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Supply Chain Optimization in Manufacturing: An Approach Based on Project Management

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Abstract

A documentary review was carried out on the production and publication of research papers related to the study of Supply Chain, Manufacturing Industry, project management. The purpose of the bibliometric analysis proposed in this document was to know the main characteristics of the volume of publications registered in the Scopus database during the period between 2017 and 2022, achieving the identification of 321 publications. The information provided by this platform was organized through graphs and figures, categorizing the information by Year of Publication, Country of Origin, Area of Knowledge and Type of Publication. Once these characteristics have been described, the position of different authors on the proposed topic is referenced through a qualitative analysis. Among the main findings made through this research, it is found that India with 66 publications with the highest scientific production registered in the name of authors affiliated with institutions in that country. The Area of Knowledge that made the greatest contribution to the construction of bibliographic material related to the study of supply chain optimization in the manufacturing industry based on project management was offered in the intensive care unit was Engineering with 181 published documents, and the most used Publication Type during the period indicated above were Journal Articles with 54% of the total scientific production.

Keywords: *Supply Chain, Manufacturing Industry, project management.*

1. Introduction

In today's dynamic and fast-paced global marketplace, the manufacturing industry faces increasing challenges in optimizing supply chains to remain competitive and respond effectively to customer needs. Among the critical components that require a lot of attention, inventory management stands out as a success factor. Effective inventory management has a direct impact on a company's profitability, customer satisfaction, and overall competitiveness. Therefore, in this era of increased competition and volatile market conditions, it has become imperative for manufacturers to adopt robust strategies to optimize their supply chain with a strong focus on inventory management.

Optimizing supply chains in the manufacturing industry is a multifaceted process that optimizes all aspects of the production and distribution network. From sourcing raw materials to delivering products, all links in the supply chain must work together seamlessly to ensure that the right products are available at the right time, in the right

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quantity, and in the right place. Inventory management, a key part of this optimization, plays a central role in balancing production costs, minimizing lead times, reducing transportation costs, and maximizing service levels.

In the pursuit of efficient inventory management, manufacturers must deal with a variety of complex issues, such as demand volatility, supplier reliability, production lead times, transportation constraints, and changing market trends. The use of advanced technologies, data analytics, and supply chain modeling is essential to making informed decisions and improving visibility across the supply chain. The purpose of this is to learn about the most important strategies and methods that manufacturing companies can use to optimize their supply chain using a specialized approach to inventory management. By identifying and correcting bottlenecks, implementing lean practices, implementing just-in-time principles, integrating real-time tracking systems, and fostering collaboration among stakeholders, manufacturers can significantly improve the efficiency of their supply chain.

As manufacturers strive to be flexible and respond to rapidly changing market demands, optimizing supply chains through effective inventory management has become a strategic imperative. By continuously evaluating and adapting their supply chain strategies, manufacturers can achieve significant cost savings, increase customer satisfaction, and gain a competitive advantage in the fast-paced world of manufacturing. With this study, we aim to shed light on best practices and innovative approaches that enable manufacturing companies to navigate the complexities of supply chain optimization with a strong focus on inventory management. In this way, we hope to provide valuable insights that contribute to the sustainable growth and success of manufacturers in this increasingly complex global environment. For this reason, this article seeks to describe the main characteristics of the compendium of publications indexed in the Scopus database related to the variables Supply Chain, Manufacturing Industry, Inventories, as well. Such as the description of the position of certain authors affiliated with institutions, during the period between 2017 and 2022.

2. General Objective

Analyze, from a bibliometric and bibliographic perspective, the preparation and publication of research papers in high-impact journals indexed in the Scopus database on the variables Supply Chain, Manufacturing Industry, project management during the period 2017-2023.

3. Methodology

This article is carried out through a research with a mixed orientation that combines the quantitative and qualitative method.

On the one hand, a quantitative analysis of the information selected in Scopus is carried out under a bibliometric approach of the scientific production corresponding to the study Supply Chain, Manufacturing Industry, Inventories. On the other hand, examples of some research works published in the area of study mentioned above are analyzed from a qualitative perspective, based on a bibliographic approach that allows describing the position of different authors on the proposed topic. It is important to note that the entire search was carried out through Scopus, managing to establish the parameters referenced in Figure 1.

3.1. Methodological design

Figure 1. Methodological design

Source: Authors.

3.1.1 Phase 1: Data collection

Data collection was carried out from the Search tool on the Scopus website, where 321 publications were obtained from the following filters:

- TITLE-ABS-KEY (supply AND chain, AND manufacturing AND industry, AND project management) AND PUBYEAR > 2016 AND PUBYEAR < 2023
- Published documents whose study variables are related to the study of the Supply Chain, Manufacturing Industry, project management.
- Limited to the years 2017 to 2022.
- Without distinction of country of origin.
- Without distinction of area of knowledge.
- No distinction of type of publication.

3.1.2 Phase 2: Construction of analytical material

The information collected in Scopus during the previous phase is organized and then classified by graphs, figures and tables as follows:

- Co-occurrence of words.
- Country of origin of the publication.
- Area of knowledge.
- Type of publication.

3.1.3 Phase 3: Drafting of conclusions and outcome document

In this phase, the results of the previous results are analysed, resulting in the determination of conclusions and, consequently, the obtaining of the final document.

4. Results

4.1 Co-occurrence of words

Figure 2 shows the co-occurrence of keywords found in the publications identified in the Scopus database.

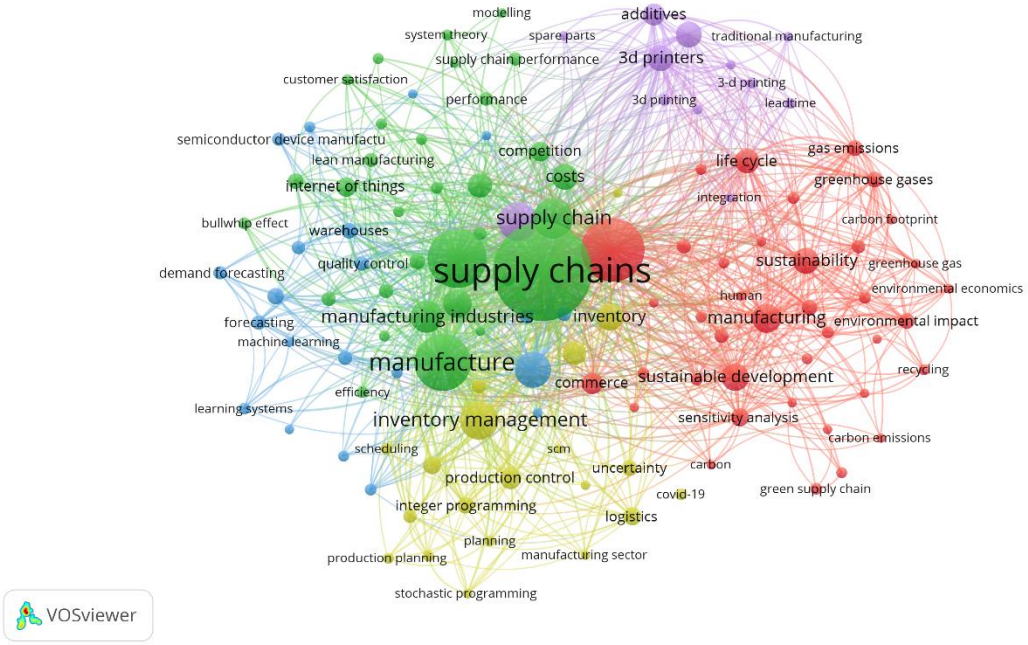

Figure 2. Co-occurrence of words

Source: Authors' own elaboration (2023); based on data exported from Scopus.

Supply Chain was the most frequently used keyword within the studies identified through the execution of Phase 1 of the Methodological Design proposed for the development of this article. Manufacturing industry is also among the most frequently used variables, associated with variables such as Inventory, Inventory Management, Sustainability, Costs, Competitiveness. From the above, it is striking that supply chain optimization in the manufacturing industry is a multifaceted process that involves the fine-tuning of several interrelated elements, such as procurement, manufacturing, distribution, and inventory management. Of these, inventory management is a cornerstone in the pursuit of operational excellence. How organizations manage their inventory has a direct impact on their ability to deliver products quickly, minimize costs, and remain competitive in emerging markets. Therefore, inventory optimization in the broader context of the supply chain has become a strategic imperative for manufacturing companies. This means adopting advanced techniques, leveraging cutting-edge technology, and adopting data-driven methods to strike a delicate balance between supply and demand.

4.2 Distribution of scientific production by year of publication

Figure 3 shows how scientific production is distributed according to the year in which each document was published.

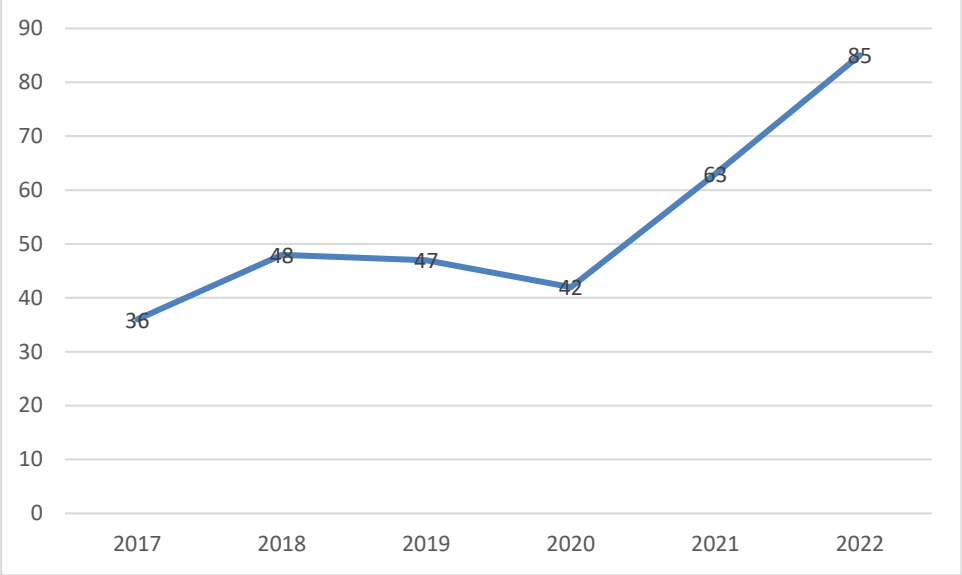

Figure 3. Distribution of scientific production by year of publication

Source: Authors' own elaboration (2023); based on data provided by Scopus

Among the main characteristics evidenced through the distribution of scientific production by year of publication, the number of publications registered in Scopus was in 2022, reaching a total of 85 documents published in journals indexed on this platform. This can be explained by articles such as the one entitled "Applying Agility to Improve Customer Performance When Supply and Demand Vary from Core Conditions" to expand existing knowledge about supply chain agility by identifying the interrelationships between key elements of agility that can affect customer performance improvement when supply conditions are different. and demand vary from the basic assumptions used to design supply chain networks. Design/Methodology/Approach: The research employs the principles of mid-range theorizing (Merton, 1968) to incorporate observations from field interviews and data collected from executives, managers, and analysts of six global manufacturing firms in a variety of industries to form research proposals on the nature of the relationships between the dimensions of cognitive agility, antecedent impediments to cognitive agility and the relationships between cognitive and physical agility to improve performance that can then be subjected to deductive testing. Findings: The supply chain designs used by participating companies to deliver value to core products were not agile enough to meet customer-desired performance levels when certain supply or demand conditions varied significantly from the norm.(Stank, 2022)

4.3 Distribution of scientific output by country of origin

Figure 4 shows how scientific production is distributed according to the country of origin of the institutions to which the authors are affiliated.

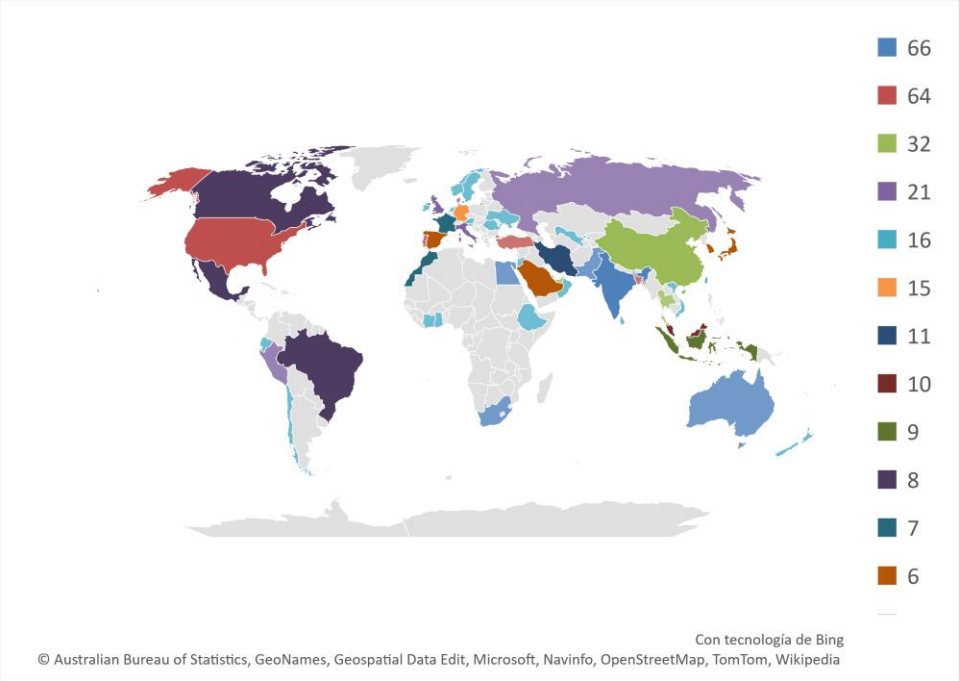

Figure 4. Distribution of scientific production by country of origin.

Source: Authors' own elaboration (2023); based on data provided by Scopus

Within the distribution of scientific production by country of origin, the records from institutions were taken into account, establishing India as the country of this community, with the highest number of publications indexed in Scopus during the period 2017-2022, with a total of 66 publications in total. In second place, the United States with 64 scientific papers, and China occupying the third place presenting to the scientific community, with a total of 32 documents among which is the article entitled "Integrated decision model based on optimization for intelligent resource management in the petrochemical industry" In this study, a new decision support platform for the overall supply chain management of industries was proposed petrochemicals to maximize business profits. The proposed system integrates several decision support models that address critical challenges, both vertically and horizontally. Specifically, horizontal integration includes various decision-based problems along with the production flow in the value chain from the purchase and manufacture of raw materials to the sale of the final product, while vertical integration involves critical decisions at different levels, including the company's supply chain, plant scheduling/planning, and process operation. The optimization-based decision platform effectively supports the company's supply chain management, plant planning, and process operation strategy. The platform integrates different decision models and features, including a price prediction and paper trading model to reduce financial risks, a naphtha thermal cracker mathematical model to identify the optimal operation, and an optimization model to maximize trading profits. As a result, business profits improved by 5.30% with paper trade optimization alone, 6.67% with optimal operating conditions combined with price forecasting, and 11.98% with overall supply chain optimization.(Kwon, 2022)

4.4 Distribution of scientific production by area of knowledge

Figure 5 shows the distribution of the elaboration of scientific publications based on the area of knowledge through which the different research methodologies are implemented.

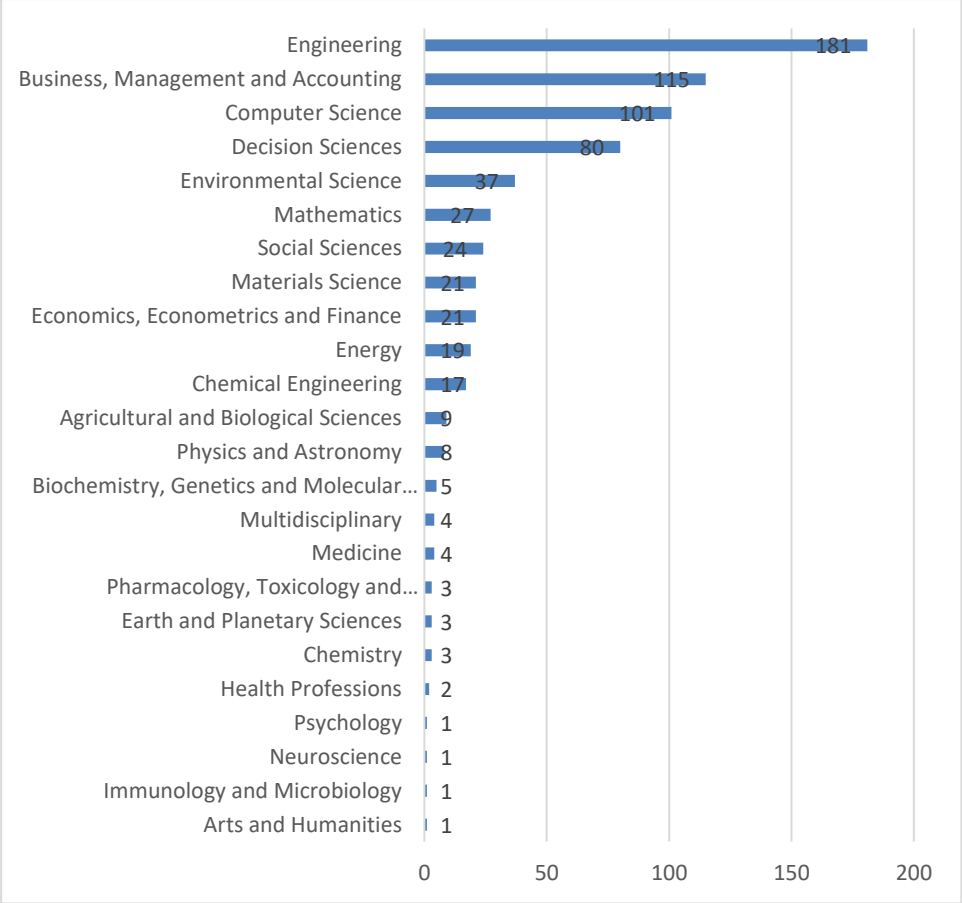

Figure 5. Distribution of scientific production by area of knowledge.

Source: Authors' own elaboration (2023); based on data provided by Scopus

Engineering was the area of knowledge with the highest number of publications registered in Scopus with a total of 181 documents that have been based on its Supply Chain, Manufacturing Industry, and Inventories methodologies. In second place, Business, Management and Accounting with 115 articles and Computer Science in third place with 101. The above can be explained thanks to the contribution and study of different branches, the article with the greatest impact was registered by the Engineering area entitled "Evaluation of the resource of structural material scarcity towards the sustainable performance of the supply chain" The objectives of this study; investigate the level of SSCP in Material Scarcity Resources, explore the implications of Material Scarcity Resources for Structural Scarcity Enterprises towards sustainable supply chain performance and finally investigate the impact of Material Scarcity Resources in SSCP on the environmental, economic and social in Malaysia. A total of 101 respondents were collected among the manager level of the southern region of Malaysia's manufacturing industry. The result showed that Material Structural Scarcity Resource has a positive effect on environmental, economic and social performance in a sustainable supply chain. Thus, sustainable supply chain performance showed consistency in performance in overcoming material shortages, reducing inventory improving productivity, environmental initiatives moving toward product innovation, and cost reduction. As a result of the factor analysis on the components, the demand for environmental legislation at 89.7% showed that the performance of the sustainable supply chain improved significantly in the manufacturing stages, increased product diversity, reduced the manufacturing price, increased market share, introduced new products quickly, and was at the forefront of the demands of future legislation. Therefore, it is beneficial for companies

in the manufacturing industry to improve their performance and indirectly stabilize the economic condition.(Kamarudin, 2022)

4.5 Type of publication

In the following graph, you will see the distribution of the bibliographic finding according to the type of publication made by each of the authors found in Scopus.

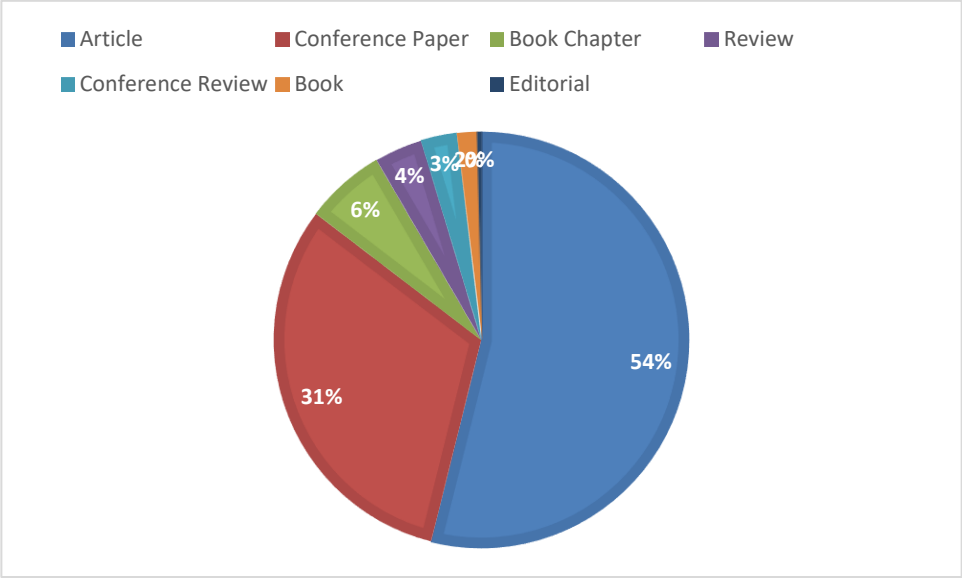

Figure 5. Type of publication.

Source: Authors' own elaboration (2023); based on data provided by Scopus.

The type of publication most frequently used by the researchers referenced in the body of this document was the one entitled Journal Articles with 54% of the total production identified for analysis, followed by Session Paper with 31%. Chapter of the Book are part of this classification, representing 6% of the research papers published during the period 2017-2022 in journals indexed in Scopus. In this last category, the graduate stands out "Blockchain-Based Cloud Manufacturing SCM System for Collaborative Enterprise Manufacturing: A Case Study of Transportation Manufacturing" This article introduces us to the application of industrial DevOps by merging Industry 4.0 technologies for collaborative and sustainable supply chains. A blockchain-based information system (IS) and a cloud manufacturing process (CM) system were integrated for a supply chain management (SCM) system for the railcar manufacturer. A systems thinking methodology was used to identify the multi-hierarchical system and a domain-based design (DDD) approach was applied to develop the event-driven microservices architecture (MSA). The result is a blockchain-based cloud manufacturing-as-a-service (BCMaaS) SCM system to outsource the production of boxed sheet metal parts. In conclusion, the BCMaaS system performs provenance, traceability, and analysis of parts in real-time to improve quality control, inventory management, and audit reliability.(Matenga, 2022)

5. Conclusions

Through the bibliometric analysis carried out in this research work, it was possible to establish that India was the country with the highest number of published records for the variables Supply Chain, Manufacturing Industry, project management. with a total of 66 publications in the Scopus database. In the same way, it was established that the application of theories framed in the area of Engineering were the most frequently used in the optimization of supply chains in the manufacturing industry, since it is fundamental for operational efficiency, cost reduction and general commercial success. Effective

inventory management can save money by minimizing storage costs, shipping costs, and inventory obsolescence losses. By having the right amount of inventory, manufacturers can avoid tying up capital due to excess inventory or causing production delays and lost sales opportunities due to insufficient inventory. Collaboration and integration between suppliers, manufacturers, and distributors is critical to optimizing supply chains and managing inventories. Transparent communication and real-time data sharing help identify potential bottlenecks, optimize inventory, and streamline the entire inventory management process. Additionally, implementing technologies such as advanced inventory management and automation software can significantly improve inventory accuracy and efficiency. Automated systems help monitor inventory levels in real-time, create replenishment orders, and streamline the entire inventory process.

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