



BIBLIOMETRIC ANALYSIS OF LEAN SIX SIGMA IN SOCIAL ECONOMY

ANÁLISIS BIBLIOMÉTRICO DE LEAN SIX SIGMA EN ECONOMÍA SOCIAL

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ABSTRACT

This study conducted a bibliometric analysis of Lean Six Sigma methodologies and the social economy, previously unexamined in scholarly research. Using the Scopus database, 204 articles related to these topics were identified. Advanced bibliometric tools like VOSviewer and Bibliometrix facilitated co-authorship, citation, co-citation, and thematic evolution analysis, revealing the intellectual structure and thematic trajectory of the domain. Despite extensive literature on Lean and Six Sigma, a notable gap exists in studies integrating these methodologies with the social economy. The conclusion stresses the need for future research to merge operational efficiency with social value creation, proposing comparative studies to overcome barriers to interdisciplinary collaboration.

KEYWORDS

Lean management, Six Sigma, Total Quality Management, Social Economy, Corporate Social Responsibility.

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RESUMEN

Este estudio realizó un análisis bibliométrico de las metodologías Lean Six Sigma y la economía social, no examinadas previamente en la investigación académica. Utilizando la base de datos Scopus, se identificaron 204 artículos relacionados con estos temas. Herramientas bibliométricas avanzadas como VOSviewer y Bibliometrix facilitaron la coautoría, la citación, la co-citación y el análisis de la evolución temática, revelando la estructura intelectual y la trayectoria temática del dominio. A pesar de la extensa literatura sobre Lean y Six Sigma, existe una brecha notable en los estudios que integran estas metodologías con la economía social. La conclusión enfatiza la necesidad de que futuras investigaciones combinen la eficiencia operativa con la creación de valor social, proponiendo estudios comparativos para superar las barreras a la colaboración interdisciplinaria.

PALABRAS CLAVE

Gestión Lean, Six Sigma, Gestión de la Calidad Total, Economía Social, Responsabilidad Social Corporativa.

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1. INTRODUCTION.

Lean and Six Sigma methodologies have garnered substantial recognition for their pivotal roles in enhancing operational efficiency across various industries. This approach combines the principles of Lean and Six Sigma, aiming to reduce defects, eliminate waste, and enhance organizational culture (Bhaskar, 2020). Lean methodology, initially developed to address manufacturing inefficiencies, emphasizes the elimination of waste within processes to ensure that each step adds value to the customer without unnecessary resource expenditure. This is achieved through the adoption of just in time (JIT) systems, continuous improvement, achieving zero defects, and decentralization (Chauhan and Chauhan, 2019). The philosophy seeks to eliminate seven key wastes, including overproduction and waiting time, and has evolved diagnostic and problem-solving tools with the singular objective of waste elimination (Leite and Vieira, 2015; Lagos et al., 2022). On the other hand, Six Sigma primarily targets the reduction of process variation, aiming for near-perfect results through a data-driven approach and rigorous quality control (Schroeder et al., 2007). These methodologies, independently and in conjunction, have proven instrumental in optimizing processes, reducing costs, and improving product quality and customer satisfaction in numerous sectors.

The adaptation of Lean and Six Sigma in social economy enterprises presents a compelling avenue for exploration. Social economy enterprises, which include cooperatives, mutual societies, non-profit associations, and foundations, operate with objectives that balance economic performance with social and often environmental missions (Jatocha and Bogacz-Wojtanowska, 2016). The inherent focus on community and stakeholder value makes the integration of Lean and Six Sigma methodologies particularly intriguing, as these tools could potentially enhance operational efficiencies while still aligning with the social goals of these organizations. This synergy could lead to significant improvements in how these enterprises meet their dual objectives of social impact and sustainable business performance.

The study presented here adopts a bibliometric approach to examine the scholarly landscape surrounding Lean and Six Sigma within social economy enterprises. This quantitative analysis will help in understanding the depth and breadth of research conducted in this area, highlighting key trends and patterns in publication outputs over time. The research questions are as follows:

- Q1: What is the total number of publications related to Lean and Six Sigma in social economy enterprises, and how do these publications distribute over time, across different disciplines and authors?
- Q2: What is the nature of intellectual interaction among the research constituents in this field?
- Q3: What are the key themes explored in the most cited articles within the domain of Lean and Six Sigma applied to social economy enterprises?

In examining similar studies employing the terms “Lean,” “Six Sigma,” and “social economy,” our bibliometric analysis reveals a striking paucity of research in this specific intersection. Notably, only one article titled “Total quality management and corporate social responsibility: a systematic review of the literature and implications of the COVID-19 pandemics” (Felicetti et al, 2022) addresses related themes. However, this study is confined primarily to the context of the COVID-19 pandemic, suggesting that a broader research framework is necessary. This gap underscores the urgency and validity of pursuing the current study. Furthermore, a search using the specified terms in major academic databases such as Scopus and Web of Science yields only a limited number of articles—eight and thirteen respectively—with none featuring both “Lean” and “Six Sigma” alongside “social economy” in their titles. This paucity of literature highlights the niche yet critical intersection these methodologies share with social economy sectors, justifying the necessity to broaden the lexical scope of this research to encompass additional terms that might bridge these two distinct groups of keywords.

The structure of the scientific article follows a systematic approach. Firstly, it begins with the theoretical framework, defining Lean, Six Sigma, and Social Economics. Subsequently, it outlines the methodology employed in the bibliographic research, detailing the sources, tools, and techniques utilized. The Findings section encompasses a bibliometric analysis, divided into performance analysis and science mapping, with the latter further subdivided into intellectual structure and thematic analysis. The final part of the Findings section provides a review of the most cited articles from the publications examined in the bibliometric analysis. Lastly, discussions and conclusions are presented to synthesize the findings and offer insights into the research domain.

2. THEORICAL FRAMEWORK

2.1 LEAN.

Lean manufacturing, originally attributed to the Toyota Production System developed by Ohno, is considered the main holistic business strategy to improve performance. It emphasizes excellence through continuous improvement and elimination of waste by applying lean principles and tools (Zhu and Lin, 2017). The concept of lean manufacturing originated at the Toyota plant in Japan after the Second World War as a manufacturing strategy to minimize or eliminate non-value-added activities

(waste) in the production and operation system (Thanki and Thakkar, 2014). Lean manufacturing is founded on delivering value through the elimination of seven types of waste, which were originally defined by Ohno for the automotive manufacturing environment (Gtadysz et al., 2020). The aim of lean manufacturing is the continuous elimination of all waste in the production process (Abolhassani and Jaridi, 2016).

The emergence and subsequent popularization of lean manufacturing have been one of the most significant developments in the history of operations management (Negrão et al., 2019). Lean manufacturing has been widely perceived by the industry as an answer to the requirements of reducing waste without additional resource requirements (Bhamu and Sangwan, 2014). It is one of the most popular improvement agents in the pursuit of perfection (Ramadan et al., 2020). Lean manufacturing is being embraced by companies to simultaneously achieve a competitive edge and economic growth (Roy, 2018).

2.2 SIX SIGMA.

Six Sigma is a methodology that originated from statistical analysis and has its foundations in statistics and statisticians (Uluskan, 2016). It was initially developed within Motorola and is closely related to Total Quality Management (TQM). The methodology also has ties to the Toyota Production System, from which the concept of "Lean" was derived (Rodgers et al., 2019). Six Sigma has evolved from previous quality methods such as TQM, incorporating statistical quality control principles (Yousefi and Hadi-Vencheh, 2016).

The origins of Six Sigma can be traced back to the statistical foundations upon which it was built. It is a methodology that aims to improve processes by identifying and eliminating defects, thereby reducing variation and enhancing overall quality. The DMAIC (Define, Measure, Analyze, Improve, Control) toolbox is a central component of Six Sigma, emphasizing the importance of data-driven decision-making and statistical analysis in process improvement (Uluskan, 2016).

2.3 SOCIAL ECONOMY

The social economy differentiates itself from traditional public and private sectors through organizations committed to blending economic goals with societal benefits, often termed as "social enterprises" or "social entrepreneurship." This sector's significance is highlighted by its unique ability to bridge societal divides, shaped by various regional socio-contextual dynamics. It evolved from communal associations and cooperatives in the 18th and 19th centuries in response to industrial capitalism, now structured around cooperatives, mutual societies, and associations and foundations, each essential for societal needs (Hossein and Pearson, 2023; Gál and Pásztor, 2022; Wu et al., 2020; Chaves and Monzón, 2012).

Social economy enterprises are characterized by their focus on serving community and member interests over maximizing investor returns,

featuring participatory decision-making and prioritizing labor over capital in profit distribution. This approach diverges sharply from traditional capitalist models, underscoring its macroeconomic significance. Additionally, these enterprises address poverty and social exclusion by providing essential services and employment to marginalized groups, reducing public expenditure on social benefits and long-term unemployment (Blagoycheva, H., Andreeva, A., and Yolova, G., 2020). The principles of the social economy, defined by the Social Economy Charter of 2002 by Social Economy Europe (SEE), emphasize the primacy of people and social goals over capital. These include voluntary membership, democratic control by members, a balance of interests, and solidarity and responsibility. They also stress autonomous management and reinvestment of surpluses into sustainable development or public services, painting the social economy as a dynamic ecosystem poised for significant economic and social impact (Chaves y Monzón, J. L., 2012).

3. METHODS.

The decision to employ bibliometric analysis in this study is driven by its growing recognition and application in various academic fields such as business, management, economics, and social sciences, as noted by Donthu et al. (2021). This methodology is particularly adept at delineating the extent of research activity over time and across disciplines, evidenced by the frequent appearance of the keyword "bibliom*" in searches within the Scopus database. While systematic literature reviews offer a more granular, focused analysis, this study will utilize bibliometric analysis to chart the broader landscape and will conclude by examining the most cited articles in the field. Outlined below is the structured methodology for the bibliometric analysis based on the framework provided by Donthu et al. (2021).

STEP 1: DEFINE THE AIMS AND SCOPE OF THE BIBLIOMETRIC STUDY

An exhaustive search was conducted in the Scopus database for a bibliometric analysis due to its comprehensive coverage of peer-reviewed literature and its validity in bibliometric studies. Scopus is recognized for systematically analyzing literature in various academic fields, making it a suitable choice for defining the aims and scope of bibliometric studies. This database provides a robust foundation for conducting in-depth bibliometric mapping and analysis, ensuring the quality and impact of scientific publications are thoroughly examined (Sobral, 2020). The formulation of search terms was a collaborative effort among researchers, aiming to encompass a broad and well-informed perspective, aligning with best practices for collaborative search term selection in academic research (Ng et al., 2022). This process was further enriched by collaborative brainstorming, which is known to enhance creativity and bring a wide array of ideas to the table (Paulus et al., 2018). The search was confined with search terms organized into two categories: Lean/Six Sigma and social economy. Each query was mandated to include at least one term from each category as

Table 1 - Terms of search. Own elaboration.

Terms associated with Lean/Six Sigma		Terms associated with social economy
• Lean manufacturing • Lean production • Lean management • Lean methodology • Lean principles • Lean philosophy • Lean practices • Kaizen • 5S • Just in Time (JIT) • Value stream mapping • Poka-yoke • SMED • Kanban • Gemba • Andon • TPM (Total Productive Maintenance) • Heijunka • Muda • Mura • Muri • Takt time • Hoshin Kanri • Visual management • Lean tools	• Lean techniques • Lean implementation • TQM (Total Quality Management) • PDCA (Plan Do Check Act) • Six Sigma (6 Sigma) • DMAIC (Define Measure Analyze Improve Control) • DFSS (Design for Six Sigma) • Black Belt • Green Belt • Master Black Belt • SIPOC (Suppliers Inputs Process Outputs Customers) • Cause and effect diagram • Fishbone diagram • Root cause analysis • Ishikawa diagram • Quality function deployment (QFD)	• Social economy • Social Enterprise • Cooperative Economics • Social Entrepreneurship • Social Innovation • Non-Profit Organizations • Social Business • Corporate Social Responsibility • Mutual societies • Non-profit associations • Cooperatives • Third sector

detailed in Table 1, focusing on titles of publications with the cut-off date set to April 30, 2024.

STEP 2: CHOOSE THE TECHNIQUES FOR BIBLIOMETRIC ANALYSIS

The second step in our bibliometric study involved selecting appropriate analytical techniques, based on the comprehensive frameworks developed by Gaviria-Marín et al. (2018) and Mitta et al. (2022). This phase utilized a dual approach: performance analysis and science mapping, applied via the Scopus database. The performance analysis was designed to monitor total publications and categorize them according to several metrics such as productivity per year, subject areas, countries and authors. This approach provided a detailed view of the overall productivity and helped distribute publications across different categories, effectively addressing Research Question 1 (Q1).

For the science mapping portion of the study, we adopted the methodology outlined by Goyal and Kumar (2021), which focuses on dissecting the data into its intellectual structure and thematic content. This included:

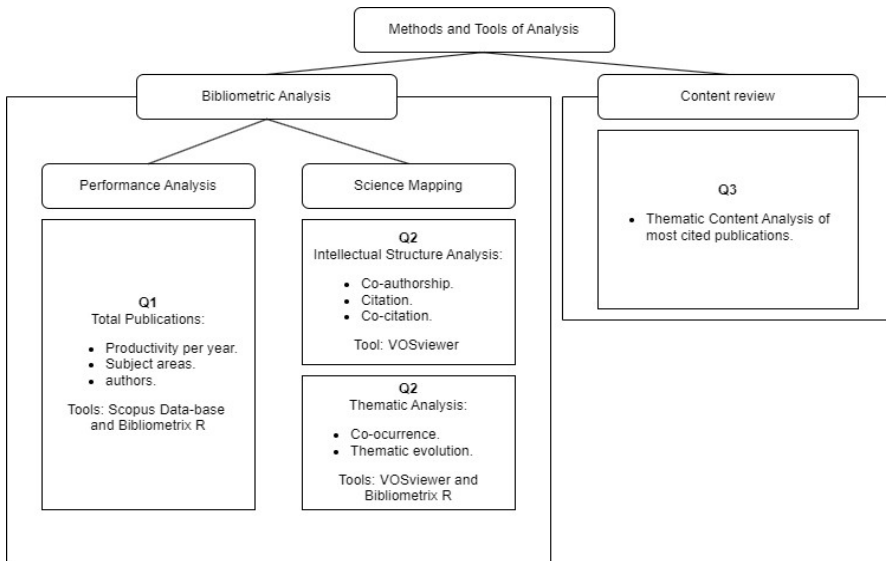
- **Intellectual Structure Analysis:** This involves mapping the relationships within the research field through citation, co-authorship and co-citation analysis, providing a visual representation of how studies are interconnected.
- **Thematic Analysis:** Utilizing co-occurrence analysis and thematic evolution to identify and outline the predominant themes within the literature.

These analyses were guided by the detailed definitions provided by Donthu et al. (2021), ensuring both clarity and precision throughout the science mapping process. This methodology offered comprehensive insights into the evolving landscape of the discipline. To support and facilitate bibliometric analysis, specialized tools like VOSviewer and the Bibliometrix R package were utilized, known for their effectiveness in the bibliometric community, particularly in the synthesis stage of analysis (Dindorf et al., 2022). These tools enable the visualization and analysis of bibliometric data, aiding in the identification of central authors, core themes, and the automation of synthesis processes (Shim et al., 2017). By leveraging these tools, researchers can efficiently navigate large volumes of scientific publications, extract valuable insights, and enhance the quality of bibliometric studies. In this way, we address Research Question 2 (Q2) regarding the nature of intellectual interaction among the research constituents in this field. Figure 1 in the document illustrates the methodology utilized for this analysis.

STEP 3: COLLECT THE DATA FOR BIBLIOMETRIC ANALYSIS

This step involved the systematic collection of data from the Scopus database, based on the defined search terms and criteria. The data was meticulously gathered to ensure a comprehensive dataset was available for

Figure 1 - Scheme of analysis used in present study.



Own elaboration

analysis. A total of 204 documents were identified, with no application of exclusion criteria to any of the documents. The documents were categorized into different types, ordered by quantity from highest to lowest: articles (133), conference papers (41), book chapters (15), reviews (6), conference reviews (5), and books (4). This thorough collection facilitates a detailed exploration of the current landscape in the field, setting a robust foundation for the subsequent bibliometric analysis.

STEP 4: RUN THE BIBLIOMETRIC ANALYSIS AND REPORT THE FINDINGS

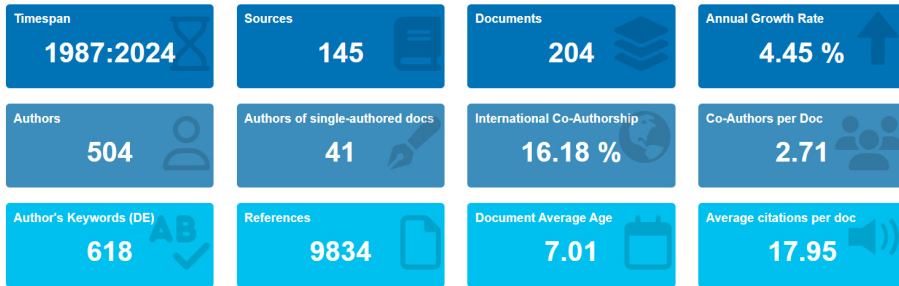
The data gathered is thoroughly examined using selected bibliometric methods, and the outcomes are reported in a structured and comprehensive manner.

4. FINDINGS.

4.1 PERFORMANCE ANALYSIS.

Figure 2 analysis from 1987 to 2024 shows a modest 16.18% international co-authorship rate and only 41 single-authored documents, indicating limited independent and global collaboration that may hinder innovation. An average document age of 7.01 years and a citation rate of 17.95 suggest reliance on foundational studies without significant new contributions. Despite a steady growth rate of 4.45% and extensive use of 9834 references and 618 keywords, the field appears thematically saturated, potentially limiting new insights. This calls for enhanced international collaboration and innovative research to rejuvenate the field.

Figure 2 - Main information from database. Generated using Bibliometrix

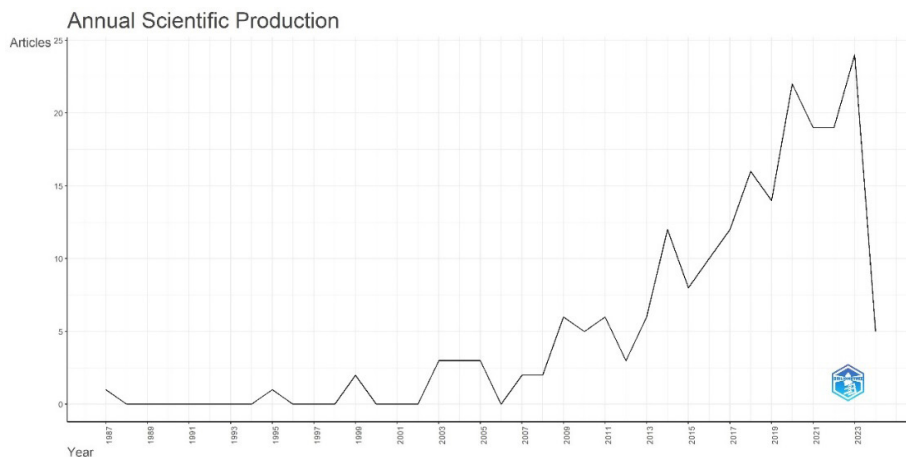


Own elaboration

The scientific production graph in Figure 3, covering 1987 to 2023, illustrates a growth trajectory in research output. Initially, the field experienced low productivity until the early 2000s, indicative of either its nascent stage or limited engagement. A significant surge occurred in 2023, with over 20 articles published, driven by increased funding and academic interest, in response to evolving socio-economic demands. Since the data for 2024 is incomplete, it would be premature to suggest a decline; instead, the current information points to continued robust activity in the field.

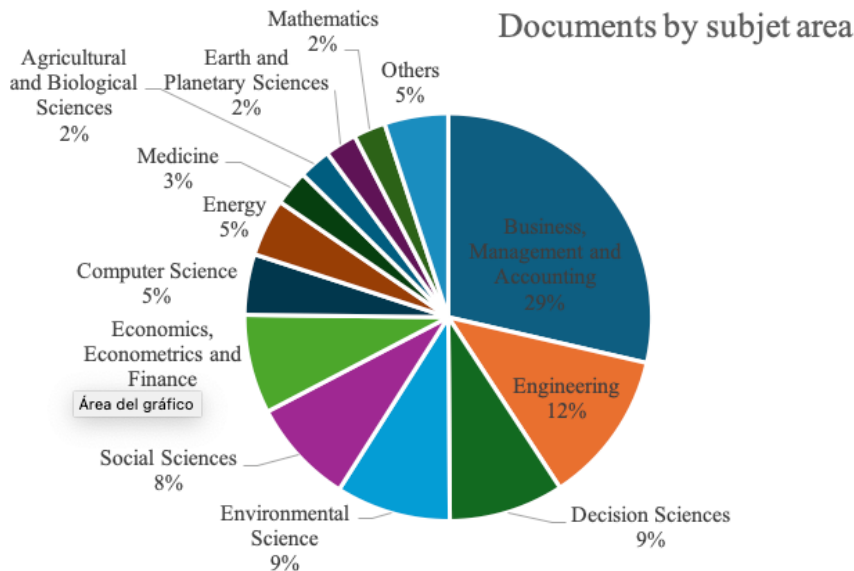
The pie chart (Figure 4) indicates that 29% of the research focuses on Business, Management, and Accounting, highlighting Lean Six Sigma's traditional emphasis on commercial efficiencies. However, its application in Computer Science, Energy, and Medicine is limited, with only 5%, 5%, and 3% respectively, pointing to potential areas for expansion. The low engagement with the medical sector, in particular, suggests an opportunity to apply process improvement methodologies to healthcare systems. On a

Figure 3 - Annual scientific production. Generated using Bibliometrix



Own elaboration

Figure 4 - Documents by subject area

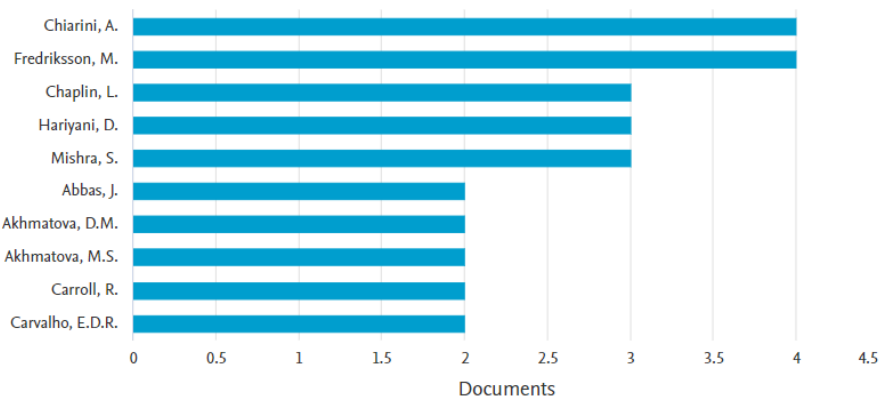


Own elaboration

positive note, the 8% representation in Social Sciences suggests a growing integration of Lean Six Sigma in fields typically less associated with it, like social dynamics and policy making, indicating a move towards broader, innovative applications. This underscores the need for a strategic expansion of Lean Six Sigma to include a wider range of sectors.

The bibliometric analysis reveals insights about author productivity and citation impact, as shown in Figure 5. Despite Chiarini A. being

Figure 5 - Documents by author. Data retrieved form Scopus database.



Own elaboration

the most prolific author with fewer than 5 documents, the correlation between publication quantity and scholarly impact is weak. Notably, only Abbas J., with 399 citations across two articles, demonstrates significant influence, indicating that frequent publication does not necessarily equate to substantial academic impact. The analysis further indicates low overall author productivity, with no individual authoring more than four documents. However, Abbas J. stands out for substantial citation impact, emphasizing the relevance of his work with the highest citation count among researchers. This analysis highlights that while overall publication output is modest, certain works achieve significant resonance within the academic community, such as those by Piercy N. and Rich N., and collaborative teams led by Gaustad, G. et al. and Benavides-Velasco C.A. et al., which have shown notable scholarly impact.

4.2 SCIENCE MAPPING.

4.2.1 INTELLECTUAL STRUCTURE.

- Co-authorship analysis.

Figure 6 shows the co-authorship network among researchers, identifying distinct clusters that represent limited collaboration mainly within specific groups, with minimal cross-cluster or cross-institutional co-authorship. This suggests that researchers tend to form small, isolated teams, and the same pattern is observed among research institutions, indicating a lack of connection between different centers. This segmentation implies potential missed opportunities for broader, synergistic collaborations that could improve the reach and impact of research.

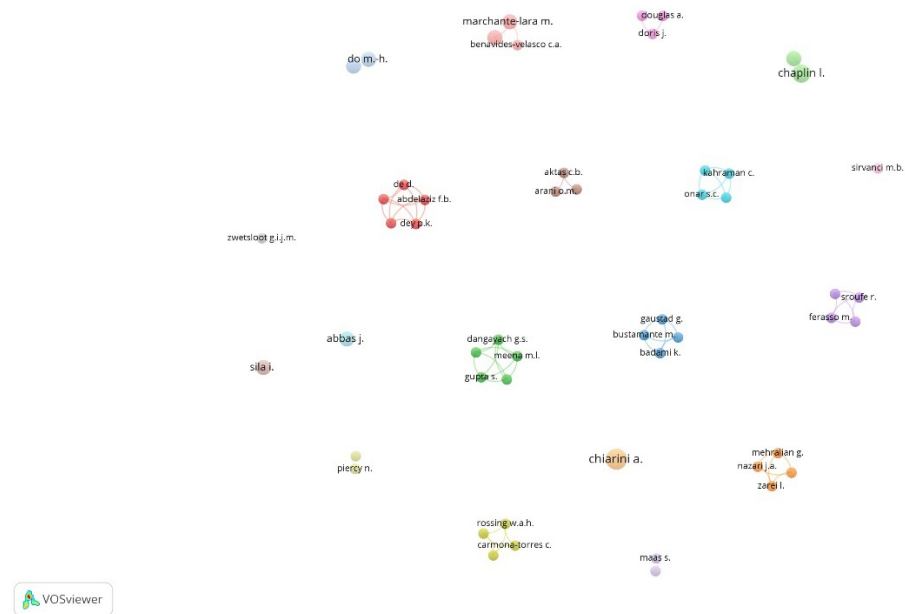
Figure 7 depicts international co-authorship among countries with significant research outputs, showing selective collaborative connections rather than a comprehensive network. The United States, United Kingdom, and India have some links, but China, despite its high publication output, lacks strong connections with other key contributors like India or the United Kingdom. This indicates that while there is an effort to promote international collaboration, it is not evenly spread among all potential partners, suggesting room to broaden and diversify global research collaboration for a richer, more inclusive international research landscape.

- Citation analysis.

In Figure 8, a bibliometric analysis reveals an emerging relationship among the authors, primarily clustered around two main nuclei led by Do, M.H. and Chiarini, A. There is also a single citation directed towards Chaplin, L. The rest of the authors show a lack of inter-citation, remaining isolated within the publications analyzed in this study. This limited interaction among the authors reaffirms the observations from the co-authorship analysis, emphasizing the need to foster linkages between authors associated with Lean and Six Sigma within fields incorporated into the social economy.

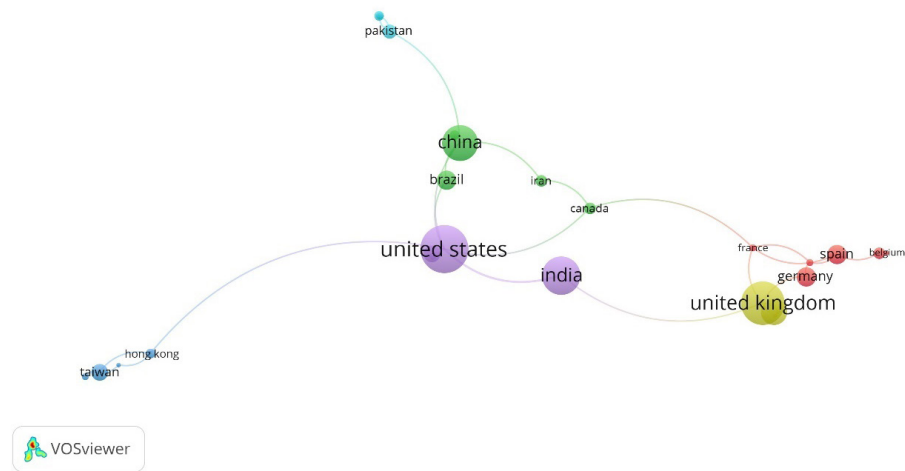
The analysis includes authors who have amassed at least 50 global citations. It is noteworthy, however, that the authors with higher global citation counts do not correspondingly exhibit strong citation connections

Figure 6 - Co-authorship analysis by authors.
Generated using VOSviewer



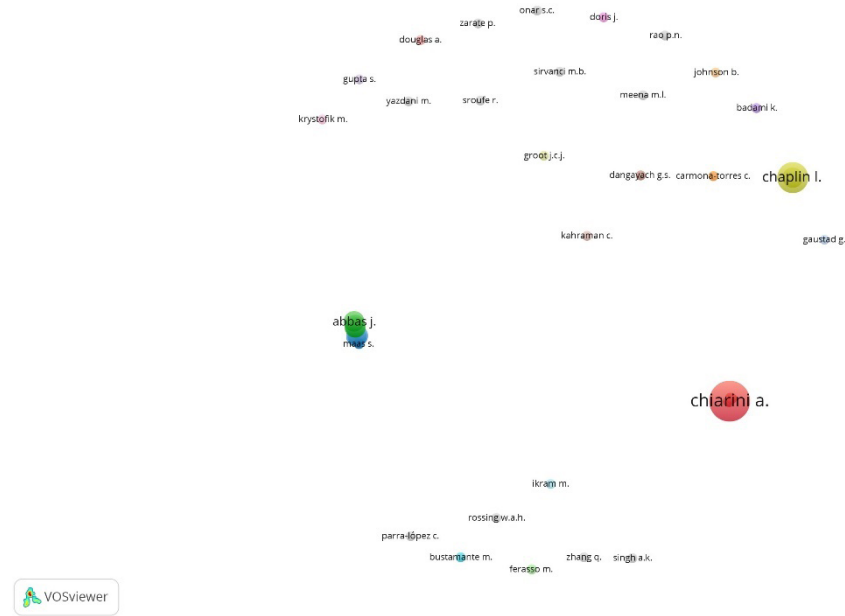
Own elaboration

Figure 7 - Co-authorship analysis by country/territory.
Generated using VOSviewer



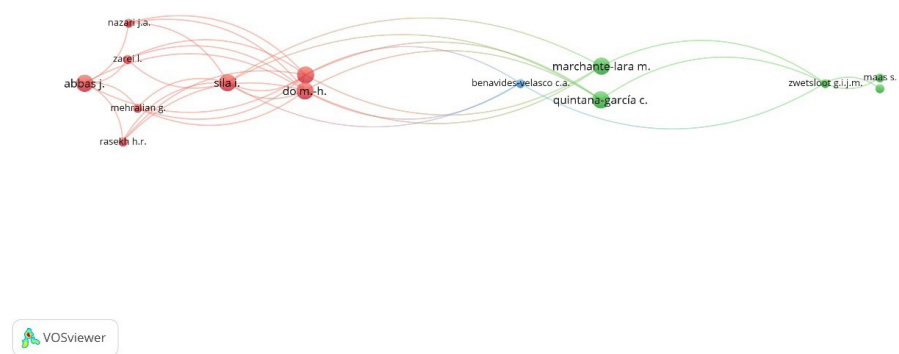
Own elaboration

Figure 8 - Citation Analysis. Generated using VOSviewer



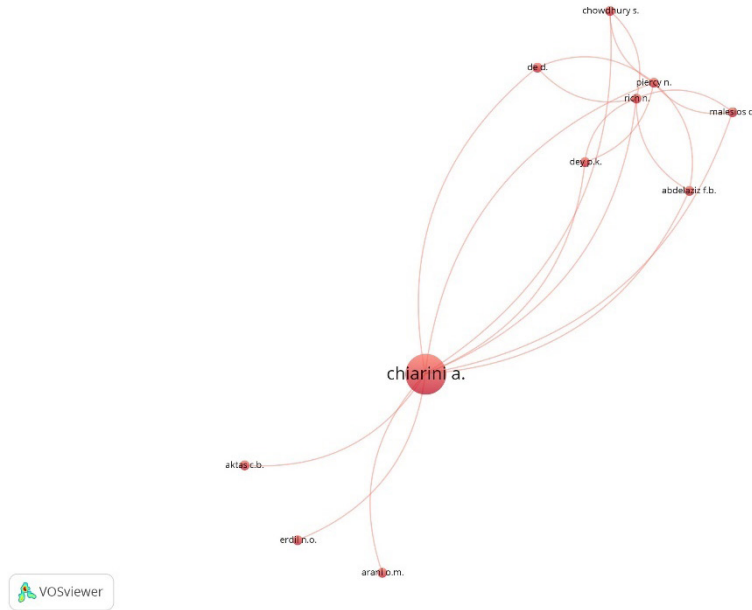
Own elaboration

Figure 9 - Citation analysis cluster A. Generated using VOSviewer



Own elaboration

Figure 10 - Citation analysis cluster B. Generated using VOSviewer



Own elaboration

within this particular study. For example, Abbas, J., who has accumulated a high number of global citations (399), shows only a modest total link strength of 8 in this citation network. This indicates that while Abbas, J. is significantly recognized on a global scale, their influence is not as pronounced within the specific scholarly interactions of this analysis. This discrepancy between global citation impact and localized citation strength provides a nuanced insight into the dynamics of scholarly influence and recognition. Figure 9 and Figure 10 further delineate the authors within each of the two identified clusters (A and B), providing a visual representation of these scholarly networks.

- Co-citation analysis.

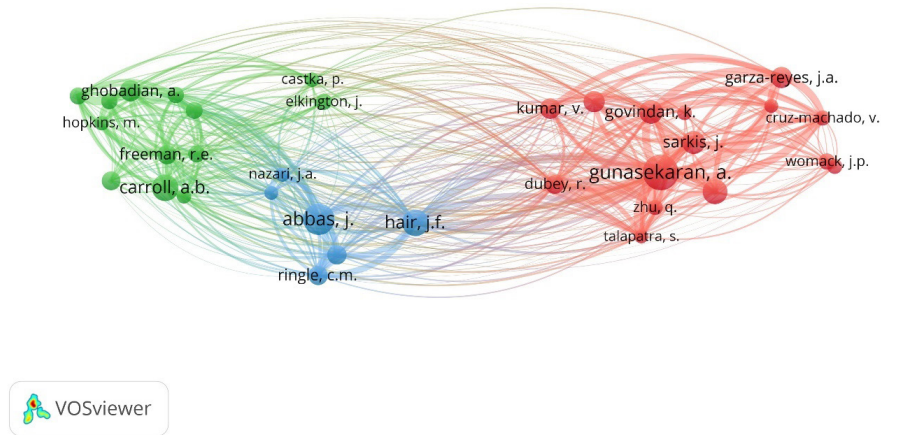
Figure 11 displays a co-citation analysis identifying three primary clusters of authors who have been cited at least 20 times, indicating significant interconnectedness among articles through shared citations. This visualization reveals three main clusters: the red cluster includes Gunasekaran, A., Dubey, R., and Govindan, K.; the green cluster consists of Sila, I., Freeman, R.E., and Ghobadian, A.; and the blue cluster comprises Hair, J.F., Abbas, J., and Sarstedt, M. This distribution of co-citations reflects a stronger relational dynamic between these articles than previously observed in co-authorship and citation analyses, highlighting commonalities in research focus areas despite the lack of explicit collaboration indicated in other bibliometric mappings.

Table 2 - Citations and link strength in citation analysis. Data retrieved from VOSviewer

author	citations	total link strength
do m.-h.	51	24
huang y.-f.	51	24
silá i.	58	15
chiarini a.	95	10
marchante-lara m.	204	9
quintana-garcía c.	204	9
abbas j.	399	8
mehralian g.	108	7
nazari j.a.	108	7
rasekh h.r.	108	7
zareí l.	108	7
zwetsloot g.i.j.m.	138	7
benavides-velasco c.a.	172	6
piercy n.	269	6
rich n.	269	6

Own elaboration

Figure 11 - Co-citation analysys by authors. Generated using VOSviewer



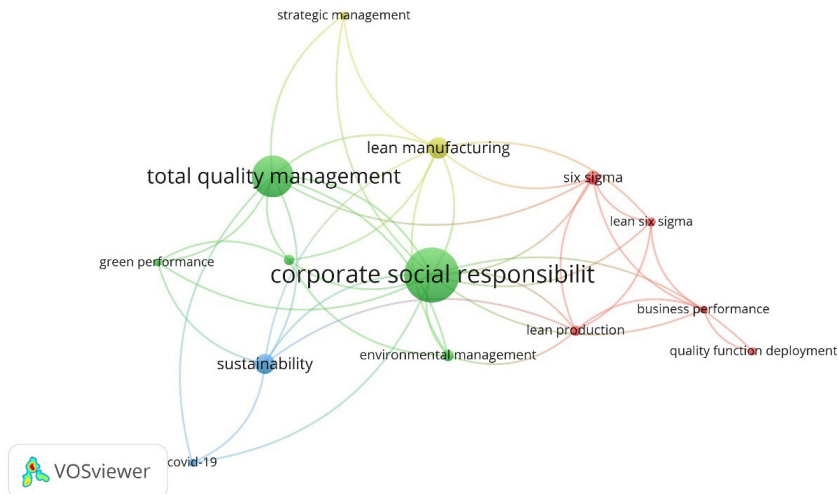
Own elaboration

4.2.2 THEMATIC ANALYSIS.

The co-occurrence analysis presented in Figure 12 demonstrates significant interdisciplinary links among various operational and strategic concepts related to “lean six sigma” and its application within the social economy. The central node, “corporate social responsibility” (CSR), with a high total link strength of 82 as shown in Table 3, is closely linked to “total quality management” and “sustainability,” indicating a deep integration of CSR with continuous improvement and sustainable practices. However, there’s a noticeable lack of terms related to key social economy structures like “foundations,” “cooperatives,” and “NGOs.” This suggests that the application of lean six sigma in the social economy is viewed more through a corporate performance lens rather than direct engagement with typical social economy organizations, pointing to potential research opportunities for adapting lean practices to these contexts for enhanced social and operational outcomes.

The analysis of Figure 13, which depicts the Sankey diagram of thematic evolution, tracks key terms in lean and six sigma over three periods. From 1987 to 2009, the emphasis was on “total quality management,” highlighting its role in foundational quality improvement central to these methodologies. This period focused on enhancing production efficiency and quality, with no direct ties to the social economy, indicating an initial application aimed primarily at boosting operational efficiency in traditional business settings. From 2010 to 2019, there was a significant shift in operational strategies towards incorporating themes like corporate social responsibility, environmental issues, and lean manufacturing, reflecting the maturation of lean and six sigma methods towards sustainability. The introduction of

Figure 12 - Co-occurrence analysis. Generated using VOSviewer

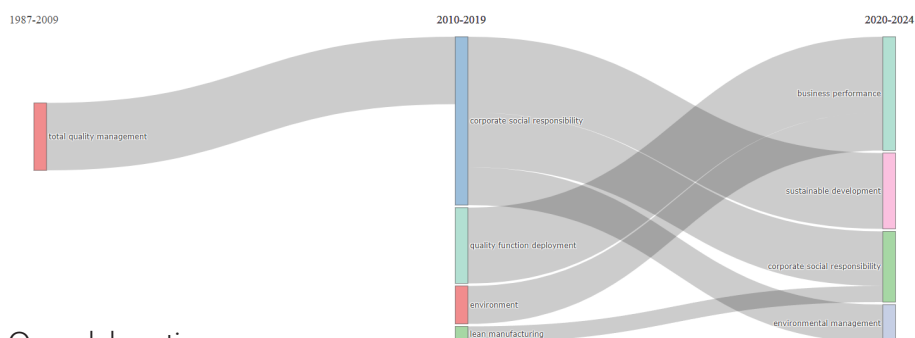


Own elaboration

Table 3 - Total link strength in Co-occurrence analysis. Data retrieved form VOSviewer

keyword	total link strength
corporate social responsibility	82
total quality management	53
sustainability	21
lean manufacturing	17
six sigma	15
environmental management	12
green performance	11

Figure 13 - Thematic evolution. Generated using Bibliometrix.



Own elaboration

“quality function deployment” shows the adaptation of management tools to meet environmental and social objectives. By 2020 to 2024, the focus moved substantially towards sustainable development and environmental management, with a decrease in emphasis on traditional lean and six sigma terminology, indicating a broader approach to integrating operational excellence with sustainability and corporate ethics. This marks a shift from focusing solely on process efficiency to a more comprehensive perspective that includes global sustainability challenges.

4.3 MOST CITED AUTHORS ANALYSIS.

In this section, we focus on pivotal articles that have advanced the integration of operational excellence with societal and environmental goals. We will analyze selected articles from Table 4 that have garnered over 100 global citations and are significant according to our citation analysis. This review will assess the core themes, aligning them with prevalent terms from the latest period in our thematic evolution including “total quality management”, aiming to reveal how operational strategies are merging with social economy principles, enhancing our understanding of their influence on business and society.

Table 4 – List of articles under review. Own elaboration

Authors	Title	Year
Abbas J.	Impact of total quality management on corporate green performance through the mediating role of corporate social responsibility	2020
Abbas J.	Impact of total quality management on corporate sustainability through the mediating effect of knowledge management	2020
Benavides-Velasco C.A., Quintana-García C., Marchante-Lara M.	Total quality management, corporate social responsibility and performance in the hotel industry	2014
Chiarini A.* ¹	Relationships between total quality management and Six Sigma inside European manufacturing companies: A dedicated survey	2013
Chiarini A.	Corporate social responsibility strategies using the TQM: Hoshin kanri as an alternative system to the balanced scorecard	2016
Chiarini A., Vagnoni E.	Strategies for modern operations management: Answers from European manufacturing companies	2017
Dey P.K., Malestios C., De D., Chowdhury S., Abdelaziz F.B.	The Impact of Lean Management Practices and Sustainably-Oriented Innovation on Sustainability Performance of Small and Medium-Sized Enterprises: Empirical Evidence from the UK	2020
Do M.-H., Huang Y.-F., Do T.-N.	The effect of total quality management-enabling factors on corporate social responsibility and business performance: evidence from Vietnamese coffee firms	2020
Douglas A., Dorris J., Johnson B.	Corporate social reporting in Irish financial institutions	2004

Continue

¹ Article not retrieved.

Authors	Title	Year
Gaustad G., Krystofik M., Bustamante M., Badami K.	Circular economy strategies for mitigating critical material supply issues	2018
Mehralian G., Nazari J.A., Zarei L., Rasekh H.R.	The effects of corporate social responsibility on organizational performance in the Iranian pharmaceutical industry: The mediating role of TQM	2016
Piercy N., Rich N.	The relationship between lean operations and sustainable operations	2015
Sila I.	Investigating changes in TQM's effects on corporate social performance and financial performance over time	2020
Sila I.	Linking Quality with Social and Financial Performance: A Contextual, Ethics-Based Approach	2018
Tsou Y.-H., Huang Y.-F., Liu S.-C., Do M.-H.	The Effects of Total Quality Management and Corporate Social Responsibility on Firm Performance: A Future Research Agenda	2021
Yazdani M., Kahraman C., Zarate P., Onar S.C.	A fuzzy multi attribute decision framework with integration of QFD and grey relational analysis	2019
Zwetsloot G.I.J.M.	From Management Systems to Corporate Social Responsibility	2003

Own elaboration

Table 5 -Thematic analysis. Own elaboration.

Theme	Review
Total Quality Management	Total Quality Management (TQM) is a pervasive philosophy aimed at enhancing organizational processes, customer satisfaction, and overall business outcomes. The literature reveals that TQM practices are extensively employed across various industries, integrating tools and methodologies like statistical process control, brainstorming, and quality function deployment to improve the quality and efficiency of production processes (Piercy and Rich, 2015; Yazdani et al., 2019). Specifically, TQM's role in improving environmental management and sustainability is highlighted, with studies showing how TQM practices mediate through corporate social responsibility (CSR) to boost green performance and stakeholder satisfaction in different sectors, including the hotel and manufacturing industries (Abbas, 2020; Benavides-Velasco et al., 2014). Moreover, the strategic implementation of TQM is linked to significant improvements in corporate social performance (CSP) and financial and market performance (FMP). Studies have demonstrated that well-integrated TQM practices enhance organizational performance across multiple dimensions, contributing to better business sustainability and competitive advantage. Notably, TQM enablers, such as human and functional factors, have been identified as critical in positively impacting CSP and, by extension, overall business performance (Do et al., 2020; Sila, 2013; Sila, 2020). Thus, the continuous application of TQM principles like waste reduction, continuous improvement, and strategic alignment of processes with corporate goals proves central in realizing operational excellence and long-term business sustainability (Chiarini, 2018; Dey et al., 2020).

Continue

Theme	Review
Business Performance	The review on “Business Performance” indicates a strong link between improved management practices and enhanced business outcomes, even though the term is not often explicitly defined. Quality improvements and efficient operations, frequently achieved through TQM and lean practices, directly contribute to better economic performance. These include advancements in waste reduction, enhanced decision-making, and improved stakeholder satisfaction, which collectively enhance overall business performance (Piercy and Rich, 2015; Gaustad et al, 2018; Yazdani et al, 2019). Moreover, the integration of CSR with TQM is repeatedly highlighted for its positive impact on business performance. Strategic alignment of business operations through frameworks like Hoshin Kanri or systems such as ERP is noted as crucial for improving operational efficiency and business flexibility. Additionally, sustainable practices and innovations also play a significant role in boosting economic performance, underscoring the importance of sustainability in modern business strategies (Chiarini, 2018; Chiarini and Vagnoni, 2021; Do, 2020).
Sustainable development	Sustainable development emerges as a multifaceted theme strongly intertwined with corporate practices that extend beyond environmental considerations to include social and economic dimensions. The literature reflects a consensus on the integral role of TQM and CSR in promoting sustainable practices across different sectors. Notably, sustainable development in the context of circular economy strategies is discussed as a means to enhance resource efficiency and address supply chain sustainability, thereby contributing positively to environmental, social, and economic outcomes (Gaustad et al, 2018; Abbas, 2020; Dey et al., 2020). Moreover, the application of international standards such as ISO 14001 is highlighted for their contribution to better environmental performance and sustainable business practices (Zwetsloot, 2003). Furthermore, the literature underscores the importance of integrating sustainability into core business strategies through strategic CSR and TQM approaches. This integration is evident in the enhancement of corporate sustainability performance, which incorporates a balanced approach to managing economic, environmental, and social factors. The strategic deployment of TQM and CSR not only supports sustainability outcomes but also improves corporate social performance, thereby aligning business operations with sustainable development goals (Douglas et al., 2004; Chiarini, 2018; Sila, 2020). Such practices are emphasized as essential for long-term business sustainability and for fostering better stakeholder relationships and operational efficiencies, ultimately contributing to a more sustainable global business environment.

Continue

Theme	Review
Corporate Social Responsibility	CSR is extensively addressed in the literature as an essential facet of modern business practices, particularly through its integration with TQM strategies. This integration enhances corporate sustainability by enriching environmental, social, and economic dimensions of business operations. Specifically, CSR is depicted as playing a mediating role, enhancing the impact of TQM on corporate green performance and facilitating improved sustainability outcomes. Such outcomes are not limited to environmental benefits but extend to social dimensions, including workforce treatment and community engagement (Piercy and Rich, 2015; Abbas, 2020; Dey et al., 2020). Furthermore, the strategic deployment of CSR through management systems such as Hoshin Kanri emphasizes the alignment of CSR initiatives with broader business goals, thus fostering a comprehensive incorporation of CSR values within corporate strategies (Chiarini, 2018). Moreover, CSR is discussed as a crucial component of organizational performance, serving as a strategic management tool rather than merely a compliance or ethical obligation. Through the enhancement of Corporate Social Performance, CSR initiatives are shown to significantly impact business sustainability and performance. This is particularly evident in sectors where CSR practices are tied to operational routines, thereby enhancing stakeholder satisfaction and competitive advantage. The literature suggests that effective CSR practices, facilitated by frameworks like ISO 14001 and influenced by TQM, contribute to better transparency, ethical practices, and overall social responsibility within organizations, reflecting a commitment to sustainable and ethical business practices across multiple dimensions (Zwetsloot, 2003; Mehralian et al., 2016; Sila, 2020).

Continue

Theme	Review
Environmental Management	Environmental management is a critical topic within the broader framework of sustainable business practices, with a strong emphasis on integrating environmental considerations into corporate strategies through TQM and CSR. The literature reflects a consensus on the importance of incorporating environmental management systems, such as ISO 14001, to enhance resource efficiency and reduce environmental impacts. Such systems are pivotal in aligning business operations with sustainability goals, fostering green processes and products, and improving overall environmental performance (Piercy and Rich, 2015; Abbas, 2020; Zwetsloot, 2003). Additionally, the application of circular economy principles is notably discussed for their contribution to resource conservation, waste reduction, and enhancing environmental management across various industries (Gaustad et al., 2018; Dey et al., 2020). Furthermore, environmental management is often discussed in the context of CSR, where it is integrated as a component of broader social responsibility initiatives. This integration helps companies manage their environmental impacts more effectively, contributing to better corporate sustainability. The literature also points to the strategic use of environmental management practices to bolster corporate social performance, including enhancing transparency with stakeholders and improving community and environmental outcomes. Through such practices, businesses not only comply with legal standards but also push the envelope in terms of environmental innovation and sustainability, making environmental management a cornerstone of responsible and competitive business practices (Douglas et al., 2004; Chiarini and Vagnoni, 2021).

5. DISCUSSIONS AND CONCLUSIONS

This article serves as an initial exploration combining the terms “lean,” “six sigma,” and “social economy,” marking a novel intersection in scholarly research. However, the definition of search terms could have benefited from broader expert input in both fields, which might have expanded the relevant article pool. The analysis primarily focused on the articles obtained through the search and, apart from co-citation analysis, did not extensively utilize other bibliometric techniques like bibliographic coupling that could have enriched our understanding of the scholarly networks. Additionally, a more detailed examination of international collaborations and publication sources could provide deeper insights into the global impact and dissemination of research in these intersecting domains.

The “Performance Analysis” section highlights a modest international collaboration rate and a low number of single-authored papers, indicating limited research efforts. It suggests a stagnation in theoretical development, with a dependency on foundational studies, and points out the need for increased collaboration and fresh research to rejuvenate the field. The “Intellectual Structure” section of the science mapping demonstrates limited interconnectivity in research collaboration, primarily confined within small, isolated clusters of authors and institutions. This segmentation suggests missed opportunities for broader, synergistic collaborations. Additionally, while selective international co-authorship exists among a few countries, major contributors like China show weak collaborative ties, indicating potential areas for expanding inclusive international research partnerships. The “Thematic Analysis” section emphasizes the strong interdisciplinary connections in “lean six sigma” applications, particularly between CSR, total quality management, and sustainability. It reveals a robust integration of CSR in continuous improvement frameworks, highlighting an opportunity to extend these practices more directly into the social economy’s core structures. The final section of the document reviews sixteen articles on the application of “lean six sigma” methodologies, focusing on themes highlighted in the thematic analysis such as TQM, Business Performance, Sustainable Development, CSR, and Environmental Management. It emphasizes the integration of TQM and CSR strategies to improve corporate sustainability and operational efficiency across various industries.

The bibliometric analysis reveals a distinct absence of convergence among researchers in the fields of “lean,” “six sigma,” and the social economy. This lack of interconnectedness suggests a missed opportunity for synergistic research that could bridge the gap between operational efficiency methodologies and social economy applications. Addressing this, future research should focus on establishing a relationship between these disparate areas, exploring how lean and six sigma methodologies can be specifically adapted to enhance both the operational efficiency and social impact of social economy organizations. Additionally, comparative studies are needed to overcome the barriers to effective interdisciplinary collaboration and integrate these operational strategies more robustly within social economy frameworks. Such investigations would fill critical academic gaps and offer practical insights for organizations aiming to meld efficiency with social value creation.

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