

CRITICAL ISSUES ON AUDITS IN THE PUBLIC SECTOR: A SYSTEMATIC REVIEW AND BIBLIOMETRIC ANALYSIS

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Abstract

This study is a comprehensive systematic review and bibliometric analysis of audit research in the public sector, focusing on publications from 2010 to 2024. By the PRISMA approach, the research then examines 902 articles from Web of Science and Scopus databases to identify critical issues, methodological trends, and emerging themes in public sector auditing. The analysis then visualized by Python and Matlab apps reveals a significant shift towards sustainability, corporate social responsibility, and governance in audit research, with these topics garnering the highest citation counts. Content analysis, surveys, and case studies emerge as the dominant research methodologies. This study discovered and identified relevant research clusters, including auditing and CSR, sustainability reporting, and public sector accounting. Emerging important issues include the impact of technical improvements on audit methods, the incorporation of Environmental, Social, and Governance (ESG) considerations into auditing frameworks, and the difficulties in maintaining auditor independence and objectivity. This study identifies possible gaps in audit areas such as auditing cybersecurity, cultural influences on global audit procedures, and the adaptation of audit methodology to emergencies like the COVID-19 epidemic. This review adds to the field by synthesizing current knowledge, identifying research trends, and proposing future directions for audit research in the public sector, emphasizing the need of interdisciplinary methods to addressing complex difficulties in modern auditing procedures.

Keywords: Public sector auditing, Sustainability reporting, Bibliometric analysis, Systematic review, Audit quality, Technological advancements, Environmental Social and Governance (ESG)

1. Background of Study

According to the Global Reporting Initiative (2016), audits are crucial in the public sector especially in the evaluation of results to enforce accountability, transparency, and effectiveness. Audit also considered as an essential component of governance that offer guarantee to citizens on proper and legal use of public funds (Power, 2003). Audit not simply reports the financial performance of an organization, but also delves into how an organization utilises its resources, affects the natural world and the wellbeing of society at large (Eccles & Serafeim, 2013). Such disclosure can enhance public confidence and, hence, the reputation of the organisation (Adams, 2015). As governments deliver better services and strive to get value for money, there has been a growing emphasis on issues of audit in the past decades (INTOSAI, 2019). This pressure extends from a numerous influence for instance, financial constraints, increasing client demands, and the ability to solve recurrent social issues like climate change and social injustice (Guthrie & Parker, 2016).

Nevertheless, problems that audit research in the public sector encounters question several significant critical concerns. First of all, it makes sense to notice that the fact of having evolution as the characteristic of the transformation strategies can be considered both as the advantage and pulling-out factor. Risk-based auditing and continuous auditing and data analysis have become integrated or are replacing traditional audit techniques, which has led to the emergence of new auditors' qualification and competence requirements (Kpmg, 2008, Vasarhelyi et al., 2012). Second, creation of technologies like artificial intelligence and blockchain is altering the nature of the audit differentiations for data analysis and fraud

identification, on one hand, and creating fresh risks and ethical complexities on the other hand (Appelbaum et al., 2017). Thirdly, alterations in the expectations of various stakeholders are shifting auditors from their traditional role of verifying only financial data and legal compliance, to measuring value for money, sustainability, and future impact of public policies and programs (Reichborn-Kjennerud et al., 2019).

The public sector audits are divided into several types, and each of them has its peculiar topics and strategies. Personnel audits focus on the aspects relevant to the target employee; and financial audits look into the appropriateness, accuracy and reliability of the financial accounts to properly accountable for public money (Hay & Cordery, 2018). Performance audits aim at evaluating economy, efficiency and effectiveness of operations which in this case is the government, consequently improving public service provision [World Bank, (2016), Lonsdale et al., (2011)]. Cooper and Olekalns (2009) argue that compliance audits confirm that written and enforced rules of laws, regulations, and ethical standards are met in order to maintain public confidence. New types of sustainability audits have recently emerged assessing the ESG credentials of public sector bodies [see Elkington, (1997); Adams et al., (2014)].

Both scholars and practitioners face rich opportunities and risks associated with each form of audit. For instance, in the case of performance audits, one must delineate strict parameters of evaluating public value, which might be a challenging and a contextual undertaking (Ferry & Ahrens, 2017). Sustainability audit must measure and communicate about qualitative impacts and future performance (O'Dwyer & Unerman, 2020). However, the implementation of combined use of different audit types to give a multi-faceted result on public sector performance is still an area of focus in research and more discussions (Cordery & Hay, 2019).

Given the ongoing development of public sector auditing, the investigation and summarization of current audit research would be useful for future work. This evaluation may help to integrate research projects with real-world requirements, inform policy choices, and ultimately help raise the efficiency and effectiveness of public sector audits. Furthermore, the present review can shed light on the relationships between the fields, the new methodologies that are developed and new trends which may influence the progress of audit research and practice in the public sector in the coming years (Dumay et al., 2016).

Therefore, this study seeks to fill this gap by conducting a systematic review and bibliometric analysis of audit research in the public sector. Specifically, our objectives are to: (i) Identify and analyze critical issues in public sector audit research (ii) Examine methodological trends and theoretical frameworks employed in the field. (iii) Evaluate the impact of technological advancements on audit practices and research.

With reference to current literature and the exploration of new patterns, this research study will generate relevant knowledge for scholars, decision makers, and auditors. It will identify domains that require more investigation and present recommendations on how to build up the audit research field in the public sector. The format of the paper is as follows: First, this study gives a proper state of the art that focuses on the current theoretical underpinnings, research methodologies and concerns in public sector auditing. The contexts of this study are then discussed for the bibliometric analysis and systematic review. Then, the study provides findings and discuss the implications. Finally, recommendations for future research and analysis of public sector auditing are presented.

2. State of the Art

Public sector audits, therefore, have expanded in meaning and now refer to; financial, performance, compliance, and sustainability audits. They help provide accountability,

transparency and good governance throughout the public organisations (Power, 2003; Reichborn-Kjennerud et al., 2019).

Transparency and reliability of financial statements are the concern of financial audits which remain crucial. On the other hand, performance audits which evaluate the economy, efficiency, and effectiveness of public programs are becoming increasingly relevant (Johnsen et al., 2019). Sustainability audits assess ESG and Governance, Risk, and Compliance (GRC) audits check for compliance, they also have differences sometimes they are used interchangeably (Mozaffar, Alon, & Van Landeghem, 2019). Some issues in public sector audit are: i) Independence and objectivity: Maintaining auditor independence in a politically sensitive context is one of the key concerns in public sector audit research (Radcliffe, 2008). (ii) Impact evaluation, measuring the actual impact of audit on public sector accountability and performance (Reichborn-Kjennerud & Johnsen, 2018). (iii) Integration of technology into the audit process to use and adapt emerging technologies such as blockchain and artificial intelligence (Appelbaum et al., 2017). (iv) Stakeholder engagement in audit reporting to balance the requirements and expectations of multiple stakeholders (Ferry & Ahrens, 2017). (v) The difficulty of developing a standardized framework across different audit types and countries (Cordery & Hay, 2019).

Bibliometric analysis demonstrates the emergence of interest in performance and sustainability audit of not only purely financial nature. At the present time, it is possible to identify a trend towards interdisciplinary Auditing in conjunction with such areas as Public Administration, Information Systems and Environmental Science. Some of the methodological approaches done in systematic reviews in this area includes the content analysis of audit reports, survey of the auditors and auditees as well as the case studies of the audit experience (Hay & Cordery, 2018). However, few contemporary audit studies consistently examine the long-term impacts of such an element on public sector governance.

It is required a comprehensive theoretical framework for public sector auditing, as recent research such as Jacobs (2012), Funnell et al., (2016) emphasizes the need to go beyond agency theory and include stakeholder and institutional theories. Furthermore, there is increasing interest in the ways that audits in public institutions can spur organizational learning and innovation (Reichborn-Kjennerud, 2014). Another area where further research work will be needed is understanding the role of audits in crisis response level, for example, managing a pandemic, the impact of digitalization of audit processes, and integrated reporting in Public Sector (Grossi et al., 2020). It will be essential if public sector auditing wants to advance and strengthen its role in good governance to resolve these pressing problems and knowledge gaps

3. Research Methodology

This research employs both the systematic literature review and bibliometric analysis to conduct a fuller investigation into the landscape of audits research in the public sector. The use of both qualitative and quantitative research type enables the designer to get a better understanding of the research problem than would be the case if only one of the research types was used. These methodologies enable for an in-depth exploration of existing literature, identification of key trends, and assessment of research gaps, they might help to make the research process as rigorous, transparent and replicable as possible. Here's how each component contributes to the study:

- PRISMA review approach

An originally developed for healthcare and medical research, PRISMA has been adapted for use in a variety of fields, including environmental sciences, social sciences, and public

policy. The protocol's emphasis on detailed reporting and a standardized process makes it an invaluable tool for ensuring high-quality systematic reviews (Moher et al., 2009). PRISMA is particularly suitable for disciplines that require a meticulous approach to synthesizing existing literature, including economics and public policy. Unlike other protocols, such as the ROSES (Reporting Standards for Systematic Evidence Synthesis), PRISMA primarily focuses on the internal validity of studies, making it ideal for fields where ensuring the accuracy and reliability of findings is crucial. However, as noted by Estoque et al. (2019), PRISMA can sometimes be less adaptable to non-health fields due to its traditional focus and the absence of guidelines for newer methodologies, such as systematic maps.

Clearly defined research questions are the first step in the PRISMA protocol and serve as a roadmap for the full systematic review procedure. A thorough literature search that involves the crucial processes of identification, screening, eligibility, and inclusion comes next. Using relevant databases and precise keywords and search queries, researchers first find pertinent studies. To make sure that only the most pertinent and excellent studies are taken into consideration, the selected papers are then screened using predetermined inclusion and exclusion criteria.

This study decided to follow PRISMA guidelines as a way of ensuring the highest level of transparency, reproducibility, and methodological rigor so important in any systematic review. This study applied PRISMA because it is a standardized way to provide better comparability with other reviews on sustainability audits and public sector governance. Sustainability audits often involve complex, multidisciplinary data and diverse methodologies, making systematic reviews in this field challenging. PRISMA's structured approach helps in organizing and synthesizing this diverse information effectively.

Furthermore, there is also an active trend in the further progression of sustainability auditing, as there constantly appear new approaches and models. What distinguishes PRISMA is on identifying accurate techniques of searching and appropriate eligibility criteria; this ensures that the obtained review readily incorporates the latest and relevant studies in a subtopic that constantly develops. The standards also facilitate identification of the areas of the lack of literature on sustainability audits, which is essential for enhancing the published knowledge and practice in this area. By conducting the study within the standards of PRISMA, this study contributes to enhance the soundness of evidence in sustainability audits to offer improved uniformity for the future development of research about public sector governance and taxation as well as policy and practice.

- **Research Question Formulation**

Developing research questions for this study is critical to generating appropriate inquiries for investigation. Therefore, the objectives of this study are to examine how sustainability audits in the public sector affect taxation policies and governance practices. Starting with this main objective, the present study examines the relevant literature to identify general research topics through a set of research questions (RQs) that are stated as follows:

- What are the current practices and methodologies used in audit research within the public sector?
- What trends and patterns emerge from the bibliometric analysis of audit literature in the public sector?
- What potential future research can be identified based on the existing literature?

- **Systematic Search Strategies**

The initial stage in conducting this systematic search was to identify, concepts, synonyms, and variations for the primary keywords correlated to audits in the public sector. Previous

literature, an online thesaurus, and the keywords search function available in Scopus were used to broaden the set of keywords. A comprehensive online search was undertaken in three stages: identification, screening, and eligibility (Shaffril et al., 2020) to collect journal articles published between January 2010 and December 2024 using four databases: Web of Science, Scopus, and Google Scholar (see Table 1).

The Web of Science and Scopus databases have been selected as the main databases because they are preferable for SRs in scholarly academia. Some of these databases have enhanced searching capabilities, better articles quality, multidisciplinary approach and are comprehensive; covering over 5000 publishers (Shaffril et al, 2020).

Table 1. Systematic Search Strategies

Database	Search Strategy	Justification
Web of Science	Topic search using the primary search string	Comprehensive coverage of high-impact, peer-reviewed journals across multiple disciplines
Scopus	Title-Abstract-Keyword search using the primary search string	Extensive coverage of peer-reviewed literature, including strong representation of European and Asian publications

Based on the emission of keywords drawn from the general research questions developed in the protocol phase (Okoli, 2015), the publications were obtained and marked in the list displayed by the selected databases. The initial screening process from the databases was undertaken simultaneously by limiting publications to the following criteria: Originally, criteria used to select the articles were as follows: (i) to have been published in between 2010 and 2024, (ii) to be in English, and (iii) to include only full papers in peer-reviewed journals. In the search of journals, this study employed a variety of terms connected with Boolean operators of AND and OR in constructing the search inquiries. The primary search string was structured as follows:

Table 2. Key search string of database

Database	String (TITLE-ABS-KEY)	Result
Scopus	“(TITLE-ABS-KEY (issues) AND TITLE-ABS-KEY (auditing) OR TITLE-ABS-KEY (reporting) OR TITLE-ABS-KEY (assessment) AND TITLE-ABS-KEY (public AND sector) OR TITLE-ABS-KEY (government)	198 articles
Web of Science	issues (All Fields) AND auditing (All Fields) OR reporting (All Fields) OR assessment (All Fields) AND public sector (All Fields) OR government (All Fields)	183 Articles

This research employed an automated screening process for 902 articles using database sorting functions, with selection criteria aligned to the research question as recommended by Kitchenham and Charters (2007). Given the impracticality of reviewing all published works, Okoli (2015) advises researchers to establish a manageable time frame. Our database search revealed a significant increase in public sector audit studies from 2010 onwards. The decision to focus on literature from 2010 was informed by the aftermath of the 2008 global financial crisis, which triggered substantial changes in the auditing landscape. These changes encompassed major regulatory reforms such as the Dodd-Frank Act, technological

innovations, and evolving business practices. By concentrating on post-2010 research, this study captures these transformative shifts and their consequences, thereby ensuring the inclusion of the most current and pertinent insights in auditing practice and scholarship.

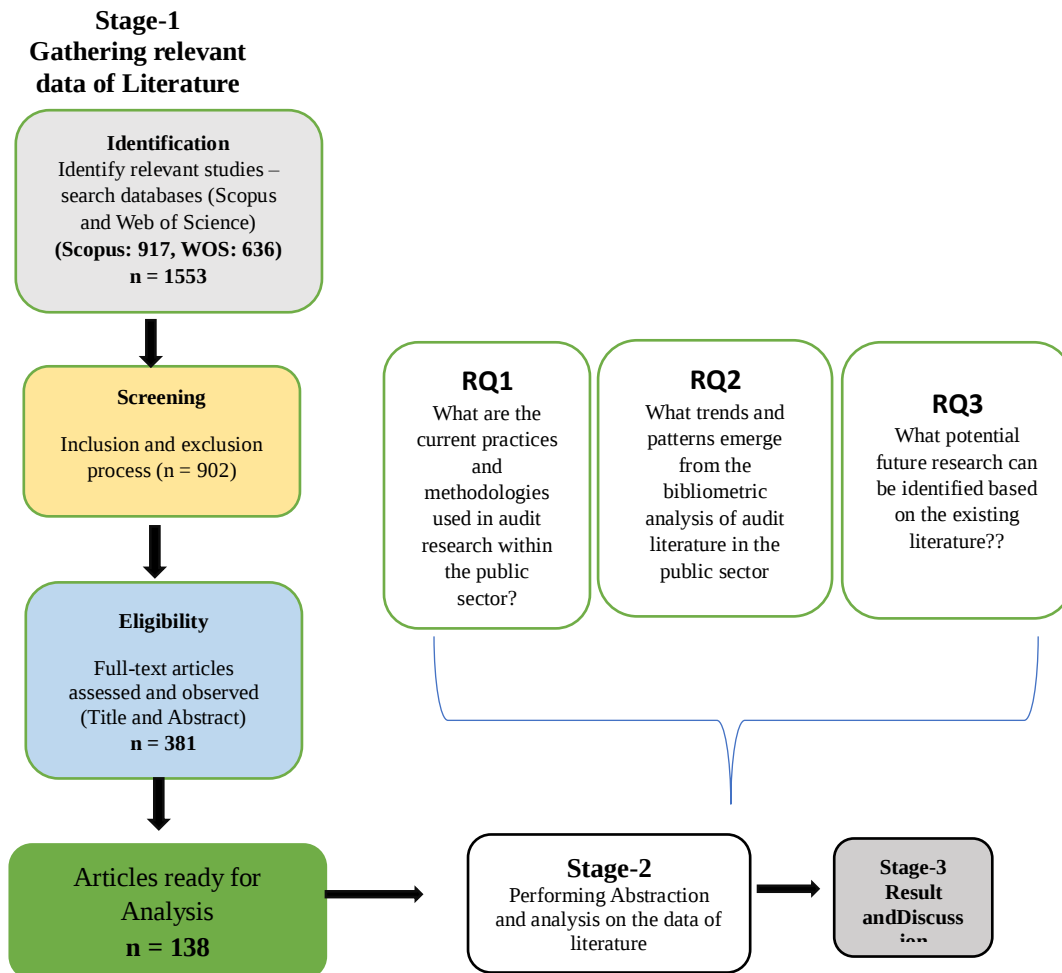


Figure 1. Flow Diagram of Systematic Search Strategies

Table 3. Main Information of Data

Metric Description (Main information about data)	Result (2010-2024)	
	Scopus	WOS
Source (Journal)	917	636
Document	198	183
Annual growth rate %	35.92%	35.92%.
Document average age	5.99	4.74
Average Citations per document	25.75	25.18
Average Citations per year per document	4.3	4.7
Total citation	50.98	45.78
Unique author	198	685
Author Appearances:	541	735
Authors per Document	2.73	3.99

4. Finding and Discussion

4.1. Top 20 Keywords trend in Audit research

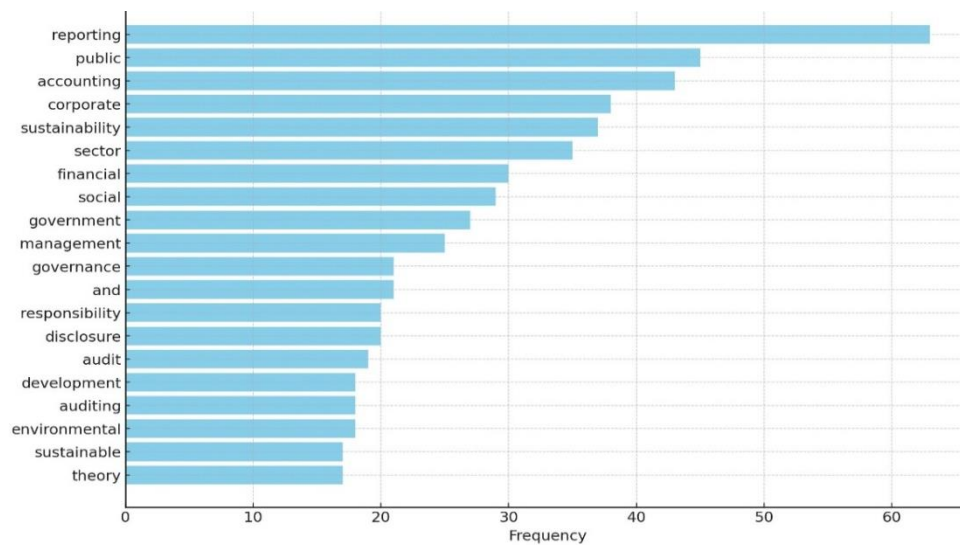
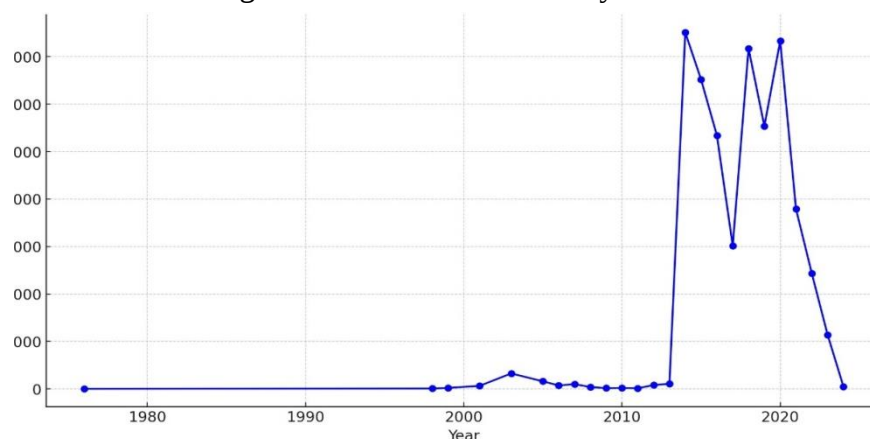


Figure 2. To 20 Keywords trends

Figure 2 reveals that there is a great dynamism in the flow of auditing research, which means that over time, there is the emergence of new trends and issues. The growth in literature on sustainability (37 articles with total citations of 841), governance (21 articles with total citations of 542), responsibility (20 articles with total citations of 1833), environmental (18 articles with total citations of 361) issues shows that audit has evolved beyond the financial analysis. This trend is close to the increasing need for the multi-criteria performance assessments of the public sector organizations, including economic, social, and environmental results. According to Brusca, I., Labrador, M., and Larran, M. in 2018, which state the following: The emerging matters that concentrate on sustainability, governance, responsibility, and environment also indicate the increasing pressure from stakeholders based on greater expectations regarding companies' responsible and transparent behavior [Mio, C., Fasan, M., & Costantini, A., (2020) Eccles, R. G., Ioannou, I., & Serafeim, G. (2014)] Audits provide independent and objective

Figure 3. Citation trends over year



The bar chart in **Fig 3** gives the plot of the total citations accrued to a given year in order to show citation growth. This figure makes it possible to find trends in citations, for example, periods of high citation rates. But as it is seen from the graph below, citation at the earliest years of this century is very low, which may both imply that there were fewer articles which were highly cited or the field was not as developed as the current days. For example, citation numbers in the years up to 2000 are still rather in the region of zero. From the early 2000s there appears to be a very small rise in citation counts. For example, the citation counts have started to increase from the year 2005 and are approximating 50 citations which is the initial sign of intensified and more rigorous research work done on this area of auditing with respect to sustainability as well as corporate governance.

A dramatic spike in citations is observed around 2010. There is a peak of articles cited in 2010 and the citation indication slightly increased in 2012. Particularly in the year 2011 the number of citations rose to about 1000 citations per scholar. This increase could be due to a few notorious papers or a new appreciation of subjects such as sustainability, corporate social responsibility, and governance in the auditing discipline. It also corresponds to a stream in the international business environment regarding sustainability and other aspects of corporate governance, stimulated by shifts in legislation and raising awareness. Specifically, in 2011, citation counts soared to approximately 1000. This surge could be attributed to a few highly influential publications or a growing recognition of the importance of topics such as sustainability, corporate social responsibility, and governance in the auditing field. This period also coincides with increased global attention to sustainability and corporate governance issues, driven by regulatory changes and growing public awareness.

With regard to the citation, numbers, the graphs of changes in the citation counts for the 2010s have multiple peaks. For instance, in 2013 the subject area had a record high citing about 7, 000 articles and in 2015 about 6, 000 articles had been cited. This can be evidenced by the publication of several articles, which received considerable attention, and citation. They may be related to influential articles or important development in the auditing scholarship such as changes in the nature of reporting of sustainability, audit practices, and the escalating incorporation of social and environmental aspects in audits. It is also possible to observe a decline in citation counts starting from the end of the 2010s to the beginning of the 2020s.

For instance, citations declined to about 2000 by 2018 and to about 1000 by 2020 as shown in the figure 3 below. This trend could indicate a few possibilities such as: This is in respect to: (i) Development of newer areas or themes of research that are acting as factors of diversion from auditing research. As well, secondary peaks which might imply a saturation point such that, the first steep rise of influential articles in the specified time frame is followed by less influential articles.

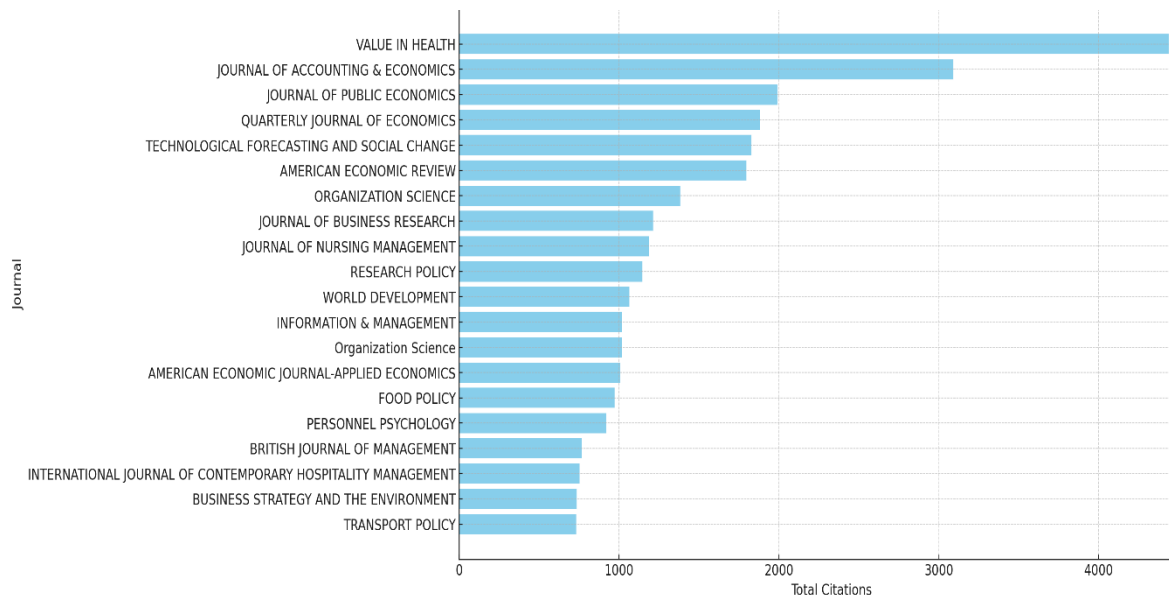


Figure 4. Top 20 journal by total citation

In the sense of this context, the fig. 4 presents the total citation counts for journals considering the top 20 of them which would help for identifying the most influential journals related to auditing and other allied issues. The most cited article is the ‘Value in Health’ with citations exceeding 4000 and this applies to aspects of health economics and policies including auditing of healthcare systems as well as economic evaluation. The “Journal of Accounting & Economics” with about 2500 citations has been central to the discussion of accounting practice and theories – the two important domains for audit professionals.

By having garnered approximately 2000 cites, the Journal of Public Economics is shown to be relevant to public policy and taxation which are two highly sensitive and important areas in public sector audits. Another highly cited journal is the “Quarterly Journal of Economics” with just under 1800 citations suggesting an important contribution of this journal to the progress of economic research on which many types of audits draw on. ‘Technological Forecasting and Social Change’ has nearly 1600 cites and is crucial for mastering technological and social effects on audit practices.

The “American Economic Review” proves the work’s significance with its 1500 citations while the theory and policy it advances are at the root of many auditing standards and procedures. ‘Organization Science’ indexed for >1300 citations in the field of organizational study and management and therefore would be relevant for audit professionals who are required to assess organization structure and governance systems. The “Journal of Business Research” as the most popular journal among the sources with circling approximately 1200 citations, the journal concerns a vast array of business areas related to auditing. Out of the mentioned journals, the “Journal of Nursing Management” has the most citation of about 1100, provides valuable insights in healthcare management, essential during auditing of healthcare organisations. “Research Policy,” with around 1000 citations, focuses on innovation and technology policy, indispensable for auditing in tech-savvy organizations.

“World Development,” with close to 900 citations, addresses global development issues, including the auditing of development projects and programs. “Information & Management,” with approximately 800 citations, highlights the intersection of information

technology and management practices, crucial for IT audits. The "*American Economic Journal-Applied Economics*," with around 700 citations, emphasizes applied economic research pertinent to audit professionals. "*Food Policy*," with about 600 citations, covers the impact of food policy on nutrition and agriculture, areas often subjected to specialized audits.

"Personnel Psychology" with nearly 500 publications is devoted to management of human resources and psychology, which is important for auditing of HR practices. The "British Journal of Management" has around 400 citations and takes probably the largest area of interest to auditing with sections on human resource management, organizational behaviour and strategic management. The "International Journal of Contemporary Hospitality Management", has been cited approximately 350 times and is shown as being highly relevant to auditing hospitality management practices. "Business Strategy and the Environment", with bibliography base of nearly three hundred sources, discusses sustainable business and it is of paramount importance for any environmental audit. Including approximately 250 articles, the 'Transport Policy' is focused on the research in transport policy, infrastructure and transport mobility, useful for auditing transport projects. Overall, these publications' high citation counts demonstrate their considerable impact on auditing-related topics and underscore the value of their published research informing and enhancing audit procedures in a variety of industries. By recognizing these patterns, audit professionals can locate important sources of research with a significant influence and stay up to date on the latest developments in their industry.

- **Top most cited articles**

Table 4. Top Most cited articles in Audit research

Author	Year	Article Title	Sources	Citation
Mark DeFond, Jieying Zhang	2014	A review of archival auditing research	Journal of Accounting and Economics	1501
BROWN, L.D., CALL, A.C., CLEMENT, M.B. and SHARP, N.Y.	2015	Inside the "Black Box" of Sell-Side Financial Analysts	Journal of Accounting Research	548
David Hay, Carolyn Cordery	2018	The value of public sector audit: Literature and history	Journal of Accounting Literature	86
Alqaraleh, M. H., Almari, M. O. S., Ali, B. J. A., &Oudat, M. S.	2022	The mediating role of organizational culture on the relationship between information technology and internal audit effectiveness	Corporate Governance and Organizational Behaviour Review	46
Dumay, J., de Villiers, C., Guthrie, J. and Hsiao, P.-C.	2018	Thirty years of Accounting, Auditing and Accountability Journal: A critical study of the journal's most cited articles	Accounting, Auditing & Accountability Journal	43
Salehi, M., Tarighi, H. and Safdari, S.	2018	The relation between corporate governance mechanisms, executive compensation and audit fees: Evidence from Iran	Management Research Review	37
Traxler, A.A. and Greiling, D.	2019	Sustainable public value reporting of electric utilities	Baltic Journal of Management	31
Grossi, G., Hay, D.C., Kuruppu, C. and Neely, D.	2023	Changing the boundaries of public sector auditing	Journal of Public Budgeting, Accounting & Financial	6

			Management	
Abdulhussein, A. S., Al-Refiay, H. A. N., &Wahhab, A. M. A.	2023	The impact of internal auditing on corruption: Evidence from the emerging market	Journal of Governance & Regulation	2

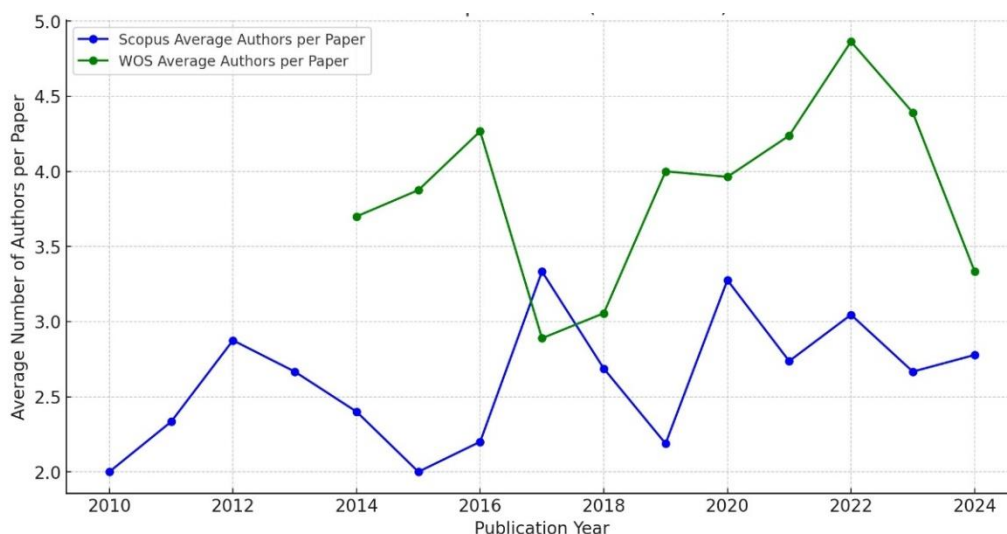
Table 4 outline a compendium of papers in auditing and related areas with high citation rank. These papers have played a pivotal role in defining the topical and theoretical discussion and thereby the course of research in their fields. In terms of the high citation counts which suggest that the paper under consideration has been read, cited, and extended by others in the field, an important characteristic of the top papers has very high citation counts, for instance, DeFond and Zhang (2014) have received 1501 citations to date. Thus, some of the papers with fewer citations, for instance, “*The impact of internal auditing on corruption*” which was cited twice, and “*Changing the boundaries of public sector auditing*”, cited 6 times, may reflect the fact that these topics are still in the process of development or belong to the relatively recently emerged areas of research interest in the academic community.

These topics address a variety of subjects, including audit fees, archive auditing research, and the effect of internal auditing on corruption. This diversity is a reflection of audit research's broad application and range of industries and situations. A wide range of auditing-related subjects are covered in the research. These include the conduct of financial analysts, auditing in the public sector, the efficacy of internal audits, corporate governance, reporting on sustainability, auditing, and corruption. Papers on subjects like "The impact of internal auditing on corruption" and "Sustainable public value reporting of electric utilities" demonstrate a tendency towards investigating the function of auditing in governance and sustainability.

The research, which cover the years 2010 through 2024, provide insight into the changing nature of research topics. Previous articles

4.2. Authorship Pattern over years (2010-2024)

Figure 5. Authorship pattern over year



In fig. 5, the authorships from 2010 to 2024 were also illustrated as the average numbers of authors per paper in Scopus and WOS sets. The Scopus and WOS datasets show a

progressive average number of authors' trend over the years as a whole, but are not parallel. This tend to point to the fact that there is an increase in the number of papers that are being co-authored by a number of researchers. The rise in co-authorships also shows the nature of work in contemporary scholarship, where teamwork is inevitable in view of the complex nature of research questions posed in many fields.

When comparing Scopus and WOS, the WOS dataset typically displays a greater average number of authors per paper in comparison to Scopus. This might be because of the incorporation of bigger collaborative projects or an emphasis on fields where team-based research is more prevalent. The data from WOS displays a clear rise in the quantity of authors per document, especially starting in 2015, reaching its highest point between 2018 and 2020. This peak indicates that in these years, articles published in WOS-indexed journals probably included extensive collaborative groups. The Scopus dataset displays increased variability with peaks and valleys, yet it also exhibits an overall upward trend. Remarkably, there is a spike in the data from around 2019-2020, indicating a time of heightened teamwork or potentially the release of special editions or initiatives with extensive groups.

In the latest trends (after 2020), there is a decrease in the average number of authors per paper in both datasets, with a more significant drop seen in the WOS dataset. This may be due to various factors, including a potential change in research methods after COVID-19, leading to a revival of individual or small group research. The impact of publication guidelines that might have promoted more concentrated research groups. This outcome indicates that cooperation in research is on the rise, particularly in the last few years, despite some variations in this pattern. Discrepancies in the Scopus and WOS databases could be due to differences in the journals they include, with WOS potentially emphasizing disciplines that frequently involve large partnerships. The decrease in recent years may be a short-term phenomenon or a sign of a shift towards smaller teams generating impactful research.

4.3. Top Keyword-Based Research Clusters

Table 5. Research cluster in Audit Research

Research cluster in Audit Research	Citations	Keywords
Audit and CSR	1.813	corporate social responsibility, sustainability reporting, corporate social responsibility (CSR), corporate governance, sustainability
Auditing services	164	auditing, public sector, standards, performance auditing, auditing activity
Audit in public sector	428	Public-sector, public-sector accounting, auditing, sustainability reporting, corruption
Auditing and corporate governance	236	corporate governance, shareholder, accounting standards, corporate social responsibility, political connection
Audit and accountability	332	accountability, covid-19, corporate accountability, critical, parliamentary examination
Financial reporting	85	financial reporting, shareholder, non-financial reporting, accounting standards, corporate governance
Audit and accounting	621	accounting, public-sector accounting, accounting standards, governance, accrual accounting
Audit, Sustainability,	841	Sustainability, corporate sustainability, sustainability

Corporate Sustainability		reporting, corporate social responsibility, corporate governance, accounting standards
Sustainability reporting	370	Sustainability, sustainability reporting, accounting, corporate governance, accounting standards, global reporting initiative, corporate governance, corporate social responsibility

Table 5 offers a glimpse of the key and developing research clusters in the audit industry, encompassing traditional subjects like accounting and corporate governance, alongside newer domains like sustainability, accountability, and public sector effects. The number of citations shows how each cluster in audit research compares in terms of influence, with CSR and sustainability being the most prominent, signalling their increasing significance in the field. The auditing cluster is made up of research that emphasizes the fundamental aspects of auditing, such as techniques, criteria, and the responsibilities of auditors [Lonsdale J. (2016), Adams C.A. (2021)]. This cluster is fundamental in the field and continues to be a focus of research, even though it may not garner as much interest as more recent topics such as sustainability.

The management of corporate responsibilities to the community is a main area of interest in auditing research, denoted CSR. This group considers the relationship between company behaviour, ethics, and assessment procedures [Landrum N.E., Ohsowski B. (2018), Marquis C., Qian C. (2014)]. The literacy rate is another strong evidence that reflects the broad recognition, or this kind of attention, in academic and practical applications, as shown by the large citation number, 1.813. Sustainability is set of concepts which are somewhat related to CSR but encompasses more parameters. Some studies analyse how firms adopt and verify ESG standards and practices [D'Amato D., et al. (2019), Landrum N.E., Ohsowski B (2018)]. The progress of climate change consciousness and sustainable behaviour on an international level is putting more focus on sustainability in auditing as it has been expressed in the 25 articles and 841 citations.

4.4. Top Methodology in audit research

Table 6. Top methodology used in Audit research

Research Methodology	Article Count	Citation
Content analysis	24 articles	723
Survey	21 articles	495
Case study	12 articles	224
Regression analysis	3 articles	20
Statistical methods	2 articles	17
Experimental	1 article	38

The most frequently used methodologies are content analysis (24 articles with 723 citation), indicating its significant impact and frequent use in high-quality research. Surveys (21 articles with 495 citation) and case studies (12 articles with 224 citation) reflecting their importance in gathering detailed and empirical data in the field of auditing. Other methodologies like experimental, regression analysis, and statistical methods have fewer citations, suggesting they are less commonly used or perhaps applied in more niche areas within auditing research.

These techniques are highly displayed in auditing researches indicating a bias towards qualitative and descriptive paradigms. The preference for these approaches indicates that the

auditing research often tends to focus on the identification and analysis of the qualitative factors within and across the audit settings, processes, actions, and outcomes. Case and content analysis helps the researchers pick up the actual picture of auditing scenarios at the same time case study also helps the researchers to pick up the real picture of actual situations; surveys provide over all perception and trends in perceptions. The use of qualitative and descriptive methods is more evident in this regard underlines the important of understanding the human, organisational and contextual factors that affect auditing, which is critical in improving auditing standards, practice and outcomes.

Although these methods have been useful in audit research, they are all limited by the complexity and nuances of many research questions. For example, content analysis can show trends in sustainability reporting but not explain why the companies report [Unerman, J., & Chapman, C. (2014)]. Surveys allow for high level understanding about what auditors think of the change in technology but may not get to all obstacles or challenges associated with implementations Vasarhelyi, M. A., Kogan, A., & Tuttle, B. M. (2015). While providing rich data about particular audit events, case studies may not generalize to larger industry phenomena (Cooper & Morgan, 2008).

More generally, the field might benefit from a mixed-methods designs which capitalise on the strengths of both paradigms [Modell S. (2010)]. For example, coding media articles might complement conducting some interviews in which they will look at patterns that are emerging from the content analysis process and then discuss why they are emerging. Furthermore, there is little (Power & Gendron, 2015) that would explain audit practices in the long run, in other words, how they evolve. In addition, new audit challenges such as cybersecurity and ESG auditing may demand for innovative research methods (Appelbaum et al., 2017). Take, for example, that one could use experimental studies to learn how auditors choose an audit in a difficult technology-focused environment [Griffith et al., 2015].

4.5. Top critical issues in Audit Research

In the case of critical issues as it is highlighted in the academic auditing literature, we are thinking about topics or lay questions faced by academics that shape their current discussion withing field. The following is as what the academic community identify in top degree of challenge or change within auditor profession itself:

- **Audit Quality and Standards**

A large amount of work has been published on the quality of audits, with special emphasis on the cohesiveness and effectiveness of auditing norms. Scholars are undertaking a review of research on how audit quality is best measured, what determines audit quality and evidential value of audit quality both from high and low audit quality perspective in the financial reporting system and stakeholders' confidence. This matter is especially important given the different international standards and the necessity for increased harmonization across nations. Study by Francis, J. R., & Wang, D. (2008) examine the audit quality and the level of earnings management evident from Japanese firms. In these studies, various audit procedures, roles of audit committees, the effects of audit firm size on quality usually form subjects of comparison (Khudhair et al. 2019; Ernstberger, J., et al, 2020)

- **Independence and Objectivity of Auditors**

Concerns about auditor independence are a constant issue in scholarly research. Researchers have pointed out the dangers associated with conflicts of interest, especially when auditors have strong ties with their clients. Maintaining objectivity is a challenging issue in environments where auditors also offer consulting services, impacting the credibility of audits. Studies in this field usually explore how regulatory changes affect

- **Impact of Technological Advancements:**

These important matters underscore the specific areas that receive the most focus in academic research, mirroring the continuous discussions and disputes in the audit field. Scholars strive to improve the field by suggesting solutions, enhancing practices, and predicting the future challenges that the auditing profession will encounter. This continuous conversation is crucial to guarantee that auditing keeps progressing and adjusting to both internal and external challenges.



The keyword co-occurrence illustrates the connections between keywords in audit research by displaying their frequency of appearing together in studies. Every node symbolizes a keyword, and each connection symbolizes a co-occurrence between keywords in the same research. Key phrases that are highly linked in the network probably symbolize key topics in audit studies, such as "CSR," (15 articles with 1813 citations), "sustainability," (25 articles with 841 citations) "accounting and sustainability reporting," (12 articles with 370 citations), "Public sector," (25 articles with 428 citations) and "corporate governance." (9 articles with 236 citations). The groupings within the network provide insight into the connections between various subjects, unveiling research trends in the field. Keywords with limited connections or separate clusters could signal underdeveloped topics in the literature, suggesting potential research opportunities.

Based on the network analysis, this study identified potential research gaps for future exploration in audit research:

- **Emerging Technologies and Audit**

Key words: "Cyber security," "information security economics," "homeland security." Although these subjects have less of a connection to traditional audit themes, they are nonetheless important in the current digital environment (Islam, M. S., Farah, N., & Stafford, T. F., 2018). Research on how new technologies affect audit procedures could be beneficial, especially when it comes to data security and privacy [Kogan, A., Mayhew, B. W., & Vasarhelyi, M. A. (2019), Haapamäki, E., & Sihvonen, J. (2019)].

- **Environmental and Social Governance (ESG) Audits**

Keywords: "Sustainable development," "corporate social responsibility (CSR)." These keywords are present, but their integration with typical audit subjects may not be as extensive. This gap might be filled by looking into how ESG variables can be audited and reported more thoroughly.

- **Governmental and Public Sector Audits**

Keywords: Government grants," "accounting choice." The relationship between public sector and governmental audits and more general audit practices seems to be lacking. One possible avenue for research is to examine how to enhance public sector auditing or harmonize it with private sector norms.

- **Cultural and Globalization Impacts on Audits**

Keywords: "Globalisation," "development," "institutional theory." Another topic that appears to be understudied is how cultural differences and globalization affect audit processes. Research may concentrate on how multinational corporations handle audits or how global standards are modified in various cultural contexts.

- **Audit and Ethical Considerations:**

Keywords: "Accountability," "governance." Even though these are important audit concerns, additional research on ethical issues in audits is needed, especially as it relates to accountability and governance in various organizational systems.

5. Conclusion and Implication

This revealed bibliometric analysis presents and elaborates that audit research is more connected to the present global issues, such as sustainability, corporate governance, and modern technologies. The growing popularity of terms like 'sustainability', 'corporate responsibility', and 'public sector' carries out an indication of a shift in focus towards the areas of corporate reporting of their social and economic impact. This change indeed implies that auditing is no more just a financial reporting operation but broader social responsibility. Thus, the focus on the part of stakeholders on the sustainable activities in the spheres

mentioned above increases an auditor's role in the verification and reporting on such programs.

Using different language terms, such as 'disclosure' and 'accountability' the study indicates increasing emphasize Healthy food store's organization in the public sector has enhanced the culture of open operation. This tendency may lead to the laws on enhanced and more frequent reporting by public sector organisations affecting the government's stakeholder engagement. Within the perspective of the paper on performance auditing, the author notes concern on performance audits in the public sector. And this implies a shift from only financial audits to performance audits of the economy, effectiveness, and efficiency of the public sector. There may be a need for the authorities to develop new standards to evaluate the effectiveness of the public sector.

This dataset also shows how technology has impacted audit methods in its unique perspective. Two of the highlighted themes, big data analytics and cybersecurity, are novel trends the emergence of which suggests that auditors have to update themselves with novel technologies or risk compromising accuracy and reliability of audits. Such changes in technology present both positives and negatives to auditors that have to master techniques in using the technologies, and understanding and dealing with the ethical and privacy implications of the technologies. Hence, assurance that the audit procedures of heightened concern are still relevant and effective in the context that is rapidly advancing digitizes requires research in this area.

That is why the results imply that, in the future, audit research should focus on the development of the audit practices' resistance to global adversities, analyze the effects of technological advancements, and integrate the Environmental aspect into audit practices. It is thereby important to find the relevancy of the trends represented in the dataset with today's auditing profession that has assumed higher levels of accountability and flexibility. Thus, audit research needs to further develop and expand to meet the needs for a dynamic and interconnected global economy as the world faces ever more complex challenges.

6. Future Direction for Research in Audit Studies

The developing landscape of global business practices, environmental concerns, and technological advancements seem to have a significant impact on the future direction of research in audit studies. As companies place greater importance on sustainability and CSR, audit research needs to further examine how these ideas are incorporated into existing auditing models. The increasing use of terms like "sustainability," "corporate governance," and "CSR" in current research indicates a rising demand for the creation of strong auditing guidelines that consider environmental, social, and governance (ESG) elements. (Christensen, H. B., Hail, L., &Leuz, C., 2021) studied the referenced text. Future research may involve improving these criteria and investigating ways in which auditors can enhance their assessment and disclosure of a company's ESG performance, ultimately aligning financial results with wider societal effects. (Velte and Stawinoga, 2017; Farooq and de Villiers, 2019)

One more important area for future study is how emerging technologies are affecting audit practices. The audit profession is changing due to the growth of digital tools and big data analytics. Terms such as "cybersecurity" and "information security" show the growing importance of technology in auditing. Kahyaoglu and Caliyurt (2018) wrote the following text. Li, H., No, W. G., and Boritz, J. E. (2020). Investigation should focus on how technologies like blockchain, artificial intelligence, and machine learning can improve the precision, effectiveness, and trustworthiness of audits. Moreover, it is possible for researchers to explore the difficulties presented by these technologies, including issues related to data privacy and the necessity for auditors to develop new abilities and expertise.

Finally, the significance of flexibility in auditing has been highlighted by the worldwide pandemic. The appearance of phrases such as "COVID-19" and "public sector" in the data underlines how auditors have needed to adapt to fresh challenges and un-predictabilities. Further studies could investigate ways in which audit practices can enhance their resilience in a global crisis, whether they be health-related, economic, or environmental (Guenther, E., Endrikat, J., & Guenther, T. W., 2016). This includes developing frameworks for remote auditing, assessing the long-term effects of the pandemic on financial reporting, and understanding how auditors can support organizations in navigating such disruptions. By addressing these emerging challenges, audit research can continue to contribute to the integrity and transparency of financial reporting in an increasingly complex world. (Salijeni, G., Samsonova-Taddei, A., & Turley, S., 2019).

Competing interests

The authors declare no competing interests.

Ethical approval

This article does not contain any studies with human participants performed by any of the authors. Information/Data used in this study were supplied by Scopus and the Web of Science database.

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