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Article

Exploring the recent development of management control systems study

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Exploring the recent development of management control systems study

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ABSTRACT

The research on management control systems (MCS) is developing in recent decades. However, there is an existing gap in the available literature concerning a comprehensive overview of MCS research. Therefore, this research aimed to provide a summary of the most recent investigation on the relationship between MCS research. To achieve this aim, VOSViewer and R were used as the main analytical tools where data were obtained from the Scopus database from 2003 to 2023. In addition, co-word and co-authorship analyses were used, and the results showed that there was a significant increase in the last two decades despite experiencing fluctuations. The development was determined by several factors, including national productivity, universities as study centers, organizational funding sponsors, journals as publication centers, and author productivity. This exploration identified some well-established themes, namely management control systems, performance management, performance appraisal, human resource management, and performance measurement. However, some themes still needed further development, such as performance indicators, supply chain, recruitment and selection, developing countries, business intelligence, ethics, decision making, governance, and business performance. The development also provided a comprehensive synthesis of fragmented documents and proposed potential themes for future research.

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1. Introduction

In recent decades, the field of business management is experiencing a significant transformation. One of the effective ways to determine the performance and success of an organization is through the use of management control systems (MCS). MCS helps management to identify, evaluate, select, and implement real actions to reduce earnings management (García Osma et al., 2022), encouraging social responsibility action (Feder & Weißenberger, 2021; Hasanudin et al., 2019), and increasing the effectiveness of stakeholder pressure in order to improve higher firm performance (Abdel-Maksoud et al., 2021). Moreover, as firm endeavor to achieve strategic objectives, the implementation of MCS become crucial for guiding decision-making processes and improving total financial and non-financial performance (Duréndez et al., 2023). The relationship between MCS and firm performance has become an interesting subject, thereby causing academic practitioners to pursue a deeper understanding of this topic, such as technological innovation and MCS (Henri & Wouters, 2020; Ruiz-Palomo et al., 2019), strategic management (Wall, 2021), and corporate social responsibility (Hasanudin et al., 2019). Previous research also suggests that company managers and practitioners encourage the development of MCS to increase innovation behavior so as to achieve extraordinary performance (Frare et al., 2022; Le et al., 2023).

MCS is a tool or system used by managers to guide employees toward reaching predetermined goals and objectives (Segovia-Villarreal et al., 2021). In practice, MCS has experienced various changes and

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developments. Furthermore, it focused on providing formal financial information and using measures based on traditional accounting. MCS has currently changed into a comprehensive system that provides information including external information, non-financial details, predictive information, as well as personal and social controls. Recent research has contributed significantly to this field where discovered a positive impact of performance evaluation on firm performance (Mustafa & Islami, 2023), the relationship between MCS and earning management (García Osma et al., 2022), and the impact of entrepreneurial orientation on MCS adoption (Frare et al., 2022). Other research found that MCS, specifically performance measurement, improves managerial creativity (Nuhu et al., 2022), also increases innovation (Le et al., 2023). This can encourage companies to accelerate innovation and identify areas of business operations that can be improved in terms of efficiency and effectiveness. Integration of forensic accounting and MCS also promotes information security in the banking industry so that it can prevent fraud (Akinbowale et al., 2024). Finally, MCS is proposed as a factor to increase productivity and corporate sustainability performance (Dana et al., 2021), through MCS's ability to shape work culture and increase employee motivation. Empirical results from previous studies highlight the importance of MCS as a strong system to ensure the achievement of company objectives.

Previous research has explored several variables to explain the important role of MCS. Bibliometric analyses and document reviews on MCS have covered different topics, including performance measurement, innovation driven HRM practices, aircraft maintenance performance measurement, and supply chain performance measurement. Furthermore, the topics on MCS include MCS in higher education institutions, performance measurement for sustainable business, the balanced scorecard, key performance indicators, MCS in the public sector, MCS in banking, balanced scorecard in the hospitality and tourism industry, as well as performance measurement systems in small and medium-sized enterprises (Aman et al., 2023; Bracci et al., 2022; Cazeri et al., 2019; Fatima & Elbanna, 2020; Govindan et al., 2022; Hansen & Schaltegger, 2016; He et al., 2022; Heinicke, 2018; Helsen et al., 2017; Hristov et al., 2021; Kunz & Heitz, 2021; Lenart-Gansiniec et al., 2023; Mio et al., 2022; Munik et al., 2021; Nappi & Kelly, 2022; Oppi et al., 2022; Rojas-Lema et al., 2021; Timjerdine, 2023; Vale et al., 2022). Despite significant development in MCS research in the last two decades, no effort has been made to create the findings of these documents. Although, previous literature has described MCS in various worlds, critical reviews of the topic are still few. Previous explorations have not specifically conducted bibliometric analyses on MCS, potentially excluding contributions from other MCS research. Considering the importance of MCS in company achievements and understanding the contributions of previous literature, the aim of this research is to analyze and synthesize the MCS literature which is still fragmented in various sources. Bibliometric analysis is important because it serves researchers to develop new research in this area, investigate current trends, and highlight under-researched streams in this research domain (Mushtaq et al., 2023). In this way, researchers are not trapped in established areas and can develop new areas that contribute to existing literature and provide great benefits to the development of science and practice in organizations. This finding uses the Scopus database, which has unique characteristics compared to several other databases, different from previous research that used databases such as Web of Science (WoS), Google Scholar, and ABS.

This research aimed to contribute to the changing dialogue by conducting a bibliometric analysis of MCS. It formulates the following questions:

- RQ1. What is the MCS publication frequency over the last two decades?
- RQ2. Which country is the most productive?
- RQ3. Which organizations, funding sponsors, and journals are the most productive?
- RQ4. Which countries and journals are most cited?
- RQ5. What themes have been widely and rarely researched in MCS research?
- RQ6. What are the trends in MCS research themes over the last two decades?
- RQ7. Who are the most prolific and most influential authors?
- RQ8. What upcoming areas will be the focus of research in MCS?

This research synthesizes documents based on a systematic review in four stages, similar to the approach used by Xu and Liu (2023) but further developed. The results contribute in several ways: (1)

providing a comprehensive briefing of fragmented documents using big data analysis, i.e., bibliometrics; (2) identifying drivers of the movement in MCS research; and (3) offering information on developing and well-established themes, providing direction for future research. Finally, this offers proposals for authors to broaden the scope of this research.

2. Methods

This research used a bibliometric approach to map and create previous research on MCS. Bibliometrics, as defined by Ellegaard and Wallin (2015), reviewed various publications, including journals, books, and other relevant sources. To address the research questions, four stages were used, as defined by Xu and Liu (2023) which included (1) data acquisition, (2) data processing, (3) data statistics and mapping, and (4) finding and review.

The data acquisition stage followed the PRISMA protocol, consisting of four stages namely identification, screening, eligibility, and inclusion (C. Hansen et al., 2022; Kuckertz & Block, 2021; Lim et al., 2022; Rojas Molina et al., 2022). The PRISMA protocol, shown in Table 1, considered factors such as the search engine, subject area, types of sources, search language, search period, and keywords (Tautiva et al., 2022). Exclusively using the Scopus database as the search engine, this finding ensured comprehensiveness, as Scopus contains high-quality articles from major publishers (Alves & Mariano, 2018; Ochoa et al., 2019). Other databases were not used in this study such as Google Scholar (consideration of overall article quality). Even though Web of Science has good quality articles, bibliometric data and full articles are easy to access, Scopus provides a better representation of the literature, covering many journals, especially in the social and humanities domains (Paul et al., 2021; Pranckutė, 2021; Setiawan et al., 2023), so it is suitable for bibliometric reviews (Abhilash et al., 2023; Antwi et al., 2022). Scopus also applies strict indexation requirements so that the quality of the articles published is high quality. Using two or more databases simultaneously may cause duplication of articles and errors during the analysis process due to differences in database characteristics and ability to read article information. Although this study does not include contributions from MCS studies published in other databases (such as Web of Science and Google Scholar), it offers proper analysis with quality guaranteed sources. This study analyzes publications in the areas of Business, Management, Finance, and Accounting according to the aim of this study to understand MCS in a business context and the author's professional assessment regarding the lack of relevance of other scientific disciplines to MCS so that other subject areas are excluded in this study. This exploration included only journal articles, excluding other publications such as books, book chapters, and conference proceedings, as these did not significantly contribute to experimental and theoretical discussions (Tautiva et al., 2022). The emphasis on journals is also justified because published articles have undergone stricter peer review than other sources such as books, book chapters, and conference proceedings (Paul et al., 2021). English was exclusively used as the search language to avoid introducing preconceptions in the bibliometric analysis (Gulluscio et al., 2020; Stechemesser & Guenther,

Table 1. PRISMA protocol.

Stage	Description	Results
Identification	Keywords searched: "management control system"; or "performance appraisal"; or "performance management system"; "performance management"; or "PM Practice"; or "performance evaluation"; or "key performance indicator"; or "KPI"; or "management compensation scheme"; or; "performance indicator"; or "management control"; or "human resource"; or "reward system"; or "target performance"; or "reward strategy"; or "performance measurement"; or "balance scorecard"; or "human resource management"; or "human resource management practice"; or "HRM Practice".	5,718 articles
Screening	Screening criteria: 1. Year: 2003-2023 2. Subject Area: (1) Business, Management, and Accounting; (2) Economics, Econometrics, and Finance 3. Language: English 4. Document type: article 5. Source type: journal	Screened and excluded (N=3,657) 1. Year= 890 2. Subject Area= 2,002 3. Language= 56 4. Document type= 681 5. Source type= 28
Eligibility	Justification based keywords used, title, abstract, & error checking	680 articles excluded
Inclusion	Validation process and bibliometric analysis	1,381 articles were eligible

2012) as the data spanned from 2003 to 2023. The balanced scorecard, developed by Robert S. Kaplan and David Norton in 1992, gained widespread adoption by organizations in the 2000s as a performance measurement and management tool. The past two decades witnessed increased business scandals and governance issues, signifying the importance of MCS. The MCS implementation was believed to improve firm performance and promote good business governance, leading to the development of research on MCS in this two-decade period. Finally, this research used several keywords based on professional assessments and discussions with MCS experts. The final keywords used include: "management control system"; or "performance appraisal"; or "performance management system"; "performance management"; or "PM Practice"; or "performance evaluation"; or "key performance indicator"; or "KPI"; or "management compensation scheme"; or; "performance indicator"; or "management control"; or "human resource"; or "reward system"; or "target performance"; or "reward strategy"; or "performance measurement"; or "balance scorecard"; or "human resource management"; or "human resource management practice"; or "HRM Practice". This study uses many keywords to ensure that all articles related to MCS are covered during the data mining process and articles that are less suitable will be eliminated at the next stage (screening and eligibility stage). Based on these keywords, 5,718 documents were found. These articles are articles published on Scopus and are spread across various subject areas such as Business, Management, Accounting, Finance, Economics, Social Sciences, Engineering, Psychology, Computer Science, Medicine, etc. To ensure that the MCS articles discussed in this study support the business context and are not biased, screening was carried out.

From the 5,718 documents identified, screening based on specified criteria was conducted which included year ($N=890$ excluded), subject area ($N=2,002$ excluded), language ($N=56$ excluded), document type ($N=681$ excluded), and source type ($N=28$ excluded). This process led to a total of 2,061 documents for the eligibility and inclusion stage. The eligibility stage consisted of reviewing, the title, abstract, and keywords were reviewed to ensure grouping with the research focus. The eligibility stage is important because to ensure this study obtains comprehensive articles about MCS, many keywords are used during the search process and because of this process there may be less relevant articles appearing, so it is necessary to test the feasibility of the articles used. After the eligibility stage is based on reasonable justification, the next step is error checking. Before error checking is carried out, articles that pass the previous stage are downloaded in RIS and BibTeX format. Error checking on the database was also performed to ensure the usability of big data articles during data processing. Each journal in the Scopus database has a different layout format and settings and under certain conditions there may be articles whose bibliometric information cannot be read completely, which will interfere with the analysis process using VOSViewer and R. Therefore, error checking is carried out at the beginning of the process using R (based on downloaded articles in RIS and BibTeX format). If there are articles that cannot be read properly in R, they are excluded during the RIS and BibTeX download process. The eligibility stage led to the exclusion of 680 articles, leading to a final dataset of 1,381 articles. The last stage was the inclusion stage, which included validation checks, publication statistics, and bibliometric analysis of the 1,381 selected documents. In addition, the authors independently authorized the entire process to ensure the strength and validity of the previous three stages, preventing errors during data acquisition and enabling subsequent research for duplication and further development.

The final search query used was as follows (27 November 2023):

TITLE-ABS-KEY ("management control system"; OR "performance appraisal"; OR "performance management system"; "performance management"; OR "PM Practice"; OR "performance evaluation"; OR "key performance indicator"; OR "KPI"; OR "management compensation scheme"; AND or; "performance indicator"; OR "management control"; OR "human resource"; OR "reward system"; OR "target performance"; OR "reward strategy"; OR "performance measurement"; OR "balance scorecard"; OR "human resource management"; OR "human resource management practice"; OR "HRM Practice") AND PUBYEAR > 2002 AND PUBYEAR < 2025 AND (LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT-TO (SUBJAREA, "ECON")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (SRCTYPE, "j")) AND (EXCLUDE (EXACTKEYWORD, "Human") OR EXCLUDE (EXACTKEYWORD, "Management") OR EXCLUDE (EXACTKEYWORD, "Job Satisfaction") OR EXCLUDE (EXACTKEYWORD, "Article") OR EXCLUDE (EXACTKEYWORD, "Case Study") OR EXCLUDE (EXACTKEYWORD, "Training") OR EXCLUDE (EXACTKEYWORD, "Strategy") OR EXCLUDE

(EXACTKEYWORD, "Industrial Management") OR EXCLUDE (EXACTKEYWORD, "Feedback") OR EXCLUDE (EXACTKEYWORD, "Supply Chain Management") OR EXCLUDE (EXACTKEYWORD, "Control") OR EXCLUDE (EXACTKEYWORD, "Trust") OR EXCLUDE (EXACTKEYWORD, "Humans") OR EXCLUDE (EXACTKEYWORD, "Managers") OR EXCLUDE (EXACTKEYWORD, "Motivation") OR EXCLUDE (EXACTKEYWORD, "Higher Education") OR EXCLUDE (EXACTKEYWORD, "Total Quality Management") OR EXCLUDE (EXACTKEYWORD, "Corporate Social Responsibility") OR EXCLUDE (EXACTKEYWORD, "Local Government") OR EXCLUDE (EXACTKEYWORD, "Organizational Change") OR EXCLUDE (EXACTKEYWORD, "Fairness") OR EXCLUDE (EXACTKEYWORD, "Culture") OR EXCLUDE (EXACTKEYWORD, "Employee") OR EXCLUDE (EXACTKEYWORD, "Universities") OR EXCLUDE (EXACTKEYWORD, "Societies And Institutions") OR EXCLUDE (EXACTKEYWORD, "Perception") OR EXCLUDE (EXACTKEYWORD, "Organization") OR EXCLUDE (EXACTKEYWORD, "Hospitals") OR EXCLUDE (EXACTKEYWORD, "Hospital") OR EXCLUDE (EXACTKEYWORD, "Communication") OR EXCLUDE (EXACTKEYWORD, "Surveys") OR EXCLUDE (EXACTKEYWORD, "Quality") OR EXCLUDE (EXACTKEYWORD, "Measurement") OR EXCLUDE (EXACTKEYWORD, "Learning") OR EXCLUDE (EXACTKEYWORD, "Appraisal") OR EXCLUDE (EXACTKEYWORD, "Work Engagement") OR EXCLUDE (EXACTKEYWORD, "Qualitative Research") OR EXCLUDE (EXACTKEYWORD, "Organizational Justice") OR EXCLUDE (EXACTKEYWORD, "Productivity") OR EXCLUDE (EXACTKEYWORD, "Knowledge Sharing") OR EXCLUDE (EXACTKEYWORD, "Gender") OR EXCLUDE (EXACTKEYWORD, "Employee Engagement") OR EXCLUDE (EXACTKEYWORD, "Creativity") OR EXCLUDE (EXACTKEYWORD, "Case Studies") OR EXCLUDE (EXACTKEYWORD, "Career Development") OR EXCLUDE (EXACTKEYWORD, "Service Sector") OR EXCLUDE (EXACTKEYWORD, "Satisfaction") OR EXCLUDE (EXACTKEYWORD, "Risk") OR EXCLUDE (EXACTKEYWORD, "Employment") OR EXCLUDE (EXACTKEYWORD, "Employee Attitudes") OR EXCLUDE (EXACTKEYWORD, "Competition") OR EXCLUDE (EXACTKEYWORD, "COVID-19") OR EXCLUDE (EXACTKEYWORD, "Budgeting") OR EXCLUDE (EXACTKEYWORD, "Adult") OR EXCLUDE (EXACTKEYWORD, "New Public Management") OR EXCLUDE (EXACTKEYWORD, "Outsourcing") OR EXCLUDE (EXACTKEYWORD, "Family Business") OR EXCLUDE (EXACTKEYWORD, "Employees") OR EXCLUDE (EXACTKEYWORD, "Employee Retention") OR EXCLUDE (EXACTKEYWORD, "Employee Development"))

Next was the data processing, which included the selected data, comprising 1,381 articles, to show bibliometric networks where VOSViewer and R were used as the main tools (Aria & Cuccurullo, 2017). Two bibliometric methods were used namely co-word analysis and co-authorship analysis. The assumption was that words frequently appearing together showed a close relationship (Zupic & Čater, 2015). Co-word analysis showed the conceptual structure, showing relationships among concepts and group records through terms co-occurrence of keywords (Farrukh et al., 2021; Mushtaq et al., 2023). Furthermore, this structure was used to understand discussed topics, identify important and current issues, and identify unexplored research areas. Co-word analysis addressed RQ1, RQ2, RQ3, RQ4, RQ5, RQ6, as well as RQ8 and Co-authorship analysis showed the social structure, showing collaborations in networks such as authors. Co-authorship analysis groups authors based on their co-occurrence in articles. This also indicates collaboration between authors. Moreover, Co-authorship was used to address RQ7, as collaborations among authors could influence the development of MCS research.

Data statistics and mapping that were based on co-word and co-authorship analysis showed the results were mapped through statistics and various visualizations to describe the development and contribution of published MCS research. Finally, various findings were analyzed and reviewed to answer the research questions.

3. Results and discussion

3.1. Document general characteristics

Table 2 showed an overview of the quantity characteristics used in this research, and the timespan considered ranged from 2003 to 2023. The analysis focused on the development of MCS research in the past two decades, marked by fast globalization and technological advancements. This period witnessed significant development in MCS research, providing a distinctive understanding for the documentation of MCS. Following stringent selection criteria, 1,381 articles were selected from 461 journals, and the average annual growth of MCS publications reached 9.74%. Additionally, Table 2 showed that the average

Table 2. Document general characteristics.

Description	Results
Main information about data	
Timespan	2003:2023
Sources (Journals, Books, etc)	461
Documents	1381
Annual Growth Rate %	9.74
Document Average Age	7.55
Average citations per doc	25.6
References	1
Document contents	
Keywords Plus (ID)	368
Author's Keywords (DE)	3374
Authors	
Authors	2878
Authors of single-authored docs	267
Authors collaboration	
Single-authored docs	295
Co-Authors per Doc	2.51
International co-authorships %	25.71
Document types	
article	1368
article article	13

citations per document reached 25.6; however, this research included 3,374 keywords and 2,878 authors, contributing to bibliometric analysis and other relevant information.

3.1.1. Evolution in the number of publications

As shown in [Figure 1](#), the number of publications per year increased (green line) where the average annual publication rate reached 65 documents. In 2004, there were 17 documents, and in subsequent years, they fluctuated until reaching a peak in 2019 with 125 published documents. Following this peak, MCS publications decreased until 2021 ($N=77$) but increased again in 2022, and this decline could be attributed to decreased author productivity during the pandemic. As we all know, the pandemic has dealt a big blow to company operations. During the pandemic and after the pandemic situation, researchers showed great interest in the relationship between MCS and firm performance (Dao et al., 2023; Mahmoudian et al., 2022; Phan et al., 2023), innovation (Krishnan et al., 2022), and risk taking (Duréndez et al., 2023). This is one of the factors driving the increase in publications over the last five years. By the end of November 2023, 109 documents had been published, with the potential for further increase. This recovery showed renewed interest in MCS analysis, possibly driven by various challenges faced by firm. A case in view was Pertamina (Indonesia), being a State-Owned Enterprise (SOE) with about 120 subsidiaries and the largest payment contributor. Specifically, Pertamina used Key Performance Indicators (KPIs) to assess work performance. Despite the deterioration in financial performance, the average value of KPI of the Pertamina remained stable. This raised questions about the correlation between KPIs and firm performance, thereby leading to the development of MCS research. In other cases, this is also driven by the productivity of authors such as Arnold and Bracci, whose average publications were made in the last five years. In the last five years, previous studies have contributed to the literature, such as proposing a new framework for integrating risk management with strategy and MCS with performance measurement systems (PMS) (Rana et al., 2019), coupling literature in risk management and MCS (Bracci et al., 2022), and the impact of business intelligence on MCS (Elbashir et al., 2021). This implies that technological advances have also contributed to encouraging new MCS practices and designs that have attracted various researchers.

[Figure 1](#) also showed the average citations per year (blue line), and an important observation was the decreasing trend in the development of citations per year. The decrease in average citations in recent years can be explained that citations depend on time (Mushtaq et al., 2023). Articles that have been published a long time ago tend to have more citations. However, it is still possible for a new publication to have a large impact and gain attention in the short term after publication. Therefore, it is important that future research be more innovative and explore crucial areas that are not yet well established. The

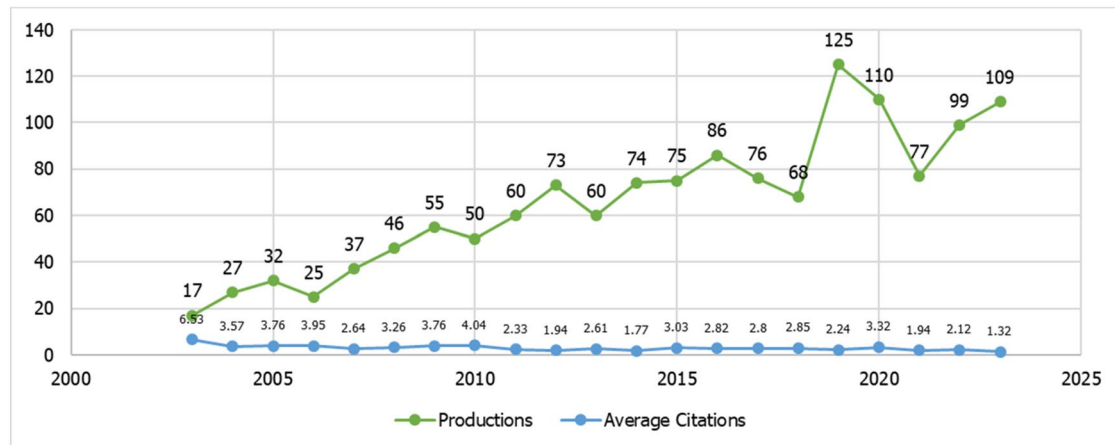


Figure 1. Evolution in the number of articles production and average citations.

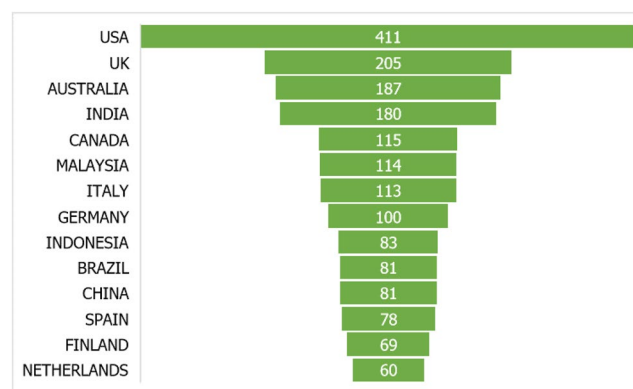


Figure 2. Top 14 contributing countries.

highest average citation was in 2003, at 2.98. However, in 2019, a year with substantial production (125 documents), the average citation was only 2.24. A similar pattern was observed in 2023, in which the average citation was only 1.32, even though there were 109 publications in the middle of the fourth quarter.

3.1.2. Distribution across global regions and organizations

In the last two decades, the United States led in publications, reaching 411 documents (Figure 2), and the United Kingdom as well as Australia followed with 205 and 187 publications, respectively. Besides these top three countries, 73 others also contributed to the development of MCS research. This proposed that the topic was not confined to a single country or continent but was distributed relatively evenly on a global scale. Figure 3 showed the density of publications across regions worldwide, showing that each country contributed differing numbers, ranging from one to 411 MCS research documents in the past two decades.

Recent MCS studies in the United States discuss supply chains, SMEs, and MCS design for various firms such as health care and construction. In the United States, with its rapidly developing industry, many MCS redesigns have been carried out to suit industrial conditions and company operations. United Kingdom is more interested in sustainability issues and SMEs related to MCS. The United Kingdom, as one of the countries with strict regulations regarding Climate Change, Carbon Emissions and Renewable Energy, is trying to integrate sustainability insights with MCS. Meanwhile, Australia discusses more about leadership, intellectual capital, and stakeholders' perspective. The Top 3 most productive countries have different interests in MCS research. This may be tailored to each country's needs and consider current issues, regulations and other characteristics. This contributes to the development of MCS research in various areas so that MCS studies are not limited to one area and can explore various parts, such as MCS

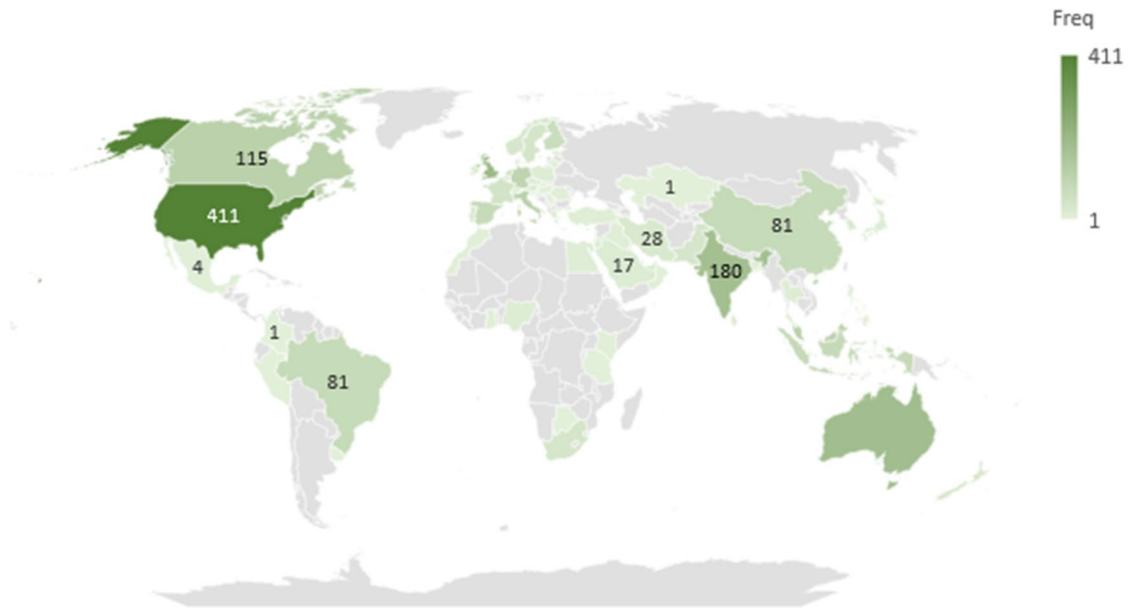


Figure 3. Global distribution of publication density.

Table 3. Top 10 organizations contributing to research on MCS.

Organization	Country	Documents
Macquarie University	Australia	27
University of Central Florida	United States	17
Universiti Utara Malaysia	Malaysia	16
Universiti Sains Malaysia	Malaysia	15
Aarhus University	Denmark	13
Federal University of Santa Catarina	Brazil	12
Monash University	Australia	11
RMIT University	Australia	10
University of Rome Tor Vergata	Italy	10
University of Vaasa	Finland	10

redesign, corporate governance, regulation, behavior, and leadership characteristics. Each country can also create a central theme regarding the focus of MCS studies so that it can become a competitive advantage in the research output of each country.

The presence of universities and other organizations performed a role in the high number of publications in certain countries where Macquarie University, based in Australia, topped the list with 27 documents. This is associated with Figure 2, where Australia held the top three positions in countries with the most publications. One of the publications from Macquarie University that has received great attention is regarding the ethical motivation of companies regarding their involvement in Corporate Social Responsibility (CSR) activities (Schaltegger & Burritt, 2018). The study identified four motivations, namely short-term financial motivation, reputation, responsible motivation integrated in PMS, and collaborative motivation. The University of Central Florida (United States) secured second place with 17 publications, and the University Utara Malaysia (Malaysia) ranked third with 16 publications. Table 3 showed that universities were the center of MCS research, making a significant contribution to its development. Moreover, the table showed that the universities with the highest contribution were from developed countries, proposing that MCS was more advanced in such countries with better systems, corporate governance, and a tendency for higher-quality human resources.

The substantial progress in MCS research drew the attention of various stakeholders, including authors and funding sponsor organizations, as it positively affected firm performance. This was because, with a well-designed MCS, workers understood the expectations of the firm and the consequences and rewards associated with meeting aims. This increased worker motivation, in turn, led to improved firm performance. Conversely, ineffective MCS, such as inappropriate performance measurement, had the potential to diminish firm performance, failing to improve worker motivation.

Table 4. Top organizations (funding sponsor) contributing to research on MCS.

Funding sponsor	Region	Numbers
National Natural Science Foundation of China	China	9
Social Sciences and Humanities Research Council of Canada	Canada	9
Coordenação de Aperfeiçoamento de Pessoal de Nível Superior	Brazil	8
Conselho Nacional de Desenvolvimento Científico e Tecnológico	Brazil	7
Economic and Social Research Council	United Kingdom	6
Fundação para a Ciência e a Tecnologia	Portugal	6
Ministerio de Ciencia e Innovación	Spain	6
Chartered Institute of Management Accountants	United States	5
Japan Society for the Promotion of Science	Japan	5

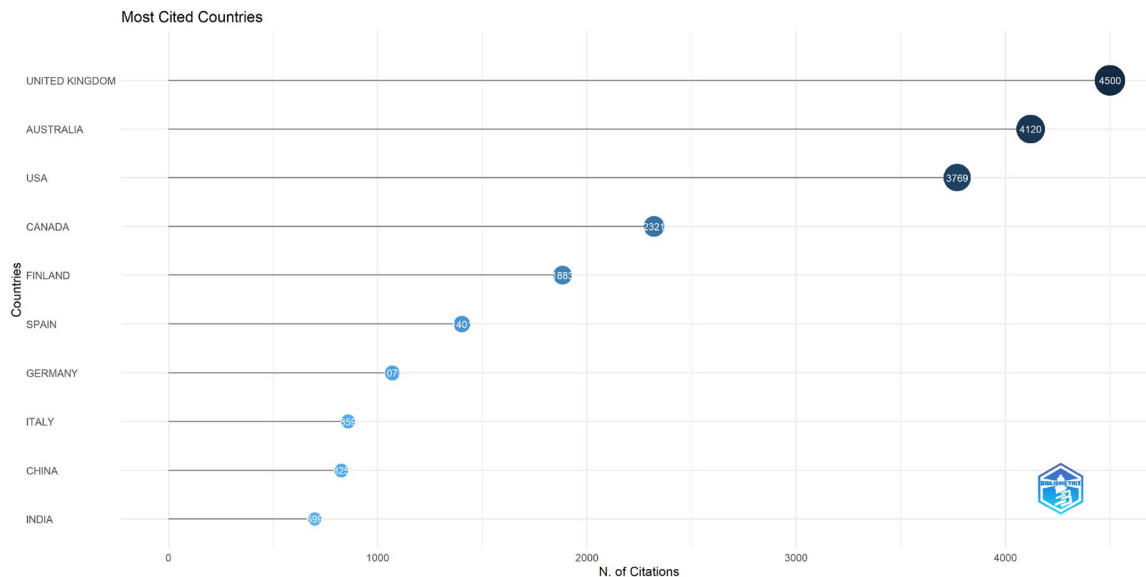
**Figure 4.** Top 10 Most Cited Countries.

Table 4 showed nine organizations (funding sponsors) that contributed to the development of MCS research where Brazil came out as the country with the most funding sponsors and produced significant articles. The presence of these funding sponsors positioned Brazil among the top 10 countries, boasting 81 publications, with organizations in Brazil financing 18.5% of these publications. On the other hand, the National Natural Science Foundation of China (China) and the Social Sciences and Humanities Research Council of Canada (Canada) were among the funding sponsor organizations having the highest publications, reaching nine documents. The support of funding sponsors played a crucial role in promoting the productivity of countries and authors in advancing MCS research. Table 4 further showed that the majority of funding sponsors were from developed countries. MCS, being a crucial factor in firm success and performance, received more attention and investment from developed countries. In developed countries the field of research tends to develop more rapidly compared to developing countries. They tend to have universities (study centers) with high independence, initiative, and motivation in research. In developing countries, research may be less productive, so the government is involved in encouraging researchers to be more productive by providing sponsor funding so that the quality of research is expected to be better. Therefore, there is a lot of funding sponsorship from governments in developing countries. Furthermore, in developing countries there may still be few sponsor funding organizations from the private sector so they are more dependent on funding allocations from the government.

Figure 4 showed the top 10 countries with the most citations, of which United Kingdom ranked the first with 4,500 citations. This result was closely related to those shown in Figure 2, where United Kingdom followed the United States in the number of publications. Furthermore, Australia was ranked the second by 4,120 citations, consistent with its significant contribution to MCS research. The next was the United States by 3,769 citations and Canada by 2,321 citations. Despite the United States having the most publications

and the United Kingdom having around 50% of the publications of the United States, United Kingdom surpassed in terms of citations. This may be because the United Kingdom has more innovative and trending research topics such as sustainability issues related to MCS. Sustainability issues have received great attention over the last few years amid worsening climate change, waste, and emissions. MCS can contribute to these studies by offering control systems such as production processes and waste disposal. Figures 8 and 9 can explain this, in recent years the United Kingdom has discussed more about sustainability and intellectual capital, where these themes are currently developing so that the United Kingdom may get high citations from this. Moreover, developed countries dominated the list of countries having the most citations, showing a substantial contribution to intellectual property. This scenario could be because authors from developed countries had a strong network with others as well as funding sponsor that help them improve the quality of their research, which had effect on the number of citations.

3.1.3. Journal analysis

Figure 5 showed the 14 journals with the most production in the past two decades. The International Journal of Productivity and Performance Management led with 52 publications, followed by Management Accounting Research with 48 publications. Accounting, Organizations and Society were ranked the third position, with three documents. Additionally, five other journals published 36 documents as seen in Figure 6. The ones in the top five position and with the highest impact included Management Accounting



Figure 5. Top 14 journals by production.

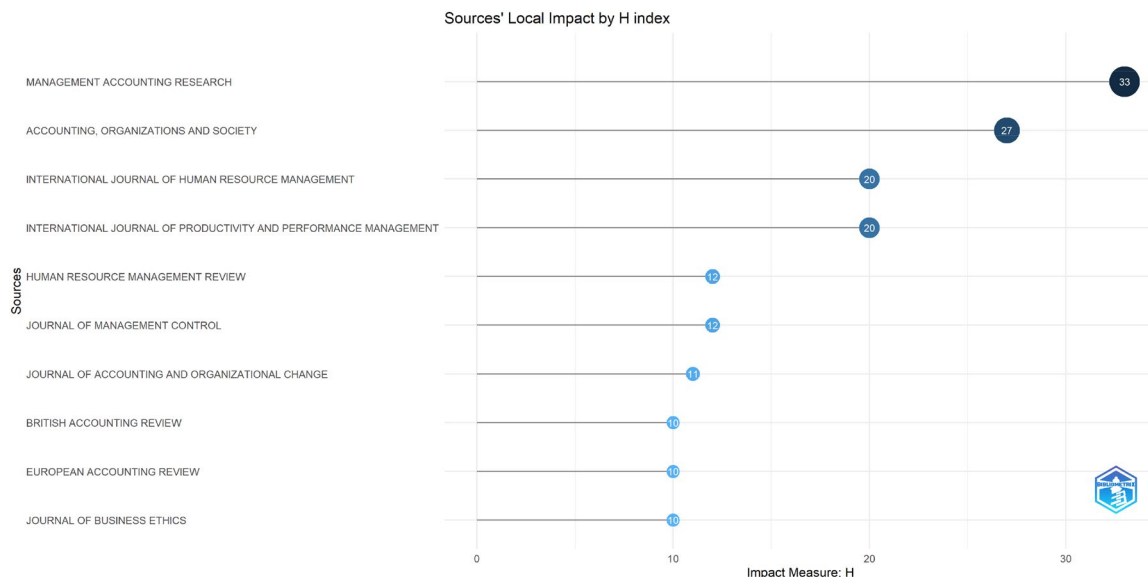


Figure 6. Top 10 Sources' Local Impact.

Table 5. Variable used in MCS research.

Variables	Cluster	Total connection strength	Occurrences	Avg. Pub. Year
Management control systems	1	215	204	2017.039
Performance management	6	252	179	2014.575
Performance appraisal	2	177	164	2013.555
Human resource management	2	97	72	2014.667
Performance management systems	5	88	68	2013.794
Management control	3	84	67	2015.433
Management control system	1	69	55	2018.727
Performance measurement	1	102	52	2016.481
Balanced scorecard	6	87	47	2011.532
Performance management system	3	45	45	2018.289
Performance	1	42	31	2016.903
Innovation	3	56	30	2016.467
Levers of control	1	45	30	2018.567
Performance evaluation	9	41	29	2014.448
Organizational performance	7	43	28	2017.393
Performance measures	9	40	28	2009.679
Public sector	3	39	23	2017.609
Organizational culture	4	28	21	2015.714
HRM practices	2	16	19	2017.579
Human resource management practices	7	21	18	2016.833
India	2	35	18	2015
Risk management	6	34	18	2015.944
Management Accounting	7	34	17	2016
Sustainability	1	36	17	2019.412
China	2	18	16	2011.438
Contingency theory	1	21	15	2016.267
Control systems	4	24	14	2011.857
Firm performance	4	12	14	2015.5
Leadership	8	24	14	2016
Business strategy	3	29	13	2016.231
MCS	4	19	13	2013.615
Training and development	2	34	13	2018.077
Accountability	7	21	12	2017.083
Australia	6	23	12	2012.25
Decision making	1	29	12	2014.833
Worker performance	2	24	12	2018.083
Performance appraisals	6	10	12	2015.667
SMEs	7	15	12	2017.417
Survey	1	20	12	2014.833
HR practices	2	19	11	2017.818
Intellectual capital	4	11	11	2012.455
Jordan	2	27	11	2016.727
Knowledge management	4	16	11	2011.818
Performance assessment	1	29	11	2018.364
Compensation	2	24	10	2012.9
Competitive advantage	5	17	10	2011.5
HRM	2	14	10	2015.4
Information technology	3	19	10	2015.8
Malaysia	7	10	10	2014.5
Performance measurement system	3	12	10	2016.9
Strategic management	6	15	10	2013.1
Organisational performance	2	16	9	2017.333
Structural equation modeling	2	13	9	2018.889
Effectiveness	3	11	8	2015.375
Environmental performance	7	11	8	2020.5
Financial performance	1	7	8	2017.625
Informal control	4	18	8	2017.25
Key performance indicators	5	11	8	2017.625
Organizational learning	5	11	8	2017
Performance appraisal system	9	5	8	2020
Performance management system (PMS)	4	8	8	2017
Strategic planning	8	16	8	2017.625
Sustainable development	1	14	8	2018.5
Business performance	5	7	7	2017.286
Corporate strategy	1	20	7	2014.286
Decision-making	3	8	7	2019.571
Ethics	8	8	7	2013.429
Governance	3	9	7	2011.857
Human resource practices	2	13	7	2016.571
Human resources	4	6	7	2015
Management control systems (MCS)	4	8	7	2019.571
Manufacturing	7	8	7	2015.143

(Continued)

Table 5. Continued.

Variables	Cluster	Total connection strength	Occurrences	Avg. Pub. Year
Performance measurement systems	1	14	7	2015.286
Public sector organizations	6	15	7	2011.429
Schools	8	13	7	2010.714
Stakeholders	4	12	7	2015.286
Banking	2	15	6	2013.667
Big data	5	9	6	2018.667
Business Analytics	5	17	6	2014.667
Business intelligence	5	9	6	2017.333
Cluster analysis	1	11	6	2019.833
Control system	1	15	6	2016.5
Developing countries	3	13	6	2012
Economic value added	6	10	6	2013.167
Healthcare	4	8	6	2019.167
Incentives	2	6	6	2015.167
Integration	5	6	6	2014
Interactive use	1	9	6	2019
Italy	1	15	6	2017.5
Management controls	3	5	6	2019.333
Management development	8	5	6	2014.333
Management practice	1	21	6	2018.833
Multinational firm	2	10	6	2008.833
Organizational commitment	4	7	6	2017.5
Performance indicators	8	13	6	2019
Project management	5	9	6	2018.5
Qualitative	3	6	6	2020.167
Recruitment and selection	2	18	6	2017.667
Small and medium-sized enterprises	3	13	6	2016.5
SME	5	8	6	2019
Strategy implementation	3	11	6	2016.333
Structural equation modeling	4	12	6	2016.833
Supply chain	4	10	6	2017.333
Systematic literature review	3	13	6	2021.167

occurrence value proposed extensive analysis, while a low value showed the potential for further development. Avg. Pub. Year was the average publication year of the variables, and based on Table 5, variables such as performance measurement systems, performance indicators, recruitment and selection, organizational commitment, as well as business performance showed great potential for future research. Previous research has extensively researched MSC using primary data (surveys) such as using balanced scorecards. The study has enriched the study of MCS. However, there may be bias in using surveys because there is a tendency for respondents not to answer according to real conditions. Further research can use Key Performance Indicators (KPI) scores which show the original performance of the company, directors, and employees. On the other hand, subjectivity during the MCS performance appraisal process may occur, the closeness between employees and superiors may have an influence on the superior's assessment. Future research could explore unethical behavior and performance appraisal biases in MCS. Exploration of SMEs, multinational firms, developing countries, and the banking sector also showed opportunities for further findings, as these variables had been scarcely examined in previous research. Future research could also examine state-owned enterprises (SOE) that have unique characteristics such as high political connections, monopoly, and financial stability that enable them to better develop MCS. The systematic literature review further signified the limited exploration, specifically in bibliometric analysis.

Figure 8 showed a thematic map based on keywords, categorizing the map into motor, niche, developing or declining, and basic themes. Motor themes formed well-developed clusters with high centrality and density, including topics such as management control, performance management systems, and performance measurement. Niche themes, on the other hand, had high density but low centrality, showing limited relevance, and the examples included interactive use, intellectual capital, management control system (MCS), and stakeholders. Developing or declining themes showed low centrality and density, signifying low development and marginal relevance. Themes in this category included performance management, performance appraisal, and human resource management. Basic themes, with high centrality and low density, were crucial for trans-disciplinary research, covering variables such as performance management, performance evaluation, human resource management, management control system, and levers of control. Figure 8 visually represented trajectories, where upward movement

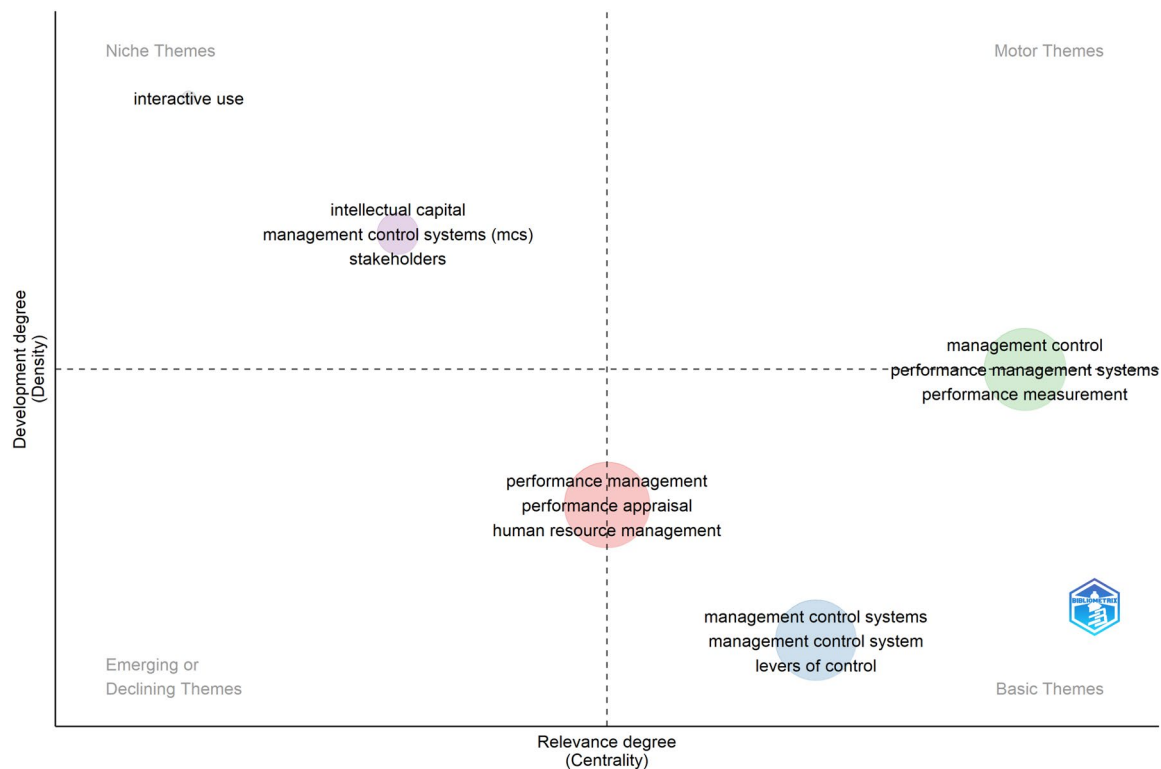


Figure 8. Thematic map by keywords.

signified an increasing trend, while leftward paths showed a declining trend. Consequently, research gaps were identified in certain themes, including interactive use, intellectual capital, and stakeholders, which could be connected to established themes such as performance measurement. Amid conditions such as climate change, environmental damage and political tensions occurring in several countries, increasing uncertainty in the business world. This increases attention to interactive control systems which are thought to be able to protect organizations from uncertainty (Nuhu et al., 2022). Future research could explore the influence of interactive control systems particularly on non-financial performance which has received little attention. Apart from that, future research could explore the relationship between stakeholder pressure (creditors, investors, etc.), stakeholders' power (government ownership, foreign ownership, family ownership, etc.), stakeholder characteristics (gender, age, education, professional experience, political connections, etc), and intellectual capital with MCS.

Figure 9 showed the evolution of themes in the past two decades and from 2003 to 2011, developing themes included performance evaluation, intellectual capital, governance, performance management, MCS, and organizational culture. In the first part of thematic evolution, performance appraisal receives great attention in MCS studies. During this period there was a global financial crisis which reached its peak in 2008 and had a major impact on companies and quite a few companies went bankrupt. Technological advances also developed during this period, marked by management information systems, enterprise resource planning (ERP), and business intelligence (BI) which have encouraged companies to evaluate and update their MCS. Lastly, regulatory demands. Increasing regulatory demands in terms of financial reporting, transparency, and compliance have pushed companies to improve their internal controls and management control systems, especially in the wake of major scandals such as Enron. Therefore, themes such as governance, performance management, performance appraisal, and organizational culture developed in this period.

In the period 2012–2016, several themes saw significant development, such as MCS, performance management, organizational performance, organizational learning, balanced scorecard, performance evaluation, human resource management (HRM) practice, key performance indicator, and economic added value. In this period, there are several things that can be highlighted, namely increased awareness of sustainability and CSR issues, increased data and information security risks, and capital market

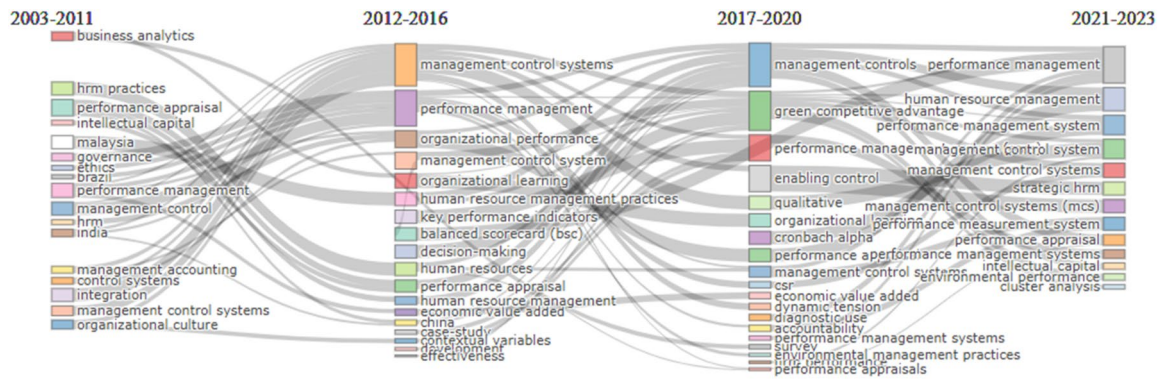


Figure 9. Thematic evolution by titles.

developments. Amid sustainability and CSR issues, various initiatives have been carried out, such as the Carbon Disclosure Project and the Paris Agreement. This encourages companies not only to focus on financial performance but also to pay attention to people and the planet (environment), so that non-financial performance indicators such as the balanced scorecard develop. On the other hand, in order to improve data and information security as well as internal control, MCS is developing with a lot of emphasis on the organization's ability to adapt, adopt technology and learning capabilities. Lastly, along with the development of the capital market, companies are required to pay attention to the interests of stakeholders, especially investors. Consequently, companies received strict supervision from stakeholders, so that studies regarding key performance indicators and how companies create added value developed in this period.

From 2017 to 2020, developing themes included management control, green competitive advantage, performance management, performance management systems, CSR, and accountability. In this period, sustainability issues received increasingly widespread discussion. A green competitive advantage is a company's ability to provide products according to customer needs and demands in relation to the environment. MCS supports this through its role in internal control to ensure environmentally sound operations and products, such as waste disposal control and information disclosure (carbon emission disclosure, water disclosure, climate change disclosure, etc). 2020 was the beginning of the Covid-19 pandemic which has had a major impact on the global population. In this condition, the use of CSR is increasingly emphasized. On the other hand, the company must also maintain its disrupted operations during this period and try to achieve the targets set. Therefore, diagnostic control systems, enabling control, and management control developed in this period.

In the last three years, it could be said to be the toughest situation faced by various organizations and countries around the world where Covid-19 is increasingly widespread and in 2023 various parties are trying to stabilize their operations again and a "new normal" is being announced during that year. Developing themes included performance management, management control system, strategic HRM, performance measurement system, performance appraisal, intellectual capital, and environmental performance. Strategic HRM is an important factor in aligning business goals to improve company performance and intellectual capital as company capital to achieve these goals. Environmental performance also receives great attention because of its role in increasing the legitimacy of stakeholders.

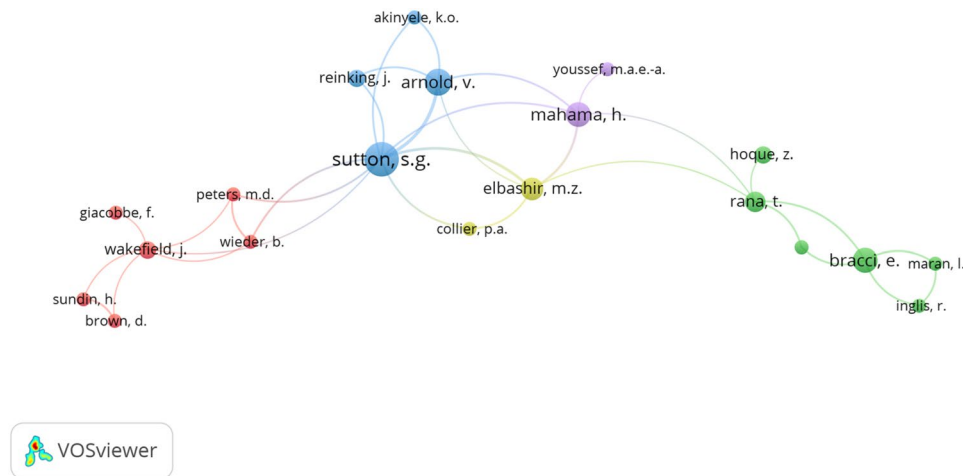
The development showed a gap in this area, with research on performance management systems signifying an increasing trend, associated with Figure 8. In this context, MCS and intellectual capital showed high development levels and limited relevance. Future research can explore the relationship between intellectual capital, environmental performance, and MCS adoption.

3.3. Network analysis of social structure

Table 6 showed 20 authors engaged in collaborative research, categorized into five clusters, each represented by differently colored nodes in Figure 10. Sutton, S.G., was the author having the highest number of publications and the strongest connections, showing frequent collaboration with other authors in the advancement of MCS

Table 6. Collaborative author.

Authors	Cluster	Total connection strength	Documents	Avg. Pub. Year
Sutton, s.g.	3	23	11	2016.9091
Arnold, v.	3	13	7	2019.1429
Bracci, e.	2	8	6	2019.8333
Mahama, h.	5	9	6	2017.3333
Elbashir, m.z.	4	11	5	2016.4
Rana, t.	2	7	4	2020.75
Hoque, z.	2	1	3	2018.3333
Reinking, j.	3	4	3	2021
Wakefield, j.	1	6	3	2013.6667
Akinyele, k.o.	3	4	2	2021
Brown, d.	1	3	2	2009.5
Collier, p.a.	4	4	2	2012
Giacobbe, f.	1	1	2	2012.5
Inglis, r.	2	4	2	2017.5
Maran, l.	2	4	2	2017.5
Peters, m.d.	1	5	2	2017
Sundin, h.	1	3	2	2009.5
Wickramasinghe, d.	2	4	2	2020.5
Wieder, b.	1	5	2	2017
Youssef, m.a.e.-a.	5	1	2	2017.5

**Figure 10.** Graphical representation of the author's network.

research. In the second position, Arnold had seven publications and a total connection strength of 13, in the third position, both Bracci and Mahama had six publications, respectively but Mahama showed stronger connections than Bracci. According to Table 6, the average publication year was 2017 which brought an interesting observation about the absence of collaborative authors with an average publication during the COVID-19 pandemic, implying that this condition hindered research collaboration and blocked the development of MCS research. However, based on the average number of publications per year (Figure 1), publications on MCS started to increase after the pandemic, but findings on the impact of COVID-19 on MCS in firms were still lacking.

The latest study from the collaboration of Elbashir, Sutton, Mahama & Arnold confirms the positive relationship between the interaction of integrated information systems and MCS which supports business intelligence on the assimilation of integrated management control information at the business process level (Elbashir et al., 2021). These results have broad implications for managers, information systems professionals, accountants, and consultants. In MCS, the use of advanced technology will only be valuable and beneficial to the organization if MCS is integrated into business processes. Furthermore, MCS projects that support information technology require large investments, so management needs to create strategic policies that promote the synergy of business intelligence technology and integrated information systems so that the potential for MCS investments made can be utilized optimally. Future research can explore dynamic capability theory which provides a valuable framework and is thought to be able to explain how strategic level capabilities teams with operational level capabilities can create competitive advantages for companies.

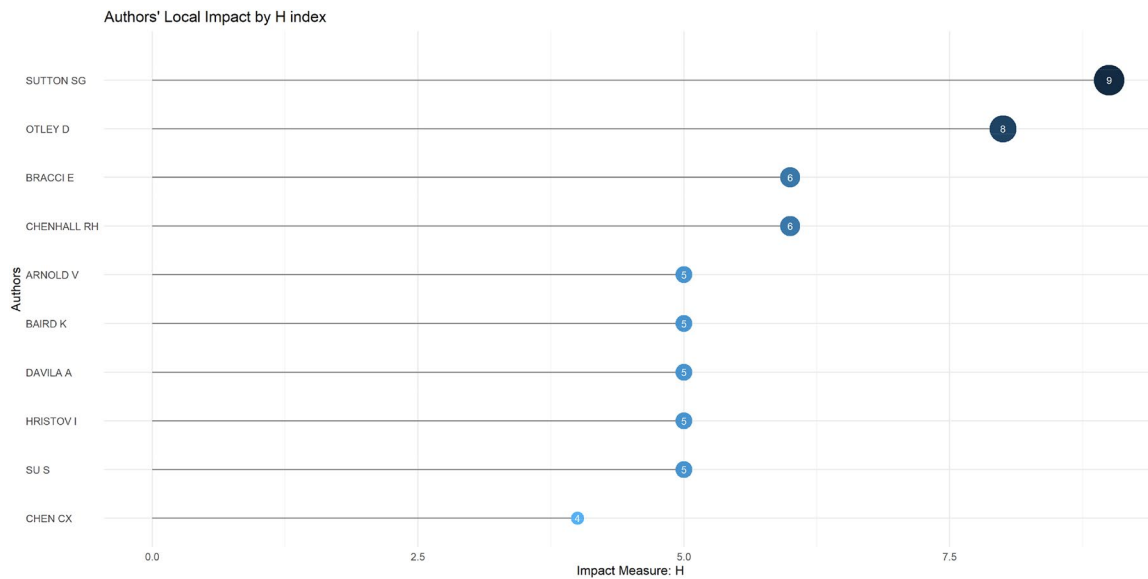


Figure 11. Top 10 Authors' Local Impact.

Berdicchia, Bracci, and Masino's recent collaboration contributes to the literature on the relationship between PMS and job crafting. The study found that perceived PMS accuracy increases job crafting through intrinsic motivation. On the other hand, PMS reduces job crafting through extrinsic motivation (Berdicchia et al., 2022). Motivation has big implications for employees and their performance. On the other hand, MCS adoption is basically employee control which is used to manage employee motivation so as to create a competitive work culture. In the end, MCS improves company performance (Mustafa & Islami, 2023). Considering the different implications of intrinsic and extrinsic motivation provides signals regarding the effectiveness of PMS. Future research may be able to investigate differences in the implications of well-managed and less-well-managed PMS. What previous research seems to say is that only if MCS is managed well will it become a competitive advantage (Frare et al., 2022).

Figure 11 showed the top 10 authors with the highest H index, showing the intellectual contribution of the authors to the development of MCS research. Sutton claimed the first position with an H index of nine, in the second position, Otley followed by an H index of eight, trailed by Bracci and Chenhall, each with an H index of six. Sutton received great attention through research on the relationship between business intelligence and MCS (Peters et al., 2016). Figures 10 and 11 showed an incident where five collaborative authors among others, ranked the top five with the highest H index. This implied that authors who engaged in research collaboration yielded better outputs, contributing more to the advancement of MCS research. Research collaboration improved understanding as well as discussions in articles and expanded networks among authors.

4. Conclusions

In conclusion, this research showed a growing scholarly interest in MCS research, addressing research questions on how research on Management Control Systems (MCS) changed, the main trends in MCS relationships research, and the research gaps in the business context related to MCS. In the past two decades, total finding on MCS showed consistent growth, and the times of decline in publications were observed in 2006, 2010, 2013, 2017, and particularly during the COVID-19 pandemic in 2020–2021. The peak of MCS research output was reached in 2019, with 125 publications. By the mid-fourth quarter of 2023, the number of MCS publications had reached 109, signaling sustained interest from members. The development of MCS research was attributed to various factors, including the contributions of countries, universities acting as research centers, funding organizations, external factor (special key event in that year) and journals serving as publication hubs for MCS research. Countries leading in publications included the United States, the United Kingdom, and Australia. Famous contributors in terms of publications were Macquarie University (Australia, $N=27$), the University of Central Florida (United States, $N=17$),

and Universiti Utara Malaysia (Malaysia, $N=16$). Brazil, represented by Coordenacao de Aperfeicoamento de Pessoal de Nivel Superior and Conselho Nacional de Desenvolvimento Cientifico e Tecnologico, was the funding sponsor with the most significant contribution, supporting 15 publications. The International Journal of Productivity and Performance Management held the record for the highest number of publications ($N=52$). The examination of collaborative authors showed that research collaboration was distinct due to its substantial contribution. This was evident in the number of publications and impact on MCS research development, as reflected in the H-Index. Additionally, analyzing the intellectual structure, which included country, source, and author citations, the United Kingdom was distinct with the highest intellectual contribution, showing 4,500 citations. Management Accounting Research was the source with the highest intellectual contribution. Finally, the author making the most significant contribution to MCS research was Sutton SG, and these sources represented major foundations in MCS research.

The primary trends in MCS research included management control, performance management systems, and performance measurement. MCS literature proposes the importance of MCS in increasing creativity, innovation, and work culture to improve financial performance in a sustainable manner. However, the literature also reminds that companies can achieve competitive advantage only if MCS is managed well. This includes regular development to adapt the latest technology, organizational learning, and control systems to its implementation, especially subjectivity in performance assessment. Therefore, it is hoped that commissioners as supervisors, audit committees and top management will pay attention to the implementation of MCS and have integrity. This also emphasizes the importance of top management paying attention to the company's intellectual capital, recruitment and selection, and human resource management.

Developing themes with potential for further research included interactive use, intellectual capital, MCS, and stakeholders. Other less-developed themes included performance management, performance evaluation, as well as human resource management, and all these themes offered directions for additional research to fill the gaps in MCS. Future studies can explore these themes such as intellectual capital, the relationship between stakeholder pressure (creditors, investors, etc.), and stakeholder power (ownership structure, personal characteristics, etc.) in the implementation of MCS and their impact on company performance and competitive advantage. Then, explore the integration of technological advances such as Artificial Intelligence (AI) and blockchain in increasing the effectiveness of MCS. Previous studies have discussed the influence of management or personal behavior on MCS, but there is still little evidence regarding the influence of personal characteristics (Chief Executive Office, top management, commissioners, audit committee, etc.).

The research showed several limitations which included firstly, the finding limited its analysis to articles in English, excluding those in Spanish, Russian, Lithuanian, Czech, Portuguese, German, French, and Chinese to prevent partiality during the research process. Addressing this limitation in future findings could include analyzing documents in non-English languages. Secondly, this review relied exclusively on the Scopus database due to its size and high-quality content, making it highly relevant to this finding. Future research could benefit from using other databases, taking into account the quality of articles and the contributions of the authors to experimental and theoretical reviews. Thirdly, the finding used bibliometric analysis using metadata, such as keywords, titles, abstracts, citations, and affiliations. Subsequent research could explore the determinant and consequent variables of MCS review to offer a more comprehensive overview of previous research. Using techniques such as causality effect mapping and field charting could improve this analysis. Despite these limitations, this exploration effectively addressed the review questions and contributed to MCS research, particularly in consolidating previously fragmented documents.

Author contributions

Conceptualization, A.F., D.S., D., T.R.; data curation, A.F.; formal analysis, A.F., D.S.; investigation, A.F., D.S., D., T.R.; methodology, A.F., D.S.; visualization, A.F.; writing-review and editing, A.F., D.S., D., T.R. All authors have read and agreed to the published version of the manuscript.

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Data availability statement

The data of our research came from Scopus database and its open access. To access the data, you can visit the final search query in the body of this article.

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