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A Bibliometric Analysis of Sustainability in MSME

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Abstract. This research paper examines the role of Micro, Small, and Medium Enterprises (MSMEs) in the Indian economy and their sustainability. It analyses 85 Scopus documents from 66 sources between 2014 and 2024, revealing a peak in scientific production in 2023. The study emphasizes the importance of sustainable practices for long-term success. This comprehensive research paper rigorously examines the pivotal role of Micro, Small, and Medium Enterprises (MSMEs) in the Indian economy and emphasizes the critical importance of sustainable practices for long-term success. Through meticulous analysis of 85 Scopus documents from 66 sources between 2014 and 2024, the study conclusively reveals a peak in scientific production in 2023 and robust ties between India and various other countries in this domain.

Keywords: MSME; Sustainability; Bibliometric; India

1. Introduction

Although commerce is often associated with multinational corporations and large industrial complexes, an equally vital yet less visible sector drives significant economic growth: Micro, Small, and Medium Enterprises (MSMEs). Despite their smaller scale, MSMEs are the backbone of the global economy, playing a crucial role in fostering innovation, growth, and job creation (Hartanto & Pramuka, 2023; Muhammad Akbar et al., 2023; Ruswandi et al., 2024). Their agility and adaptability allow them to quickly respond to market shifts and meet specific demands by developing niche products (Putranto et al., 2023; Utami et al., 2023; Velmurugan et al., 2023). However, MSMEs face unique challenges that need to be addressed to fully harness their potential as key drivers of economic progress. This discussion explores MSMEs by examining their definitions, classifications, and the substantial contributions they make to the global economy.

MSMEs, or Micro, Small, and Medium Enterprises, are generally smaller in size compared to large corporations. The specific criteria for what constitutes an MSME can vary depending on a country's classification system. A common way to categorize these businesses is by looking at their investment in plant and machinery or turnover. Understanding these classifications helps to highlight the critical role MSMEs play in both local and international markets.

Table 1 MSME Classification Criteria

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Classification	Investment in Plant & Machinery/Equipment	Annual Turnover
Micro Enterprise	≤ Rs. 1 crore	≤ Rs. 5 crores
Small Enterprise	≤ Rs. 10 crores	≤ Rs. 50 crores
Medium Enterprise	≤ Rs. 50 crores	≤ Rs. 250 crores

Source: (Development Commissioner (MSME), 2015)

Micro, Small, and Medium Enterprises (MSMEs) are vital contributors to the Indian economy, playing a key role in driving growth, job creation, and entrepreneurship. These enterprises are the backbone of the country's manufacturing sector, contributing around 30% to India's GDP. MSMEs also enhance regional economic development, promote exports, and foster innovation. However, despite their importance, MSMEs face significant challenges related to finance, skill development, and technology adoption, which affect their productivity and global competitiveness. Addressing these obstacles is essential to unlocking their full potential for the nation's economic progress.

In recent years, sustainability has emerged as a critical concept for MSMEs, focusing on balancing economic growth with environmental and social responsibilities. As these enterprises grow, so too do their environmental and social impacts, making sustainability a key factor in their long-term success. Sustainability is not only about environmental conservation but also encompasses social fairness and economic viability, all of which are interconnected. For MSMEs, adopting sustainable practices such as resource efficiency, waste reduction, and the use of renewable energy can enhance their competitiveness and ensure future resilience.

This study conducts a bibliometric analysis to assess the research landscape of sustainability in MSMEs, with the aim of understanding key trends, contributors, and collaborations. By analyzing academic publications, this research seeks to highlight the growing attention to sustainability within MSMEs and how it influences various aspects of business strategy, innovation, and development. The study's objectives include identifying research productivity over time, assessing the impact of key authors and publications, and exploring international collaborations, all within the framework of sustainability in MSMEs.

As MSMEs face increasing pressures from global markets and environmental regulations, this analysis will provide insights into how sustainability practices can be integrated into these enterprises, contributing to both economic and environmental well-being. Through this bibliometric approach, the study aims to uncover valuable trends and inform future research and policy directions for sustainable MSME development.

2. Methods

The methodology employed in this study aimed to systematically collect, organize, and analyze the relevant academic literature, thereby identifying key trends, research patterns, and significant contributors in the domain (Agarwal et al., 2023; Mahmood & Seth, 2023; Sharma & Rai, 2023). By utilizing the extensive Scopus database as the

primary source of data, this study sought to capture a wide range of academic publications, ensuring that the analysis encompassed a representative body of literature on sustainability in MSMEs (Khurana et al., 2022; Onyeje et al., 2022). The use of bibliometric analysis as a research tool has gained widespread recognition in recent years, as it enables the systematic examination of vast amounts of academic data, allowing for the identification of trends, relationships, and emerging themes in a specific field. In the context of MSMEs and sustainability, bibliometric analysis serves as an ideal methodology to assess the current state of research and to map out areas of increasing academic attention. Moreover, the adoption of R Programming and R Studio, particularly through specialized packages such as "bibliometrix," provided the necessary tools to process and analyze the collected data efficiently, thereby ensuring accuracy and precision in the findings.

The research process began with the collection of data from the Scopus database. Scopus was chosen due to its comprehensive coverage of peer-reviewed literature across a wide range of disciplines (Gupta et al., 2021; Khurana et al., 2021; Yacob et al., 2021). Its extensive filtering options further ensured that the dataset included only the most relevant studies focused on sustainability in MSMEs. A key criterion in this selection process was the inclusion of publications that explicitly addressed sustainability challenges, solutions, or strategies within the MSME sector. The selection was guided by keywords and search terms such as "sustainability," "MSME," "circular economy," "environmental impact," "resource efficiency," and "innovation." These keywords were used to identify relevant articles, ensuring that the dataset was both comprehensive and thematically focused.

Following the data collection phase, the next step involved organizing and preparing the dataset for analysis. This process entailed structuring the data in a way that facilitated effective analysis, with key bibliometric information such as author names, publication titles, journal names, publication dates, citation counts, and keywords being extracted and categorized (Kaban & Safitry, 2020; Maheshwari et al., 2020; Vedhathiri, 2020). This structured dataset formed the basis for the subsequent bibliometric analysis, allowing for a detailed examination of research trends over time, the identification of key authors and institutions, and an exploration of thematic clusters within the field.

The bibliometric analysis employed a range of techniques to gain insights into the research landscape of sustainability in MSMEs. One of the primary objectives was to identify temporal trends in the literature, including the growth in the number of publications over time and the evolution of key topics within the field. By examining the publication trends, it was possible to determine whether interest in sustainability in MSMEs has been increasing, stagnating, or declining over recent years. Furthermore, the analysis provided insights into peak periods of research activity, helping to identify specific years or timeframes when sustainability in MSMEs became a prominent topic of scholarly inquiry.

Another key aspect of the analysis was the identification of influential authors, journals, and institutions. Citation analysis was employed to assess the impact of individual publications and authors, using metrics such as the H-index and total citation counts to determine which researchers and publications have had the greatest influence on the field. This type of analysis is particularly useful in identifying the most prolific and impactful contributors to the literature, as well as in mapping out the key journals that serve as the primary outlets for research on sustainability in MSMEs. Moreover, by

analyzing the affiliations of authors, the study was able to identify the leading institutions and countries contributing to this body of knowledge.

The thematic structure of the research on sustainability in MSMEs was also explored through co-occurrence analysis of keywords and co-citation analysis (Eijdenberg, 2019; Mukherjee et al., 2020; Yadav et al., 2020). Co-occurrence analysis allowed for the identification of frequently associated keywords within the dataset, thereby revealing the key themes and topics that dominate the literature. This analysis highlighted important concepts such as the circular economy, resource efficiency, innovation, and environmental management, which emerged as central themes in the research on MSMEs and sustainability. Co-citation analysis, on the other hand, was used to examine the relationships between publications, identifying clusters of studies that are frequently cited together. This approach helped to uncover underlying thematic networks within the literature, revealing how different areas of research are interconnected and where potential gaps in knowledge might exist.

In addition to analyzing temporal trends and thematic patterns, the study also applied Bradford's Law to assess the distribution of the literature across different journals. Bradford's Law is a bibliometric principle that predicts the concentration of literature in a small number of core journals, with a decreasing number of relevant publications appearing in peripheral journals. By applying this law, the study was able to identify the core journals in which the majority of research on sustainability in MSMEs is published. This information is valuable for future researchers seeking to identify the most authoritative sources in the field, as it helps to streamline the literature review process and direct attention to the most influential journals. International collaboration was another area of focus in this bibliometric analysis. Co-authorship patterns were examined to assess the extent of collaboration between authors from different countries and institutions. This analysis provided insights into the global nature of research on sustainability in MSMEs, revealing which countries are leading the conversation and where knowledge exchange is occurring. Mapping out these international collaborations also helped to identify potential research networks and partnerships that could be leveraged for future studies. The analysis demonstrated that sustainability in MSMEs is a topic of global interest, with significant contributions coming from researchers in both developed and developing countries. Furthermore, the presence of cross-border collaborations highlighted the importance of shared knowledge and expertise in addressing the complex challenges faced by MSMEs in adopting sustainable practices.

3. Results and Discussion

3.1. Bibliometric Analysis

Bibliometric analysis is a statistical approach used to examine quantitative aspects of research literature such as publication counts, citation patterns, author contributions, and thematic trends. This helps researchers gain insights into the intellectual landscape of a field, identify influential authors, prominent sources, and emerging research areas. By analyzing this data, researchers can navigate existing knowledge, identify gaps, and strategically direct future research efforts.

In this paper we have done bibliometric analysis on 85 Scopus documents from 66 sources, with references of 5249, in a time span of year 2014 to year 2024. The average

citation per doc is 12.36 and the document types are Article (66), Book Chapter (3), Conference Paper (15), and review paper (1).

3.2. Annual Scientific Production

Annual scientific production is a widely used metric to evaluate the productivity, quality, and impact of scientific research within a particular discipline or field. It refers to the total number of publications produced by researchers during a given year. The highest publication was in year 2023 with total publication of 33, following 12 publications on 2022. The lowest publication was in year 2015 with only one publication and in 2024 till now there are 3 publications on sustainability in MSME. Fig 1 is the graph for it.

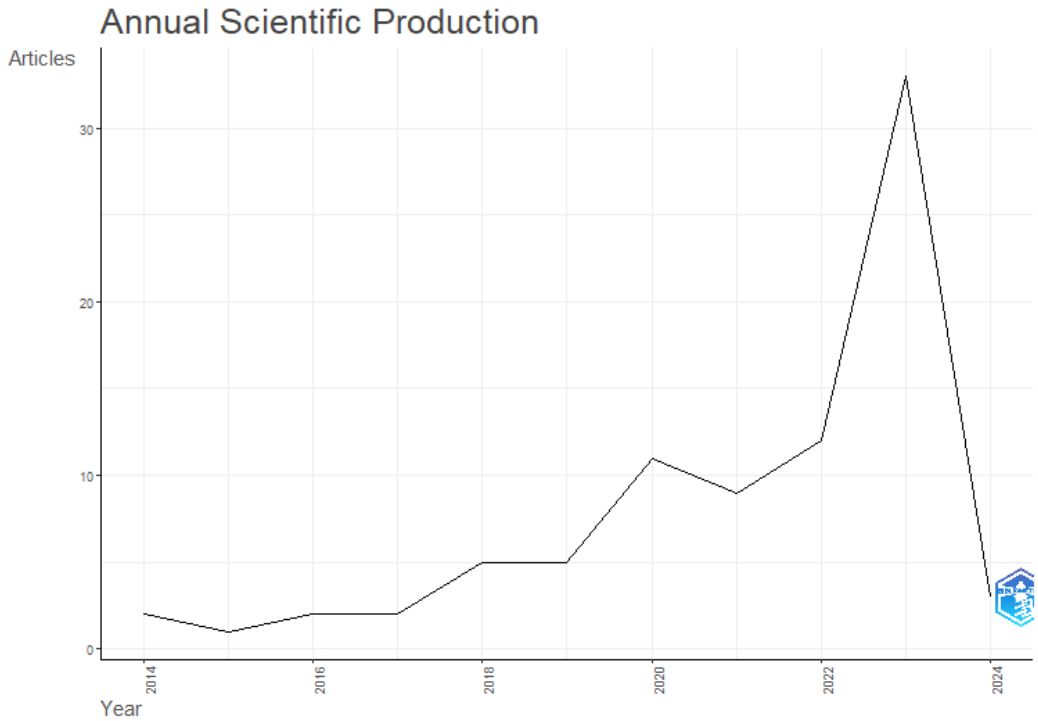

Figure 1 Annual Scientific Production

This gradual rise reflects consistent academic activity in the field, though not at an accelerated pace. Between 2020 and 2021, there is a noticeable uptick in the number of publications, suggesting increased interest or focus on the research area during this period.

A dramatic surge in scientific production is observed in 2022, where the number of articles rises sharply, peaking at over 30 articles. This could indicate a significant expansion in research interest, possibly due to heightened attention on sustainability or MSMEs following global economic or environmental developments. However, by 2024, the production drops drastically, suggesting either a decrease in research output or incomplete data for that year. This sudden dip might also reflect a lag in data collection or publication processes, as the year is still ongoing. Overall, the figure captures key trends in the progression of academic research in this field, with a remarkable spike in recent years followed by an abrupt decline.

3.3. Three Field Plot

In bibliometric analysis, a three-field plot is a visual evaluation tool that is used for exploring the relationship between various factors. It is often referred to as a Sankey diagram and is used to illustrate the proportion of subjects for each country and the date of the publications that they cite.

The study examines the relationships between authors, keywords, and sources. Figure 2 provides a visual representation of which authors have published the most papers in specific journals using particular keywords. In Figure 2, "AU" represents the authors, "DE" refers to the keywords, and "SO" indicates the sources (journals) in which the papers were published. This figure effectively highlights the interconnectedness of these elements, offering insights into the key contributors and thematic focus areas in the research.

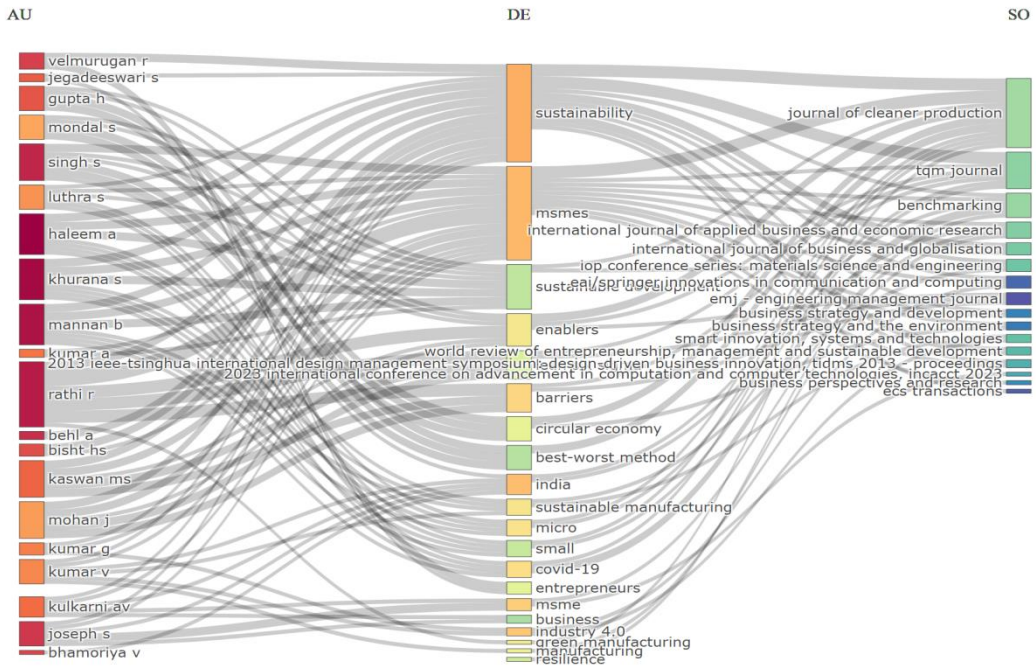

Figure 2 Three-Field Plot

The provided figure is a three-field plot representing the relationship between authors (AU), key topics or descriptors (DE), and the journals or sources (SO) where the research is published. On the left, the authors are listed, and the lines connecting them to the middle field show which topics or descriptors are associated with their research. The middle field displays these topics, such as "sustainability," "circular economy," and "business strategy," indicating the thematic focus of the authors' publications. The right side lists the journals or sources where these topics are published, such as the "Journal of Cleaner Production," "TQM Journal," and "Benchmarking."

This visualization helps to identify patterns and connections between different elements in academic research. For instance, it shows which authors contribute to specific themes and which journals commonly publish those themes. This is useful for understanding the distribution of research topics across authors and publication outlets, providing insight into collaboration trends, research focus areas, and the most common

journals where these themes are explored. Additionally, the diagram can reveal dominant authors in certain fields and highlight which topics are receiving attention in particular journals.

3.4. Most Relevant Affiliation

In this study, it was found that researchers affiliated with Lovely Professional University contributed the highest number of articles, with a total of 13 publications. This is followed by Malaviya National Institute of Technology, which has produced 7 articles, and Symbiosis International (Deemed University) with 6 articles. Several other institutions also made significant contributions to the academic output. Amity University, Indian Institute of Management (IIM) Raipur, and Indian Institute of Technology (IIT) Roorkee each published 5 articles, demonstrating their active engagement in research within this field. Additionally, the Chhattisgarh Council of Science and Technology, Chitkara University, and the Fortune Institute of International Business each contributed 4 articles. These institutions, while having slightly lower outputs, still play a vital role in advancing scholarly knowledge. Collectively, the contributions from these universities and research institutions underscore the active role played by Indian academia in contributing to the body of literature within the relevant field of study. This distribution of research efforts highlights the importance of diverse academic institutions in fostering scholarly discourse and indicates a broad-based commitment to research across a range of institutions in India.

By analyzing the number of publications from each institution, can be identified not only the leaders in terms of research output but also appreciate the collaborative and widespread nature of academic contributions in this study, suggesting a growing emphasis on research in key thematic areas across the country.

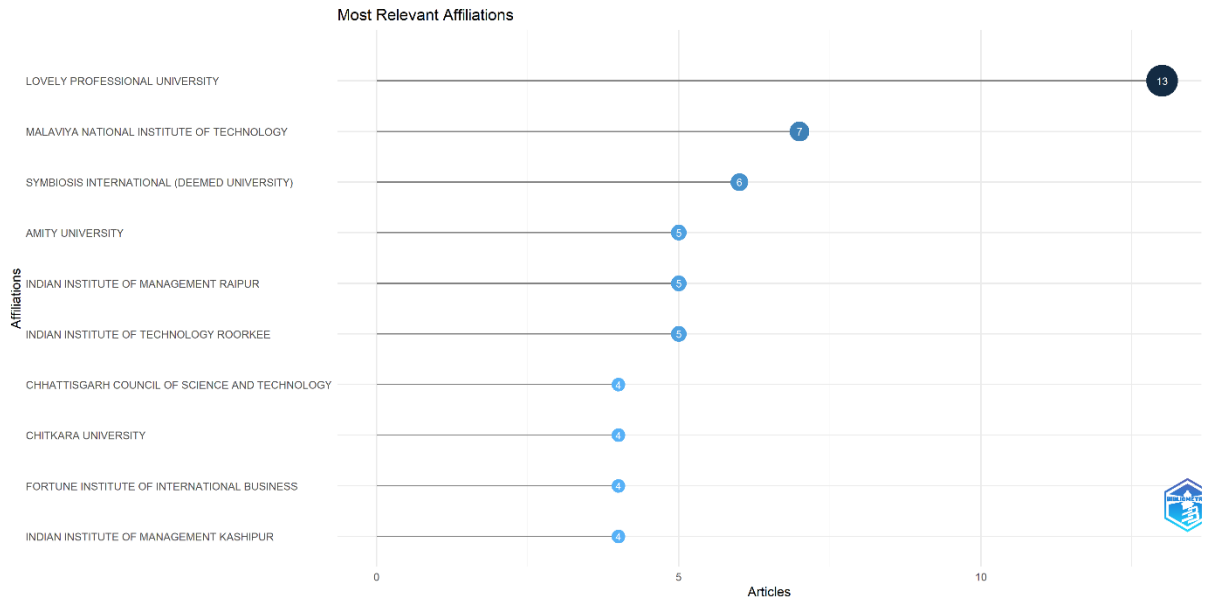

Figure 3 Most Relevant Affiliation

3.5. Country Scientific Production

Figure 4 and Table 1 present a clear comparison of the frequency with which different countries are mentioned, with India taking the lead by a substantial margin, recording 225 mentions. This suggests that India has a dominant presence in the dataset or subject

matter being analyzed, potentially reflecting its significant role or influence within the specific context. In contrast, China comes in a distant second, with only 6 mentions. This stark difference highlights the disproportionate representation or focus on India compared to other nations.

The UK and France follow China with 5 mentions each, suggesting a relatively moderate presence in the analysis. Canada, which appears 4 times, and the USA, with 3 mentions, are somewhat less prominent in the dataset. These countries, while globally influential, seem to play a more limited role in the specific area of focus in this study. The modest number of mentions for these nations indicates either less engagement or a smaller emphasis on them within the context being evaluated.

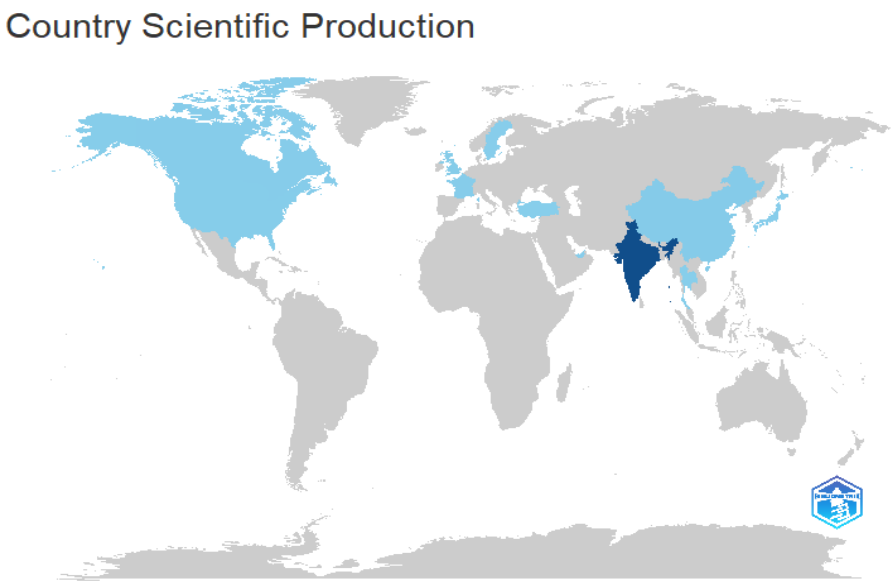

Figure 4 Country Scientific Production

Additionally, countries such as Japan, Sweden, and the United Arab Emirates each have 2 mentions, while Singapore, Thailand, and Turkey are mentioned only once. These smaller numbers reflect a minimal presence of these countries in the data. This suggests that either their involvement in the specific context is relatively minor, or the focus of the study does not heavily concern these nations. Overall, the data reveals a strong concentration on India, with other countries playing smaller roles, contributing to a more global yet uneven distribution of mentions across the nations analyzed.

Table 2 Country Scientific Production

Region	Freq
India	225
China	6
UK	5
Canada	4
France	4

USA	3
Japan	2
Sweden	2
United arab emirates	2
Singapore	1
Thailand	1
Turkey	1

3.6. Most Global Cited Documents

Table 2 highlights the most globally cited documents in various research domains. Kamble et al.'s paper, published in 2020 in the International Journal of Production Economics, leads with 202 citations, averaging 40.4 citations per year and having a normalized score of 6.86. This suggests the paper's significant influence in its field, reflecting widespread recognition and relevance. Mohanty's paper, published in 2014 in Production Planning & Control, has accumulated 137 citations, with an average of 12.45 citations per year and a normalized score of 2. This paper, though older, continues to maintain a steady citation rate, indicating its enduring impact within the research community. Singh et al.'s 2021 publication in the Journal of Cleaner Production follows closely with 98 citations, averaging 24.5 citations annually and achieving a normalized score of 3.87, highlighting its strong citation performance despite being relatively recent.

Table 3 Present Top 15 Documents

Paper	DOI	Total citations	Total citations per year	Normalized Total Citations
Kamble ss, 2020, int j prod econ	10.1016/j.ijpe.2020.107853	202.00	40.40	6.86
Mohanty rp, 2014, prod plann control	10.1080/09537287.2013.832822	137.00	12.45	2.00
Singh m, 2021, j clean prod	10.1016/j.jclepro.2020.123592	98.00	24.50	3.87
Jamwal a, 2021, procedia cirp	10.1016/j.procir.2021.01.129	80.00	20.00	3.16
Gupta s, 2018, benchmarking	10.1108/bij-12-2016-0186	54.00	7.71	3.60
Chaurasia ss, 2020, j knowl manag	10.1108/jkm-04-2020-0319	52.00	10.40	1.77
Khurana s, 2019, j clean prod	10.1016/j.jclepro.2019.04.022	47.00	7.83	2.80
Khurana s, 2021, j clean prod	10.1016/j.jclepro.2020.124466	35.00	8.75	1.38
Singh s, 2023,	10.1108/bij-08-	29.00	14.50	7.25

benchmarking	2021-0497			
Mukherjee m, 2020, prog disaster sci	10.1016/j.pdisas.2020.100117	26.00	5.20	0.88
Mondal s, 2023, j clean prod-a	10.1016/j.jclepro.2023.135999	22.00	11.00	5.50
Maheshwari m, 2020, int j product perform manage	10.1108/ijppm-12-2019-0599	20.00	4.00	0.68
Yang l, 2023, technol forecast soc change	10.1016/j.techfore.2022.122308	20.00	10.00	5.00
Gani a, 2022, environ sci pollut res	10.1007/s11356-021-15194-6	17.00	5.67	3.92

Jamwal et al.'s 2021 work in Procedia CIRP has garnered 80 citations, with a yearly average of 20 and a normalized score of 3.16. Although this paper has fewer overall citations compared to others, its high annual citation rate indicates growing recognition and relevance in the research domain. Collectively, these papers reflect significant contributions across their respective fields, as demonstrated by their global citation counts and impact within academic research.

4. Conclusions

Eighty-five Scopus documents from 66 sources were analyzed to gain insights into the research landscape of sustainable development, small and medium-sized enterprises (SMEs), decision-making, competition, and industrial research from 2014 to 2024. The analysis reveals an average citation per document of 12.36, indicating a moderate level of academic impact. The types of documents examined include articles, book chapters, conference papers, and review papers, with articles being the most predominant.

The annual scientific production shows fluctuations, with the highest publication rate occurring in 2023 and the lowest in 2015. Notably, research on sustainability in micro, small, and medium-sized enterprises (MSMEs) has gained traction in recent years, with a growing number of publications in 2024. The use of visual tools such as three-field plots, Bradford Law graphs, and thematic maps aids in understanding authorship patterns, journal contributions, and thematic trends. Key journals in this field, such as the Journal of Cleaner Production, Benchmarking, and the TQM Journal, play a significant role in disseminating research on sustainability and industry-related topics.

Bradford's Law assists in predicting the size of relevant literature and guides researchers in planning comprehensive literature reviews. The analysis of author impact, based on the H-index, identifies influential researchers such as Haleem A, Khurana S, and Mannan B, whose work is particularly significant within their fields. The collaboration network map also highlights strong international research collaborations, with India emerging as a prominent collaborator with countries like the United Kingdom, the USA, France, and Canada.

Future research should focus on emerging themes like sustainable development in developing economies, performance measurement in SMEs, and social sustainability. These areas offer significant potential for further exploration and advancement, particularly in resource-constrained environments. Comparative studies on sustainability

practices across different regions would provide valuable insights. By examining regional variations, tailored solutions can be developed to address unique industrial challenges and enhance sustainable development efforts globally. Additionally, collaboration between academia, industry, and government bodies is essential. Such partnerships can foster interdisciplinary research, enabling the practical application of sustainability initiatives and supporting SME growth through innovative, real-world solutions.

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