


Navigating the Challenges of AI Integration into Business Analytics Platforms for SMEs: A Systematic Literature Review

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Abstract

This study investigates the growing attention around the integration of Artificial Intelligence (AI) into Business Analytics (BA) platforms within Small and Medium Enterprises (SMEs). The objective is to provide an overview of the existing literature related to this topic, with a systematic literature review, highlighting the challenges and potential benefits of AI integration in SMEs. A central finding is the critical importance of training programs to develop AI competencies which is essential for maintaining competitiveness. However, implementation is often hindered by technical and financial barriers. Additionally, there is a range of opinions regarding the ethical implications and long-term effects of automation. The research indicates that successful AI integration can yield in efficiency gains alongside social and ecological benefits when suitable conditions are established within enterprises. This underscores the necessity for further examination of the impacts of AI on organizational structures, workforce dynamics and ethical standards. The findings offer valuable insights for developing and implementing AI strategies and highlighting the need for empirical studies to better understand the long-term effects of AI integrations.

Keywords

Artificial Intelligence, Digital Solutions, Business Analytics, Systematic Literature Review

1. Introduction

1.1. Relevance and Problem Statement

The integration of artificial intelligence (AI) into business analytics platforms

poses a number of challenges for small and medium-sized enterprises (SMEs). These challenges are not only of a technical nature, but also concern organisational, strategic and cultural aspects.

Firstly, the technical integration of AI into existing systems is one of the biggest hurdles for SMEs. Many of these companies have outdated IT infrastructures that are not designed to process large amounts of data or implement complex AI algorithms [1]. The need to modernise or even redevelop existing systems can require significant financial and time resources that SMEs are often unable to provide. In addition, many SMEs lack specialists with the necessary knowledge in the discipline of data science, which further complicates implementation [2]. Another critical point is data availability and data quality. High-quality data is essential for the successful implementation of AI technologies. However, many small and medium-sized enterprises (SMEs) struggle to manage consistent data. Often, data is stored across various systems, making access and analysis difficult [3]. In addition, integrating data from different sources is a complex task that requires technical expertise—something many SMEs lack [4].

A strategic focus on AI initiatives and effective management of AI integration are also crucial for the successful incorporation of AI into existing business analytics platforms. SMEs need to develop a clear strategy that defines the objectives of AI implementation and outlines the necessary steps to achieve these goals [5]. However, there is often a lack of a strategic framework to support the integration of AI into business processes. This can result in AI projects being pursued in isolation and not aligned with the company's overall strategy [6]. Consequently, parallel AI architectures may emerge, leading to fragmented knowledge management. The absence of a strategic framework also hampers the coordination and scaling of AI initiatives, ultimately affecting the organization's agility and capacity for innovation. Another key challenge is the acceptance of AI within the organization. Employees may have concerns about job security or resist the changes that come with the introduction of new technologies [7]. To foster acceptance, it is essential to involve employees in the process and provide training that helps them understand and effectively use the new technologies [8].

The use of AI continues to present significant challenges in the areas of data security and data protection, particularly in the context of the General Data Protection Regulation (GDPR) [9]. SMEs must ensure that their AI applications comply with legal requirements, which often necessitates the use of additional resources and specialized expertise [10]. This can hinder access to AI technologies for SMEs and slow down the innovation process, as meeting data protection requirements is not only complex but can also be costly. The challenges of integrating AI into business analytics platforms are therefore multifaceted and require a holistic approach. SMEs must invest not only in technical infrastructure and data quality but also develop a clear strategy and promote employee acceptance. Additionally, it is crucial to consider regulatory requirements to minimize legal risks. Only by addressing these aspects can SMEs effectively leverage the potential of AI and secure

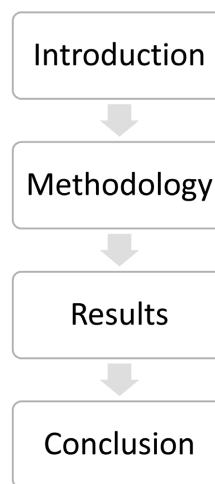
their competitiveness in the digital age.

As the topic has evolved, interest in AI has significantly increased in recent years, leading to a growing number of new publications in this research area. The aim of this paper is to provide a structured and comprehensible overview of the current academic literature on this subject. To meet academic standards and enable future researchers to trace the methodological steps transparently, a systematic literature review was chosen as the methodological approach. This ensures a structured and well-founded analysis and synthesis of relevant studies. The research question guiding this study can be formulated as follows:

What challenges do small and medium-sized enterprises (SMEs) face when integrating artificial intelligence into business analytics platforms?

1.2. Structure of the Study

The first chapter of the introduction addresses the problem statement, which forms the basis for the objectives of the study and the formulation of the research question. Furthermore, the structure of the thesis is outlined in order to ensure a transparent presentation of the study's organization and progression. Chapter 2 provides a detailed description of the methodological approach. The chosen methodology is explained, and the procedure is defined. In addition, Chapter 2 covers the results of the conducted literature review, summarizing the key findings. The final chapter presents a discussion of the results, outlines the limitations of the study, and explores possibilities for future research. **Figure 1** illustrates this process schematically.



Own Illustration.

Figure 1. Structure of the Study.

2. Methodology

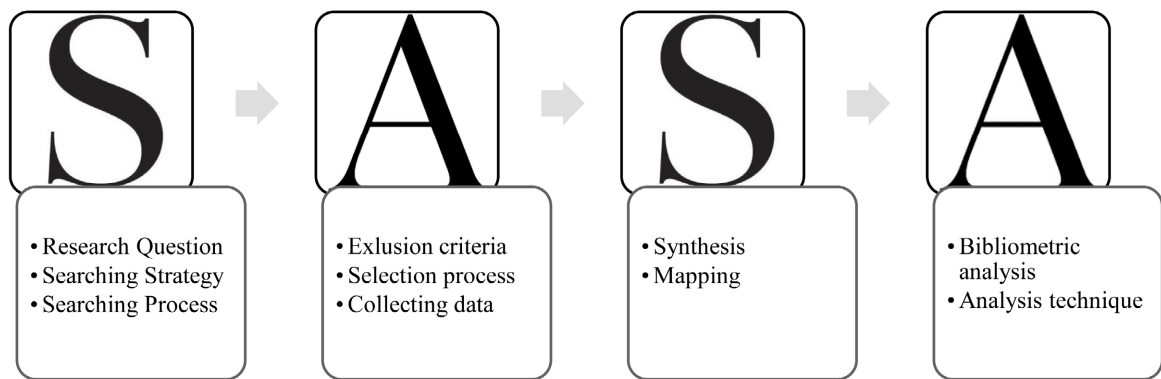
The systematic literature review is a fundamental method in academic research, aimed at collecting, systematically evaluating and synthesizing comprehensive and objective information on a specific topic. Its goal is to generate well-founded

and traceable insights that can serve as a basis for further research or practical applications.

In addition to providing a comprehensive overview of the topic, this method also enables the identification of research gaps and supports the formulation of new hypotheses, which may serve as a starting point for future studies [11] [12].

To ensure a thorough examination of the scientific literature, the SALSA model is applied. SALSA stands for Search, Appraisal, Synthesis, and Analysis, and offers a clear methodology that supports researchers in conducting a systematic and transparent review process.

In the first step, the search phase involves the targeted search for relevant literature sources in various databases. In the appraisal phase, the identified studies are evaluated to determine their quality and relevance. The synthesis phase includes the integration of results from the studies, while the analysis phase allows for a deeper examination of the synthesized information to generate new insights [13] [14]. **Figure 2** illustrates the SALSA process.



Own Illustration, based on the framework of Booth *et al.* [15].

Figure 2. SALSA-process-model.

The first step in the SALSA process is the precise formulation of the research question, which was defined in Chapter 1.1 and establishes the framework for this study. Based on this, the databases to be searched and the search strategy are determined [15]. The search strategy and the appraisal process are discussed in the following chapter.

2.1. Search Strategy and Bibliometric Analysis

This study is based on a search in the bibliographic database Scopus. The search process was conducted from October 31, 2024, to November 3, 2024. Since English is the predominant language in academic research, only English-language literature was included in the search. The following exclusion criteria were applied: Limit To: Language: English. No further restrictions were applied. The inclusion criteria have been carefully defined to encompass studies that focused explicitly on the integration of AI within BA platforms in SMEs. Specifically, the research articles must have been published in peer-reviewed journals and written in Eng-

lish. Only studies published within the last ten years were included to capture the most current trends and insights relevant to AI integration in SMEs. The exclusion criteria eliminated studies that did not directly address AI applications within SMEs or those that addressed broader aspects of AI without focusing on the integration challenges. Additionally, articles that were opinion pieces, non-empirical studies or lacked primary data were not included as they do not provide robust evidence to support the research objectives.

Following the preliminary identification of articles through database searches, an initial bibliometric sorting was conducted. This involved a filtering of the results based on the set inclusion and exclusion criteria as defined in the earlier phases of the review. Articles were retained if they focused specifically on the integration of AI BA in SMEs, were published in peer-reviewed journals and were accessible in full-text form [16] [17].

After the bibliometric sorting, a full-text screening was systematically employed to ensure that each selected article adhered to the established criteria comprehensively. During this stage, articles were evaluated in detail for their alignment with the research question posed in the study. Full texts were evaluated for methodological soundness, relevance to AI integration in SMEs and the original data they presented, as well as their contributions to understanding the challenges and benefits associated with this integration.

Concurrent with the full-text screening process, a quality grading was applied to the selected studies. This involved an independent assessment of each article which focused on aspects such as research design, data collection methodologies and generalizability of the results. Following established protocols, studies that demonstrated adequate quality (for instance: randomized control trials, systematic reviews or those with robust qualitative methodologies) were favored for inclusion in the final synthesis, reflecting a commitment to incorporating the most valid findings available [18].

Ultimately, after a review of eligible studies, a final selection of articles was compiled for inclusion in the systematic review. This selection was driven by the insights and data provided by the articles which concerned the challenges faced by SMEs during AI integration.

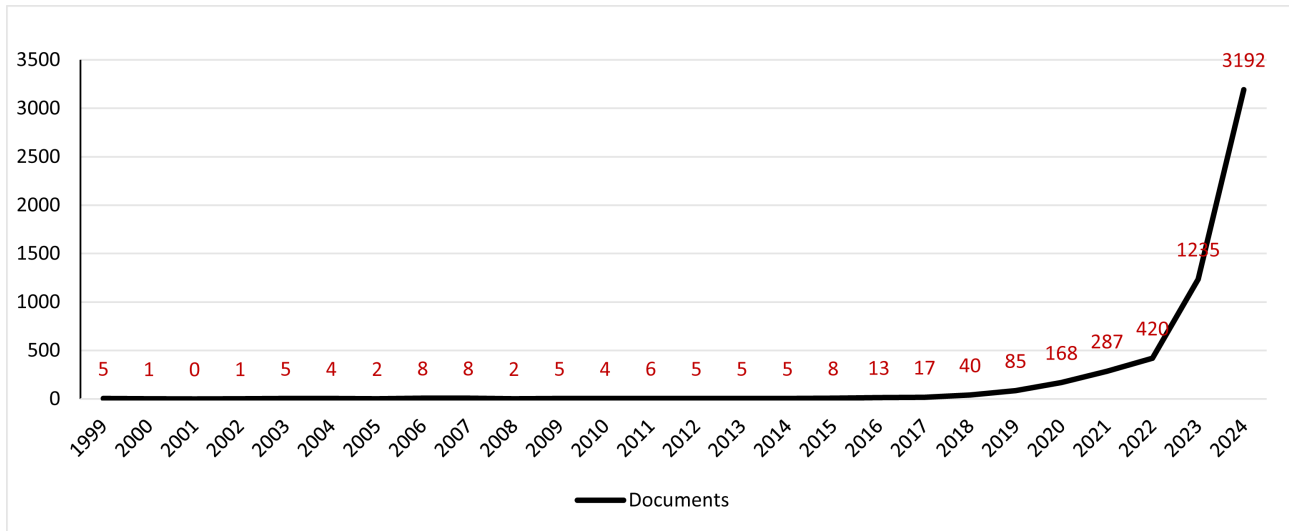
The following search algorithm has been used to ensure an efficient and precise search within the article titles, abstracts, and keywords:

“challenges”AND “ai”AND “integration”

Initially, 5566 articles were found. An analysis of the search results reveals, as shown in **Figure 3**, that there have been publications on the topic in recent decades, but the intensity of the topic has increased since 2018, with the peak in publications occurring in 2024. This demonstrates the intensity of research activities in this area, which can be attributed to the continuous development and relevance of the topic in practice.

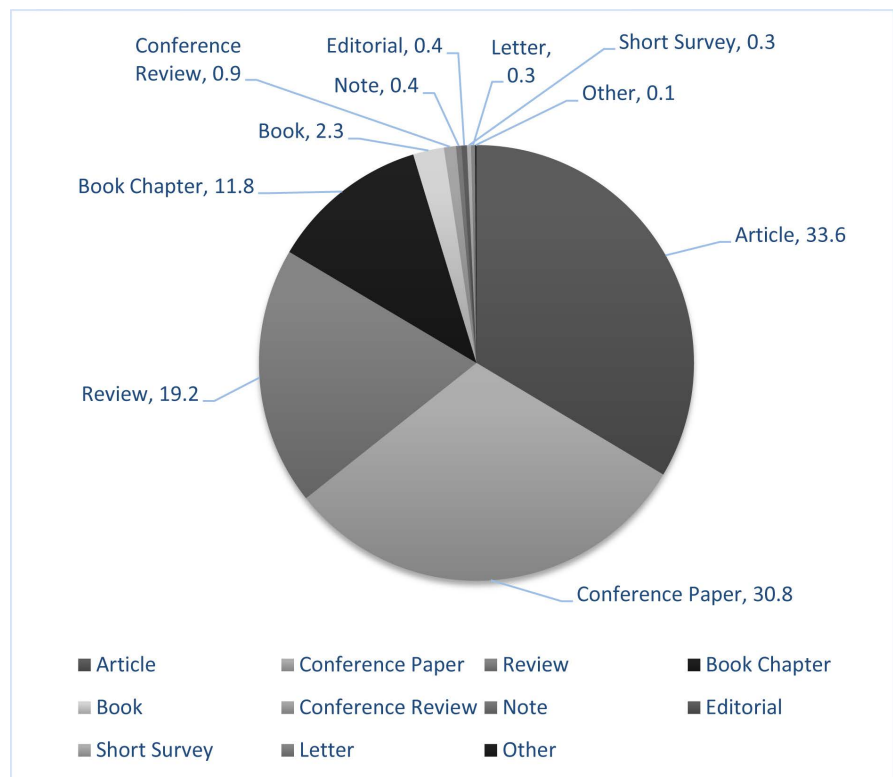
An analysis of the distribution by document types shows, as illustrated in **Figure 4**, that the largest share consists of scientific articles, which also indicates in-

tensive research activity in this area. A nearly equally large share consists of conference papers, suggesting the relevance, timeliness, and achievements in this field. Reviews are the third-largest category, indicating that a significant number of review articles exist, analyzing and summarizing existing research findings.



Own Illustration, based on the Scopus extract, 03.11.2024, 11:04 Uhr.

Figure 3. Scopus results distribution by year without proximity operator.



Own Illustration, based on the Scopus extract, 03.11.2024, 11:44 Uhr.

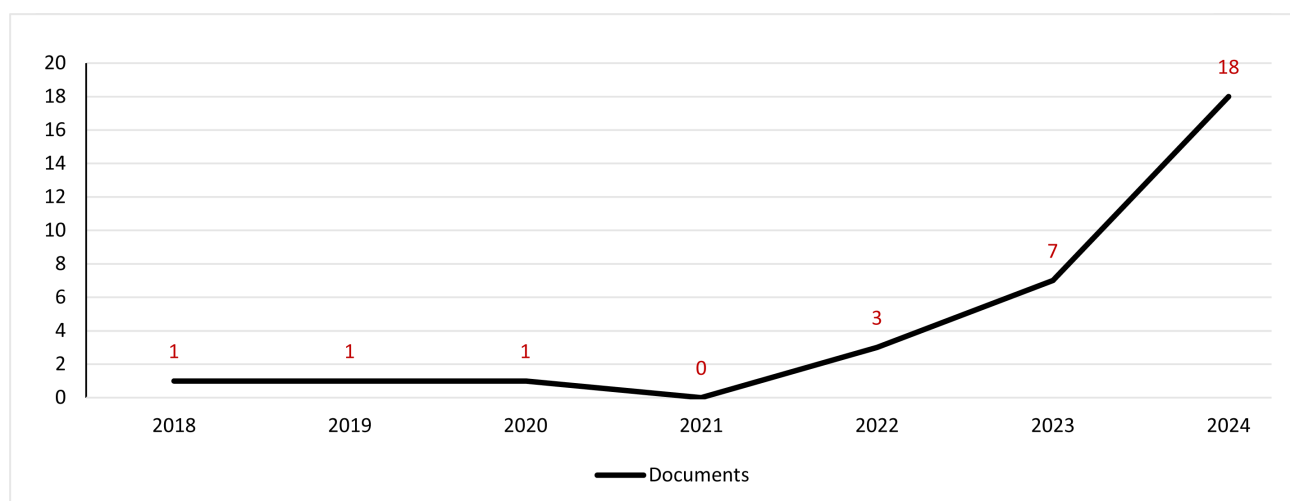
Figure 4. Scopus results distribution by document types without proximity operator.

During the appraisal phase, each identified study underwent a quality assessment to employ a standardized evaluation framework. This framework includes criteria such as methodological soundness and the relevance to the defined research questions. Each study was categorized based on its study type (qualitative, quantitative, or mixed-methods) to facilitate an analysis of the robustness of evidence provided. To refine the search and improve the relevance of the search results, a revised search algorithm was created. The previously used parameters were maintained: Limit To: Language: English. No further restrictions were applied. To ensure an even more precise search within article titles, abstracts, and keywords and to narrow down the relevance of the topic, the following search algorithm was used:

“challenges” W/500 “ai AND integration” AND “smes”

The proximity operator W/500 searches for articles where the term “Challenges” appears within a distance of 500 words from “AI Integration”. Additionally, the articles must include the term “SMEs”. This ensures that “Challenges” and “AI Integration” are thematically and linguistically closely related, while still being flexible enough to allow for variations and sentence structures. Although the length of abstracts in academic articles can vary, there are some generally accepted standards that are widely used within the academic community. The RECORD statement, which deals with the reporting of observational studies, emphasizes that abstracts should contain a concise summary of the key results and conclusions to effectively inform the readership [19]. Typically, abstracts range between 150 and 250 words, although the exact length often depends on the specific requirements of the journal and may even extend to 500 words. Therefore, the proximity operator W/500 was chosen.

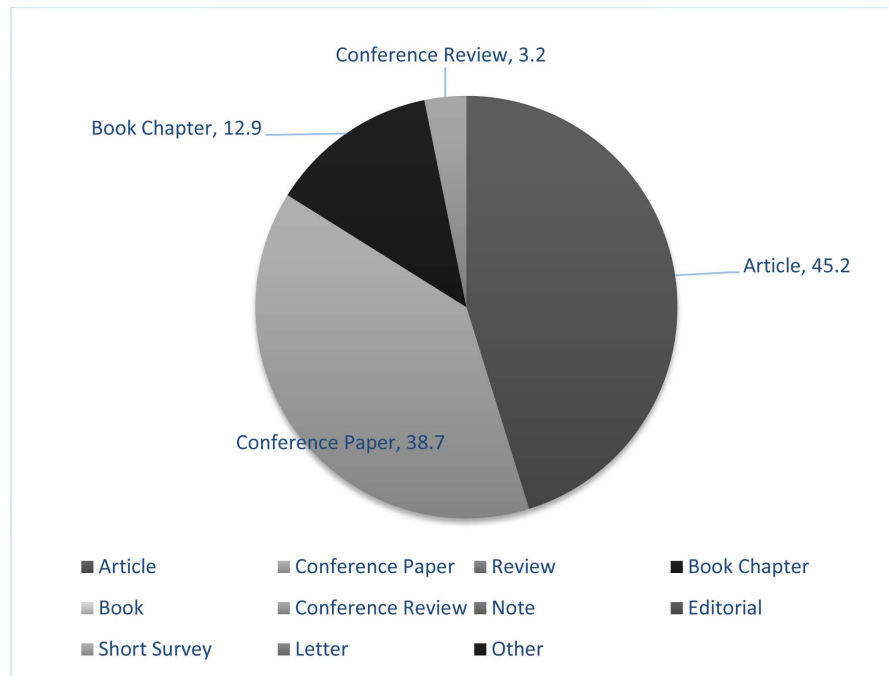
The new search algorithm resulted in 31 articles found on Scopus. An analysis of the search results reveals, as shown in **Figure 5**, that publications on the topic have been present since 2018, with the intensity of the topic increasing from 2022 and reaching its peak in 2024.



Own Illustration, based on the Scopus extract, 03.11.2024, 13:44 Uhr.

Figure 5. Scopus results distribution by year without proximity operator.

An analysis of the distribution by document types shows, as in the first search, that the largest share consists of scientific articles, indicating intensive research activity in this area, followed by conference papers, books, and conference reviews, as shown in **Figure 6**.



Own Illustration, based on the Scopus extract, 03.11.2024, 14:05 Uhr.

Figure 6. Scopus results distribution by document types with proximity operator.

As part of the identification process, a total of 5,566 articles were initially identified in the Scopus database. After refining the search algorithm, 5,535 articles were excluded, leaving 31 articles that are addressed in this study. The final step of the SALSA methodology is the synthesis process. In this phase, the included articles are examined and analyzed for their interrelationships [15]. The synthesis is discussed in the following section, the qualitative analysis.

2.2. Results

A central aspect addressed in several studies is the need for training programs to promote AI skills in SMEs. Sandoval-Gómez emphasizes that the development of technological innovations and training programs is crucial to enhance productivity and efficiency in public institutions [20]. This research shows that the implementation of such programs can lead to improvements in employee skills, as well as a social and ecological impact. Orth adds to this perspective by highlighting the importance of AI-supported further education concepts for SMEs, which are strategically aligned with the transformation goals of companies [21]. Both studies underline that targeted training in AI technologies is essential for the competitiveness of SMEs.

The challenges associated with implementing AI in SMEs are thoroughly examined by Govori and Sejdija as well as Ridho. Govori and Sejdija identify high costs and technical requirements as the greatest obstacles for SMEs in integrating AI [22]. These findings align with Ridho's results, who stresses the relevance of future empirical studies to explore the long-term effects of conversational AI in SMEs [23]. Both studies show that despite the potential benefits of AI, such as increased efficiency and improved decision-making, significant challenges must be overcome.

Another important aspect discussed in the literature is the role of AI in production optimization. Kangru *et al.* develop a concept for evaluating the performance of robot-assisted manufacturing cells, considering technical and functional capabilities [24]. This study highlights the importance of key performance indicators (KPIs) for assessing the efficiency of production cells. In contrast, Ko *et al.* focus on the challenges associated with implementing smart factories [25]. These different emphases show that AI integration is not limited to production but also has significant impacts on other business areas. The challenges of data collection and data management for AI applications in SMEs are addressed in the work by Steuer *et al.* [26]. This study highlights the difficulties SMEs face when implementing AI due to insufficient data infrastructure. This contrasts with the optimistic perspectives outlined in the works of Parkinson *et al.* who discuss the role of AI in strengthening SME resilience during the COVID-19 pandemic and the integration of AI into energy management systems [27].

These differing perspectives emphasize that while some studies focus on the challenges, others highlight the positive effects of AI. Another significant point is the discussion of the ethical implications of AI usage in SMEs. Han develops an explainable AI tool to assess operational risks of AI systems for SMEs. This work is particularly relevant as it stresses the need to integrate ethical considerations into the AI implementation process [28]. The consideration of ethical aspects is crucial for fostering trust in AI technologies and ensuring that these technologies are used responsibly. The works of Zairis and Zairis as well as Agrawal *et al.* extend the discussion to the impact of AI on the labor market. Zairis and Zairis examine the challenges of digital innovation in a rapidly changing environment [29], while Agrawal *et al.* analyze the ambivalent effects of automation on the labor market [30]. These studies emphasize that the integration of AI has not only technological but also social and economic implications that need to be carefully considered.

In addition to the commonalities between the authors, differences are also evident. A central difference between the authors lies in their focus on specific aspects of AI integration. While Orth focuses on the development of AI-supported further education concepts strategically aligned with SMEs' transformation goals [22], Ridho examines the opportunities and challenges of conversational AI in SMEs [24]. Orth argues that targeted education in AI technologies is essential for the competitiveness of SMEs, while Ridho emphasizes the need for future empirical studies to examine the long-term effects of conversational AI [22]. These dif-

ferent focuses show that the authors address different facets of AI integration, leading to different conclusions about the necessity of training programs and empirical studies.

Another significant difference lies in the perception of the challenges associated with AI implementation in SMEs. Govori and Sejdija [22] identify high costs and demanding technical requirements as the primary challenges for SMEs in integrating AI. This view is supported by Steuer *et al.*, who examine the difficulties in data collection and management for AI applications in SMEs [27]. In contrast, Parkinson *et al.* emphasize that AI can be used as a tool to strengthen SME resilience during the COVID-19 pandemic [28].

The ethical implications of AI usage are also treated differently. Han develops an explainable AI tool to assess operational risks of AI systems for SMEs, highlighting the need to integrate ethical considerations into the AI implementation process [29]. In contrast, Agrawal *et al.* focus on the impacts of automation and AI on the labor market, discussing the ambivalent effects of automation on various professions [30]. These differing approaches to the ethical consideration of AI integration show that there are varying views in the literature on how ethical considerations should be integrated into the implementation process. Additionally, there are differences in methodology and the approaches used. Kangru *et al.* employ qualitative and quantitative methods to assess the performance of robot-assisted manufacturing cells [25], while Baiyere *et al.* focus on digital transformation and the new logics of business process management [31]. These different methodological approaches lead to varying insights into the effects of AI on the efficiency and effectiveness of business processes in SMEs.

3. Conclusion

In conducting a systematic literature review, it is imperative to acknowledge the limitations inherent in the search strategy employed, particularly regarding database selection and language restrictions. These limitations can significantly affect the breadth and comprehensiveness of the review outcomes.

Specifically, the choice of using Scopus as the sole database imposes a constraint on the diversity of the studies retrieved. While Scopus is a reputable and expansive resource, it may not encompass all relevant publications on the integration of AI in BA within SMEs. Other databases in the fields of technology management, entrepreneurship or business analytics could offer additional valuable insights that remain unindexed in Scopus. Using only one source increases the risk of missing important research published in niche or cross-disciplinary publications, which can restrict the scope of the reviews and bias its conclusions. Furthermore, restricting the search to English-language publications introduces an additional constraint. This excludes potentially relevant studies published in other languages such as German, Spanish, French or Chinese, which could contribute significantly to the discourse. Consequently, the review may underrepresent region-specific insights, culturally informed practices or alternative approaches to AI integration in

SMEs. These exclusions could limit the generalizability and inclusiveness of the conclusions.

A proximity-based search algorithm seeks to identify studies by narrowing focus on specific keywords or phrases that appear close to one another within a body of literature. While this approach may yield studies that are highly relevant to the core themes of AI integration in SMEs, it may exclude essential works that frame challenges differently, either linguistically or structurally. For instance, studies that utilize varying terminologies might not surface in this search, which results in a lack of diversity in the literature pool. If a relevant article discusses challenges in AI integration using alternative phrasing or organizational structures, it may risk being overlooked altogether.

Moreover, the diversity in the presentation of research findings, including differences in academic writing styles or modes of argumentation, may further compound this issue. Some studies may employ a narrative or qualitative approach that doesn't conform to the expectations upheld by proximity algorithms. Therefore, research that focuses on socio-technical dimensions of AI integration, although indirectly related, might be excluded due to lack of keyword alignment. The reduction of literature to narrowly defined search terms diminishes the robustness of the analysis by promoting homogeneity, which can obscure critical insights provided in varied formats.

To mitigate these biases, it is crucial to employ a more inclusive search strategy that transcends the limitations of proximity-based algorithms. Future systematic reviews should consider adopting a multi-database approach that encompasses diverse academic sources beyond a singular database such as Scopus. Inclusion of databases like Web of Science, IEEE Xplore or Google Scholar will broaden the scope of literature reviewed, allowing for a more diverse and representative understanding of the topic. Furthermore, implementing flexible search queries that incorporate synonyms and related terms can enhance retrieval effectiveness. Researchers might benefit from integrating comparative analyses of keywords, ensuring that studies addressing similar challenges can be captured, even when different terminologies are employed. Despite these limitations, the conducted literature shows, that the topic of integrating AI into BA-Platforms in SMEs is gaining an increasing attention. The aim of this paper was to provide an initial overview of the existing literature, which has been successfully achieved. The synthesis of studies reveals both the challenges and the opportunities involved in AI adoption. A recurring theme is the necessity of targeted training programs to build AI competencies and ensure competitiveness among SMEs. However, numerous studies emphasize the technical and financial hurdles that SMEs face in implementing AI, which are often more pronounced in smaller firms.

Many studies emphasize issues related to inadequate IT infrastructure and skills deficits within the workforce. SMEs often find themselves operating on outdated systems that are not equipped to support advanced AI technologies, which leads to integration complications. Data management issues are also frequently re-

ported, particularly concerning the quality and accessibility of data necessary for effective AI applications. A considerable portion of the articles discuss technical hurdles and by that highlight their significance as immediate barriers to effective implementation.

The financial dimensions of implementing AI in SMEs emerge as another dominant theme in the literature. Numerous articles underscore the financial constraints faced by smaller enterprises when considering investments in AI technologies. The high upfront costs associated with AI adoption, including technology acquisition, staff training and ongoing maintenance are a common concern. Many studies illustrate how these financial barriers can render the integration of AI untenable for SMEs, which typically operate with limited budgets and resources.

While ethical challenges are discussed less frequently than technical and financial difficulties, their presence in the literature is growing. Ethical considerations regarding AI, such as data privacy, algorithmic bias and the societal implications of automation, are increasingly recognized as important themes. The literature highlights that even though these concerns may not dominate the discourse to the same extent as technical or financial challenges, they are nevertheless crucial for fostering trust in AI technologies and ensuring their responsible use. Articles discussing ethical challenges often emphasize that SMEs may lack the frameworks or guidelines necessary to navigate these complex ethical landscapes. Furthermore, the literature frequently discusses the desperate need for financial support mechanisms to facilitate AI adoption among SMEs. This includes calls for grants, subsidies, or favorable financing terms tailored specifically to assist smaller enterprises in overcoming financial obstacles. The frequency of references to financial challenges suggests that this aspect is critically intertwined with the overall success of AI integration in SMEs, often positioning it as a key determinant of the feasibility of such endeavors.

Moreover, the literature suggests that AI integration can generate not only efficiency gains but also social and ecological benefits-provided that the right framework conditions are in place. These findings underline the importance of further investigation into how AI affects organizational structures, personnel development, and ethical standards in SMEs. The reviewed studies offer valuable insights for developing and implementing AI strategies that are not only technically sound but also responsibly designed from a business and societal perspective. In light of this, there is a clear need for more empirical research to better understand the long-term effects of AI, enabling the creation of forward-looking measures that support SMEs in aligning economic growth with ethical and sustainable practices.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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