

Cost Reduction: Trend and Bibliometric Analysis Based on Scopus Database

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Abstrak

Pengurangan biaya merupakan subjek yang menarik dan dibahas secara aktif di kalangan akademisi dan praktisi. Studi ini bertujuan untuk memberikan wawasan tentang tren dan pola pengurangan biaya melalui analisis bibliometrik yang komprehensif terhadap literatur ilmiah. Penelitian ini menggunakan Bibliophagy, alat berbasis web yang dikembangkan di R-studio dan bagian dari paket Bibliometric, untuk mengidentifikasi jurnal, penulis, negara, artikel, dan tema utama secara otomatis. Temuan penelitian menunjukkan bahwa Journal of Cleaner Production merupakan jurnal yang paling produktif. Menurut h-index, Journal of Cleaner Production juga menonjol sebagai publikasi yang paling berpengaruh. Wang Y diidentifikasi sebagai penulis yang paling produktif, sementara Tiongkok muncul sebagai negara terdepan dalam menerbitkan penelitian tentang pengurangan biaya. Kata kunci yang paling sering digunakan adalah pengurangan biaya, diikuti oleh manfaat analisis biaya, pengendalian emisi, dan pengambilan keputusan. Penelitian ini berfungsi sebagai referensi berharga bagi para akademisi yang melakukan studi bibliometrik tentang Pengurangan Biaya, yang menawarkan wawasan tentang jurnal, penulis, negara asal, dan kata kunci utama di bidang ini. Selain itu, temuan studi ini membantu peneliti dalam mengeksplorasi kolaborasi akademis yang luas dalam domain ini.

Kata Kunci: *analisis bibliometrik, bibliofagi, pengurangan biaya, tren penelitian, scopus.*

Abstract

Cost Reduction is an intriguing and actively discussed subject among academics and practitioners. This study aims to provide insights into the trends and patterns of Cost Reduction through a comprehensive bibliometric analysis of scholarly literature. The research employs Bibliophagy, a web-based tool developed in R-studio and part of the Bibliometric package, to automatically identify journals, authors, countries, articles, and main themes. The research findings indicate that the Journal of Cleaner Production is the most productive journal. According to the h-index, the Journal of Cleaner Production also stands out as the most influential publication. Wang Y is identified as the most prolific author, while China emerges as the leading country in publishing research on cost reduction. The most frequently used keyword is cost reduction, followed by Cost Benefit Analysis, Emission Control, and Decision Making. This research serves as a valuable reference for scholars conducting bibliometric studies on Cost Reduction, offering insights into journals, authors, countries of origin, and key keywords in this field. Additionally, the study's findings assist researchers in exploring extensive academic collaborations within this domain.

Keywords: *bibliometric analysis, bibliophagy, cost reduction, research trend, scopus.*

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INTRODUCTION

The significance of cost reduction in a company's operations is undeniable. This is crucial because of its direct impact on the company's profitability. By reducing unnecessary costs and optimizing resource allocation, companies can enhance their profitability. Cost reduction refers to the process of identifying and implementing strategies to reduce costs and improve efficiency within an organization. This process involves analyzing all cost components, identifying areas of waste or inefficiency, and taking appropriate actions to eliminate or minimize these costs (Armstrong, 2017).

Cost reduction is a systematic approach to lowering costs and expenses to enhance profitability. This approach involves identifying and eliminating unnecessary or non-value-adding activities, optimizing processes, negotiating better deals with suppliers, and finding innovative solutions to reduce costs while maintaining or enhancing product or service quality (Kotler, 2019). Cost reduction is a process of implementing steps to decrease an organization's expenditures. This process involves analyzing cost structures, identifying cost factors, and implementing strategies such as streamlining operations, improving productivity, leveraging economies of scale, and adopting cost-saving technologies (Horngren et al, 2015). Cost reduction is the practice of managing and controlling costs to achieve higher efficiency and profitability (Parmenter, 2016).

Cost reduction is a strategic management approach to identifying and eliminating unnecessary expenditures while maintaining or enhancing the value provided to customers (Mardjuni et al., 2023). This process involves continuously evaluating various costs, exploring cost-saving opportunities, and implementing cost-reduction initiatives aligned with the organization's overall objectives. Cost control has a positive impact on organizational performance and also management style has a positive impact on organizational performance (Akeem, 2017). Furthermore, over time, process characteristics are measured and observed. The creation of control charts is the process of studying differences from the mean. It accurately identifies whether the process has experienced special differences that require better attention. Through the use of SPC, companies can significantly enhance organizational effectiveness, product quality, and process efficiency. There are two major financial management tools including budgeting and variance analysis (Wing, 2000).

When conducting variance analysis, the main difficulty is the need to know whether costs behave as variable or fixed costs. In practice, a large number of costs do not behave in this way. It will be used positively and constructively to provide cost-related evaluation systems and cost progress analysis. Thus, all forms of cost control methods must be designed and implemented in such a way as to complement people's behavior in an organization. However, with increasing competition, the development of new products must surpass old or outdated products (Dewi et al., 2022). Cost control aims to reduce actual costs to meet the target, while cost reduction aims to reduce the target cost itself. Therefore, it can be understood that one of the objectives of cost-saving is to demonstrate the potential for savings by reducing expenses such as input materials, labor costs, and overhead, thereby making the business more profitable.

According to the Cost Accounting Terminology from the Institute of Cost and Management Accountants London, cost reduction should be understood as the achievement of real and unchanging unit cost reductions without reducing their suitability for the intended use. Therefore, the term cost reduction indicates genuine savings in

production, administration, sales, and distribution costs resulting from the elimination of wasteful and unnecessary elements from product design and the techniques and practices carried out in connection with it (Palipada et al., 2024). The need for cost reduction arises when profit margins need to be increased without an increase in sales turnover, i.e., for the same sales volume, costs must be reduced.

To understand the importance of this issue on the global public agenda, the following presents data related to research with the keyword "Cost Reduction" processed from data the application of the dimensions.

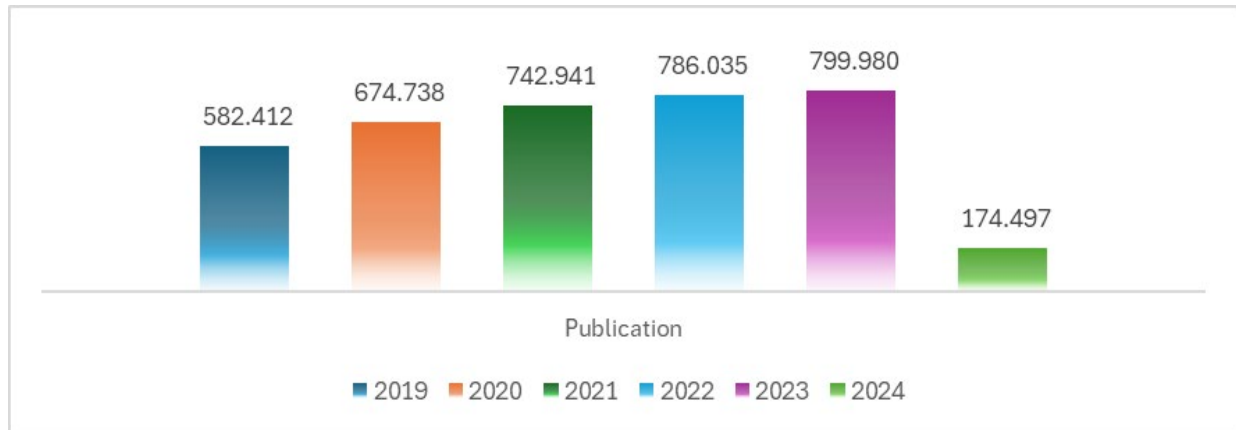


Figure 1. Publication Trend

Source: Authors elaboration in Dimensions, 2024.

Figure 1 above shows that the topic of cost reduction is highly significant and widely discussed among researchers. It has been proven that from 2019 to early 2024, research on this topic has consistently grown, with data indicating that over a period of more than five years, 3,760,603 publications have been produced by researchers worldwide.

The goal of cost reduction is to increase a company's profitability by reducing production, operational, or administrative costs without compromising the quality of products or services. This can include operational efficiency, price negotiations with suppliers, the use of more efficient technology, and various other strategies.

In more detail, the main contributions of this paper are as follows: (1) Presenting the development of articles on cost reduction over the years. At the same time, the review of highly cited publications provides insights into what is popular in cost reduction research. (2) Analysis at the country and author level. This research reveals the most productive authors and countries that contribute significantly to the future development of research. Meanwhile, international collaboration in research is also presented visually. (3) Keyword analysis. We delve into the content level of research on cost reduction, highlighting various clusters, the relevance of countries and authors to the theme, as well as thematic evolution. (4) Comprehensive discussion. This paper discusses key issues based on the analysis above.

Cost reduction is a systematic approach to lowering costs and expenses to improve profitability. It involves identifying and eliminating unnecessary or non-value-added activities, optimizing processes, negotiating better deals with suppliers, and finding innovative solutions to reduce costs while maintaining or improving the quality of products or services (Kotler, 2019). Kotler emphasizes that cost reduction is not simply about cutting expenses arbitrarily. Instead, it is an organized and strategic process to achieve effective cost reduction alongside increased profitability. With this approach, organizations can attain better operational efficiency without sacrificing quality.

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cost components, identifying areas of waste or inefficiency, and taking appropriate actions to eliminate or minimize those costs (Armstrong, 2017).

Armstrong emphasizes that to achieve cost reduction, organizations need to conduct a comprehensive review of all cost components. This includes operational costs, production costs, and other aspects that can significantly contribute to the organization's total costs. Identifying areas of waste or inefficiency becomes a key step. Armstrong stresses the need to carefully identify every potential source of waste, both in production processes and operations, to formulate targeted cost-reduction strategies. Once areas of waste are identified, concrete steps need to be taken to eliminate or minimize these costs. These actions may involve process changes, efficiency improvements, or even overall organizational restructuring.

In essence, Armstrong's perspective on cost reduction views it as a process that requires a holistic approach, ranging from comprehensive analysis to the implementation of appropriate actions to achieve cost reduction and organizational efficiency. The holistic approach applied by Armstrong in cost reduction reflects a deep understanding of organizational complexity. Involving all layers of costs, including those related to human resources, technology, and infrastructure, enables organizations to make more informed and measurable decisions.

Cost reduction is the process of implementing measures to decrease the expenditure of an organization. It involves analyzing the cost structure, identifying cost drivers, and implementing strategies such as streamlining operations, improving productivity, leveraging economies of scale, and adopting cost-saving technologies (Horngren et al, 2018). The authors emphasize the importance of analyzing the organizational cost structure. This entails a deep understanding of the cost components involved in every aspect of operations, production, and business management. With this understanding, organizations can accurately identify where cost reduction potential can be realized.

In their view, identifying cost drivers or cost factors is a key step in the cost reduction process. Knowing the factors that most influence costs helps organizations direct their efforts to areas that have a significant impact on expenditures. The cost reduction strategies proposed by Horngren et al, include several approaches. First, they emphasize the importance of streamlining operations, which involves eliminating or reducing steps or processes that do not significantly add value.

METHOD

This article opts for the Scopus database as its data source (<https://www.scopus.com/>). Scopus stands as the largest abstract and citation database globally, comprising over 81 million items from over 7,000 publishers across 105 countries and encompassing 17 million author profiles (Elsevier in Mougnot, 2021). The search query utilized is "Cost Reduction." All complete records for each publication retrieved from the search are transformed into BibTex Scopus files and then imported into Bibliometrix and Biblioshiny.

The open-source packages Bibliometrix and Biblioshiny are utilized from the R language environment. Bibliometrix enables the completion of the entire process of analyzing scholarly literature and data processing. Biblioshiny captures Bibliometrix's core code and creates an online framework for data analysis (Aria & Cuccurullo, 2017). Researchers utilizing Biblioshiny can perform relevant bibliometric analysis and visualization through an interactive web interface.

By employing the Bibliometrics and Biblioshiny packages, this research enables the demonstration of bibliometric indicators regarding Cost Reduction, such as publication volume in terms of article count, citation counts, and keywords. Subsequently, this article

presents visualizations such as citation network diagrams, thematic evolution maps, and international collaboration network maps to identify research hotspots and research status.

RESULT AND DISCUSSION

Text analysis was conducted using the R-Studio software and Biblioshiny, developed by Massimo Aria and Corrado Cuccurullo from the University of Napoli, and Luigi Vanvitelli from the University of Campania (Italy). The analyzed text was then further examined for frequently occurring words related to the theme of "Cost Reduction". Table 1 explains the documents used in the study using the keyword "Cost Reduction", applying search filters limited to the period from 2019 to 2024, focusing solely on journals and conference proceedings, where overall findings are presented from the R-Studio software analysis. The types of documents, authors, and collaboration over time were also examined. According to the statistical analysis presented in Table 1, the topic of "Cost Reduction" consists of 1,772 publication documents, comprising 1,532 articles and 240 conference papers published by 5,014 authors from various countries worldwide, with only 147 of them being single-authored documents, with an average citation (AC) per year of 10.92.

Table 1. Main Information

Description	Results	Description	Results
MAIN INFORMATION ABOUT DATA			
Timespan	2019:2024	AUTHORS	
Sources (Journals, Books, etc)	615	Authors	5014
Documents	1772	Authors of single-authored docs	147
Annual Growth Rate %	-47.04	AUTHORS COLLABORATION	
Document Average Age	2.93	Single-authored docs	152
Average citations per doc	10.92	Co-Authors per Doc	3.46
References	80652	International co-authorships %	26.13
DOCUMENT CONTENTS			
Keywords Plus (ID)	9074	DOCUMENT TYPES	
Author's Keywords (DE)	6301	article	1532
		conference paper	240

Source: Author's findings, 2024.

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Source Analysis

Figure 2 illustrates the number of research articles published in each journal based on their relevance to the theme of "Cost Reduction". This data presents a list of the most frequently published journal titles as well as the range of the number of articles published using a bar graph. The darker the color, the higher the number and relevance to the research theme, indicating the number of articles published in these journals. The Journal of Cleaner Production emerges as the top journal, publishing a total of 308 articles, followed

by *Frontiers in Energy Research*, with 46 articles published, and the *International Journal of Production Research* ranking third with 36 articles.

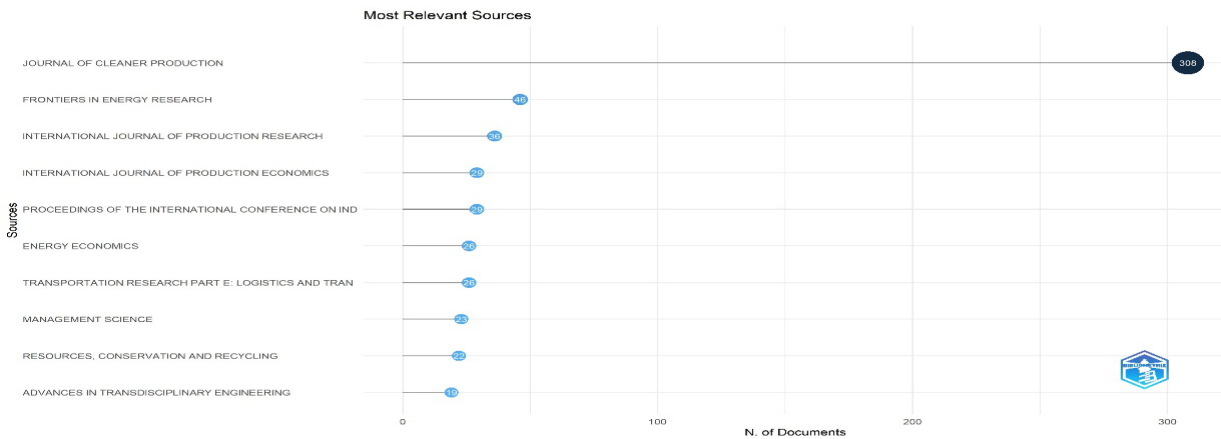


Figure 2. Most relevant source
Source: Author’s findings, 2024.

This study also evaluates the impact of journals publishing papers on the theme of "Cost Reduction" by referring to their H-index, depicted in a bar graph. In addition to displaying the obtained H-index values, the diagram also showcases the impact generated by these journals through the displayed colors. The darker the color of the graph, the more significant the impact of the journal. The range of H-index values of the journals in this study, as shown in Figure 3, range from 0.0 to 47.0. The *Journal of Cleaner Production* ranks first with an H-index of 47, followed by the *International Journal of Production Research* in second position with an H-index of 16, and *Energy Economics* occupies third position with an H-index of 15.

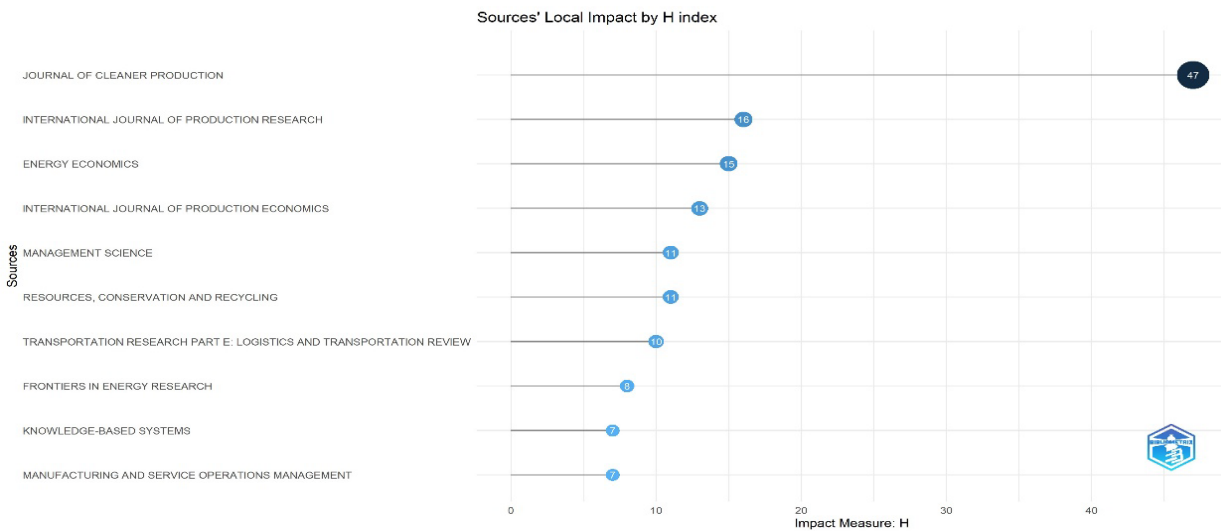


Figure 2. Most relevant source
Source: Author’s findings, 2024.

Author Analysis

Figure 4 illustrates the number of research publications by each relevant author on the theme of Cost Reduction. The data presents a list of authors who most frequently publish works and the range of the number of documents published using a bar graph. Darker colors indicate a larger quantity and relevance to the research theme, ranging from 0.0 to 27.0 documents published across journals. Author Wang Y tops the list, with a total of

27 published documents indicated by the dark-colored bar, followed by Li Y with 25 publications, and third is Liu J and Zhang Y with 17 publications each. For researchers with light blue bars such as Li X, Liu Y, Chen Y, Wang X, Yang Y, Zhang H, this indicates that their number and relevance to the cost reduction theme are relatively smaller in terms of publication count.

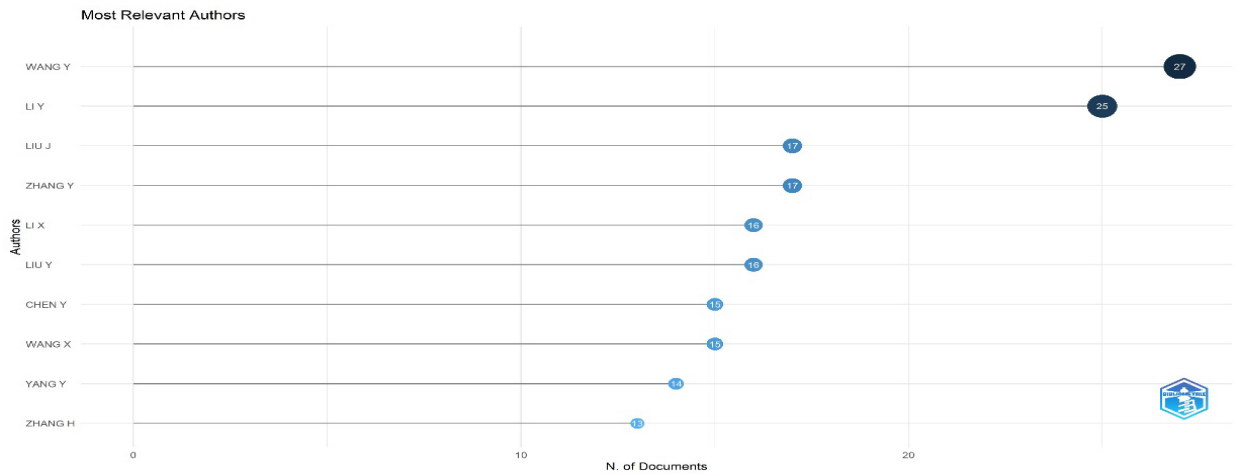


Figure 4. Most relevant authors
Source: Author’s findings, 2024.

Figure 5 showcases several leading authors during the research period from 2019 to 2024 who have contributed to research on the theme of Cost Reduction. Additionally, the circles on the red line indicate the magnitude of the number of papers published during those years, where the larger the circle, the more publications were made by the authors. As for author Li Y, they have consistently published and maintained a sustained performance record each year from 2019 to 2024 in research related to Cost Reduction.

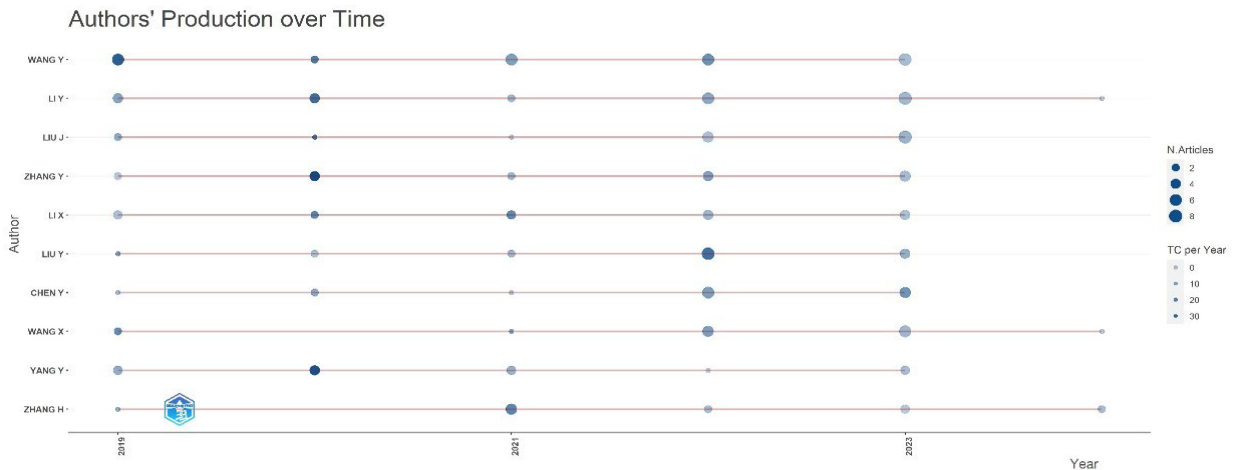


Fig. 5. Top Authors Production Over Time
Source: Author’s findings, 2024.

Figure 6 presents the correspondence between authors and countries in each article by calculating the total collaboration between collaborations from one country and collaborations from multiple countries. This data includes the top 19 countries and the quantity range of documents published on the theme of Cost Reduction, ranging from 0 to more than 300 documents. As a result, China leads as the country with the most corresponded authors, with more than 300 published articles, followed by the USA in

second place, and India in third position. The UK, Germany, Brazil, Iran, Italy, Korea, and Australia make up the top ten. This illustration demonstrates that all these countries are involved in inter-country collaborations.

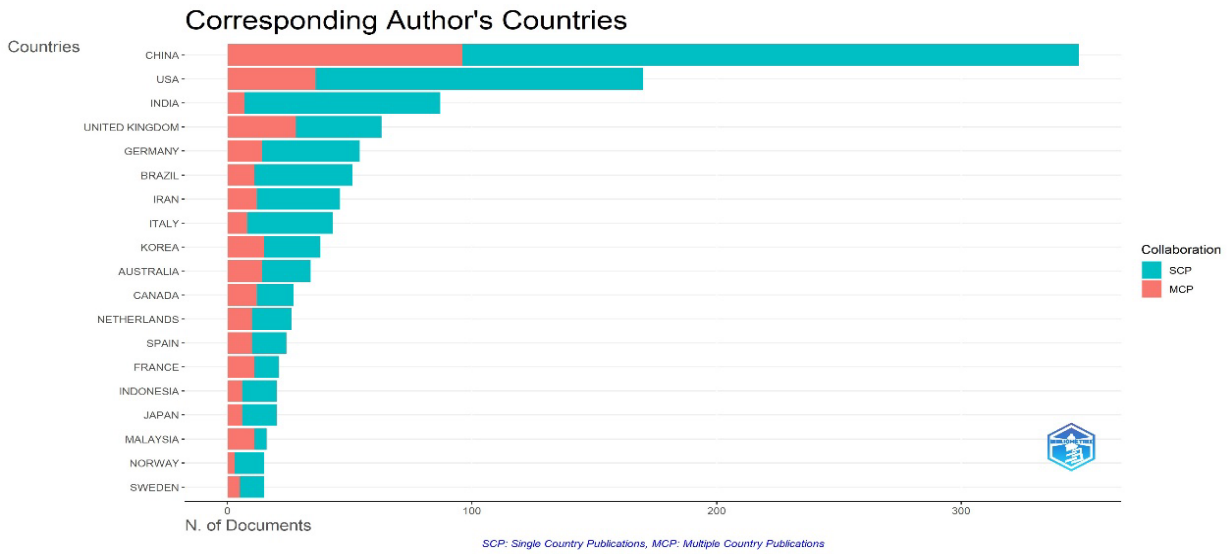


Fig. 6. Corresponding Author's Countries
Source: Author's findings, 2024.

Figure 7 depicts a collaboration map of each country worldwide, highlighting joint research efforts with various institutions from different countries. Blue indicates research outputs from a particular country, while gray signifies the lack of publications from that country. Collaborative networks among publishing countries are depicted with red lines. Figure 8 implies extensive international collaboration on the theme of Cost Reduction, emphasizing intensive collaboration among countries such as China, the USA, India, the UK, Germany, Brazil, Iran, Italy, Korea, and Australia.

Country Collaboration Map

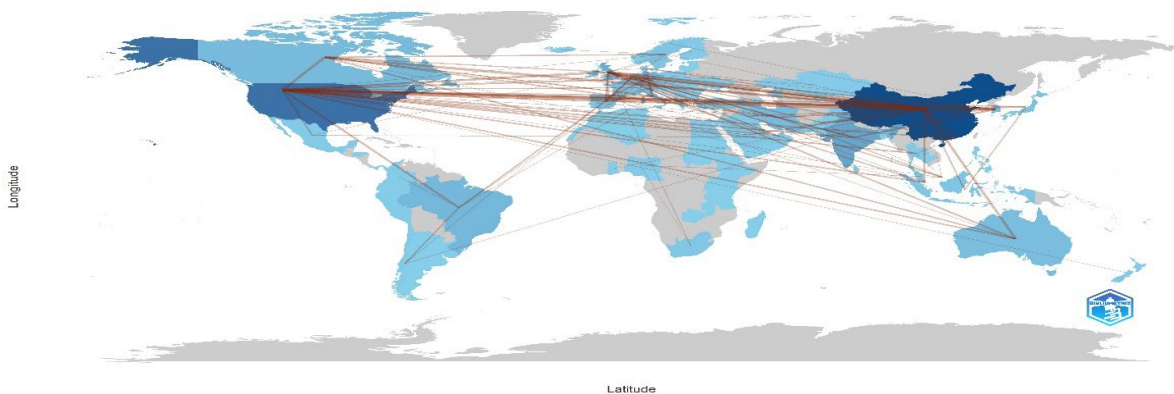


Fig. 7. Correspondence Author's Country
Source: Author's findings, 2024.

Figure 8 classifies research on the theme of Cost Reduction based on the countries of the most cited authors. The number of citations for cited documents is depicted through a bar graph. The color gradient indicates that darker colors represent higher citation counts for research on the theme of Cost Reduction. Various counts are ranging from 0 to 4809

citations. The top ten countries are compared based on the number of citations and their relevance to the theme of Cost Reduction. According to the graph, the five countries with the most cited articles are as follows: China with 4809 citations, followed by the USA with 1589 citations, India with 1137 citations, the UK with 957 citations, and Iran with 857 citations.

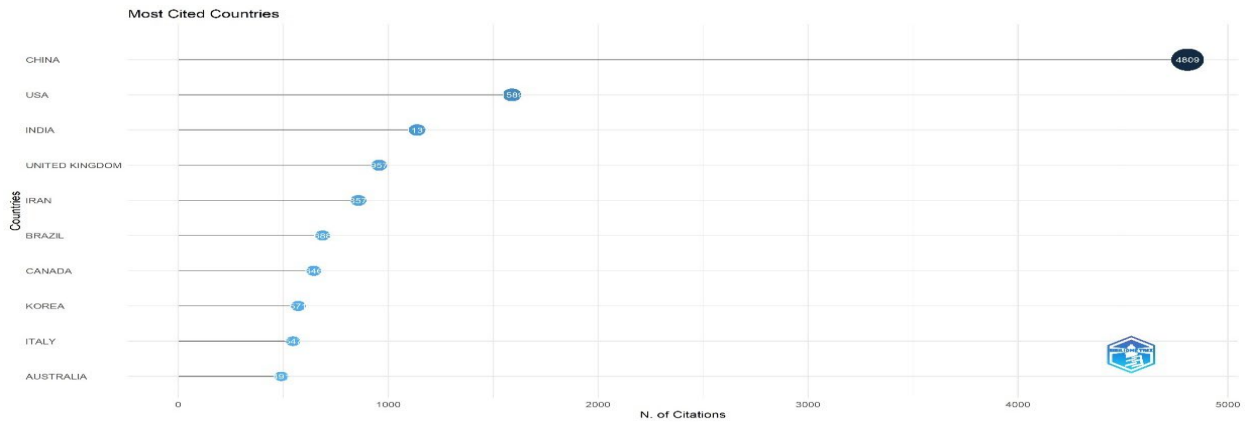


Fig. 8. Most Cited Countries
Source: Author’s findings, 2024.

The relationship between the authors' countries of origin, authors, and keywords is an important aspect of understanding the intellectual structure. To achieve this, researchers conducted an analysis using three plots through the Biblioshiny package in RStudio. It appears that several authors have made significant contributions to Cost Reduction, thus it is important to understand which authors have made substantial contributions in this field. To do so, we created three fields using Sankey diagrams. Sankey diagrams are a type of flow diagram where the width of the arrows is proportional to the flow rate. In Figure 9, authors are listed in the middle, the left side of the diagram indicates the authors' countries of origin, and the right side displays the authors' keywords. The top five keywords are Cost Reduction, Cost Benefit Analysis, Emission Control, Carbon, and Carbon Dioxide. The top five authors are Li Y, Wang Y, Wang X, Liu Y, and Liu J. Then the top authors' countries of origin are China, USA, Korea, Malaysia, and the UK.

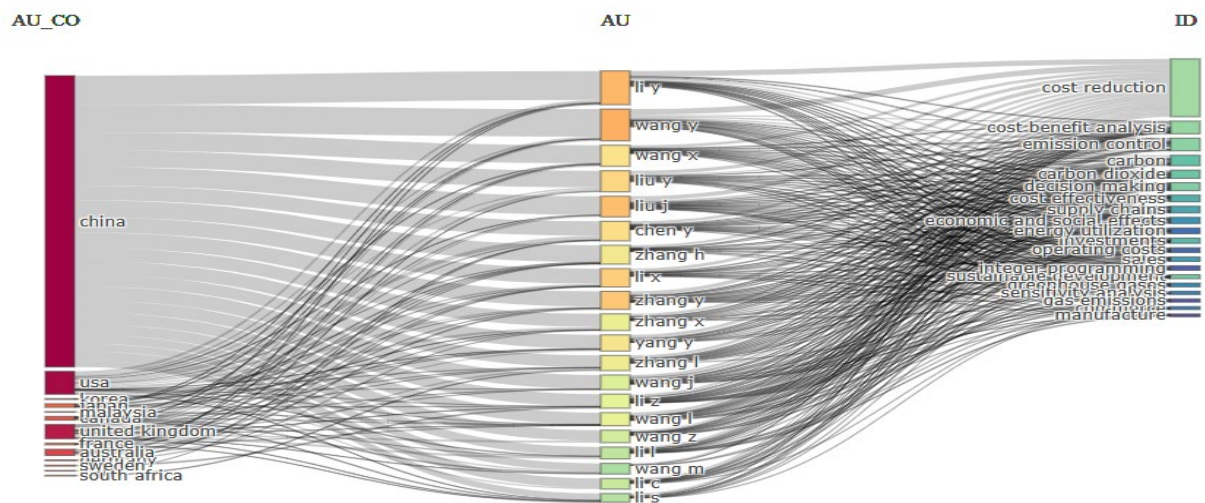


Fig. 9. Three-Field Plot
Source: Author’s findings, 2024.

Document Analysis

Figure 10 illustrates the 10 most relevant words used in the research theme of Cost Reduction. The word with the highest frequency and relevance to the keyword Cost Reduction is "Cost Reduction," occurring 1013 times. The second most relevant word is "Cost Benefit Analysis" with an occurrence of 184 times, followed by the third most relevant word, "Emission Control," with an occurrence of 156 times.

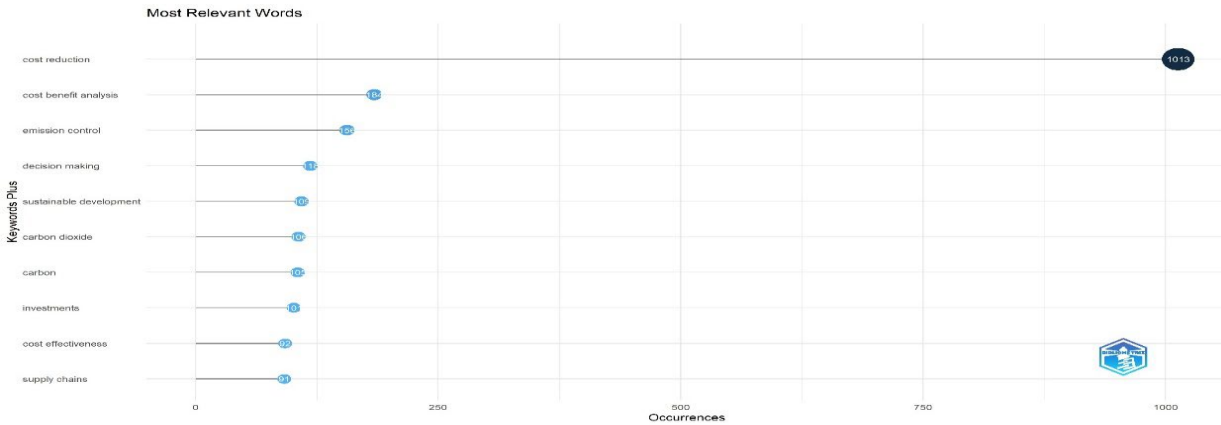


Fig. 10. Most Relevant Words
Source: Author's findings, 2024.

Relevant words related to the research theme of Cost Reduction are presented in Figure 11, in the form of a word cloud. The "cloud" depicts words that frequently appear in the dataset of articles investigated using keywords from titles associated with Cost Reduction. The word cloud displays word images in various sizes according to their frequencies. The placement within the word cloud is generally random, but dominant words are centered for greater visibility with relatively larger sizes. In this study, the word cloud results were obtained based on document keywords. Additionally, the word cloud serves as an additional bibliometric tool to visualize dominant themes in a field of study. It also reveals research focal points and emerging investigative paths. Dominant terms in the word cloud in Figure 11, related to the keyword "Cost Reduction," include Cost Benefit Analysis, Emission Control, Decision Making, Sustainable Development, Carbon Dioxide, Carbon, Investments, Cost Effectiveness, and Supply Chains.



Fig.11. Word Cloud
Source: Author's findings, 2024.

These emerging topics have the potential for further development in the future. The co-occurrence network, depicted in Figure 14, showcases keywords related to the document keywords associated with the Cost Reduction theme in clustered form, considering the relationships between different words. Several keywords frequently appearing in Cost Reduction research are divided into four clusters: Cluster 1 (Cost Reduction) encompasses keywords such as cost reduction, cost-benefit analysis, emission reduction, sensitivity analysis, carbon dioxide, life cycle, environmental management, optimizations, greenhouse gases, integer programming, carbon, energy utilization, global warming, renewable energy resources, economic and social effects. Cluster 2 (Sales) consists of keywords such as sales, efficiency, supply chains, commerce, cost reduction, manufacturer, supply chain management, game theory, profitability, and competition. Cluster 3 (Article) comprises keywords such as article, United States. Cluster 4 (Human) consists of the keyword human.

The results of this study entail a wide range of practical and theoretical implications. Firstly, it highlights the most significant and productive authors, publications, and countries in the literature. This list serves as an excellent starting point for scholars seeking ideas for further research and journals to submit their work. Secondly, researchers will be able to focus on the most important, influential, and recent articles. Thirdly, academics working with social developers and data scientists can use the study's results to identify research topics that fill the identified gaps.

An integrated knowledge management framework or specific techniques are required when addressing large-scale public issues such as Cost Reduction. From the perspective of bibliometric descriptive nature, this will provide a highly beneficial conceptual overview of understanding the research environment. Certainly, data and information become crucial as inputs to produce innovation. Therefore, everyone should enhance the amount of useful insights, which can be achieved by increasing the amount of processed information and supported by processing speed.

On the other hand, this research has limitations; one of them is its dependency on the Scopus database for relevant documents. Additionally, additional documents are overlooked because they do not include sufficient relevant information. In future research initiatives, it may be beneficial to use other leading academic repositories, such as WoS and PubMed, to conduct diverse evaluations and provide more comprehensive qualitative and quantitative assessments of the research situation on this issue.

In this study, we propose a systematic bibliometric analysis of Cost Reduction. We identify the top journals, conferences, and countries in this field. Additionally, we rank the leading researchers in this area and evaluate research trends. We identify top collaborators and their areas of interest. The results of this study will assist researchers in this field in identifying potential collaborators, new research areas, and relevant journals for their submissions.

CONCLUSION

This research establishes a framework for academics and practitioners, enabling them to understand the development of Cost Reduction research from 2019 to 2024. Additionally, the study serves as a guide for future research prospects, utilizing bibliometric analysis to explore publication trends in writing, sources, influential paper authors, and international collaborations among authors from various countries. It also identifies research gaps, innovations, and thematic developments for the future. This contribution gathers existing literature from the Scopus database, focusing on sources, authors, and key documents. The R Bibliometrix package, known for its flexibility and ease of use, is a valuable tool for bibliometric applications. The Biblioshiny RStudio platform was used to analyze the dataset for this research, which includes 1,532 articles and 240 conference papers authored by 5,014 contributors worldwide, with an average citation count of 10.92 per year.

Descriptive findings reveal that the *Journal of Cleaner Production* is the most productive journal in publishing research on cost reduction. The *Journal of Cleaner Production* also holds the highest h-index, making it the most influential publication. Wang Y emerges as the most prolific author in the field of cost reduction. China stands out as the most productive country in publishing cost reduction research. The most commonly used keyword category is "cost reduction," followed by "Cost Benefit Analysis," "Emission Control," and "Decision Making."

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