Business Intelligence Systems as innovation tool in the SMEs' Business Control Systems: A Bibliometric Literature Review

*Alessandra Tafuro[*], Chiara Colamartino[**],
Giuseppe Dammacco[***], Pierluigi Toma[****]*

Abstract

Digital technologies play a pivotal role in driving innovation within organizations and are increasingly essential for generating value in today's evolving business environment. Among these technologies, Business Intelligence (BI) stands out by enhancing organizational control, reducing risks, and offering data-driven insights to support decision-making. For small and medium-sized enterprises (SMEs), BI tools can be especially valuable in systematically addressing control-related challenges. However, current research on the use of BI in SMEs remains limited and tends to focus only on specific areas such as management control, risk management, and auditing. This study introduces a novel, integrated approach to business control systems, combining data and perspectives from the three aforementioned areas. By utilizing BI tools, this method generates interconnected, actionable information that supports the long-term success of SMEs. To date, no bibliometric reviews have specifically explored the application of BI in SME contexts. This research addresses that gap by conducting a bibliometric analysis to highlight the diversity of methodologies used and their relevance to SMEs. The goal is to advance the field, bridge existing gaps in the literature, and encourage innovation in BI applications. Findings show strong SMEs interest in BI, particularly for managing risks, conducting audits, and monitoring organizational transformation.

Keywords: Bibliometric Literature Review, Business Control System, Business Intelligence, SMEs

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[*] University of Salento, Department of Scienze dell'Economia.

[**] LUM Giuseppe Degennaro University, Department of Management, Finanza e Tecnologia.

[***] University of Bari "Aldo Moro", Department of Economia, Management e Diritto dell'Impresa.

[****] University of Salento, Department of Scienze dell'Economia. Corresponding author: pierluigi.toma@unisalento.it.

1. Introduction

Small and medium-sized enterprises (SMEs) tend to make innovation and digital technologies critical drivers for a sustained competitive advantage and sustainable business growth. In this paper, the role of innovation is considered as an element of context that affects the design and use of a new business control system that – through Business Intelligence (BI) – generates a more appropriate concept of systematic business control (Marchi and Greco, 2016).

Business Intelligence Systems (BISs) serve as decision support tools that collect, analyze, and disseminate organizational data to enhance decision-making (Fink et al., 2017). While extensively studied in broader business research, their role in SMEs has gained attention only recently (Llave, 2017). BISs support both tactical and strategic decisions by collecting and analyzing corporate data, transforming it into actionable insights (O'Grady et al., 2016; Dávila et al., 2024). This enhances performance, reduces inefficiencies, and strengthens competitive advantage. Notably, management control technologies influence firm identity: in family firms, they reinforce business identity while potentially weakening family identity (El Masri et al., 2017; Broccardo et al., 2024). In the accounting and control literature, conceptualizing the building blocks of Business Control Systems (BCSs), their functionalities, and interdependencies is a significant topic (Gerdin, 2020). BCSs encompass various forms of control; each is distinct yet complementary and instrumental. Therefore, a BIS should be regarded as an essential tool for reinforcing these interdependencies, thereby enhancing the overall functionality of the BCS.

Maintaining stakeholder trust is essential for a strong BCS (Crane, 2020). Tools such as Management Control, Risk Management, and Audit help companies monitor operations, anticipate risks, and leverage past experiences for informed decision-making. Although SME interest in BI tools is increasing, insights derived from large firms are often of limited relevance to SMEs, and research on BIS adoption in SMEs is still underdeveloped (Scholz et al., 2010; Boonsiritomachai et al., 2016; Cupertino et al., 2018). As stressed by Poba-Nzaou et al. (2019), SMEs are still lagging in implementing and leveraging the advantages stemming from the use of BI systems. On the other hand, the research efforts must identify solutions for improving the implementation of BI tools projects (Popovič, 2017). This is crucial for the limited

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resources that usually characterize SMEs, considering that industry and various market factors inherently influence whether a business would choose to implement BI in daily operations. The main objectives of this study are:

- to provide an overview of the current status of BIS in the management literature on Business Control Systems for SMEs, considering three particular sub-domains or blocks of BCSs: Management Control, Risk Management, and Audit;
- to identify research gaps and suggest the likely directions for future research.

The key innovation of this study is the use of a systemic approach to business control systems. It emphasizes the integration of data and information from Management Control, Risk Management, and Audit. Through BI tools, these controls interact to produce insights that are complementary, interdependent, and essential to ensuring SME continuity. In essence, this systemic approach transforms disparate control functions into a unified, intelligent system that empowers SMEs with better insights for strategic decision-making and long-term viability. By combining data and insights from management control (e.g., performance metrics), risk management (e.g., threat assessments), and audit (e.g., compliance checks), SMEs can gain a holistic view of their operations.

This study offers an overview of the state of the art through a bibliometric review that, as methodology, has been employed only recently in business and management studies (Öztürk et al., 2024). To the best of our knowledge, the study is innovative since no bibliometric review has focused on using BI tools in the investigated Business Control Systems sub-domains. Specifically, the exploration of the literature follows the exact intent of Habib et al. (2021) to obtain an overview of the state of the art by employing quantitative and qualitative analyses of articles published between 2013 and 2023. Considering the topic's current relevance, papers published in conference proceedings were also included in the analysis. The most prominent sources, authors, countries, methodologies, and topics have been identified, also through thematic maps, following the structure of Zamani et al. (2023).

The paper is structured as follows: in section 2, a theoretical background on the benefits and limits of the adoption of BI tools in three different sub-domains of a BCS for an SME is presented. Section 3 outlines the bibliometric review's material and methods, while section 4 presents the analysis

results. Section 5 reports discussions and concluding remarks, highlighting the study's limitations and future research directions.

2. Theoretical background

BI and Management Control

BIS are key tools for SMEs' competitiveness in the current data-driven economy (Poba-Nzaou et al., 2019; Rao-Graham et al., 2019). SMEs, as large companies, are nowadays facing a twofold problem: they should process and analyze a large amount of data from different sources (Poba-Nzaou et al., 2019) to make right decisions but, on the other side, they have time constraints to do that (Muryjas, 2014). BIS can support SMEs in this task, but the implementation of BI tools is not easy: usually, it is characterized by a high level of complexity with a significant risk of failure (Garengo et al., 2005; Bianchi et al., 2015; López and Hiebl, 2015). Ragazou et al. (2023) emphasized that SMEs often refrain from adopting BISs due to perceptions of complexity and high costs. However, the rapid evolution of the BI market has led to the development of integrated solutions specifically designed for SMEs, which are now available at lower prices. In dynamic business environments, integrating BI systems allows the monitoring of business value at both operational and strategic levels (Rouhani et al., 2016). Furthermore, a Management Control System can be important in innovation management when formal control systems are efficiently implemented (Arcari et al., 2016; Cardoni, 2018). As Bisbe and Otley (2004) asserted, innovation requires adequate use of Management Control Systems because they are necessary to ensure innovation effectiveness. Nowadays, interactive control systems serve as key measurement tools that help focus attention on the constantly evolving information deemed strategically important by top-level managers. These systems allow top managers to communicate with the entire organization, directing focus toward strategic uncertainties. As a result, interactive control systems exert pressure on operational managers at all levels, fostering information gathering, face-to-face discussions, and debate.

BI and risk management

BISs, risk management technologies, and data analytics can enhance companies' risk identification procedures (Visani, 2017; Petrosino et al., 2017). Wu et al. (2014) underscored the potential of BI in risk management,

stating that while BI tools have been utilized to bolster risk management, risk management tools also derive benefits from BI approaches. BI models are useful in defining the main framework of enterprise risk management and in hedging financial risks by incorporating market risks, credit risks, and operational risks (D'Onza, 2008; Jans et al., 2010; Ciampi and Gordini, 2013; Wong and Venkatraman, 2015).

Through the analysis of internal and external historical data, the potential risks can be identified and the impact of each risk on business activities can be assessed. In other words, business analytics and risk management tools can help the management to create risk models and set up warning systems that alert organizations, also simulating the potential impact of each risk.

BI and audit

As you know, auditing ensures that a company is complying with regulations and that all business and financial operations are in order. The primary limitation of traditional auditing processes is their annual frequency, which fails to provide timely detection of issues, often identifying them only after they have already caused damage to the organization. Many businesses are beginning to recognize the benefits related to the use of BI tools in the risk management process, especially because they are in the face of huge amounts of data. Many studies (De Santis and D'Onza; 2021; Rakipi and al., 2021) asserted that BI is an important emerging digital technology solution that provides several benefits in improving auditing functions. Indeed, using a BIS in the audit process allows auditors to dedicate the right time to analyze the data and express their opinions, considering that BISs cannot replace them completely (Alles, 2015; Webb, 2012).

Considering the aforementioned theoretical framework, the study proposes a bibliometric literature review defining the following research questions (RQs) and sub-questions (RSQs):

RQ.1 What is the current state of the literature on using BI in Business Control Systems from 2013 to 2023?

RSQ.1.1 How many academic BI and business control studies were published between 2013 and 2023?

RSQ.1.2 What are the recurring themes in which BI has been applied to business control?

RSQ.1.3 Which journals publish BI-related research in the context of management control, risk management, and auditing?

RSQ.1.4 What research methods and techniques have been used in BI studies focusing on business control systems?

3. Material and Methods

Following Donthu et al. (2021), a meta-analysis was conducted to explore research inquiries comprehensively. This analysis offers the most extensive framework available on methodologies and tools for evaluating and managing BI within Management Control Systems, Risk Management, and Audit as components of Business Control Systems. The bibliometric review identifies emerging article and journal performance trends, collaboration patterns, and research contributions (Donthu et al., 2021a; Donthu et al., 2021b). Bibliometric analysis is particularly useful for assessing the state of the art, including publication trends and key topics, helping researchers map journals, emerging themes, and research fields (de Oliveira et al., 2019). We analyzed the three sub-domains separately to compare results across queries and examine their points of intersection.

To obtain the first sample for our research, it was chosen to include keywords connected to the Business Control Systems topic, as underlined in the consequent criteria: *TITLE-ABS-KEY (business AND intelligence AND tools) OR TITLE-ABS-KEY (business AND analytics) OR TITLE-ABS-KEY (big AND data AND analytics) AND TITLE-ABS-KEY (management AND control AND system) OR TITLE-ABS-KEY (bi AND tools) AND TITLE-ABS-KEY (SMEs) OR TITLE-ABS-KEY (small AND medium AND enterprises)) AND PUBYEAR > 2012 AND PUBYEAR < 2024.*

The second research concentrated on the topic of Risk Management by including: (TITLE-ABS-KEY (business AND intelligence AND tools) OR TITLE-ABS-KEY (business AND analytics) OR TITLE-ABS-KEY (big AND data AND analytics) AND TITLE-ABS-KEY (Risk AND management) OR TITLE-ABS-KEY (bi AND tools) AND TITLE-ABS-KEY (SMEs) AND TITLE-ABS-KEY (small AND medium AND enterprises) AND PUBYEAR > 2012 AND PUBYEAR < 2024.

The third part of the bibliometric research focused on the Audit topic, and therefore the following query has been used: *(TITLE-ABS-KEY (business AND intelligence AND tools) OR TITLE-ABS-KEY (business AND analytics) OR TITLE-ABS-KEY (big AND data AND analytics) AND TITLE-ABS-KEY (audit) OR TITLE-ABS-KEY (bi AND tools) AND TITLE-ABS-KEY (SMEs) OR TITLE-ABS-KEY (small AND medium AND enterprises) AND PUBYEAR > 2012 AND PUBYEAR < 2024.*

Scopus was chosen for its extensive coverage of peer-reviewed literature, making it the most significant available repository (Chadegani et al., 2013). We included papers published between 2013 and 2023 to ensure an up-to-

date overview and capture key publications. Data collection was completed on April 24, 2024. All documents were retained to assess prevailing trends. The analysis used the Bibliometrix R-package (Aria & Cuccurullo, 2017).

For each macro-theme, a summary scheme was developed in the results that summarizes the composition of the sample of papers and allows an understanding of the methods useful for qualitative analysis, by employing a PRISMA statement accepted for meta-analysis, as stated in Sarkis-Onofre et al. (2021).

4.   Results

### 4.1 The first focus is on the "Management Control System"

The "Management Control System" research includes 125 documents (in English and Portuguese languages) from 92 sources and 293 authors, with an annual publication growth of 3.42%, as reported in Figure 1.

Figure 1 - PRISMA scheme for "Management Control System"
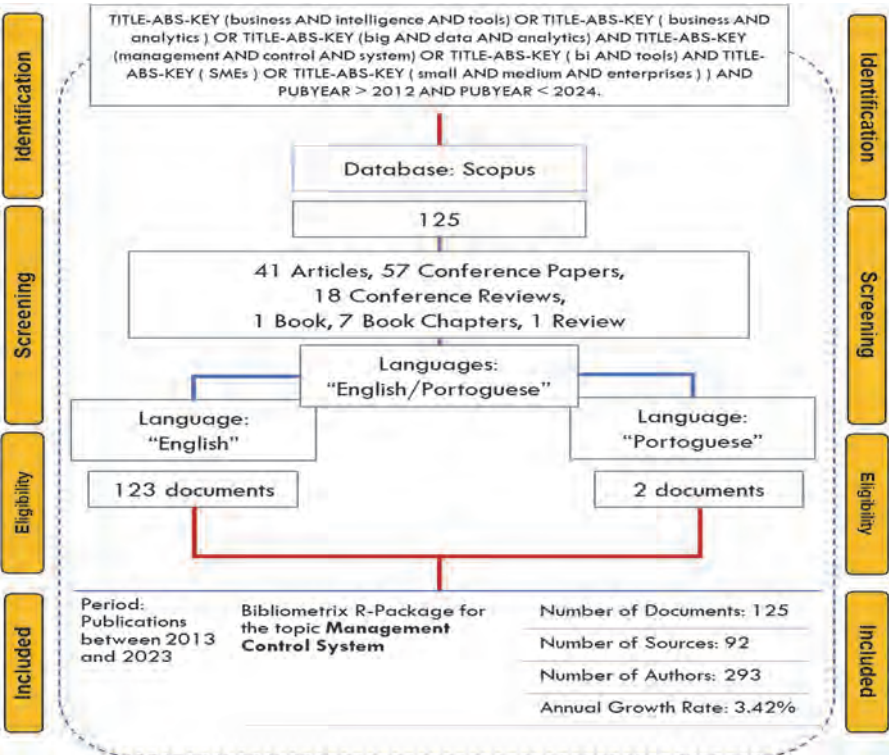
The three-field plot (Figure 2) visualizes bibliometric data, highlighting relationships among topics, authors, countries, and sources. Key terms such as "big data", "business intelligence", and "artificial intelligence" appear in the Keywords section (left, red). The middle section shows represented countries, including Portugal, Austria, and Norway, indicating author or publication origins. On the right (green), sources like the *Iberian Conference on Information Systems and Technologies* are listed. The lines of linkage illustrate the strength and frequency of these papers, identifying the predominant topics (referring to big data and methodologies for implementation), the numerous authors' countries of origin (Portugal stands out in this one) and the primary sources of publication (emphasizing the large number of conference Proceedings).

Figure 2 - Three Fields Plot for "Management Control System"
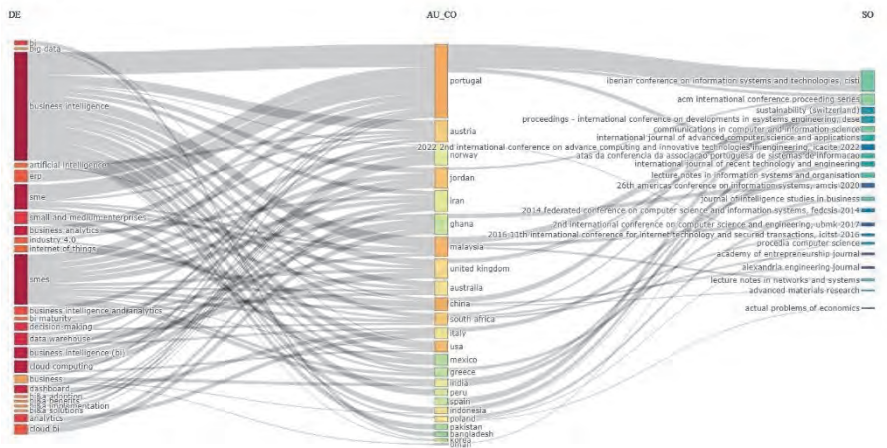
Confirming the above figure, Figure 3 on sources identifies a large number of conferences and proceedings that have integrated work on the Management Control System. The visualization using horizontally aligned blue circles makes the production volume for each source immediately apparent. *ACM Conference Series* has the most published documents, totaling seven papers. Other conferences and journals, such as the *19th Americas Conference on Information Systems and Communications in Computer and Information Science*, are represented with 5 publications. Most sources have only published one document, indicating a potential variety of topics covered, but with a lower focus than the *ACM conference series*.

Figure 3 - Most Relevant Sources for "Management Control System"
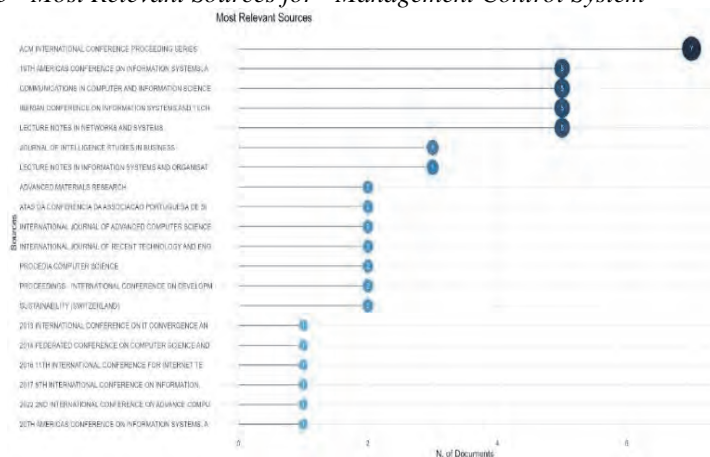

Figure 4 illustrates author productivity from 2013 to 2023, highlighting research trends. The size and color of the points visually represent publication volume and citation impact, offering insights into consistency, influence, and academic careers in the field. The author *Bernardino* maintained a consistently high production level throughout all years, with large and dark blue points indicating many articles and citations yearly. Other authors like *Loock* and *Moyo* exhibit lower production levels, as evidenced by fewer and lighter-colored points.

Figure 4 – Authors' Production over time for "Management Control System"
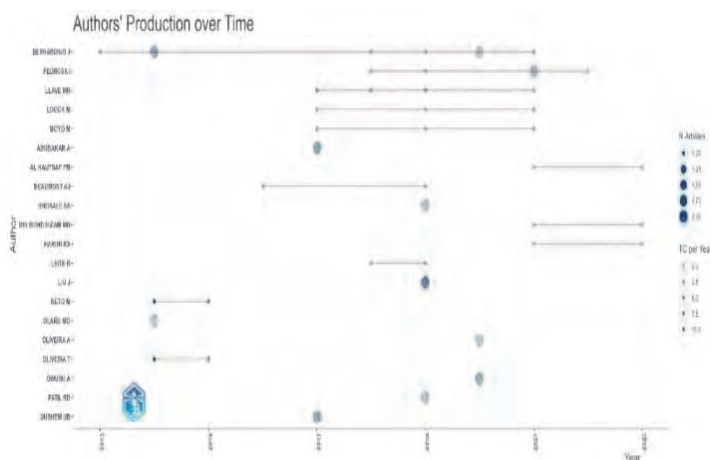
Lotka's Law describes the distribution of scientific productivity among authors in a given field (Lotka, 1926). In Figure 5, the x-axis displays the number of documents written by an author. The y-axis indicates the percentage of authors who have written a certain number of documents.

The graph shows a sharp decline in the percentage of authors as publication volume increases, following Lotka's Law: few authors produce many papers, while most contribute less. The continuous line represents the fundamental frequency of publication (inverse square law), while the dashed line reflects Lotka's theoretical beta coefficient.

Figure 5 - Author Productivity through Lotka's Law for "Management Control System"
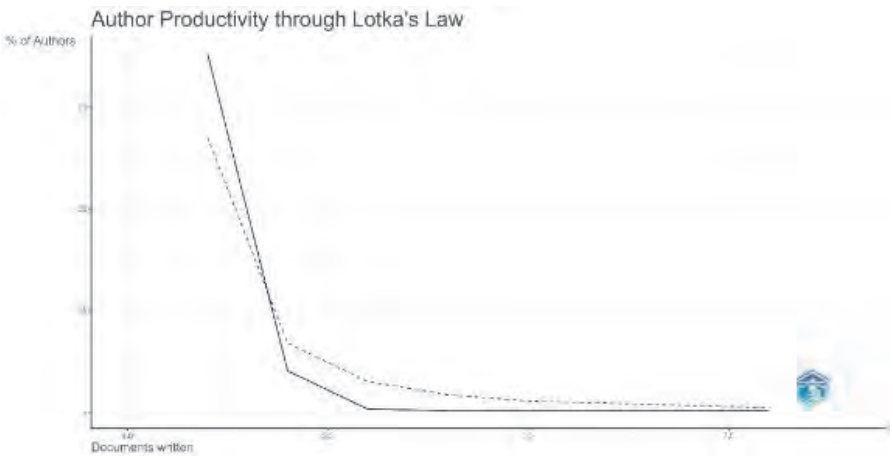

Figure 6 - Thematic Map for "Management Control System"
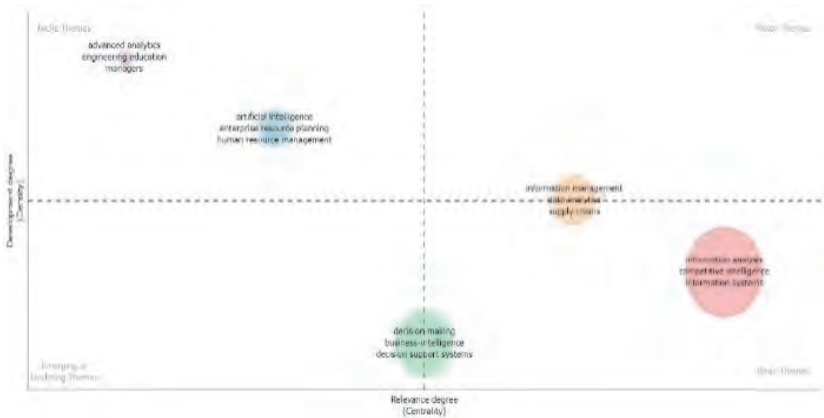

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Figure 6 helps identify key research areas, emerging or declining trends, and potential research niches. Based on the description of the Thematic Map (Yu and Muñoz-Justicia, 2020), themes are positioned within quadrants based on their centrality and development degree. The width of the circles indicates the frequency of topics in the sample of analyzed papers. Among the Niche Themes emerge "advanced analytics", "engineering education", and "managers". Between Emerging or Declining and Basic Themes, "decision making", "business intelligence" and "decision support systems" are recurring in the literature, while "information analysis", "competitive intelligence" and "information systems" represent Basic Themes and characterize the larger cluster. "Artificial intelligence", "enterprise resource planning", and "human resource management" are considered Niche themes. "Information management", "data analytics", and "supply chains" are placed between Motor and Basic Themes.

4.2 The second focus is on "Risk Management"

In the second search conducted on papers on "Risk Management", 70 documents were collected from 61 different sources and 172 authors, revealing a 28,21% annual growth rate of articles on the topics (Figure 7).

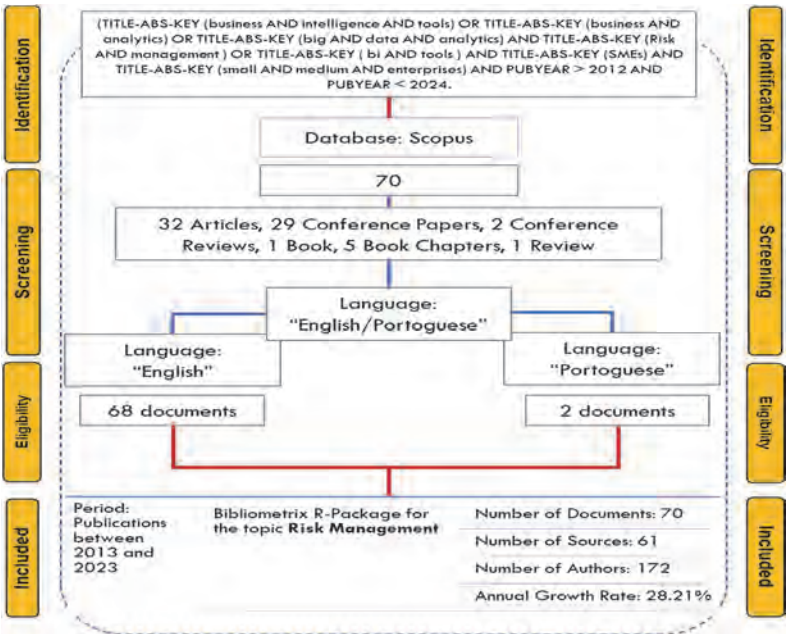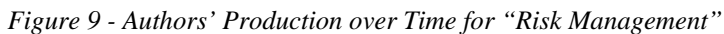*Figure 7 - PRISMA scheme for "Risk Management"*

Figure 8 provides a comprehensive overview with specific details categorized into Keywords (left field), Countries (middle field), and Sources (right field). The keywords "Business Intelligence", "Business Intelligence (BI)", "SMEs", and "SME' were utilized across nearly all countries in the graph. Each source is associated with the keywords "Business Intelligence" and "SMEs", while the distribution of other keywords varies. Also in this visualization, several Conference Proceedings emerge among the sources.

Figure 8 - Three Fields Plot for "Risk Management"

Figure 9 - Authors' Production over Time for "Risk Management"
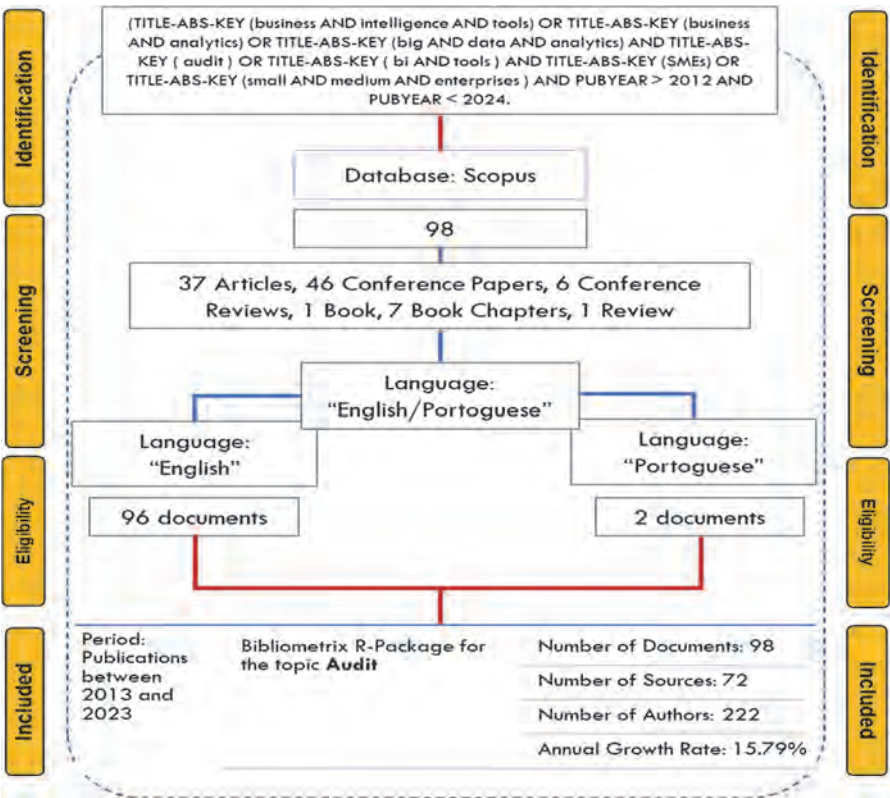
4.3 The third focus on "Audit"

With the third search, conducted on the "Audit" topic, 98 documents were collected from 72 different sources and 222 authors, revealing a 15,79% annual growth rate of articles (Figure 10).

Figure 10 - PRISMA scheme for "Audit"

We provide an overview highlighting the main Keywords, Countries, and Sources. "Business Intelligence" themes, along with "SME" and "SMEs" themes are relevant across all countries in the sample. Notably, conferences represent the primary sources of publication also for this topic.

Figure 11 - Three Fields Plot for "Audit"
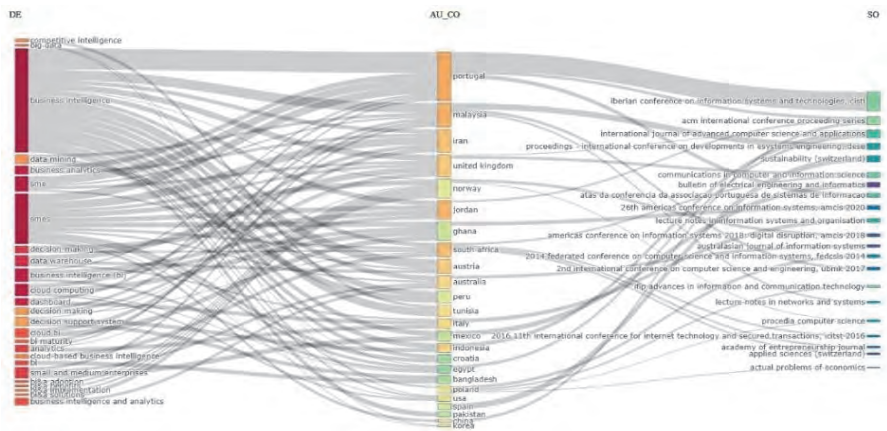
Including the analyzed topics in Books of proceedings and Conferences emphasizes the need to shift topics in relevant discussions (see Figure 12).

Figure 12 - Most Relevant Sources for "Audit"
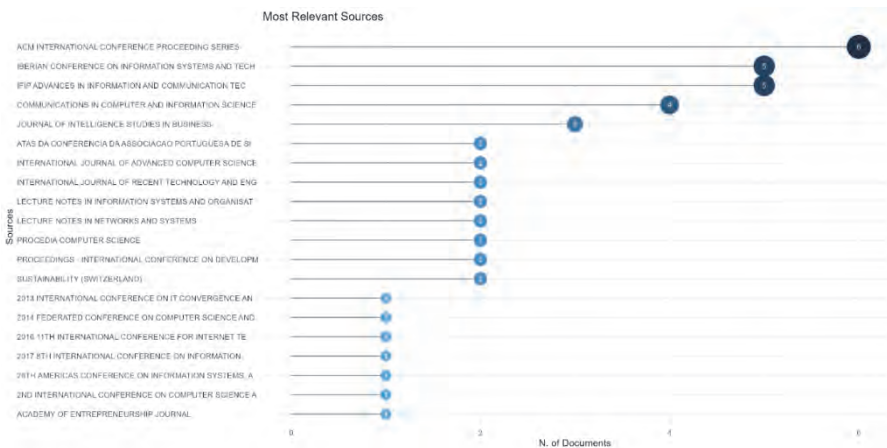

In Figure 13, relevant themes are plotted based on their degree of relevance and development. Among niche themes are terms such as "cloud-based", "security challenges", and "sustainability". Among emerging or declining themes are terms such as "cloud business", "saas" (i.e. software as a service) and "design-science research". Among the motor themes, terms such

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as "data warehouses", "experimental evaluations", and "open sources" appear. In foundational themes, there are keywords like "business analytics", "cloud computing", and "information analysis".

Figure 13 - Thematic Map for "Audit"
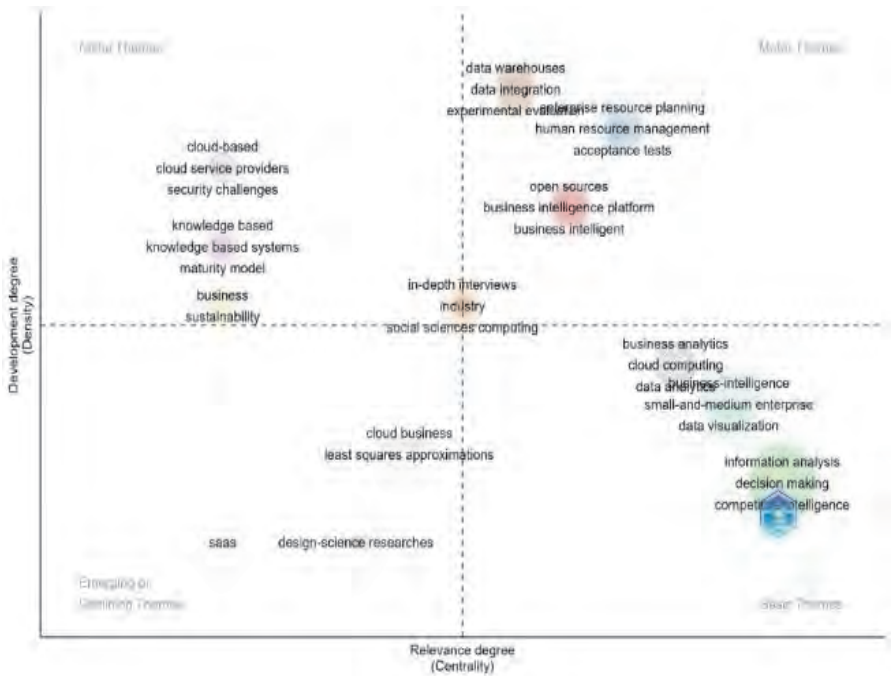
4.4 Papers in common

All documents included in this research work have been considered in this section. Duplications were removed, and an attempt was made to analyze the three topics simultaneously. It was decided to examine the abstracts, dividing each paper by research category (Management Control System, Risk Management, Audit). The three Word Cloud maps (Figure 14) are useful for focusing on central themes considered jointly and deleting duplicates. There is a higher concentration of "business intelligence" or "business intelligence (bi)" and "SME' or "SMEs", which present a larger font based on the higher frequency terms. Keywords such as "decision-making", "competitive intelligence", "decision support system", "business process management" and "internal audit of entrepreneurial" report a lower frequency while diversifying the topics covered within the analysis.

In the three maps created for the three issues (Management Control System, Risk Management, and Audit), respectively, it is noticeable how the keywords are very similar to each other, except for the topic on Audit, which differs slightly for some issues included. This, therefore, leads to the need to make common considerations for the three research topics.

Figure 14 - Word Cloud Maps for papers in common

By analyzing the frequency of words in the abstracts, all words referring to the methodologies originated. Figure 15 presents an overview of the methods identified from the analysis of all abstracts depicted on the left-hand side. Several methodologies showcased have been extensively utilized across various sectors and research domains.

On the right-hand side, a depiction of the specific techniques and tools employed is provided, encompassing methodologies such as "data mining", "deep learning", "machine learning", and "cloud business intelligence", among others. An analysis of the authors' provenance of papers in common shows that North America, Europe and parts of Asia and South America are shaded in darker blue in Figure A1 of the Appendix, indicating higher levels of scientific production for the focus on "Management Control System".

In the context of "Risk Management", 22 papers, the UK by 16, China by 11, and South Africa by 10, represent Portugal. Australia and Indonesia are associated with 9 documents each. In the domain of "Audit", authorship originates from a globally diverse range of regions, including the United States, Europe, Asia, Australia, and several African countries, indicating widespread interest in the analyzed topics.

Figure 15 - Summary of Methodologies and Techniques for papers in common

Analysis of author collaborations reveals extensive international scientific cooperation among multiple countries. It is highlighted that some countries, such as China, have many papers associated with both Single Country Publications (SCP) and Multiple Country Publications (MCP) collaborations, while others, such as Jordan and Malaysia, have only SCP collaborations. Countries such as the United Kingdom, Australia, and China have emerged as major contributors to documents associated with international collaborations. However, there are also papers from individual countries, such as South Africa, and papers involving authors from multiple countries, such as Thailand. In Figure A2 of the Appendix, the horizontal bars are divided into two colors to represent two types of collaborations: MCP (in red) and SCP (in blue).

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5. Discussion and Conclusion

In line with Zamani et al. (2023), the research questions were defined in the Theoretical Background section, and the entire set of results from the bibliometric review was examined to provide comprehensive answers. To address RQ.1, the current state of the literature on using Business Intelligence (BI) in business control systems between 2013 and 2023 includes 141 papers, with 91 documents overlapping across the three areas of focus: Management Control System, Risk Management, and Audit. When analyzed separately, 125 papers focused on Management Control Systems, 70 on Risk Management, and 98 on Audit, answering RSQ.1.1.

In response to RSQ.1.2, analyzing research themes using the Thematic Map and Word Clouds revealed several recurring concepts across the literature, such as enterprise resource planning systems, data warehouses, and case studies. Other frequently addressed themes include engineering education, supply chains, human resource management, information analysis, business analytics, and cloud service providers. These findings suggest a high degree of thematic overlap among the three research domains.

Regarding RQ.1.3, the most active journals in publishing on these topics are Communications in Computer and Information Science, Journal of Intelligence Studies in Business, Lecture Notes in Networks and Systems, International Journal of Advanced Computer Science and Applications, and Procedia Computer Science. However, it is noteworthy that over 60% of the documents analyzed were published in conference proceedings. As emerged from Three Fields plots, prominent conferences include the ACM International Conference Proceeding Series, Iberian Conference on Information Systems and Technologies (CISTI), Atas da Conferência da Associação Portuguesa de Sistemas de Informação, IFIP Advances in Information and Communication Technology, and the International Conference on Developments in eSystems Engineering (DeSE). The prevalence of conference publications highlights the topic's contemporary relevance and that the field remains in a phase of active development and conceptual consolidation.

Across the results section, a comparative reading of the different subsections reveals numerous points of convergence in terms of topic relevance, keyword density, and thematic focus. Authors who concentrate on Management Control Systems often also address Risk Management and Audit aspects, further confirming the interconnected nature of these domains within the literature. This overlap reflects the multifaceted role of BI tools and suggests a shared research agenda among scholars working in these areas.

To answer RSQ.1.4, a summary of the methodologies extrapolated from the abstracts of the analyzed papers reveals a wide range of techniques, including "data mining", "deep learning", "machine learning", and "cloud business intelligence". Other approaches, such as "document analysis", "innovation diffusion theory", the "Fuzzy Delphi method", and "gamification", also emerge, highlighting a diversified methodological landscape.

These findings have several important implications.

First, advanced computational methods such as AI-based techniques indicate a growing reliance on data-driven decision-making in Management Control Systems, Risk Management, and Auditing. This reflects a broader trend toward digital transformation, particularly relevant in SMEs that aim to remain competitive in dynamic environments.

Agreeing with Chenhall and Moers (2015) and Wee et al. (2022), we have considered a systemic approach to business control for SMEs, emphasizing the interconnection of data and information from three key control functions: Management Control System, Risk Management, and Audit. This integration, facilitated by BI tools, aims to create a dynamic and mutually reinforcing control system.

Organizations must learn to extract actionable insights from vast data volumes to respond effectively to external challenges (Rao-Graham et al., 2019), adopting BI not merely for individual functions, but rather through a fully integrated, systemic approach.

As underlined by Wu et al. (2024), management control is crucial in all sectors. BI could transform the business control process into a series of immediate actions through the identification of all the variables and factors fundamental to achieving company objectives by simulating every possible situation and thus helping management to make the most appropriate decisions. BI also allows companies to collect data into a single database, clean it, and obtain updated and precise information. With better collection of information and more frequent reporting, it is possible to go beyond simply measuring quantitative results by also assessing qualitative ones that allow for more in-depth analysis and implementation of a broader range of corrective actions (Badia and Donato, 2022). Through BISs, it is possible to systematize the data deriving from analytical and ordinary accounting concerning internal and external facts to be able to process them in real-time and allow management to carry out a timely and immediate analysis of the organization's performance (Mancini, 2016; Montemari and Nielsen, 2021; Ranta and Ylinen, 2023). There is a clear link between BI and management accounting as BI and business analytics platforms were created to facilitate the collection,

analysis and delivery of data and are designed to support decision-making, overcoming information asymmetry, which is one of the significant challenges faced by SMEs (Kikawa et al., 2019). As stated by Işık et al. (2013), BIS has represented the first relevant support for companies to interpret data also from a dynamic-evolutionary perspective and to understand market dynamics and the most appropriate ways to position themselves in the current and prospective competitive system.

Adopting risk management analytics software can help evaluate risks and strategies to mitigate or manage them. In this scenario, BI tools can help monitor risks and track changes in the risk environment, providing real-time data that can be used to update the risk management plan (Araz et al., 2020).

As Dedić and Stanier (2017) outline, BISs are powerful tools for developing, implementing, and communicating a risk management strategy. They can realize, as output, reports that can highlight the effectiveness of the risk management strategy. This aspect is very important because it allows the communication of risk management strategies to stakeholders.

BI tools can evaluate and ensure data quality, monitor individual processes by raising alerts for discrepancies or flaws relative to the established targets, and detect accounting fraud (Zuca and Tinta, 2018; Ali, 2019). Specifically, Roux et al. (2023) argue that the evolution of research can open the path to a new era in which companies not only prosper but also adapt and innovate responsibly in the face of evolving technological advances. In this regard, it is necessary to deepen the integration of BI tools within the Business Control Systems of SMEs, which are noticeably absent in the literature.

Second, the geographic analysis suggests that interest in these methodologies is not limited to a few regions. Countries across North America, Europe, Asia, and South America are actively contributing to the literature. Particularly noteworthy is the role of international collaborations, especially from countries like China, the UK, and Australia, which signal a shared global interest and the cross-pollination of practices and ideas.

Third, keyword and bibliometric analysis make it clear that BI tools are often applied to monitor risks, audit organizational processes, and track ongoing changes - functions that align with the need for real-time data and rapid responsiveness (Araz et al., 2020). This is particularly important for SMEs, which, according to Kikawa et al. (2019), must stay continuously engaged in innovation and the implementation of BI solutions.

This study, grounded in the theoretical work of Andoh-Baidoo et al. (2022), fills a gap in the SME management literature by offering the first

bibliometric review focused on BI in business control practices across Management Control, Risk, and Audit. Previous studies have relied mainly on qualitative methods or context-specific case studies; this research, instead, provides a systematic overview that can guide future inquiry. A promising direction for future research would be the implementation of cross-country comparative analyses to understand environmental and institutional influences on BI adoption.

It is essential to acknowledge that the distinction between "emerging" and "declining" themes identified through the Thematic Map - based on the framework of Yu and Muñoz-Justicia (2020) - may be somewhat interpretative. This constitutes a methodological limitation. To improve precision, future studies might integrate temporal trends or content-based analyses to distinguish the evolution of research themes better.

To sum up, this study offers a structured overview of how BI is currently employed in business control systems, especially within SMEs, and highlights the need for continued methodological and conceptual refinement. As the number of publications in this field continues to grow, further systematic reviews could consolidate knowledge and support the development of effective, innovation-driven BI strategies in practice.

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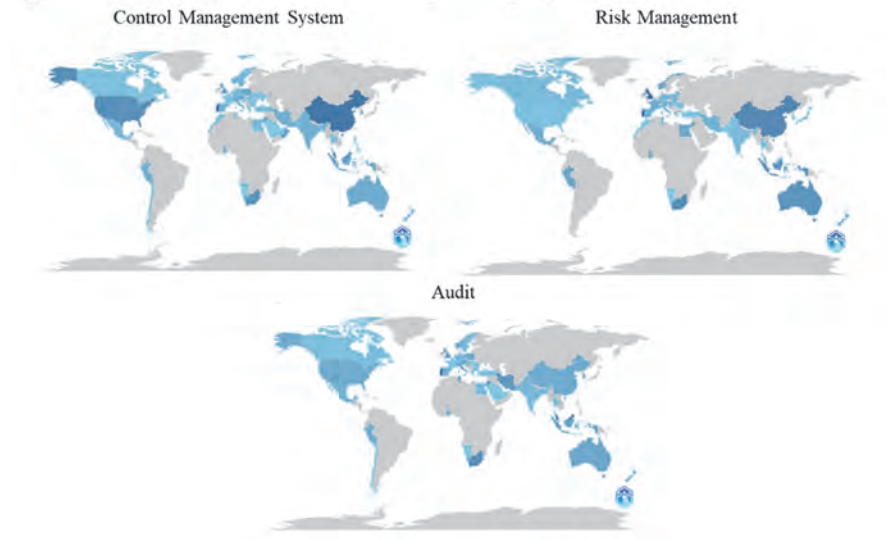
Appendix

Figure A1 - Geographical distribution of scientific production

Figure A2 - Corresponding author's Countries