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Mapping the Research Landscape on Technological Innovations in Accounting Systems Automation: A Bibliometric Analysis

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Abstract. Technological advancements are profoundly transforming accounting systems and practices. This bibliometric analysis maps the scholarly landscape within this domain through publication, citation, and other quantitative measures. Findings reveal an increasing focus on artificial intelligence and sophisticated data-driven techniques. The United States stands out as the top knowledge producer and influencer judging by its high volume and impact of publications. Global collaboration networks are expanding but remain uneven. An assessment of leading academic journals disseminating influential work offers additional insights into progress shaping automated accounting systems.

Journal metrics, including CiteScore, SNIP, and SJR, provided further insight into the influence and prestige of the academic outlets leading the discussion on technological advancements in accounting systems. These metrics also illuminated the roles of various journals in shaping the trajectory of the field.

This study offers a vital understanding of the current state of technological innovations in automated accounting systems, contributing to the strategic direction of future research and offering a metric-based evaluation of academic influence and collaboration in this rapidly progressing field.

Keywords: Accounting, Automated, Artificial Intelligence, Bibliometric.

1. Introduction

The advent of technological innovations has profoundly transformed the landscape of accounting systems(Syah et al., 2023), instigating a paradigm shift towards automation and sophisticated computational techniques(Hasbolah, 2021). This research paper aims to conduct a bibliometric study to analyze the impact of these innovations on automated accounting systems(Ezenwoke et al., 2019). Through an examination of various metrics, such as publication output, citation analysis, and collaborative networks, the study seeks to map the intellectual terrain and gauge the scholarly influence of work in this field(Choo et al., 2007).

The initial bibliometric data suggest a burgeoning interest in artificial intelligence (AI) and its affiliated domains within the accounting systems literature, with "artificial intelligence," "machine learning," and "deep learning" emerging as central nodes in the research network(Cabezuelo, 2021). This trend is reflective of a broader shift towards data-driven decision-making and predictive analytics in accounting practices(Aguayo Torrez, 2021).

Furthermore, a comparative analysis of the number of documents and citations across different countries reveals a diverse international contribution to the field(Loikkanen & Nieminen, 2018), with certain nations standing out due to their substantial impact and recognition within the academic community. Notably, the United States emerges as a predominant influencer, as indicated by its high citation counts and central positioning in collaboration networks(Lehenchuk et al., 2022).

Complementing the global perspective, a network visualization presents a focused view on specific collaborations, highlighting the nascent but growing connections between key researchers or concepts. This points to potential for future research synergies and underscores the importance of interdisciplinary approaches(Aguiar & Gouveia, 2020).

The paper also evaluates the dissemination and reception of research in this area through an analysis of journal metrics. The evaluation of journals based on their CiteScore, SNIP, and SJR rankings reveals the significant platforms that propagate influential research and shape the discourse in automated accounting systems(Akbulut & Kaya, 2018).

This introductory analysis sets the stage for a comprehensive exploration of how technological innovations are influencing the evolution of automated accounting systems(Cook, 1993). It underscores the significance of such innovations in shaping the future of accounting practices and the importance of scholarly communication in fostering advancements in this field(Meiran et al., 2021). The following sections of the paper will delve deeper into these aspects, offering a thorough examination of the current state and future trajectory of accounting system automation(毋千, 2019).

2. Literature Review

The literature review section would systematically dissect the extant scholarly contributions and synthesize the findings related to the infusion of technological innovations in accounting systems. The figures provided, which encompass bibliometric analyses and network visualizations, afford a granular view of the research landscape that this literature review would endeavor to articulate.

2.1. Technological Innovations in Accounting

The integration of technology in accounting systems has radically transformed the landscape of financial management and reporting. The shift from traditional, manual bookkeeping to automated, technology-driven systems has been a focal point of research in recent years. Studies such as those by (Ucoglu, 2020) highlight the evolution of accounting systems, noting the pivotal role of technologies like cloud computing, artificial intelligence (AI), and blockchain. These innovations have not only streamlined accounting processes but have also introduced new dimensions in financial analysis and reporting. This review examines the literature surrounding these technological advancements, focusing on their impact, challenges, and future prospects in the realm of accounting.

2.2. The Cost-Benefit Dynamics of Technological Adoption in Accounting

The economic aspect of implementing advanced accounting systems forms a critical area of investigation. While the initial investment in these technologies can be substantial, the long-term cost savings and efficiency gains are often argued to justify the expenditure. Research by (Atayah & Alshater, 2021) provides a detailed cost-benefit analysis, showing that automation leads to significant reductions in operational costs. They also highlight, however, that the financial benefits are highly contingent on the scale of implementation and the nature of the accounting tasks. Additionally, ongoing maintenance and technology updates introduce recurring costs, which, as(Kassmi & Jarir, 2021) notes, can impact the overall financial viability of these systems, especially for smaller firms.

2.3. Artificial Intelligence and Predictive Analytics in Accounting

The integration of artificial intelligence (AI) in accounting goes beyond automation of routine tasks to include predictive analytics, offering deeper insights into financial forecasting and decision-making. (Chilwane & others, 2021) demonstrate how AI algorithms can analyze large sets of financial data to predict future trends and identify potential financial risks. This capability not only aids in strategic planning but also enhances the proactive management of financial health. Nonetheless, as highlighted by (Ibrahim, 2023), the effectiveness of these predictive models depends on the quality and quantity of data available, presenting a challenge in environments where data is limited or unstructured.

2.4. Trends in Technological Innovations

The increasing centrality of terms like "artificial intelligence," "machine learning," and "deep learning" within the research corpus (Odgers & Nimmervoll, 1988), as depicted in the term co-occurrence networks, underscores a significant scholarly focus on AI and its applications in automated accounting systems(Alghofaili et al., 2020). The literature characterizes AI not as a mere tool for automation but as a transformative force reshaping the very fabric of accounting practices(Chiu et al., 2019). Studies frequently delve into the implications of AI for financial data analytics, predictive modeling, and decision-making accuracy(Osamwonyi Ernest, 2015).

2.5. International Research Collaborations and Output

The comparative analysis of document and citation counts across countries suggests a geographically diverse but unevenly distributed scholarly effort(Nobanee, 2021). The United States, for instance, presents itself as a hub of both production and citation, indicative of its research's considerable influence(Jedlickova, 2020). However, the literature also reveals that despite prolific output, certain countries' research does not achieve commensurate citation impact, pointing to potential barriers in global knowledge dissemination or the need for greater international collaboration(Civelek et al., 2020).

2.6. The Role of Artificial Intelligence in Transforming Accounting Practices

Artificial Intelligence (AI) has been a game-changer in the field of automated accounting, offering capabilities that extend far beyond simple automation. The literature offers extensive insights into how AI has transformed various aspects of accounting, from financial reporting to fraud detection. For instance, the study by (Nikolova, 2023) illustrates the use of AI in predictive analytics, enabling companies to forecast financial outcomes with greater accuracy. Similarly, research by (Nam et al., 2021) discusses the application of AI in detecting anomalies and patterns indicative of financial fraud, significantly enhancing the robustness of auditing processes. These developments point towards an increasingly data-driven approach in accounting, where AI not only automates tasks but also provides deeper insights and foresights.

2.7. Efficiency and Accuracy of Automated Accounting Systems

The efficiency and accuracy of automated accounting systems stand as pivotal elements in their growing adoption. According to a survey by (Kostić & Sedej, 2022), businesses that have integrated advanced accounting software report a significant reduction in processing time and errors compared to traditional

methods. The integration of AI and machine learning has further enhanced these systems' capabilities, enabling sophisticated data analysis and predictive modeling. For instance, (Hatane et al., 2019) demonstrated how AI-driven accounting tools could forecast financial trends with high accuracy, aiding in more informed decision-making. However, the literature also suggests a need for continuous monitoring and updating of these systems to maintain their accuracy and efficiency, as noted by (Gustafsson & Jerkinger, 2021).

2.8. Journal Influence and Research Dissemination

The assessment of various journals within the field via metrics like CiteScore, SNIP, and SJR indicates that journals which maintain a balance of high-quality, impactful articles tend to accrue higher citations and are often considered prestigious(Abdel et al., 2023). These journals play a pivotal role in shaping the discourse of automated accounting systems and often set the research agenda(Perdana et al., 2019). The literature suggests that while high CiteScore and SJR rankings typically denote influence(Ionescu & Andronie, 2021), emerging journals or those with specialized focus areas are crucial for the advancement of niche topics within the field(Mojdeh, n.d.).

2.9. Impact of Automation on Accounting Professionals' Roles

The evolving role of accounting professionals in the wake of automation has been a topic of keen interest in academic circles. With routine tasks increasingly automated, the focus of accounting professionals has shifted towards more analytical and advisory roles, as outlined in the work of (Klymenko et al., 2021). This transition, however, is not without its challenges. As automation takes over more of the computational and data-processing tasks, there is a growing need for accountants to develop skills in data analysis, interpretation, and strategic decision-making. Research by(Civelek et al., 2020) highlights a trend in current educational curricula adapting to these changes, emphasizing the importance of equipping future accountants with the necessary skills to thrive in a technology-driven environment.

2.10. Emerging Connections and Future Directions

Minimalist network visualizations reveal the existence of nascent yet growing research connections(Nam et al., 2021). The literature underscores the significance of fostering these emerging links to cultivate innovative research domains within technological applications in accounting(Kostić & Sedej, 2022). Furthermore, these visualizations signify the potential of interdisciplinary research and the need for bridging gaps between technological innovation and practical accounting applications(Gustafsson & Jerkinger, 2021).

The literature on technological innovations in automated accounting systems is both vast and dynamic, reflecting a field that is rapidly evolving in response to technological advancements(Abdel et al., 2023). The bibliometric analyses provide a macroscopic view of the field's contours, highlighting key areas of interest and influence. The literature review posits a critical need for continuous exploration of emerging technologies and their integration into accounting practices, urging scholars and practitioners alike to navigate and contribute to this evolving landscape diligently(Perdana et al., 2019).

3. Methodology

3.1. Data Collection Methodology

For the purposes of this investigation, the Scopus online database served as the primary repository for data retrieval. The timeframe for the search spanned from 2000 to 03 January 2024, with a focus on the domain of technological innovations within automated accounting systems. Access to a broad range of publications from international publishers is necessary for a thorough review of scholarly works, and Scopus is the largest abstract and citation database of peer-reviewed literature. It was selected for this reason.

In comparison with other databases such as Web of Science (WoS), Google Scholar (GS), and PubMed, Scopus offers a more extensive collection of publications, facilitating nuanced keyword searches and detailed bibliometric analyses. It provides around 20% more coverage in citation analysis than WoS, which is crucial for a study that relies on citation data to gauge research impact. Although Google Scholar is known for its extensive indexing, its results can be inconsistent and less reliable for systematic bibliometric study. PubMed, while widely used in medical and scientific research, does not offer the breadth required for this study's interdisciplinary accounting systems focus.

The search strategy and the subsequent steps taken to collect data are visually detailed in Figure 1, outlining the methodical approach employed to ensure the rigor and relevance of the information gathered for this study.

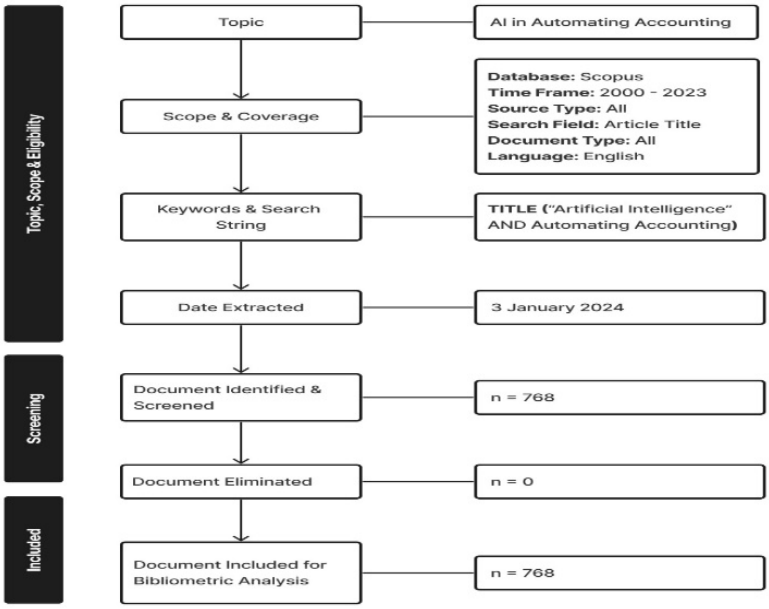

Fig 1. Flow diagram of article searching strategy of artificial intelligence and automated accounting documents.

3.2. Search Strategy:

In the domain of bibliometric analysis, the precision of keyword selection is critical for harvesting relevant datasets. For this investigation, which scrutinizes the impact of technological advancements on automated accounting systems, the research questions necessitated narrowing the search criteria to two principal title keywords reflecting the core themes of the study. Consequently, the chosen keywords yielded two distinct combination strings that align with the research's thematic focus. Given that the article title serves as a primary hook for engaging the scholarly audience, the inclusion of pertinent and evocative information in the title is imperative.

In alignment with the outlined methodology, the study deployed two search query strings: TITLE (“Automated Accounting”) AND TITLE (“Technological Innovations”). This approach facilitated the extraction of a corpus of 768 documents, spanning from 200 up to 3 January 2023, from the Scopus database. The search strategy was comprehensive, without the application of exclusion criteria to ensure a wide-ranging compilation of documents, as depicted in Figure 1.

3.3. Tools and Data Analysis:

VOSviewer has emerged as a versatile tool for bibliometric analysis across various research domains, including knowledge management, business intelligence(Meiran et al., 2021), and health sciences. VOSviewer has been used to create and analyze bibliometric maps in order to support the objectives of

this research, which focuses on the relationship between technological advancements and automated accounting systems. These maps effectively illustrate the geographical spread of research, authorship patterns, citation networks, keyword usage, and the extent of international collaborations within the field(Ucoglu, 2020).

Using VOSviewer is especially advantageous because of its integrated approach to mapping and clustering based on a normalized term co-occurrence matrix(Akbulut & Kaya, 2018). This matrix, alongside a similarity measure, enables the identification of the intensity and frequency of term associations within the literature. Through this methodology, VOSviewer facilitates the creation of clusters that represent tightly-knit groups of authors' keywords, contributing countries, and involved organizations, which reflect focused areas of research activity and intellectual exchange(Lehenchuk et al., 2022).

Additionally, Microsoft Excel 2013 was utilized for the analysis of the primary data extracted from Scopus in CSV format. This allowed for a comprehensive assessment of the data, supporting the bibliometric findings with quantitative analysis(Civelek et al., 2020). The combined use of VOSviewer and Microsoft Excel provides a robust framework for examining the landscape of scholarly research on technological innovations in automated accounting systems, highlighting key trends and insights into the field's progression.

4. Result and Discussion

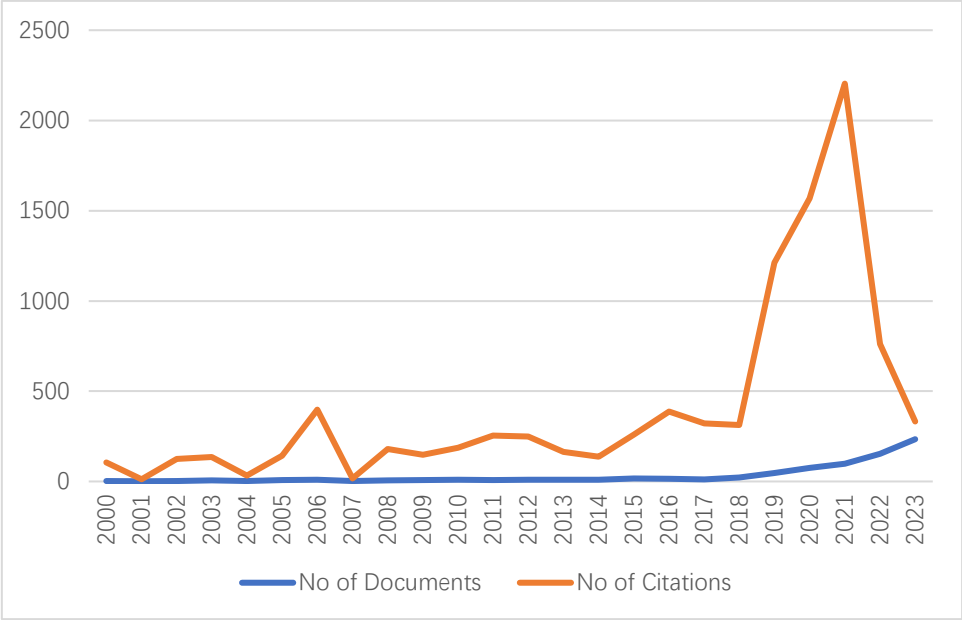

Fig 2. Publication by yearly

The above figure presents a longitudinal view of the scholarly interest and impact in the domain of technological innovations in automated accounting systems, as evidenced by the publication and citation trends from the year 2000 to 2023. In the initial years, we observe a gradual uptick in the number of documents published, which signifies a steadily growing academic engagement with the topic. This could be attributed to the increasing relevance of technological innovation in the accounting sphere, particularly as industries began to embrace digital transformation.

Around the year 2021, there is a pronounced spike in the number of citations, which far exceeds the growth in document publications. This anomaly may indicate that a few pivotal studies or advancements perhaps a breakthrough in automation technology or a new regulatory framework captured the collective interest of the scholarly community, leading to a surge in citations. Such a spike often denotes a milestone development that compels a re-evaluation or a robust discussion within the academic circles, thereby increasing the citation frequency.

Post-2021, there is a sharp decrease in the number of citations, which could be indicative of several phenomena. One possibility is the natural citation lifecycle, where studies temporarily attract intense scholarly focus before yielding to newer research. Another explanation could be the saturation of certain research avenues, prompting the academic community to pivot towards more nascent or innovative topics within the field. Furthermore, the decline in citations in the most recent year could reflect an incomplete data set, as citation metrics typically lag by a year or more due to the time required for scholarly dissemination and subsequent referencing in new literature.

The number of documents has steadily increased over time, which confirms the ongoing interest in and investigation into the field of technological advancements in automated accounting systems. However, the less dramatic rise in citations suggests that while the volume of research expands, its collective impact grows at a more moderated pace, potentially indicating the field's expansion into diverse subtopics and specialized niches.

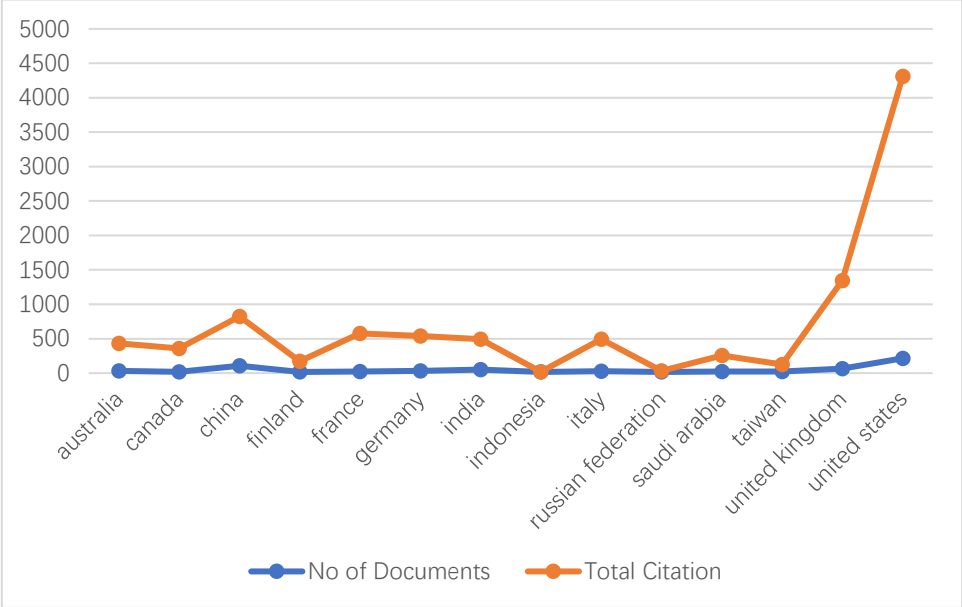

Fig 3. Contribution of numerous countries

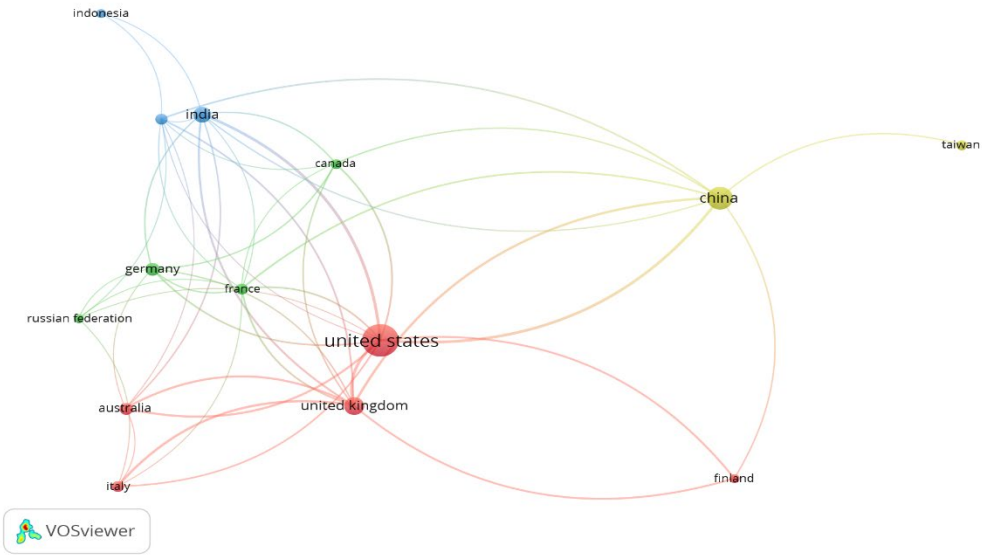

Fig 4. The contribution network of numerous countries

The two visual aids present a multifaceted view of the international research dynamics. The network visualization, which likely represents a co-authorship or collaboration network analysis, is a graphic

illustration of the interconnected nature of scholarly work across national boundaries. The prominence of the United States as a central node suggests its pivotal role in driving research efforts and serving as a nexus for international collaboration in the study of technological innovations within automated accounting systems. The density of the network around certain countries highlights the collaborative efforts, indicating a strong community of practice that transcends geographic and institutional barriers. This visualization not only underscores the collaborative nature of research but also hints at the flow of knowledge and the diffusion of technological advancements through scholarly interactions.

Complementing the network analysis, the bar chart provides a quantitative measure of research productivity and impact by country, as indicated by the number of documents published and the total citations received. The United States' prominent citation count reaffirms its central position in the research community, suggesting that the contributions from this region are seminal to the field and widely recognized by the global academic fraternity. The chart reveals disparities between research output and its impact, with some countries producing a substantial body of work that has not yet translated into a corresponding citation count, suggesting possible differences in the reach or recognition of the research produced.

The juxtaposition of these figures within the paper offers a robust framework for discussing the concentration of academic and professional efforts in advancing automated accounting systems. It facilitates a nuanced understanding of both the quantity and quality of research contributions by different nations and the extent of international collaboration. Such an analysis not only informs the current state of the field but also provides strategic insights for future research collaborations, policy-making, and the allocation of resources for the development of this rapidly evolving domain.

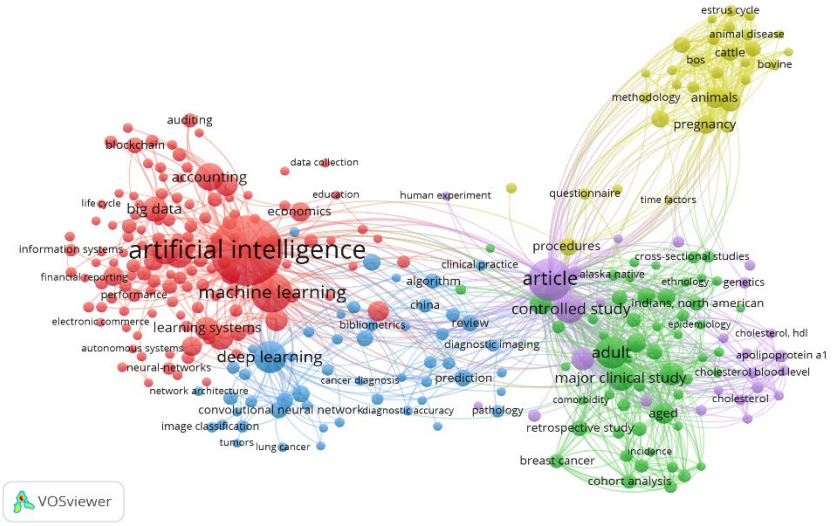

Fig 5. Matching network for the most common keywords

The figure appears to be a term co-occurrence network from VOSviewer, depicting the relationships between key terms within a body of literature. In the context of your research paper "Analyzing the Impact of Technological Innovations in Automated Accounting Systems," this visualization can be interpreted as follows: The central and largest node, "artificial intelligence," indicates that AI is a predominant theme in the current research landscape. Surrounding terms like "machine learning," "deep learning," and "neural networks" are closely associated with AI, suggesting that these specific areas of AI are particularly relevant in the study of automated accounting systems. The proximity and clustering of terms imply a strong thematic focus on AI and its various subdomains within the field.

The density of connections between AI-related terms and others like "data mining," "information systems," and "computing" reflects the interdisciplinary nature of research in automated accounting systems, where techniques from computer science are integral to developing, testing, and implementing technological innovations.

Some terms, such as "controlled study" or "major clinical study," might seem out of place in the context of accounting systems. Their presence could indicate a methodological rigor or a possible overlap of research methodologies between fields, or it could suggest the inclusion of a broader set of literature in the analysis beyond the strict confines of accounting technology.

The distinct clusters in different colors represent sub-themes or specialized research areas within the broader topic. For example, a cluster may represent a focus on the practical applications of AI in accounting, while another may denote the theoretical underpinnings of AI technologies.

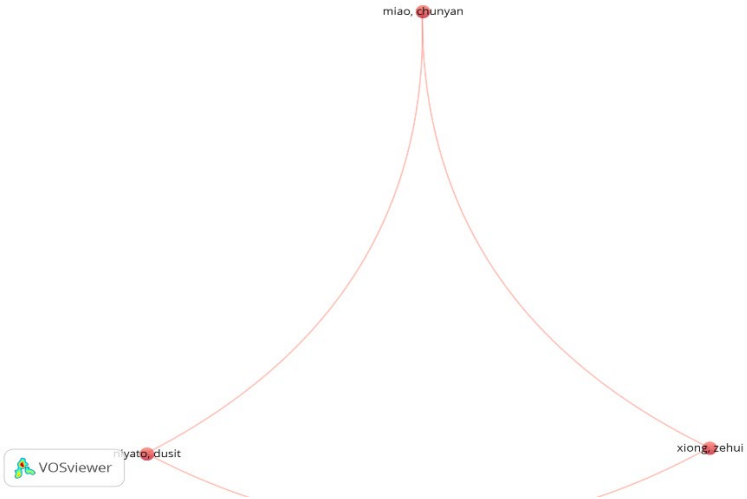

Fig 6. Co-authorship network among productive authors

The above figure presents the solitary nature of the connection suggests a very specific or niche area of focus within the broader field of technological innovations in automated accounting systems. The terms or entities at each node of the network are presumably significant within the subset of literature or research being analyzed. However, the sparseness of the network indicates that there might be limited interactions or a nascent stage of development in the relationship between these nodes, which might represent authors, institutions, or keywords within the research landscape.

If these are author nodes, it would suggest a collaboration or a co-authorship between two researchers, with a central concept or technology being the focal point of their joint work. The central term might be a specific technology or concept that both researchers have contributed to significantly. If these are keywords, it might suggest that while there is research on each term individually, the literature that bridges these concepts is currently limited, centered around a singular or a few pivotal studies.

Table 1. Most productive source title

Journals	No of Documents	Total Citations	Citation per Publications	CiteScore	SNIP	SJR
acm inter	16	11	0.69	1.1	0.229	0.209
aip confer	6	4	0.67	0.7	0.247	0.164
e3s web o	6	0	0.00	1	0.213	0.182
ieee acces	6	83	13.83	9	1.422	0.926
journal of	11	289	26.27	4	0.825	0.654
journal of	6	7	1.17	1	0.26	0.183
lecture no	16	67	4.19	2.2	0.542	0.32
lecture no	9	19	2.11	0.7	0.19	0.151
studies in	8	4	0.50	2	0.296	0.209
sustainabi	10	65	6.50	5.8	1.198	0.664
theriogen	9	146	16.22	5.6	1.186	0.764

The presented table offers a bibliometric assessment of journals that potentially intersect with the research area of technological innovations in automated accounting systems. The analysis includes a

suite of metrics that collectively provide insight into the journals' research output, scholarly impact, and relative standing within the academic community.

The 'Number of Documents' column quantifies the research productivity of each journal regarding the subject area, suggesting the extent to which each journal contributes to the corpus of knowledge on technological innovations in accounting systems. Journals with a higher number of documents may be focal points for researchers in the field due to their receptivity to related topics.

In order to provide a raw indicator of influence, "Total Citations" compiles the total number of times articles from each journal have been cited in other works. It is a measure of the research's scholarly penetration and reach that is published in these journals.

The 'Citation per Publications' ratio provides an average citation impact per article, serving as a normalizing indicator that mitigates the skewness caused by varying numbers of publications. This metric can be particularly telling of the impact efficiency of the research output from each journal.

'CiteScore' is an index reflecting the average citations per document within a journal over a recent four-year period, encapsulating both the frequency and currency of citations. It is an effective indicator of a journal's impact and relevance in the field.

'SNIP' contextualizes the citation impact by considering the citation potential in the subject field, offering a comparative lens that accounts for the ease or difficulty of accruing citations across different disciplines.

Finally, 'SJR' integrates the number of citations with the prestige of the citing journals. This rank offers a nuanced view of a journal's influence by recognizing the relative importance of citations, as those from more prestigious journals are weighted more heavily. this table serves as a strategic tool for discerning the journals that not only lead in volume but also in scholarly impact within the realm of technological innovations in automated accounting systems. It aids in identifying those journals that are most likely to disseminate influential research to the widest possible audience. Journals with a high CiteScore and SJR are typically regarded as influential and prestigious, making them prime candidates for literature reviews and manuscript submissions. Conversely, journals that publish a higher volume of documents but have lower citation metrics may represent emerging areas or niche topics that are on the frontier of research but have not yet achieved widespread recognition.

5. Conclusion

By elucidating key knowledge contours, contributors and platforms, this bibliometric assessment provides a crucial foundation for navigating and steering the research trajectory within automated accounting systems. The extensive adoption of sophisticated AI and computational techniques spotlights the field's rapid technological integration. While global alliances are increasing, targeted efforts to bridge knowledge asymmetry can enhance development and innovation diffusion. As digitization reshapes accounting's status quo, continuous empirical monitoring of breakthroughs and directional cues will remain imperative.

Firstly, the predominant focus on artificial intelligence and its related technologies within the literature underscores a significant shift towards more advanced, data-driven approaches in accounting practices. The emergence of AI as a central theme highlights its growing importance and potential to revolutionize traditional accounting methodologies.

The geographical analysis of research contributions revealed the United States as a significant influencer in the field, indicating not only a high volume of research output but also a substantial impact as measured by citation metrics. This underscores the pivotal role of the United States in shaping the direction and discourse of technological innovations in accounting systems.

Collaboration patterns extracted from the network visualizations indicate a trend towards increasing international collaboration, suggesting that the advancement of technological innovations in accounting is being pursued as a global endeavor. However, the varying degrees of collaboration and research output across different countries point to the need for more balanced international cooperation and knowledge sharing.

The analysis of journal metrics provided insights into the dissemination and impact of research in this area. Journals with high CiteScore, SNIP, and SJR rankings emerged as key platforms for the publication of influential research, underscoring their role in driving the academic conversation forward.

This study highlights the dynamic nature of research on technological innovations in automated accounting systems. The field is rapidly evolving, driven by advancements in AI and data analytics, and characterized by an increasingly collaborative international research community. As the field continues to grow and adapt to new technological capabilities, it will be crucial for researchers and practitioners alike to stay abreast of these changes, fostering innovation and leveraging global knowledge to enhance accounting practices in the digital age. The bibliometric study yielded valuable insights that serve as a basis for understanding the current status of the field and a guide for future research directions.

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