most trending technology in OR is the blockchain technology. In the automobile industry this can help reduce costs a lot (Ada et al., 2021). From reducing transaction process time (Li et al., 2018), connecting factories and machines, analyzing of data this has a wide variety of uses in the industry (Ada et

al., 2021). IBM Hyperledger is used to use blockchain (Ada et al., 2021). Non-mediation of intermediaries in the use of blockchain helps it become successful as it helps organizations in building trust and being transparent (Supranee et al., 2017).

6. Future Work & Research Gaps

In most of the current research papers, there is minimal study on the supply chain management for electric vehicles as the EV market is still on the rise. The working of the supply chain will also have a shift after a boost in the demand for electric motors and lithium batteries. New businesses would get opportunities within the industry. The entry of new suppliers and original equipment manufacturers would be needing new ways for integrating into the industry without adding various complexities to the supply chain. Thus, there can be work done in that area. It would be new to the literature to investigate the long-term impact on the automotive supply chains after the EVs dominate the industry.

Yet the challenges for the industry will remain, such as overstocked inventories, sustainability and quality control issues. Researchers can work on how to face these challenges and the solutions to it. The biggest and the most recent challenge has been the impact of Covid 19. Since after one year of the pandemic, concerns have shifted towards the supply side. The sudden shortage of semiconductors has affected the supply chain and the research of the impact is yet to be done.

Research can be conducted on how to reduce the shortage of semiconductors and the problems faced after the covid crises. Innovations in the automobile industry hasn't stopped and various companies have different methods of their supply chain management. There exists very less literature on the supply chain management methods of individual automobile giants such as Tesla, Mercedes and Ford.

7. Conclusion

The following research paper presents an overview of the role of supply chain management across the years under various concepts such as sustainability in the process, changes in the industry over the years, various obstacles faced by the market, recent and efficient models used to optimize sustainable chain management, and blockchain technology. There are several research papers that have analyzed these concepts individually. For the first time in this field, this systematic literature review has made an attempt to produce a research paper that provides a gist about the role of respective areas in the automotive industry.

Previously done research papers revealed some important findings:

1. Internal as well as external factors contribute to the challenges faced by all the members involved in the process of supply chain management in the automotive industry.
2. Changes occurring across different geographical locations and other industries in the economy can increase the probability of risk in supply chain management.
3. Apart from the technical aspect several social concerns also impact the supply chain at different levels of its process.

4. Various research papers have analyzed the different models and methods used in the analysis of supply chain management. However, no research paper has extensively combined all the methods and analyzed their influence on the automotive industry.
5. The role of blockchain technology has also been increasing in the automotive industry recently. Case study under this area has also been done to support the theoretical findings.

In conclusion, it is crucial to analyze the various aspects related to overall supply chain management such as the methods, challenges and other related topics along with the analysis of its history to improve sustainability in SCM.

Bibliography

Ada, N., Ethirajan, M., Kumar, A., Vimal, K. E. K., Nadeem, S. P., Kazancoglu, Y., & Kandasamy, J. (2021). Blockchain technology for enhancing traceability and efficiency in automobile supply chain—a case study. *Sustainability (Switzerland)*, *13*(24), 1–21. https://doi.org/10.3390/su132413667

Ali, F., Smith, G., & Saker, J. (1997). Developing buyer-supplier relationships in the automobile industry: A study of Jaguar and Nippondenso. *European Journal of Purchasing and Supply Management*, *3*(1), 33–42. https://doi.org/10.1016/S0969-7012(96)00007-X

Ambe, I. M., & Badenhorst-Weiss, J. A. (2010). Strategic supply chain framework for the automotive industry. *African Journal of Business Management*, *4*(10), 2110–2120. http://www.academicjournals.org/ajbm

Benko, C., & Mcfarlan, W. (2003). Metamorphosis in the auto industry. *Strategy & Leadership*, *31*(4), 4–8. https://doi.org/10.1108/10878570310483933

Corbett, C. J., & Klassen, R. D. (2006). Extending the horizons: Environmental excellence as key to improving operations. *Manufacturing and Service Operations Management*, *8*(1), 5–22. https://doi.org/10.1287/msom.1060.0095

Danese, P., Romano, P., & Formentini, M. (2013). The impact of supply chain integration on responsiveness: The moderating effect of using an international supplier network. *Transportation Research Part E: Logistics and Transportation Review*, *49*(1), 125–140. https://doi.org/10.1016/j.tre.2012.08.002

Enkvist, P.-A., & Vanthournout, H. (2008). How companies think about climate change: A McKinsey Global Survey. *McKinsey Quarterly*, *2*(December), 46.

Gardas, B., & Narkhede, B. (2013). Exploring the Green Supply Chain management: A Technical Review. *International Journal of Application or Innovation in Engineering & Management*, *2*(5), 441–450.

Gopal, P. R. C., & Thakkar, J. (2015). Development of composite sustainable supply chain performance index for the automobile industry. *International Journal of Sustainable Engineering*, *8*(6), 366–385. https://doi.org/10.1080/19397038.2014.947392

Halldórsson, Á., Kotzab, H., & Skjøtt-Larsen, T. (2009). Supply chain management on the crossroad to sustainability: a blessing or a curse? *Logistics Research*, *1*(2), 83–94. https://doi.org/10.1007/s12159-009-0012-y

He, M., Xie, J., Wu, X., Hu, Q., & Dai, Y. (2016). Capability Coordination in Automobile Logistics Service Supply Chain Based on Reliability. *Procedia Engineering*, *137*, 325–333. https://doi.org/10.1016/j.proeng.2016.01.265

Huo, B., Qi, Y., Wang, Z., & Zhao, X. (2014). The impact of supply chain integration on firm performance. *Supply Chain Management: An International Journal*, *19*(4), 369–384. https://doi.org/10.1108/scm-03-2013-0096

Kajal, M. S. & S. (2015). Review on Green Supply Chain Management in Manufacturing Industries. *IJSRD - International Journal for Scientific Research & Development*, *3*(5), 2321–0613.

Keeble, B. R. (1988). The Brundtland Report: "Our Common Future." *Medicine and War*, *4*(1), 17–25. https://doi.org/10.1080/07488008808408783

Lee, K. H. (2011). Integrating carbon footprint into supply chain management: The case of Hyundai Motor Company (HMC) in the automobile industry. *Journal of Cleaner Production*, *19*(11), 1216–1223. https://doi.org/10.1016/j.jclepro.2011.03.010

Li, Z., Barenji, A. V., & Huang, G. Q. (2018). Toward a blockchain cloud manufacturing system as a peer to peer distributed network platform. *Robotics and Computer-Integrated Manufacturing*, *54*(January), 133–144. https://doi.org/10.1016/j.rcim.2018.05.011

Mathivathanan, D., Kannan, D., & Haq, A. N. (2018). Sustainable supply chain management practices in Indian automotive industry: A multi-stakeholder view. *Resources, Conservation and Recycling*, *128*, 284–305. https://doi.org/10.1016/j.resconrec.2017.01.003

Meyr, H. (2004). Supply chain planning in the German automotive industry. *OR Spectrum*, *26*(4), 447–470. https://doi.org/10.1007/s00291-004-0168-4

Mishra, R. (2012). Information Technology As a Facilitator for Green Initiatives- a Sectoral Analysis. *International Journal of Computer Science Engineering and Information Technology Research (IJCSEITR)*, *2*(4), 103–111.

Orsato, R. J., & Wells, P. (2007). The Automobile Industry & Sustainability. *Journal of Cleaner Production*, *15*(11–12), 989–993. https://doi.org/10.1016/j.jclepro.2006.05.035

Piplai, T. (2001). Automobile Industry: Shifting Strategic Focus. *Economic and Political Weekly*, *36*(30), 2892–2897. http://www.jstor.org/stable/4410922

Raj Kumar Reddy, K., Gunasekaran, A., Kalpana, P., Raja Sreedharan, V., & Arvind Kumar, S. (2021). Developing a blockchain framework for the automotive supply chain: A systematic review. *Computers and Industrial Engineering*, *157*, 107334. https://doi.org/10.1016/j.cie.2021.107334

Seuring, S., & Müller, M. (2008). From a literature review to a conceptual framework for sustainable supply chain management. *Journal of Cleaner Production*, *16*(15), 1699–1710. https://doi.org/10.1016/j.jclepro.2008.04.020

Srivastava, S. K. (2007). Green supply-chain management: A state-of-the-art literature review. *International Journal of Management Reviews*, *9*(1), 53–80. https://doi.org/10.1111/j.1468-2370.2007.00202.x

Supranee, S., Rotchanakitumnuai, S., & Siriluck, R. (2017). *Association for Information Systems AIS Electronic*

Library (AISeL) The Acceptance of the Application of Blockchain Technology in the Supply Chain Process of the Thai Automotive Industry Recommended Citation. http://aisel.aisnet.org/iceb2017http://aisel.aisnet.org/iceb2017/30

Tang, D., & Qian, X. (2008). Product lifecycle management for automotive development focusing on supplier integration. *Computers in Industry*, *59*(2–3), 288–295. https://doi.org/10.1016/j.compind.2007.07.002

Wiedmann, T., & Minx, J. (2007). A Definition of ' Carbon Footprint. *Science*, *1*(01), 1–11.

Zhang, X., & Chen, R. (2006). Forecast-driven or customer-order-driven? An empirical analysis of the Chinese automotive industry. *International Journal of Operations and Production Management*, *26*(6), 668–688. https://doi.org/10.1108/01443570610666993

Zhu, Q., Sarkis, J., & Lai, K. hung. (2013). Institutional-based antecedents and performance outcomes of internal and external green supply chain management practices. *Journal of Purchasing and Supply Management*, *19*(2), 106–117. https://doi.org/10.1016/j.pursup.2012.12.001