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Dynamics of Research in Public Audit: A Bibliometric Evaluation

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ABSTRACT

The Wirecard AG case in Germany emerges as a highly relevant and in-depth example for exploration within the context of public audit. By evaluating the work that has been done, this study identifies gaps in the existing literature and provides recommendations for research areas that need further deepening. This research uses the Scopus database with 31 articles and uses the VOSviewer application to analyze them. The integration of technology, especially blockchain, into auditing practices is a focal point, enhancing efficiency and security, with the overall research landscape characterized by robust international collaboration and innovation.

Keywords:
Public Audit, Technology, Audit

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INTRODUCTION\

The Wirecard AG case in Germany emerged as a highly relevant and in-depth example for exploration within the context of public audit. Wirecard, a payment and financial technology company, experienced a significant financial scandal in 2020, where it was revealed that 1.9 billion euros from their balance sheet were unaccounted for. This incident triggered widespread discussion about the role of auditors, in this case Ernst & Young (EY), who had provided unqualified audit opinions for years before the shortfall was exposed (Storbeck et al., 2022).

Public auditing, as a vital mechanism for enhancing transparency and accountability in public financial management, has seen significant developments in academic literature. The bibliometric approach allows researchers to assess the breadth and depth of the topics discussed as well as the emerging trends, providing useful insights to guide future research in this field (Porter & Rafols, 2009).

The main focus of this analysis is to uncover how topics such as regulation, effectiveness, and ethics in public auditing have evolved over time. Financial scandals like the Wirecard case have attracted global attention and highlighted the need for a deeper understanding of the auditor's role in dealing with increasing financial complexities (Bischof et al., 2020; Coffee, 2020). However, in the mid-20th century, scientists began exploring new approaches to building intelligent devices. Based on discoveries in neuroscience and the development of cybernetics through the invention of the computer, they developed devices that could mimic the human computational thinking process (Goertzel, 2013).

Furthermore, this research also includes an analysis of the academic community's response to changes in audit policies and regulations, given the rapid dynamics in financial regulation affecting audit practices (Ball, 2009). In the era of digitization, the use of digital technology is increasingly growing day by day in all aspects of life, especially in the business sector as economic units today find themselves facing the inevitability of keeping pace with this change and the necessity of digital transformation of their businesses (IMF, 2018).

By evaluating the work that has been done, this study identifies gaps in the existing literature and provides recommendations for research areas that need further deepening. The results of this bibliometric evaluation are expected not only to enhance understanding of public auditing but also to support the development of technologies that can be used in more effective and responsive audit practices to meet current and future challenges.

LITERATURE REVIEW

Public Audit

Public audit is a complex and diverse concept, referring to a variety of different practices depending on the applicable context and regulations; thus, the purpose of this section is to provide conceptual lenses and a general perspective on public audit by defining its "what and why", "when and how", and "where and who". This is done as a method to organize explanations about the papers to be discussed further (Ferry et al., 2022). Initially, the discussion will focus on the essence of public audit and the reasons for its necessity, positioning it within a framework that includes public accountability and public interest. Next, the appropriate timing for conducting an audit and how the processes of policies, procedures, and practices should be implemented will be explored. Lastly, the location of the audit execution and the individual or entity responsible for carrying it out will be discussed.

RESEARCH METHODS

The first stage in conducting research with bibliometric analysis methods is choosing the database with the best reputation. The database used in this study is a Scopus-indexed article, where articles successfully published in Scopus are recognized by researchers globally (Caviggioli & Ughetto, 2019). for the initial search using clear and precise keywords (Le & Nguyen, 2023). After using the right keywords, focus the keyword search in the title only to limit a broader search for unrelated articles (Niñerola et al., 2019). The initial range of this research article source search was from 2015 to 2023, with 59 articles.

The screening process of the research sample was followed by selecting directly relevant articles on public audit. The criteria recovered were (1) in the form of articles and (2) in English. The final

result was that out of 31 articles, 18 were left, manually selected, and tabulated. The final article was downloaded in RIS form and then analyzed with VOSviewer.

An increase in the literature on public audit using bibliometrics helps audit public research in gathering information, evaluating research performance, and providing more in-depth knowledge based on evidence obtained from analyzing previous research publications (Ahmad et al., 2023). The performance analysis techniques used in this study include total publications, total publications by source, countries with the most publications, total affiliations, and total funding related to forecasting techniques on stock prices. Using the VOSviewer application, this study examines the occurrence of co-occurrences by utilizing scientific maps. In particular, quantitative indices reflect the importance of structural indices in the degree of relevance to the research topic (Durieux & Gevenois, 2010). The VOSviewer application was used to graphically analyze the keyword representation on two types of bibliometric maps (Le & Nguyen, 2023).

RESULTS AND DISCUSSION

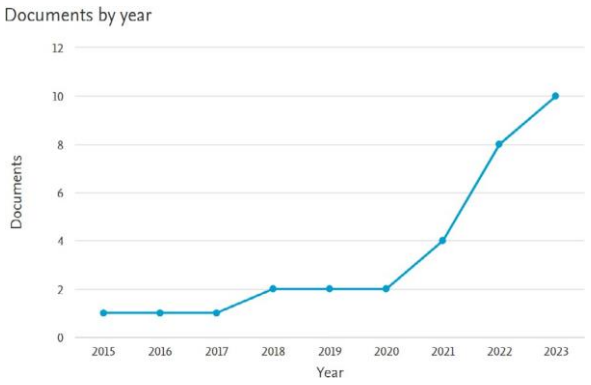

Figure 1. Documents per year

In figure 1 shows the trend of increasing numbers of documents from 2015 to 2023. In 2015, there was only one document, and this number remained stable until 2017. Starting from 2018, there was a significant increase in the number of documents each year. In 2018 and 2019, the number of documents increased to about two or three. Then, the increase became steeper starting from 2020, reaching about four documents, and continued to increase until it peaked at around eleven documents in 2023. This graph illustrates a consistent and significant increase in the number of documents over the period, indicating increased activity or interest in the topics related to these documents year by year.

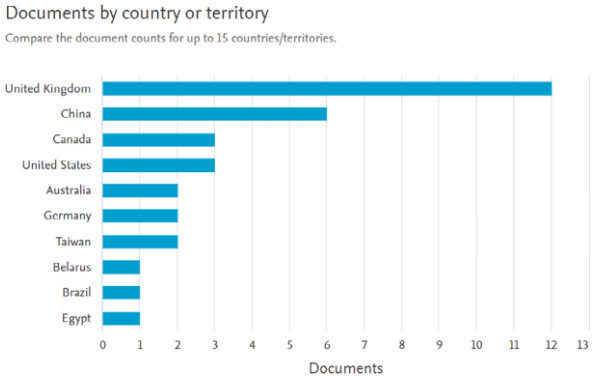

Figure 2. Documents by Country

In figure 2, compares the number of documents by country or region, covering up to 15 locations. China and the United Kingdom stand out as the countries with the highest number of documents, each having around 13 documents. Canada and the United States also show significant numbers, each with about 10 documents. Australia follows with about 8 documents. Germany and Taiwan have lower numbers, about 5 and 4 documents respectively. Belarus, Brazil, and Egypt have even fewer documents, each below three documents. This graph provides a clear visual representation of how document distribution varies among these countries, showing the dominance of some countries in the context discussed in the documents.

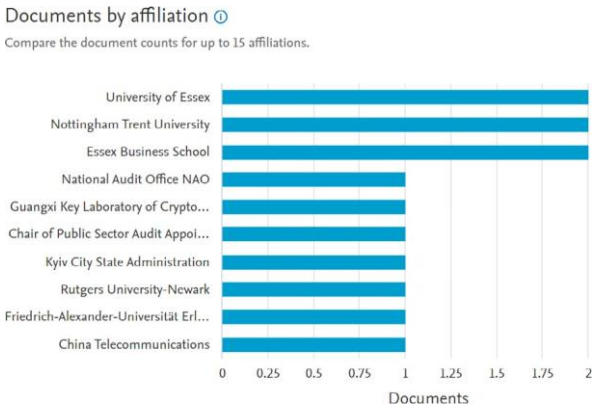

Figure 3. Document by Affiliation

This graph displays a comparison of the number of documents by affiliation, covering up to 15 different affiliations. The University of Essex

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stands out as the affiliation with the most documents, slightly above 2 documents. Nottingham Trent University follows with nearly the same amount. Essex Business School and the National Audit Office NAO, Guangxi Key Laboratory of Cryptography, Kyiv City State Administration, Friedrich-Alexander-Universität Erlangen-Nürnberg, and China Telecommunications has the lowest number of documents in this graph, just 1 documents each journal. This graph provides a visual view of the distribution of publication activities or related activities across various affiliations, showing significant variation in contributions from each affiliation.

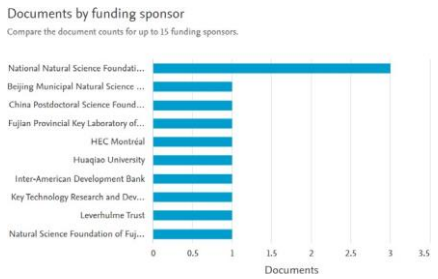

Figure 4. Documents by Funding Sponsor

This bar graph compares the number of documents funded by up to 15 different funding sponsors. The National Natural Science Foundation of China stands out with the highest number of documents, more than 3 documents. Beijing Municipal Natural Science Foundation, Fujian Provincial Key Laboratory of Network Laboratory and Cryptography, HEC Montréal, Inter-American Development Bank, Key Technology Research and Development Program of Shandong, and Natural Science Foundation of Fujian Province each have smaller contributions only 1 documents. This graph provides a clear view of various levels of funding support for publications or research projects by different institutions or programs, showing the dominance of some agencies in supporting research and development activities.

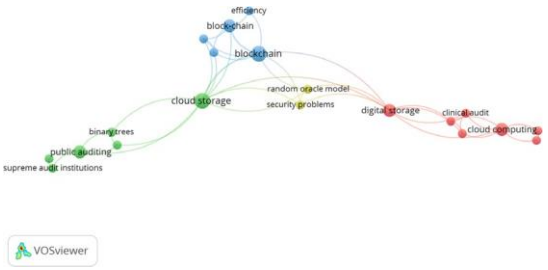

Figure 5. Keyword co-occurences

This network visualization illustrates the interconnections between various technology concepts, which are divided into three different color clusters, each highlighting a different thematic focus. The green cluster centers on ‘cloud storage’, which is closely associated with ‘blockchain’ and ‘cloud services’, indicating that discussions or research in this area explore the integration of blockchain technology to enhance the security and efficiency of cloud-based data storage. Additionally, there are also connections to ‘data privacy’, indicating concerns about privacy and data security in the use of cloud services.

The blue cluster focuses on ‘supreme audit institutions’, suggesting a study on how these top audit institutions interact with or audit these new technologies, possibly from a compliance or operational effectiveness perspective.

The red cluster concentrates on ‘cloud computing’ and ‘cloud outsourcing’, focusing on the strategies and implications of outsourcing IT infrastructure to cloud service providers. The concept of ‘digital edge’ also appears in this cluster, which might relate to the management of distributed or edge network computing resources. Each cluster represents a different dimension of modern technology dialogue, from security and privacy to audits and outsourcing, underscoring the importance of understanding these technologies in a broader and more varied context.

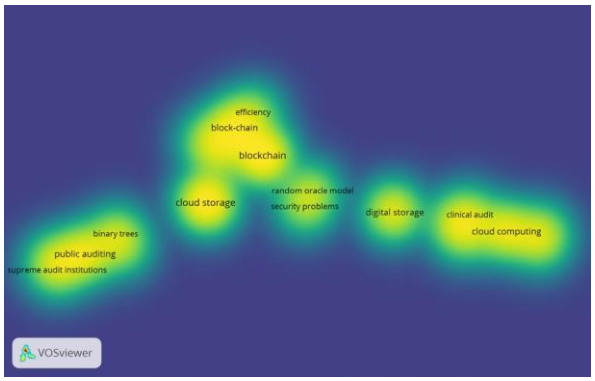

Figure 6. Key Visual Dentity

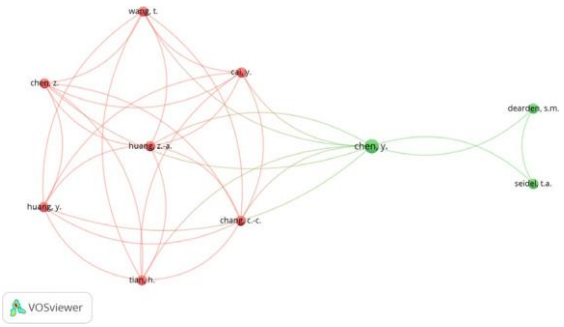

Figure 7. Co-autorship

This visualization uses a heatmap to show the intensity and relationships between various technology and audit concepts. Areas with brighter color intensity indicate a denser relationship or higher frequency of discussion between these topics.

In the center of the visualization, 'blockchain' stands out as the gravitational center with close relationships to 'efficiency' and 'cloud storage', indicating that blockchain is often associated with efficiency improvements and its applications in cloud-based data storage. This relationship highlights a strong focus on how blockchain technology can refine and secure data storage. On the right side, we see 'cloud computing' adjacent to 'clinical audit' and 'digital storage', depicting discussions focused on the application of cloud computing in clinical audits and digital data storage. This illustrates the practical application of cloud computing in more specific and measurable contexts.

The left side emphasizes audits with the presence of 'public keys', 'supreme audit institutions', and 'binary trees', which may relate to the methods and data structures used in audit processes, particularly those related to security and compliance in technology systems.

Overall, this visualization offers insights into how various technology and audit concepts are interconnected, with some becoming centers of broader discussion and application, while others are more specific to certain uses or implementations. The gradated colors add visual depth and help users identify key areas that receive the most attention in research or practical applications.

This network visualization depicts the co-authorship relationships between various researchers or institutions, divided into two main clusters indicated by two different colors: red and green. The red cluster depicts a larger and more connected group, indicating intense collaboration among individuals or entities within it. Researchers or institutions marked as "Huang, z.a" appear as the center of this cluster, suggesting that they may be key players in this research network, with many connections to other researchers such as "Huang, Y", "Chang GC", and "Cai, Y". These connections are indicated by the numerous red lines connecting these nodes, showing frequent collaboration or co-authorship among them.

Meanwhile, the green cluster consists of three entities that appear to have a more exclusive and focused relationship, with "dearden, s.m" at the center. Collaboration within this green cluster may indicate specialization in a different topic or research area from the red cluster, or it might indicate a sub-group within a larger research network focused on a specific area.

Overall, this visualization illustrates how collaboration and working relationships are formed among various researchers or institutions, with some becoming more central and widely connected, while others form smaller, more concentrated groups. This helps understand the dynamics of scientific cooperation and how knowledge and collective efforts are distributed within the academic community.

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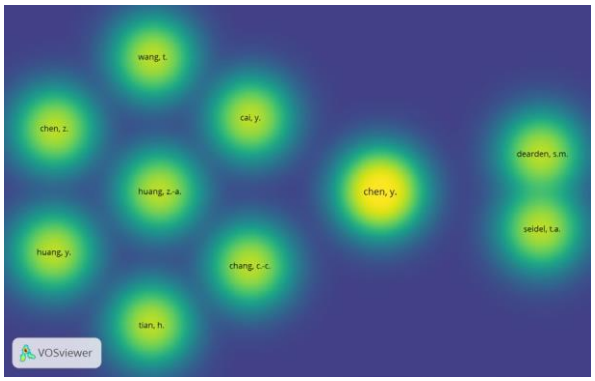

Figure 8. Co-Author Visual Dentity

This visualization uses a heatmap to show the density of co-authorship among a group of researchers, represented by the intensity and distribution of blue and green colors. Brighter colors indicate areas with higher density of relationships among researchers, indicating more frequent collaboration or joint publications.

In the center of the map, "Huang z.a." and "Chang G.C." are located in a high-density area, surrounded by bright green colors, indicating that they are the center of intense collaboration in this network. This collaboration may reflect that they have a central role in the research represented or that they are leaders in that research group.

On the other hand, researchers such as "Wang T." and "Tan H." are located on the edges of the map with slightly darker colors, indicating that they are involved in collaboration but with a lower frequency compared to researchers at the center of the network. Researchers like "Dearden s.m." and "Seidel t.a" are also located in areas with lower density, which could indicate that they are involved in smaller sub-networks or may be new to this network.

Overall, this heatmap provides insights into how cooperation and relationships among researchers are distributed in this network. Brighter colors indicate zones with higher collaborative activity, while darker colors indicate areas with less collaboration, providing a visual representation of engagement and influence patterns within the research network.

CONCLUSION

The bibliometric analysis represented by Figure 1 indicates a steady upward trend in the volume of publications from 2015 to 2023, signaling a growth in interest and research activities in the field of public auditing. Figure 2 reveals that countries such as China and the United Kingdom contribute significantly to the public auditing literature, with substantial publications reflecting the potential presence of leading research centers or a strong emphasis on public auditing research in these regions.

Figure 3 highlights the significant roles of the University of Essex and Nottingham Trent University as institutions with substantial publication outputs, indicating their strengths in audit research or strong institutional support for this field. From a funding perspective, as shown in Figure 4, institutions like the National Natural Science Foundation of China dominate public audit research funding, affirming the importance of funding sources in facilitating and directing research in this area.

As for the keyword co-occurrences illustrated in Figure 5, there is a clear interconnection between concepts in auditing and technology such as 'cloud storage' and 'blockchain', indicating a research focus on utilizing technology to improve efficiency and security in audit practices. Figure 6, using a heatmap, depicts the relationships between technology and audit concepts, with 'blockchain' as a prominent discussion center, emphasizing the importance of this technology in audit practice innovation.

Co-authorship depicted in Figures 7 and 8 shows collaboration patterns among researchers, with some individuals and groups emerging as central figures in the public audit research network. This highlights the importance of collaboration and knowledge exchange in advancing understanding and methodologies in auditing.

The conclusion in this research is to provide the trends and networks in public audit research, underscoring the importance of technology integration, international cooperation, and funding support in advancing the understanding and practices in public auditing.

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