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The Role of Artificial Intelligence in Enhancing Sustainable Accounting and ESG Reporting: A Systematic Literature Review

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Abstract

ABSTRACT
Background of study: The increasing demand for sustainability and transparency has strengthened the role of sustainable accounting and Environmental, Social, and Governance (ESG) reporting in modern business practices. However, traditional reporting systems face significant challenges in managing complex, large-scale, and heterogeneous ESG data, leading to limitations in accuracy, consistency, and timeliness. Although artificial intelligence (AI) has been widely adopted in financial analysis, its application in sustainable accounting and ESG reporting remains fragmented and underexplored.
Aims: This study aims to provide a comprehensive and structured analysis of the role of AI in enhancing sustainable accounting and ESG reporting.
Methods: This study employs a Systematic Literature Review (SLR) using the PRISMA framework, combined with bibliometric analysis. Data were collected from the Scopus database using three keyword strategies and filtered based on predefined inclusion criteria. The dataset was cleaned using OpenRefine and analyzed using VOSviewer and Biblioshiny to explore research trends, thematic structures, and intellectual development.
Result: The results show that AI technologies, particularly machine learning, natural language processing, and big data analytics, significantly improve ESG data processing, reporting efficiency, and predictive decision-making. However, ESG reporting practices remain fragmented, lack standardization, and are often implemented in isolated contexts.
Conclusion: This study contributes by integrating AI, sustainable accounting, and ESG reporting into a unified perspective supported by systematic and bibliometric analysis. The findings highlight the potential of AI to enhance transparency and efficiency in sustainability reporting, while emphasizing the need for integrative frameworks and empirical validation in future research.

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INTRODUCTION

The increasing global emphasis on sustainability has significantly transformed contemporary business practices, particularly in the areas of accounting and corporate reporting. Organizations are now expected not only to generate financial value but also to demonstrate their commitment to environmental stewardship, social responsibility, and ethical governance. As a result, sustainable accounting and Environmental, Social, and Governance (ESG) reporting have emerged as critical frameworks for disclosing non-financial performance and enhancing organizational transparency (Musa et al., 2025). These reporting mechanisms enable stakeholders including investors, regulators, and the public to evaluate a company's long-term sustainability and risk exposure beyond traditional financial metrics. However, despite their growing importance, the implementation of sustainable accounting and ESG reporting faces several challenges (Manirili et al., 2026). The increasing volume,

complexity, and heterogeneity of ESG data make it difficult for traditional accounting systems to effectively capture, process, and report relevant information. In many cases, ESG disclosures remain fragmented, inconsistent, and prone to subjectivity due to the lack of standardized reporting frameworks. Furthermore, organizations often struggle to provide real-time and reliable sustainability data, which limits the usefulness of ESG reports for strategic decision-making and stakeholder engagement (Setiatin, 2025).

In response to these challenges, artificial intelligence (AI) has emerged as a transformative technology with the potential to revolutionize accounting and reporting practices. AI technologies, including machine learning, natural language processing, and big data analytics, enable the automation of data collection, processing, and analysis at an unprecedented scale and speed (Agustini & Ulfa, 2024). In the accounting domain, AI has been successfully applied in areas such as fraud detection, financial forecasting, and process automation. Nevertheless, despite these advancements, the application of AI in sustainable accounting and ESG reporting remains relatively limited and fragmented. This indicates a critical need for a comprehensive understanding of how AI can be effectively integrated to enhance the quality, transparency, and efficiency of sustainability reporting (Ying et al., 2024).

Existing studies highlight that artificial intelligence (AI) technologies, including machine learning, natural language processing (NLP), and big data analytics, have significantly transformed data processing and reporting practices in various domains (Padmasari et al., 2025). In the context of accounting and corporate reporting, these technologies enable organizations to automate complex tasks such as data extraction, classification, and analysis. AI-driven systems are capable of processing large volumes of structured and unstructured data, thereby improving the efficiency, accuracy, and timeliness of reporting processes (Nur et al., 2024). This capability is particularly relevant for ESG reporting, which often involves diverse and complex datasets from multiple sources. Furthermore, several studies have emphasized the potential of AI in enhancing ESG disclosures through advanced analytical capabilities (Brignardello-petersen et al., 2025). For instance, machine learning algorithms can be used to predict ESG performance and assess sustainability risks, while NLP techniques facilitate the analysis of textual data such as sustainability reports, corporate disclosures, and stakeholder communications. Big data analytics also enables real-time monitoring of environmental and social indicators, allowing organizations to make more informed and proactive decisions. These advancements indicate that AI has the potential to significantly improve the quality and reliability of sustainability reporting (Aifuobhokhan et al., 2025). However, despite these promising developments, prior research predominantly focuses on isolated applications of AI rather than its holistic integration into sustainable accounting and ESG reporting systems. Many studies examine specific use cases such as ESG scoring or automated disclosure without addressing how these technologies can be systematically embedded within organizational reporting frameworks. Additionally, the lack of standardized ESG reporting guidelines and consistent data structures poses a major challenge for the effective implementation of AI-driven solutions. As a result, there remains a critical need for integrative research that explores how AI can be aligned with sustainability objectives and reporting standards in a comprehensive and coherent manner (Aljawad, 2025).

Despite the growing body of literature on artificial intelligence (AI) and sustainability, several critical research gaps remain evident. First, there is a lack of integrative frameworks that systematically link AI technologies with sustainable accounting practices and ESG reporting, resulting in fragmented understanding across disciplines. Second, existing studies are largely dispersed and lack a comprehensive systematic synthesis, limiting the ability to draw consolidated insights regarding the role of AI in sustainability contexts. Third, insufficient attention has been given to the potential of AI in enhancing ESG standardization and transparency, particularly in addressing inconsistencies and subjectivity in non-financial disclosures. Finally, prior research has not adequately explored AI as a strategic decision-support tool that can facilitate sustainability-oriented decision-making within organizations (M et al., 2025). These gaps highlight the need for a structured and integrative review to advance both theoretical and practical understanding of AI-driven sustainable accounting and ESG reporting. Given the identified gaps, a systematic literature review is essential to provide a structured

and comprehensive understanding of how artificial intelligence (AI) contributes to sustainable accounting and ESG reporting (Munawaroh et al., 2025). A systematic approach enables the consolidation of fragmented findings from previous studies, allowing for a more coherent analysis of existing knowledge, emerging trends, and unresolved challenges. Furthermore, this study seeks to bridge the disconnect between technological advancements in AI and their practical application within sustainability-oriented reporting frameworks. By synthesizing current evidence, this research aims to develop a clearer conceptual foundation, identify opportunities for integration, and offer insights that support both academic advancement and practical implementation in enhancing transparency, efficiency, and decision-making in sustainable accounting and ESG reporting (S et al., 2025).

This study aims to systematically examine the role of artificial intelligence (AI) in enhancing sustainable accounting and ESG reporting. Specifically, it seeks to identify and categorize the various applications of AI technologies within ESG reporting practices, analyze the key benefits and challenges associated with their implementation, and provide comprehensive insights into emerging trends in this field. Furthermore, this study aims to propose future research directions that can support the development of more integrated, transparent, and effective sustainability reporting frameworks driven by AI.

METHOD

This study adopts a Systematic Literature Review (SLR) approach using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework to ensure transparency, rigor, and replicability in the research process. The PRISMA approach provides a structured methodology for identifying, screening, and selecting relevant studies, thereby minimizing bias and enhancing the reliability of the review findings (Carrera-rivera et al., 2022). Data were collected primarily from the Scopus database, which is recognized as one of the most comprehensive and reputable sources of peer-reviewed scientific literature. The selection of Scopus ensures that the articles included in this review meet high academic standards and are relevant to the fields of business, management, and accounting. The systematic search process was conducted using predefined keyword strategies and inclusion criteria to ensure the relevance and quality of the selected studies.

To ensure comprehensive and relevant literature coverage, this study employed multiple Boolean search strategies using predefined keyword combinations. The use of multiple keyword sets was intended to balance breadth and specificity in capturing relevant studies on artificial intelligence, sustainability, and ESG reporting. The first keyword strategy was designed to capture a broad intersection between artificial intelligence, sustainable business practices, ESG reporting, and corporate social responsibility:

Keyword 1:

("artificial intelligence" OR "machine learning" OR "big data analytics")
AND ("sustainable business" OR "sustainable management" OR "business sustainability")
AND ("ESG" OR "environmental social governance" OR "sustainability reporting")
AND ("corporate social responsibility" OR "CSR" OR "business ethics")

Keyword 2

("artificial intelligence" OR "machine learning" OR "deep learning" OR "data analytics")
AND ("sustainability" OR "sustainable development" OR "circular economy")
AND ("ESG" OR "CSR" OR "corporate social responsibility" OR "business ethics")

Keyword 3:

("artificial intelligence" OR "machine learning")
AND ("ESG" OR "sustainability reporting" OR "non-financial reporting")
AND ("sustainable business" OR "sustainable management")

To ensure the relevance, quality, and consistency of the selected studies, a set of inclusion criteria was established prior to the literature search process. First, the studies included in this review were limited to those published between 2020 and 2026, in order to capture the most recent developments in artificial intelligence and sustainability reporting. Second, only articles written in English were considered to ensure accessibility and consistency in analysis. Third, the study focused exclusively on open-access journal articles, allowing full-text availability and ensuring transparency in the review process. Finally, the selected studies were restricted to the subject area of Business, Management, and Accounting, to maintain alignment with the research focus on sustainable accounting and ESG reporting. The data analysis in this study was conducted using a thematic analysis approach to systematically identify, analyze, and synthesize patterns across the selected studies. The research process began with data collection from the Scopus database using three predefined keyword combinations to ensure comprehensive and relevant literature coverage. The retrieved data were then subjected to a data cleaning process using OpenRefine, which aimed to remove duplicate records and minimize inconsistencies, particularly in author keywords, thereby improving data accuracy and reliability.

Following the data cleaning stage, the dataset was analyzed and visualized using VOSviewer to explore the intellectual structure of the research field. Three types of visualizations were generated: network visualization to identify relationships among keywords and research themes, overlay visualization to examine the temporal evolution of topics, and density visualization to highlight the most frequently studied areas. In addition, further bibliometric analysis was conducted using Biblioshiny (Bibliometrix R-package) to provide complementary insights into publication trends, keyword co-occurrence, and thematic development. Finally, after the bibliometric and visualization processes, a critical qualitative analysis was conducted on the selected articles. This stage focused on identifying key themes, including (1) AI applications in sustainability contexts, (2) ESG dimensions addressed in the literature, and (3) emerging research trends and gaps. Through this multi-stage analytical approach, the study ensures a comprehensive and robust synthesis of the role of artificial intelligence in sustainable accounting and ESG reporting.

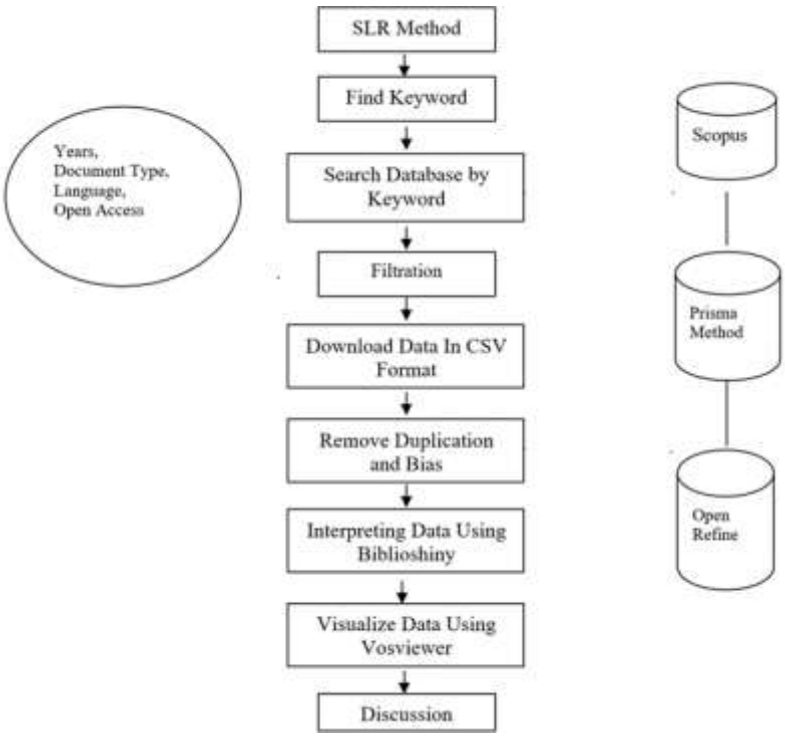

Figure 1. Research method flow diagram

The study selection process was conducted following the PRISMA framework, which consists of four main stages: identification, screening, eligibility, and inclusion. In the identification stage, a total of 279 articles were retrieved from the selected database using predefined keyword strategies.

Following this, duplicate records were removed, resulting in 35 unique articles for further analysis. During the screening stage, titles and abstracts were carefully reviewed to assess their relevance to the research topic, leading to the selection of 25 articles for full-text evaluation. In the eligibility stage, the full texts of these articles were examined based on the established inclusion criteria, and 20 articles were deemed eligible. Finally, after a thorough assessment, 7 articles were included in the qualitative synthesis. This systematic selection process ensures that the final set of studies is both relevant and methodologically sound for addressing the research objectives.

The data analysis in this study was conducted using a thematic analysis approach to systematically identify, analyze, and synthesize patterns across the selected studies. This approach enables the categorization of key findings into meaningful themes, facilitating a deeper understanding of the role of artificial intelligence in sustainable accounting and ESG reporting. Specifically, the analysis focused on three main dimensions: (1) the various applications of AI technologies, including machine learning, natural language processing, and data analytics in sustainability contexts; (2) the ESG dimensions addressed in the literature, encompassing environmental, social, and governance aspects; and (3) emerging research trends, including methodological approaches, thematic developments, and future research directions. Through this structured analytical process, the study provides a comprehensive synthesis of existing knowledge and identifies critical insights to support further research and practical implementation.

This study has several methodological limitations that should be acknowledged. First, the analysis was restricted to open-access journal articles, which may have excluded relevant high-quality studies published in subscription-based journals, potentially limiting the comprehensiveness of the review. Second, the final sample size consisted of only 13 studies, which, although selected through a rigorous PRISMA process, may not fully represent the entire body of literature on artificial intelligence in sustainable accounting and ESG reporting. Third, the rapid development of artificial intelligence technologies poses a challenge, as newly emerging studies and innovations may not yet be captured within the selected timeframe. These limitations suggest that the findings should be interpreted with caution and highlight the need for future research with broader data coverage and updated evidence. The article selection process in the Systematic Literature Review (SLR) followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, which systematically describe identification, screening, feasibility assessment, and study inclusion process. PRISMA aims to improve the quality of research reporting by providing a clear and structured framework, so the process of selection, analysis, and synthesis of studies can be understood and replicated by readers or other researchers.

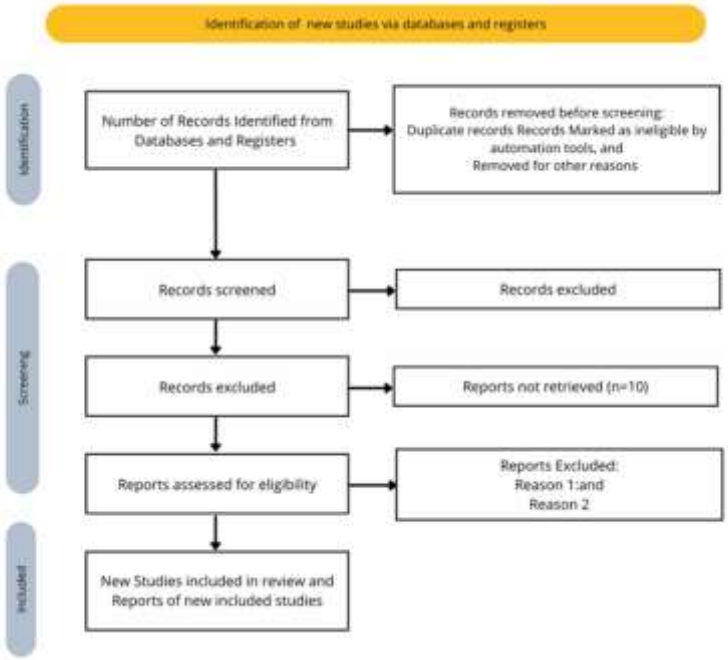

Figure 2. PRISMA Method

RESULTS AND DISCUSSION

Results

1. Bibliometric Study

Table 1. Keyword

Keywords	Number of Articles (2015-2025)	Total Articles
("artificial intelligence" OR "machine learning" OR "big data analytics") AND ("sustainable business" OR "sustainable management" OR "business sustainability") AND ("ESG" OR "environmental social governance" OR "sustainability reporting") AND ("corporate social responsibility" OR "CSR" OR "business ethics")	4	279
("artificial intelligence" OR "machine learning" OR "deep learning" OR "data analytics") AND ("sustainability" OR "sustainable development" OR "circular economy") AND ("ESG" OR "CSR" OR "corporate social responsibility" OR "business ethics")	240	
("artificial intelligence" OR "machine learning") AND ("ESG" OR "sustainability reporting" OR "non-financial reporting") AND ("sustainable business" OR "sustainable management")	35	

2. Reduce duplicate data

The search results from the three keywords datasets were exported, compressed into a Zip file, and imported into OpenRefine for cleaning. This application filters data, especially to see whether or not data is obtained from search results. In addition, this application can also be used to eliminate keyword bias contained in the data obtained. Initially, the dataset contained 279 articles; after processing in OpenRefine, the total became 35 articles.

Table 2. Main Information

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	**2020:2026**
Sources (Journals, Books, etc)	28
Documents	**35**
Annual Growth Rate %	30.77
Document Average Age	1.51
Average citations per doc	9.486
References	4502
DOCUMENT CONTENTS	
Keywords Plus (ID)	210
Author's Keywords (DE)	118
AUTHORS	
Authors	120
Authors of single-authored docs	4
AUTHORS COLLABORATION	
Single-authored docs	4
Co-Authors per Doc	3.57
International co-authorships %	2.857
DOCUMENT TYPES	
Article	**16**
book	3

book chapter	6
conference paper	6
erratum	1
review	3

Based on Table 2 above, the results of the bibliometric analysis are obtained an overview of the development of research related to Artificial Intelligence (AI) in the context of sustainable business during the 2020–2026 period. The dataset consists of 35 documents from 28 sources (journals, books, and proceedings), showing that this topic is still relatively developed but has attracted attention across publications. The annual growth rate of 30.77% indicates a significant increase in the number of publications every year. This shows that the integration of AI in sustainable business practices, including ESG and CSR, is a rapidly evolving topic and is a major focus in contemporary research. In addition, the relatively young average age of documents (1.51 years) reinforces the indication that this field is still in the early stages of development (emerging field). In terms of scientific impact, the average citation per document of 9,486 shows that publications in this field have received considerable academic attention. The number of references that reached 4,502 also reflects that this research has a strong theoretical foundation and is connected to various disciplines, such as management, accounting, information technology, and sustainability.

Content analysis showed that there were 210 Keywords Plus and 118 Author's Keywords, indicating a diversity of research topics and approaches. This reflects that research related to AI and sustainability is multidisciplinary, covering aspects of technology, corporate governance, sustainability reporting, and business ethics. In terms of authorship, there were 120 authors who contributed, but only 4 documents were written individually. The average number of authors per document of 3.57 indicates that research in this field tends to be carried out collaboratively. Despite this, the level of international collaboration is still relatively low (2,857%), which indicates a great opportunity to increase cross-border cooperation in future research.

Based on the type of document, the majority of publications are in the form of journal articles (16 documents), followed by book chapters (6) and conference papers (6). This shows that the dissemination of knowledge in this field is more done through scientific journals as the main media. The limited number of review articles (3 documents) indicates that synthesis studies such as SLR are still needed to comprehensively map research development. Overall, these results show that research on the application of AI in supporting sustainable business practices, including ESG, CSR, and sustainable management, is in a rapid growth phase with multidisciplinary and collaborative characteristics. Nevertheless, there is still an opportunity to increase research contributions through international collaborations and the development of more in-depth synthesis studies.

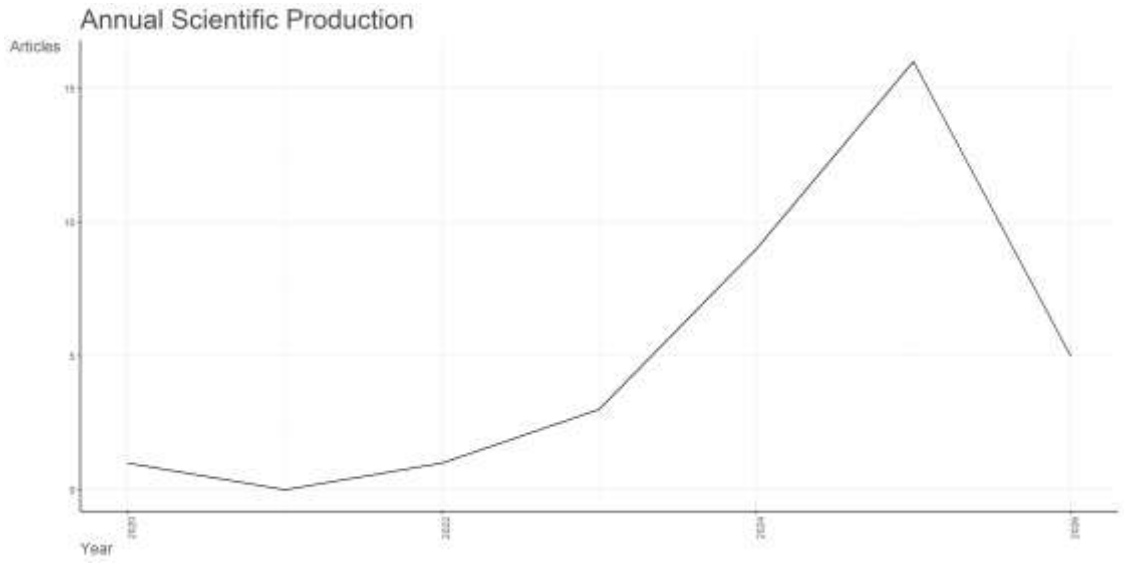

Figure 3. Annual Scientific Production

The figure above shows the trend in the number of scientific publications related to research topics in the 2020–2026 period. In general, there is a significant upward trend, although there are fluctuations at the beginning of the period. In 2020, the number of publications was still relatively low (about 1 article), then decreased in 2021 to close to zero. This can be due to the limited academic attention to the topic of Artificial Intelligence (AI) integration in the context of sustainability in the early phases. Entering 2022 to 2023, it began to be seen a gradual increase, from around 1 to 3 publications. This trend shows the growing interest in research on the use of AI in supporting sustainable business practices, including in ESG and CSR aspects.

A significant surge occurred in 2024 and 2025, where the number of publications increased sharply from around 9 to a peak in 2025 (about 16 publications). This increase indicates that the topic of AI and sustainability has become a major focus in global research, along with the growing need for digital transformation and transparency in sustainable business practices. However, in 2026, there will be a decrease in the number of publications to around 5 articles. This decline is likely due to incomplete year data, so it does not reflect the overall number of publications.

Table 3. Annual Citation

Year	MeanTCperArt	N	MeanTCperYear	CitableYears
2020	55.00	1	7.86	7
2022	3.00	1	0.60	5
2023	55.67	3	13.92	4
2024	10.22	9	3.41	3
2025	0.94	16	0.47	2
2026	0.00	5	0.00	1

Table 3. presents the distribution of citations based on the year of publication with the main indicators, namely Mean Total Citation per Article (MeanTCperArt), number of documents (N), average citations per year (MeanTCperYear), and citable years. In general, there is a significant variation in the impact of citations between years of publication, which is influenced by the age of the document and the number of publications. In 2020, even though there was only 1 document, the MeanTCperArt value reached 55.00 with the MeanTCperYear of 7.86. This shows that early publications in this field had a high impact, likely because they played a role as pioneering research (foundational studies) that was widely referenced by later research. A similar phenomenon was also seen in 2023, where 3 documents resulted in a high average citation (55.67) and the highest MeanTCperYear (13.92). This indicates that the publication in that year has a very strong quality or relevance in the development of AI and sustainability topics. In contrast, in 2022, despite 1 document, the impact of citations was relatively low (MeanTCperArt = 3.00). This suggests that not all early publications have significant influence, depending on their contribution and relevance. Entering 2024 and 2025, there was a considerable increase in the number of publications (9 and 16 documents), but it was followed by a decrease in the average number of citations (Mean TCperArt 10.22 and 0.94 respectively). This decline can be explained by two main factors:

1. The publication age is young, so it does not have enough time to get citations (citation lag)
2. The effect of citation distribution, where there are more documents, the average citation tends to decrease due to variations in the quality and visibility of the research

In 2026, the citation value will be recorded at 0, which is very likely due to incomplete data and very new publication time (early-stage publications), so that citations have not been obtained.

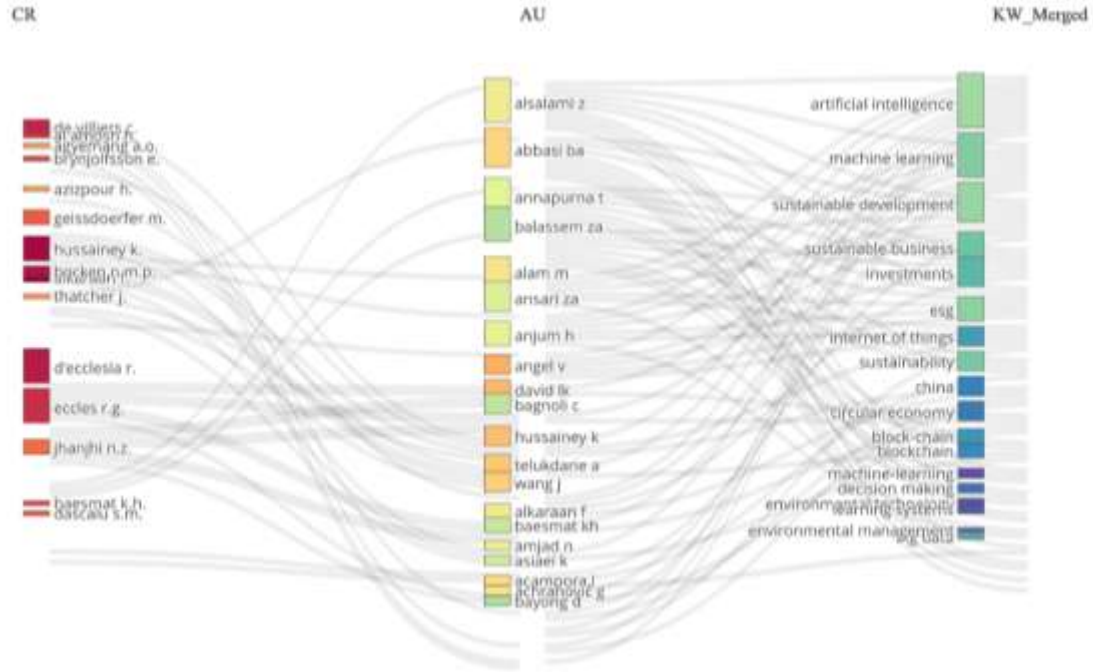

Figure 4. Diagram Three-Field Plot

The visualization of the three-field plot (CR–AU–KW) shows a strong linkage between key references, authors, and research themes in the field of Artificial Intelligence (AI) and sustainable business. In terms of references, some of the main works such as de Villiers, Brynjolfsson, and Geissdoerfer serve as theoretical foundations that are widely referenced, especially in the context of digital transformation, circular economy, and sustainability. This reference was then adopted by various authors who showed a pattern of collaboration and intellectual connection that was quite intense, reflecting the multidisciplinary nature of research. In terms of keywords, the dominance of terms such as artificial intelligence, machine learning, sustainable development, ESG, and circular economy indicates that the main focus of research lies in the integration of smart technology in supporting sustainable business practices. In addition, the emergence of supporting technologies such as the Internet of Things and blockchain strengthens the role of digital technology as an enabler in improving efficiency, transparency, and data-driven decision-making. , the flow pattern from references to authors to keywords shows a strong convergence between the development of AI technology and the need for sustainability, while confirming that the field is still developing dynamically with great opportunities for further exploration, particularly in cross-disciplinary integration and strengthening aspects of governance and business ethics.

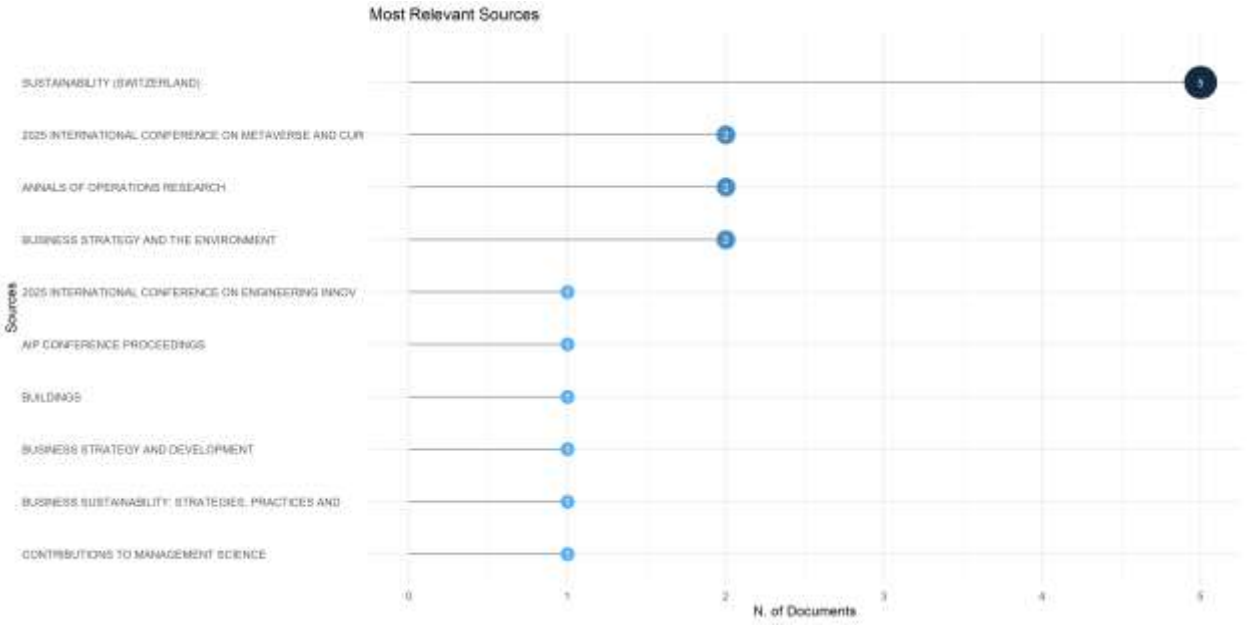

Figure 5. Most Relevant Sources

Figure 5 above shows the distribution of publication sources that contribute the most to the field of Artificial Intelligence (AI) and sustainable business research. It can be seen that the journal Sustainability (Switzerland) is the most dominant source with the highest number of publications, which is as many as 5 documents, which indicates that this journal is the main forum for the dissemination of research related to sustainability and technology. Meanwhile, several other sources such as the Annals of Operations Research, Business Strategy and the Environment, as well as the proceedings of international conferences each contributed about 2 documents, showing a significant but not dominant contribution. In addition, there are a number of other sources with smaller contributions (1 document), including journals and proceedings such as AIP Conference Proceedings, Buildings, and Business Strategy and Development, which reflect the diversity of publication outlets in this field. This distribution pattern shows that research related to AI and sustainability is spread across various types of publications, both reputable journals and scientific conferences, but is still concentrated in several major journals that focus on sustainability issues. Overall, these findings indicate that although the field is developing in a multidisciplinary manner, there is a concentration of publications in certain journals that serve as a major hub for knowledge dissemination, while opening up opportunities for researchers to target relevant and high-impact publication outlets.

Next is the Sources' Local Impact data. This data is taken from the top 10.

Table 4. Sources' Local Impact

Source	h_index	g_index	m_index	TC	NP	PY_start
Sustainability (Switzerland)	3	5	0.750	154	5	2023
Annals Of Operations Research	2	2	0.667	19	2	2024
Contributions To Management Science	1	1	0.143	55	1	2020
Corporate Social Responsibility...	1	1	0.333	10	1	2024
Intersecting Environmental Social...	1	1	0.333	8	1	2024
Aip Conference Proceedings	1	1	0.500	4	1	2025
Int. Journal Of Social Ecology...	1	1	0.200	3	1	2022
Data-Driven Esg Strategy...	1	1	0.500	2	1	2025
Buildings	1	1	0.500	1	1	2025
Green Horizons: Role Of Ai...	1	1	0.500	1	1	2025

In table 4 above. Sources' Local Impact analysis shows that the journal Sustainability (Switzerland) has the most dominant influence in the literature pool analyzed, with h-index = 3, g-index = 5, and total citations (TC) reaching 154 out of 5 publications, indicating high productivity and scientific impact since the initial year of publication (PY_start = 2023). The next position is occupied by the

Annals of Operations Research with h-index = 2 and TC = 19, showing a considerable contribution despite the smaller number of publications. Interestingly, Contributions to Management Science has only 1 publication, but it produces 55 citations, which show the existence of high-impact articles (highly cited papers). Meanwhile, several other sources such as Corporate Social Responsibility..., AIP Conference Proceedings, and Buildings show a value of h-index = 1 with relatively low citations, reflecting early or still limited contributions in this field. Varying m-index values (0.143–0.750) also indicate differences in the consistency level of citation impact over time, where newer sources tend to have lower m-index values due to the limited time of citation accumulation. Overall, these findings suggest that despite the presence of several dominant sources, the distribution of scientific impact is still relatively dispersed, with a combination of established journals and new publications beginning to contribute to the development of the literature on AI and sustainability.

Next is the Core Sources by Bradford'd Law data

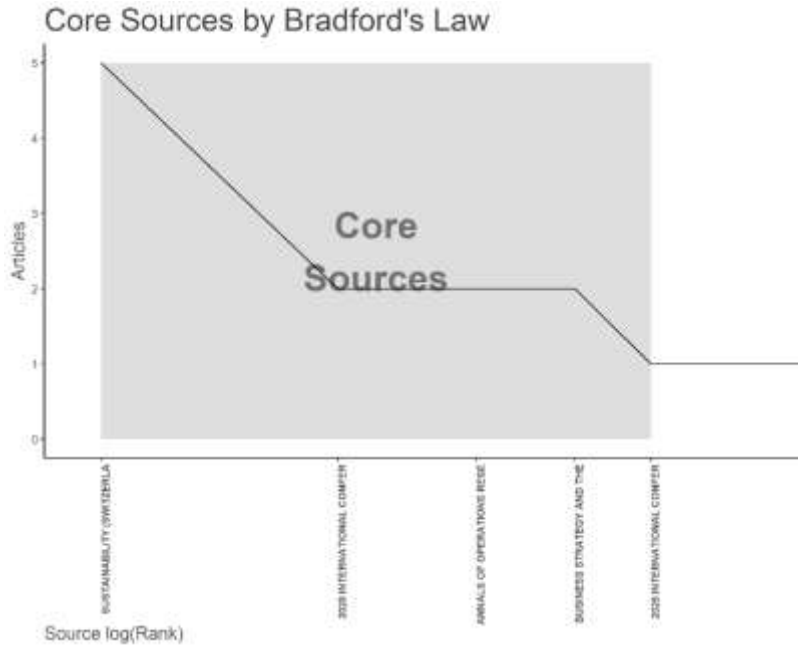

Figure 6. Core sources by Bradford'd Law

Figure 6 above shows the distribution of publication sources based on their productivity level in the field of Artificial Intelligence (AI) and sustainable business research, which follows the principles of Bradford's Law. It can be seen that there is one main source, namely Sustainability (Switzerland), which is in the core zone with the highest number of articles (about 5 publications), so it can be categorized as the most productive and influential source in this field. Furthermore, there are resource groups in the second zone such as the Annals of Operations Research and Business Strategy and the Environment which each produce about 2 publications, reflecting a significant contribution but not as strong as the core source. Meanwhile, most other sources are in the peripheral zone with only 1 publication, suggesting that the distribution of articles tends to spread to many journals with relatively small contributions. This pattern is consistent with Bradford's Law, where a small number of journals account for the majority of publications, while the rest is scattered across many other sources. , these findings confirm that research related to AI and sustainability has a concentration of publications in several core journals, but still shows a multidisciplinary character with wide dissemination in various scientific outlets, thus providing opportunities for researchers to explore various publication channels according to specific study focuses.

Next is the Cumulative Occurrences graph data.

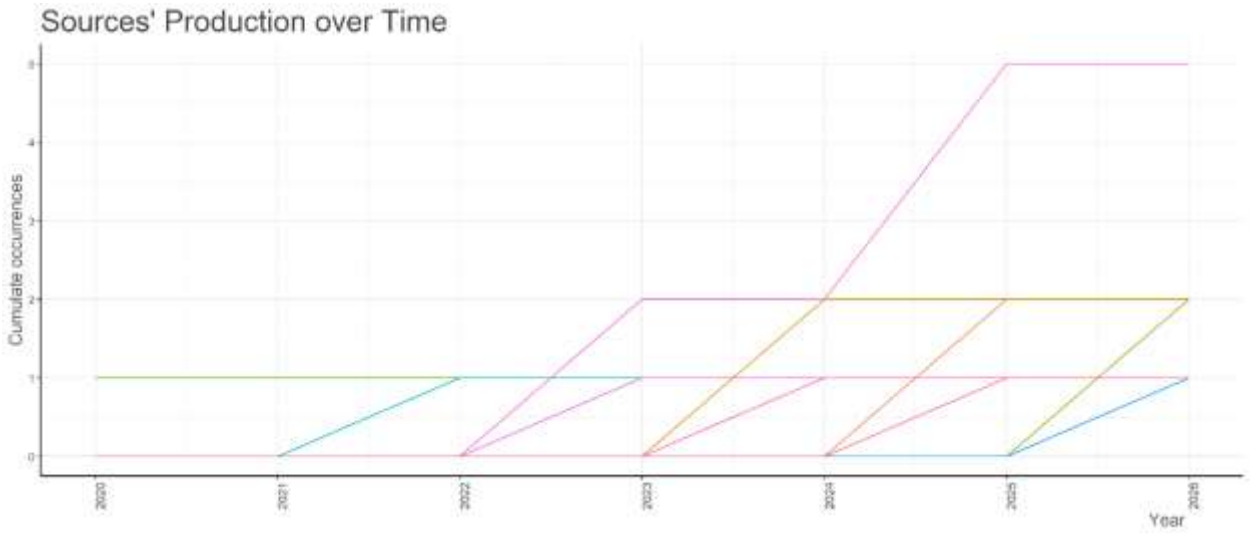

Figure 7. Cumulative occurrences

Figure 7 above, the Sources' Production over Time graph shows the dynamics of the contribution of various publication sources in the field of Artificial Intelligence (AI) and sustainable business throughout the 2020–2026 period. In general, it can be seen that most of the sources began to contribute in the mid-to-late period, specifically after 2022, which indicates that this topic is relatively new and has developed rapidly in recent years. One of the sources shows the most significant growth with a cumulative increase to 5 publications by 2025–2026, indicating consistency and dominance in scientific contributions. Meanwhile, some other sources show a moderate growth pattern with the accumulation of 2 publications, which reflects fairly stable but not dominant engagement. On the other hand, there are also a number of sources with limited contributions (only 1 publication) that have generally appeared in recent years, signaling the entry of new actors in the publishing ecosystem. This pattern reflects the characteristics of emerging fields, where there is a gradual increase in source participation and a concentration of productivity in several major journals. , this graph confirms that research related to AI and sustainability has experienced rapid expansion in recent years, with a tendency to increase contributions from various publication sources in line with increasing global attention to sustainability issues and digital transformation.

3. Authors Information

The data on the most relevant authors are presented in Table below

Table 5. Most Relevant author

Author	Articles	Articles Fractionalized
Angel V	2	0.50
David Lk	2	0.50
Hussainey K	2	0.42
Telukdarie A	2	0.83
Wang J	2	0.50
Abbasi Ba	1	0.33
Acampora L	1	0.17
Achranovič G	1	0.25
Alam M	1	0.33
Alkaraan F	1	0.17

In Table 5 above, the Most Relevant Author Analysis shows that the author's contribution in the field of Artificial Intelligence (AI) and sustainable business is still relatively spread without the very strong dominance of one particular individual. Some authors such as Angel V, David Lk, Hussainey K, Telukdarie A, and Wang J were recorded as the most prolific authors with 2 articles each, but the

varying fractionalized article values (0.42–0.83) indicated differences in the level of individual contributions to collaborative publications. Telukdarie A authors had the highest fractional value (0.83), which indicates a more dominant contribution in the resulting work, compared to other authors who tended to share contributions within the team. Meanwhile, other authors such as Abbasi Ba, Acampora L, Achranovič G, Alam M, and Alkaraan F each contributed 1 article, reflecting a more limited but still enriching diversity of perspectives in this field. Overall, this distribution shows that research related to AI and sustainability is collaborative and not concentrated in a specific group of researchers, thus opening up ample opportunities for new researchers to contribute and develop studies in this emerging field.

Authors' Production Over Time

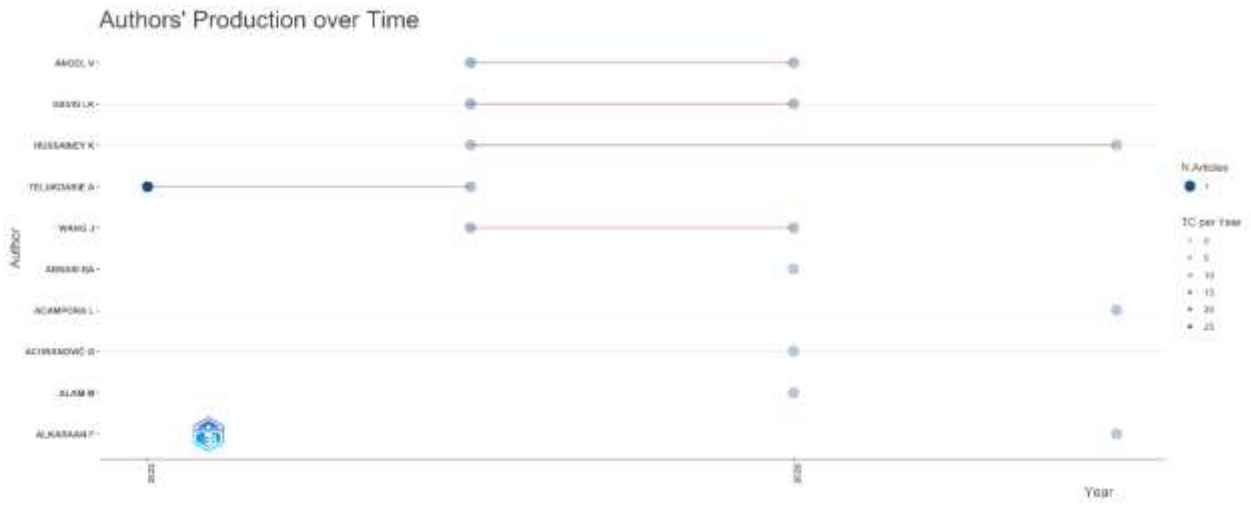

Figure 8. Authors' Production Over Time

Figure 8 above shows the dynamics of the authors' contribution in the field of Artificial Intelligence (AI) and sustainable business throughout the research period, with a pattern that reflects the development of the field that is still relatively new and rapidly developing. It is seen that most of the authors began to contribute actively from around 2022 to 2023, which marked the initial phase of increased academic interest in this topic. Authors such as Angel V, David Lk, Hussainey K, and Wang J show patterns of sustained contributions over a period of time, indicating consistency in their research. On the other hand, Telukdarie A seems to have started contributing early (around 2023), showing his role as one of the early contributors in this field. Several other authors such as Abbasi Ba, Acampora L, Achranovič G, Alam M, and Alkaraan F show more recent contributions, especially in 2025, which reflects the influx of new researchers as the topic grows. In addition, the size and intensity of the points (which represent the total citations per year) suggest that not only the productivity, but also the impact of citations varies between authors. Overall, this graph indicates that research in the field of AI and sustainability is growing dynamically with a combination of consistent authors and new researchers, and shows that there has been an increasing expansion of the scientific community in recent years.

4. Countries

The following is the Countries' Scientific Production

Table 6. Countries' Scientific Production

Country	Freq
Canada	1
Iran	1
Malaysia	1
Sweden	1
Usa	1

From table 6 above, Data Countries' Scientific Production shows that the contribution of scientific publications in the field of Artificial Intelligence (AI) and sustainable business is evenly distributed in several countries, namely Canada, Iran, Malaysia, Sweden, and the USA, each of which has the same publication frequency, namely 1 document. This pattern indicates that there is no dominance of certain countries in the development of research in this field, but is still in the early stages with relatively limited but global contributions. This even distribution reflects that the issue of integrating AI in sustainability has attracted attention across countries, both from developed and developing countries. In addition, this geographical diversity shows the potential for broad international collaboration, although at the current stage the contribution of individual countries is still low. Overall, these findings indicate that research in this area is still in the emerging stage, with great opportunities for increased productivity and global collaboration in the future.

5. Overlay Visualization

The overlay visualization shows a map of the development of research themes in the field of Artificial Intelligence (AI) and sustainable business based on the time dimension, which is characterized by a color gradation from blue (older) to yellow (newer). It is seen that core keywords such as artificial intelligence, machine learning, sustainable business, and ESG are at the center of the network with large node sizes, signifying high frequency and central role in the research structure. The predominant green color indicates that most topics are growing rapidly in the medium period (around 2024–2025), reflecting an intensive growth phase. Meanwhile, topics with newer colors (yellow), such as decision making, data integration, and circular economy, indicate the latest research direction that is starting to focus on the practical implementation of AI in decision-making and integration of sustainable business systems. On the other hand, earlier (blue) topics, such as corporate social responsibility, stakeholders, and business practices, reflect long-studied conceptual foundations. The close connectivity between nodes shows that the field is highly integrated and multidisciplinary, with AI acting as the main link between various sustainability issues. Overall, this visualization indicates a shift from a conceptual approach to a more applicative and technology-based approach, while confirming that research in this area continues to evolve towards a more complex integration between digital technologies and sustainable business practices.

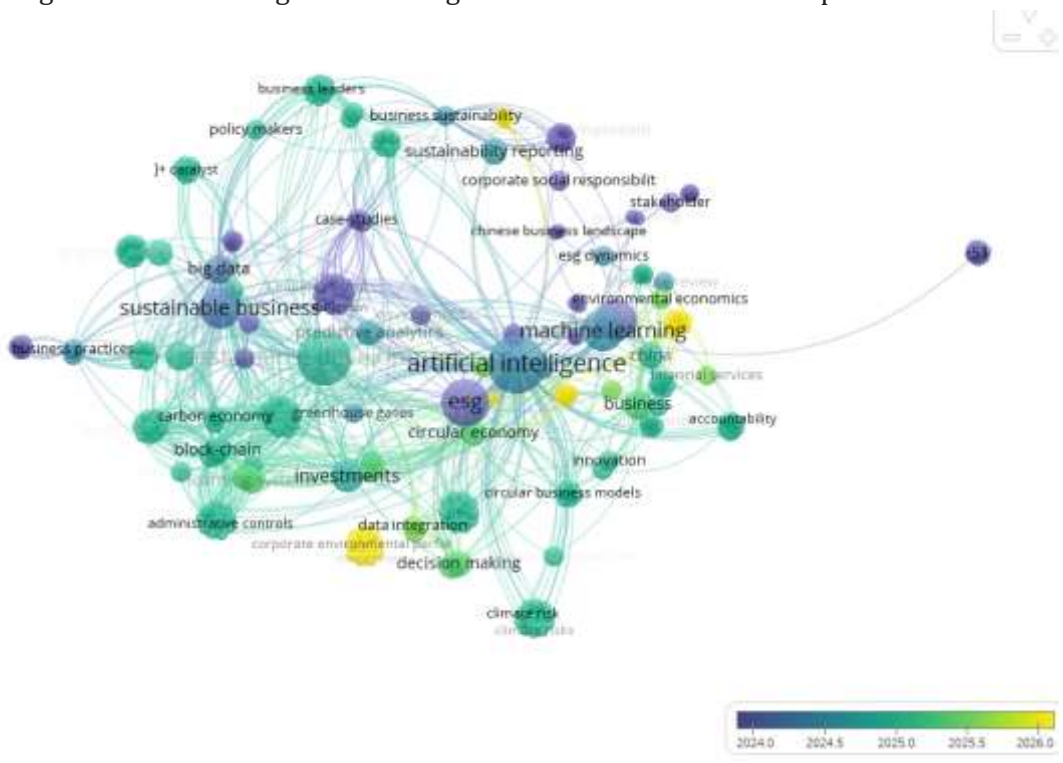

Figure 9. Overlay visualization

6. Network Visualization

This co-occurrence network visualization describes the conceptual structure of research in the field of Artificial Intelligence (AI) and sustainable business through the grouping of keywords into several interconnected thematic clusters. It can be seen that the main nodes such as artificial intelligence, machine learning, sustainable development, sustainable business, and ESG are at the center of the network with a large size, indicating a high frequency of occurrence and the role of a link between topics. The different colored clusters show several main research focuses, including technology clusters (AI, machine learning, big data, blockchain), sustainability clusters (sustainable development, circular economy, greenhouse gases), business and management clusters (business, innovation, financial services), and governance and reporting clusters (ESG, sustainability reporting, corporate social responsibility, stakeholders). The dense interconnectedness between clusters suggests that research in this field is multidisciplinary and integrated, where AI technology does not stand alone, but is used to support various aspects of sustainability, including decision-making, investment, and climate risk management. In addition, the existence of nodes such as decision making, data integration, and innovation shows a direction of research that is beginning to shift to practical implementation and strategic application in the business context. Overall, the network confirms that the field of AI and sustainability is evolving as a complex research ecosystem with strong interactions between technology, the environment, and business management. Network Visualization can be seen in figure 10 below.

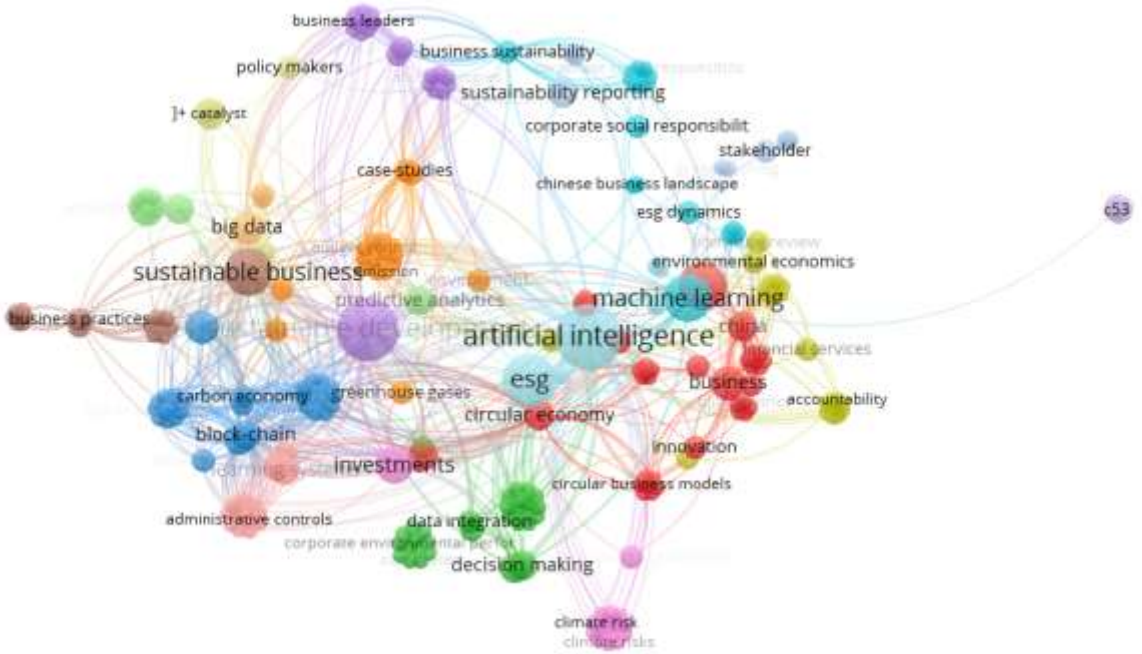

Figure 10. Network visualization

7. Density Visualization

This density visualization illustrates the level of density and intensity of keyword occurrence in Artificial Intelligence (AI) and sustainable business research, where yellow indicates areas with high frequencies and blue indicates low frequencies. It can be seen that the highest density centers are in the keywords artificial intelligence, machine learning, sustainable development, sustainable business, and ESG, which indicates that these topics are the main core in the research structure. Other high-density areas include investments, blockchain, circular economy, and decision making, which demonstrate a growing research focus on the integration of AI technology in financial aspects, business model innovation, and data-driven strategic decision-making. Meanwhile, topics such as corporate social responsibility, stakeholders, and environmental economics are in medium density,

reflecting the role of a link between technology aspects and sustainability governance. On the other hand, there are some areas with low density that indicate topics that are still limited or niche, such as climate risk and several other specific terms. Overall, the map confirms that research in this area is centered on the integration of AI and sustainability, with a growing trend towards practical applications in business, finance, and decision-making, as well as pointing to opportunities for further exploration on topics that are still underdeveloped.

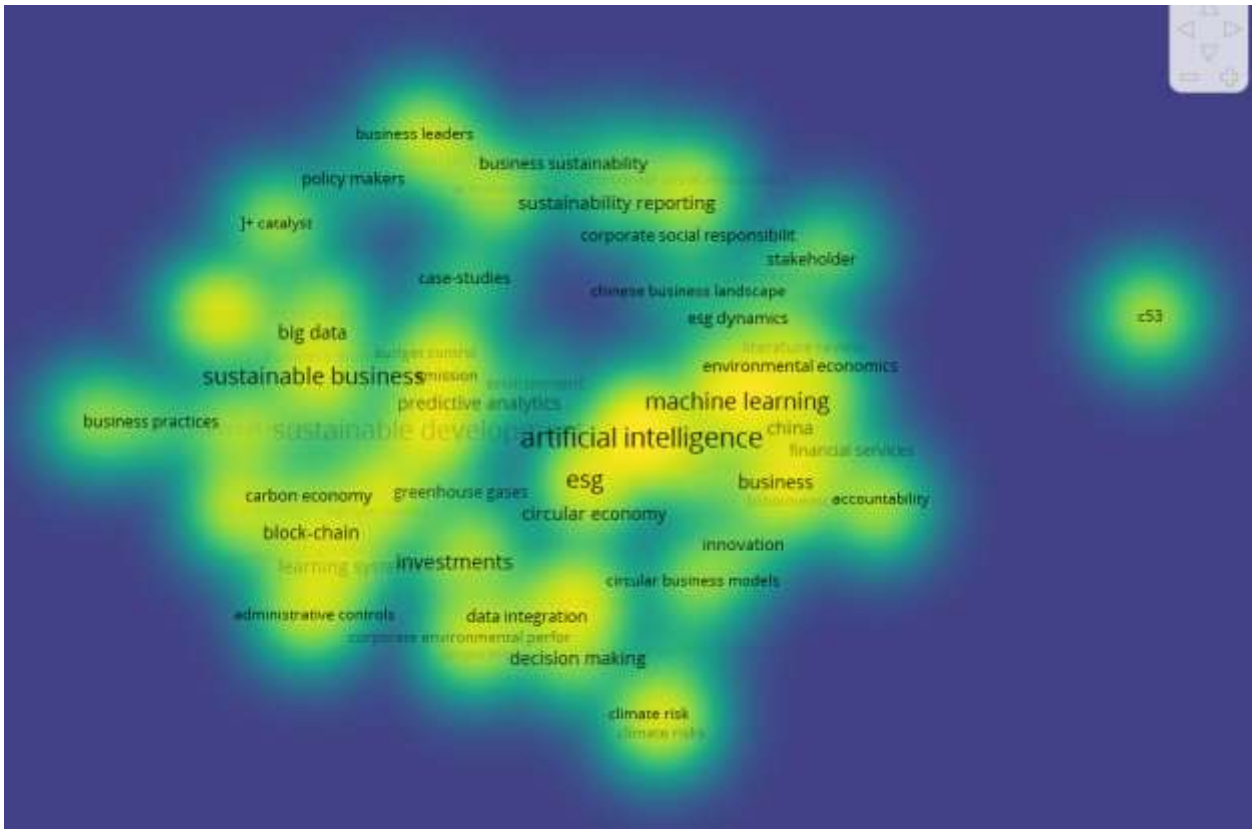

Figure 11. Density Visualization

The analysis of 13 selected studies, which identifies three main themesb AI applications in ESG reporting, AI in sustainable accounting, and emerging research trends aligns closely with the earlier bibliometric findings that highlight *artificial intelligence*, *machine learning*, *ESG*, and *sustainable business* as the central and most densely connected topics within the research landscape. The prominence of machine learning, NLP, and big data analytics in ESG reporting is consistent with the co-occurrence and density visualizations, where these technologies appear as core nodes linking sustainability reporting, corporate social responsibility, and decision-making processes. Similarly, the theme of AI in sustainable accounting, particularly in automating non-financial reporting and integrating ESG with financial data, corresponds with emerging keywords such as *data integration*, *predictive analytics*, and *decision making*, which were identified as newer and rapidly developing research directions in the overlay visualization. Furthermore, the dominance of conceptual and empirical studies, along with the increasing focus on ESG transparency, reinforces the observed growth trend in annual scientific production and the centrality of sustainability reporting within the network structure. Overall, this synthesis indicates a coherent evolution of the field, where foundational concepts such as CSR and stakeholder theory are progressively integrated with advanced AI technologies, leading to a more data-driven, transparent, and application-oriented approach in sustainable business and accounting practices.

8. SLR Study

Of the 266 data points obtained, 208 will be focused on article types.

Table 7. Data Distribution

No	Type	Sum
1	Artikel	16
2	book	3
3	book chapter	6
4	conference paper	6
5	erratum	1
6	review	3
Total		**35**

9. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses)

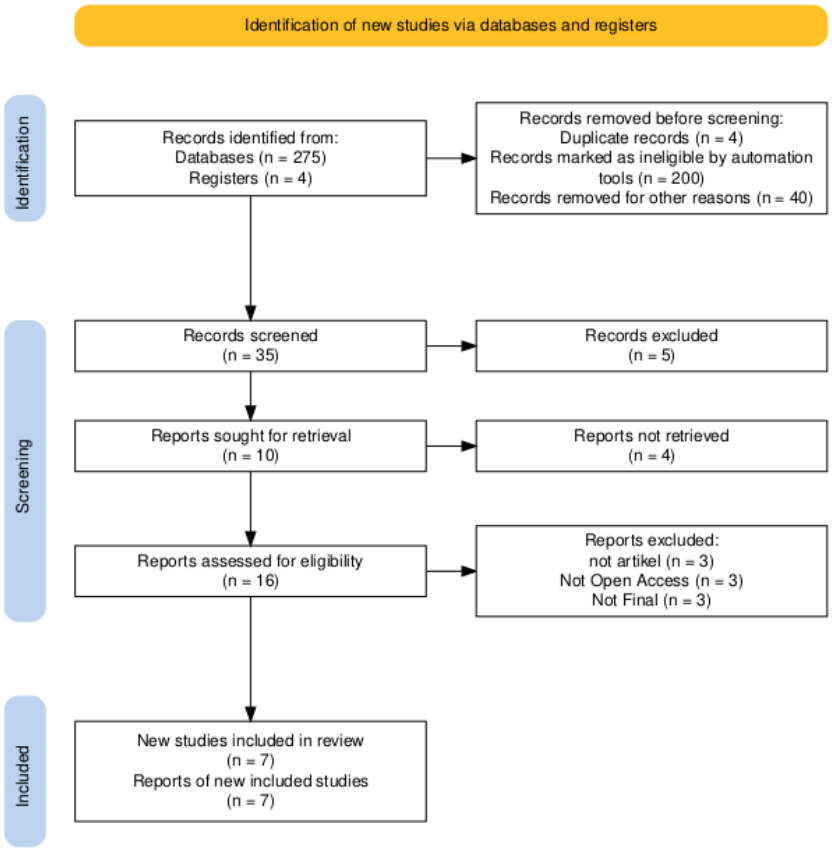

Figure 12. Results of the PRISMA Method

The analysis of the selected studies reveals that artificial intelligence plays an increasingly important role in enhancing sustainable accounting and ESG reporting. Several studies demonstrate that AI technologies, such as machine learning, natural language processing, and data analytics, are widely applied in ESG scoring, risk assessment, and data automation. For instance, recent research proposes advanced analytical frameworks integrating machine learning and clustering techniques to identify the most influential ESG pillars and support decision-making processes (Dasinapa, 2024). Similarly, AI-driven systems have been shown to improve ESG risk assessment through predictive modeling and process automation (Waita et al., 2025). However, the findings also indicate that ESG reporting systems remain fragmented and lack standardization. Studies highlight the complexity of sustainability standards and the challenges organizations face in implementing consistent ESG frameworks across industries (Anthony, 2025). Moreover, despite the growing adoption of AI, its implementation is still limited and often applied in isolated contexts rather than as part of an integrated reporting system.

In addition, organizational and governance factors continue to play a critical role in ESG performance. Evidence suggests that managerial behavior, corporate transparency, and internal governance mechanisms significantly influence sustainability outcomes (Vol & Acces, 2025). This indicates that while AI has strong potential to enhance ESG reporting, its effectiveness depends on its integration with organizational and governance structures. Furthermore, bibliometric evidence shows that research on AI in ESG contexts is still emerging and remains underexplored compared to broader ESG performance studies (Z et al., 2026). This highlights a significant opportunity for further research to develop integrative frameworks that combine AI technologies with sustainable accounting and ESG reporting practices.

Table 8. Article Data

No	Author & Year	Objective	Methodology	AI Technique	Key Findings	Research Gap
1	Mashayekhi et al. (2024)	Analyze importance of ESG pillars	Quantitative (MEREC + K-means)	Machine Learning	Social & economic pillars most influential; varies by industry	Lack of integrative ESG-AI framework
2	Censi et al. (2025)	Develop AI-based ESG risk assessment framework	Conceptual + simulation	ML, Process Mining, RPA	AI improves ESG risk identification & classification	Limited real-world validation
3	Lapinskiene et al. (2025)	Examine sustainability standards implementation	Qualitative (expert interviews)	AI tools (ERP, Clarity AI)	ESG standards are complex and fragmented	Lack of standard harmonization
4	Xia et al. (2025)	Analyze role of digital tech in sustainability	Conceptual + empirical	AI, Big Data, Blockchain	Digital tech enhances sustainability & compliance	Limited focus on ESG reporting integration
5	Ying et al. (2025)	Investigate drivers of ESG performance	Empirical (panel data)	ML + text analysis	Managerial behavior affects ESG outcomes	Underexplored AI-decision integration
6	Strazzullo et al. (2026)	Explore AI in ESG reporting (fashion industry)	Qualitative (case study)	ML, data analytics	AI improves transparency but adoption is limited	Lack of cross-industry analysis
7	Ka Tiong et al. (2025)	Map ESG research trends	Bibliometric (VOSviewer)	Data analytics	ESG research growing rapidly; AI still emerging	AI in ESG remains underexplored

10. Conceptual Framework

This study proposes a conceptual framework that explains the role of artificial intelligence (AI) in enhancing sustainable accounting and ESG reporting. The framework positions AI as a core technological driver that influences the transformation of traditional accounting systems into more advanced, data-driven sustainability reporting mechanisms. At the initial stage, AI technologies including machine learning, natural language processing, big data analytics, and process mining enable organizations to automate data collection, processing, and analysis. These capabilities facilitate the integration of large volumes of structured and unstructured ESG-related data, improving both efficiency and accuracy in reporting processes. This is consistent with prior findings that AI enhances ESG data processing and predictive capabilities in sustainability contexts. The second stage of the framework focuses on the development of sustainable accounting systems, where

AI-driven processes contribute to improved transparency, accuracy, and real-time reporting. By integrating financial and non-financial data, AI supports a more comprehensive representation of organizational performance. This aligns with the growing need for organizations to provide reliable and timely ESG disclosures to stakeholders.

At the outcome level, improved sustainable accounting systems lead to higher ESG reporting quality, which ultimately enhances ESG performance, supports strategic decision-making, and increases stakeholder trust. These outcomes reflect the strategic importance of ESG reporting in modern business environments, where sustainability performance is closely linked to long-term value creation. Furthermore, the framework incorporates several moderating variables, including corporate governance, ESG standards, and managerial orientation. These factors influence the effectiveness of AI implementation in ESG reporting. For instance, strong governance mechanisms and transparent reporting practices can enhance ESG outcomes, while managerial short-term orientation may hinder sustainability performance (Fauzi & Zahrolazizah, 2025). Additionally, the presence of standardized ESG frameworks plays a crucial role in ensuring consistency and comparability in reporting practices. Overall, this conceptual framework provides an integrative perspective that bridges the gap between technological capabilities and sustainability reporting practices. It highlights that the successful implementation of AI in ESG reporting requires not only advanced technologies but also alignment with governance structures and reporting standards.

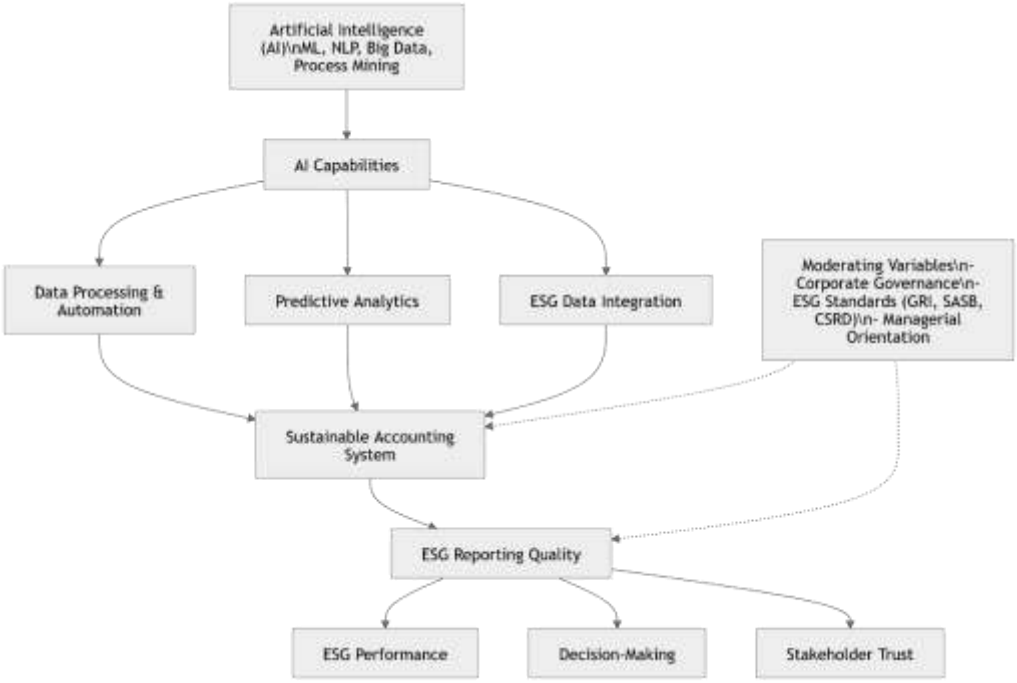

Figure 13. *diagram conceptual framework*

Discussion

1. The Role of Artificial Intelligence in Enhancing ESG Reporting

The findings of this study demonstrate that artificial intelligence (AI) plays a transformative role in enhancing sustainable accounting and ESG reporting. Across the reviewed literature, AI technologies particularly machine learning, natural language processing, and data analytics are increasingly utilized to automate data processing, improve reporting accuracy, and enable predictive analysis. For instance, AI-based frameworks have been developed to identify key ESG performance indicators and support strategic decision-making processes (Silitonga et al., 2024). Similarly, AI-driven systems have shown the ability to enhance ESG risk assessment through predictive modeling and process automation. From a theoretical perspective, these findings align with the Resource-Based View (RBV), which suggests that technological capabilities such as AI can serve as strategic resources that

provide competitive advantage. AI enables organizations to transform complex ESG data into actionable insights, thereby improving sustainability performance and reporting quality (Wijaya et al., 2023).

2. Fragmentation and Lack of Standardization in ESG Reporting

Despite the growing adoption of AI, the findings reveal that ESG reporting systems remain highly fragmented and lack standardization. Different organizations rely on various reporting frameworks, such as GRI, SASB, and integrated reporting standards, resulting in inconsistencies in data structure and disclosure practices (Djasuli et al., 2025). This fragmentation limits the effectiveness of AI implementation, as inconsistent data inputs reduce the reliability of AI-driven analysis. This issue can be explained through Institutional Theory, which highlights how organizations operate under different regulatory, normative, and cultural pressures. The absence of globally unified ESG standards creates institutional complexity, making it difficult to implement standardized AI-driven reporting systems (Wijaya et al., 2023).

3. AI as a Decision-Support System for Sustainable Accounting

Another important finding is the emerging role of AI as a decision-support system rather than merely a technical tool. AI enables organizations to conduct ESG scoring, risk prediction, and sustainability performance evaluation in real time. For example, predictive models and analytical frameworks allow firms to prioritize ESG pillars and allocate resources more effectively (Syahriani et al., 2025). However, the effectiveness of AI in decision-making is strongly influenced by organizational factors such as governance quality, managerial orientation, and transparency (Ria & Praningtyas, 2025). Empirical evidence shows that managerial behavior, particularly short-term orientation, can negatively affect ESG performance. This finding is consistent with Agency Theory, which explains how conflicts between managers and stakeholders may hinder long-term sustainability objectives (Amrulloh, 2024).

4. Limited and Sector-Specific Implementation of AI

The review also indicates that AI adoption in ESG reporting is still limited and often confined to specific industries, such as construction and fashion. For example, AI has been applied in ESG risk assessment within construction management and ESG reporting in the fashion industry, but these applications remain isolated and context-specific (Annisa et al., 2025). This suggests that current research lacks a cross-sectoral and integrative perspective, which is essential for developing generalized frameworks. The findings support the argument that AI adoption in ESG reporting is still in an early development stage, requiring further exploration and validation across industries (Usman et al., 2025).

5. Emerging Trends and Research Opportunities

Bibliometric evidence confirms that research on ESG has grown significantly in recent years; however, the integration of AI within ESG contexts remains underexplored. While ESG performance and sustainability reporting are well-established research areas, the intersection with AI represents an emerging field with substantial research potential (A et al., 2025). This trend highlights the need for future studies to: Develop integrated AI ESG frameworks, Conduct empirical validation across industries, Explore ethical and regulatory implications of AI in sustainability reporting

6. Integrative Insight

Overall, the findings suggest that while artificial intelligence has strong potential to enhance sustainable accounting and ESG reporting, its current application remains fragmented, sector-specific, and underdeveloped. The integration of AI into ESG reporting systems requires not only technological advancement but also alignment with governance structures, reporting standards, and organizational strategies. Therefore, a comprehensive and integrative framework is essential to fully realize the benefits of AI in sustainability reporting.

Implications

This study provides several important implications from theoretical, practical, and policy perspectives. From a theoretical perspective, the findings contribute to the advancement of knowledge by integrating artificial intelligence (AI), sustainable accounting, and ESG reporting into a unified conceptual understanding. This integration extends existing literature by demonstrating how AI can function as a strategic enabler in sustainability reporting, while also reinforcing the relevance of established theories such as the Resource-Based View, Institutional Theory, and Agency Theory in explaining the adoption and effectiveness of AI in ESG contexts. The study also highlights the need for future theoretical development that explicitly links technological innovation with sustainability governance and reporting frameworks. From a practical perspective, the results offer valuable insights for organizations seeking to enhance their ESG reporting practices. The adoption of AI technologies can significantly improve data processing efficiency, reporting accuracy, and real-time decision-making capabilities. Organizations are encouraged to invest in AI-driven systems that enable the integration of financial and non-financial data, while also strengthening internal governance mechanisms to ensure effective implementation. Additionally, managers should recognize that the success of AI adoption depends not only on technological capability but also on organizational readiness, transparency, and long-term strategic orientation (Lestari & Gangodawilage, 2025). From a policy and regulatory perspective, this study underscores the importance of developing standardized ESG reporting frameworks that can support the effective integration of AI technologies. Regulators and standard-setting bodies are encouraged to establish clearer guidelines and data structures to enhance consistency, comparability, and transparency in ESG disclosures. Furthermore, policymakers should consider the ethical and governance implications of AI adoption, including issues related to data privacy, algorithmic bias, and accountability, to ensure that AI-driven sustainability reporting remains reliable and trustworthy.

Research contribution

This study provides several important contributions to the literature on artificial intelligence, sustainable accounting, and ESG reporting. From a theoretical perspective, it extends existing research by integrating AI, sustainable accounting, and ESG reporting into a unified framework, while also bridging multiple theoretical lenses, including the Resource-Based View, Institutional Theory, and Agency Theory. Furthermore, this study offers a systematic synthesis of previously fragmented research, thereby enhancing conceptual clarity in this emerging field. From a practical standpoint, the findings provide valuable insights for organizations on how AI can be leveraged to enhance ESG reporting processes, improve transparency, and support sustainability-oriented decision-making, while also emphasizing the importance of aligning technological adoption with governance structures and reporting standards. Methodologically, this study contributes by applying a PRISMA-based systematic literature review approach, combining systematic review techniques with bibliometric insights and critical analysis to produce a structured and comprehensive synthesis that can serve as a foundation for future research.

Limitations

This study has several limitations that should be considered when interpreting the findings. First, the analysis is based on a limited dataset, as only 7 articles were included in the final synthesis, which may not fully capture the entire body of literature on artificial intelligence in sustainable accounting and ESG reporting. Second, the study focuses exclusively on open-access journal articles, which may result in the exclusion of high-quality studies published in subscription-based journals, thereby potentially limiting the comprehensiveness of the review. Third, the emerging nature of artificial intelligence as a research domain presents an inherent limitation, as new developments, tools, and applications are continuously evolving and may not yet be fully represented within the selected timeframe. Therefore, future research is encouraged to expand data sources, include a broader range of publications, and continuously update findings in line with the rapid advancement of AI technologies.

Suggestions

Based on the findings of this study, several recommendations can be proposed for future research and practical implementation. First, future studies are encouraged to develop integrative frameworks that systematically combine artificial intelligence (AI), sustainable accounting, and ESG reporting. Existing studies tend to focus on isolated applications of AI; therefore, a more holistic approach is needed to bridge the gap between technological capabilities and sustainability reporting systems. Second, further research should emphasize empirical validation across different industries and geographical contexts. The current literature is largely limited to conceptual models or sector-specific case studies, which restricts the generalizability of findings. Expanding empirical studies will provide stronger evidence on how AI can effectively enhance ESG reporting practices in diverse organizational settings. Third, researchers should explore the role of AI in standardizing ESG reporting by addressing inconsistencies in data structures and disclosure practices. The integration of AI with global reporting standards such as GRI, SASB, and other emerging frameworks can improve comparability, transparency, and reliability of ESG information. Fourth, future studies should examine the ethical, governance, and regulatory implications of AI adoption in sustainability reporting. Issues such as algorithmic bias, data privacy, and accountability need to be carefully addressed to ensure responsible and trustworthy implementation of AI technologies. From a practical perspective, organizations are encouraged to adopt AI-driven systems to improve data integration, real-time reporting, and decision-making capabilities. However, successful implementation requires alignment with strong corporate governance, clear sustainability strategies, and standardized reporting frameworks.

CONCLUSION

This study provides a comprehensive analysis of the role of artificial intelligence (AI) in enhancing sustainable accounting and ESG reporting through a systematic literature review and bibliometric approach. The findings reveal that AI technologies, particularly machine learning, natural language processing, and big data analytics, play a significant role in improving the efficiency, accuracy, and transparency of ESG data processing and reporting. These technologies enable organizations to automate complex data handling, integrate financial and non-financial information, and support predictive decision-making in sustainability contexts. However, the study also highlights that the current implementation of AI in ESG reporting remains fragmented, lacks standardization, and is often limited to specific applications or industries. This indicates that, despite its potential, AI has not yet been fully integrated into comprehensive sustainable accounting systems. Furthermore, organizational and governance factors, including managerial orientation and the absence of unified ESG standards, continue to influence the effectiveness of AI adoption in sustainability reporting. This study contributes to the literature by offering an integrative perspective that links AI, sustainable accounting, and ESG reporting within a unified conceptual framework. The findings emphasize that the successful implementation of AI requires not only technological advancement but also alignment with governance structures, reporting standards, and organizational strategies. Therefore, future research should focus on developing integrative models and conducting empirical validation to enhance the practical application of AI in sustainability reporting.

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AUTHOR CONTRIBUTION STATEMENT

ER: Conceptualization, methodology, writing, analysis, and editing.

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