Tax Audit in the Digital Age: A Systematic Review of The Literature

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ARTICLE INFO	ABSTRACT
	OBJECTIVE: This study endeavors to comprehensively examine the existing body of the recent literature concerning audit and taxation within the context of emerging technologies while also delineating a potential path for future research. **METHOD:** Employing a systematic literature approach, this investigation blends bibliometric and content analysis techniques to scrutinize a dataset consisting of 121 pertinent articles published in English within Scopus-indexed journals over the past 13 years. And to analyze the research data, we utilized tools such as NVIVO 14, VOSviewer, and Microsoft Excel to obtain our results. **RESULTS:** Our quantitative findings reveal the United States as the foremost contributor and most frequently cited source globally. Furthermore, our analysis indicates that digital technologies, have been the focus of increased interest among scholars in the field of accounting since 2014. **CONCLUSION:** Qualitative insights suggest that the adoption of advanced technologies presents promising opportunities to curtail tax evasion risk and augment the efficiency of auditors. This research adds to the comprehension of the transformative impacts of digital technologies on tax auditing, showcasing their capability in simplifying administrative process

Keywords: Tax audit, digitalization, emerging technologies, blockchain, artificial intelligence, tax administration, e-tax systemes. |

INTRODUCTION

For nearly two decades, the focus of digital governance has been on providing online public services to harness the potential of the internet in enhancing the performance of the public sector. Tax authorities worldwide have embraced extensive digitization, offering a wide array of advanced e-services to improve the taxpayer experience. Mergel et al. (2019) described digital transformaion as a comprehensive effort to reevaluate fundamental processes and government services. It goes beyond digitization, encompassing a full review of policies, processes, and user needs, resulting in a total overhaul of existing practices and the development of new digital services. These initiatives aim to meet user needs more effectively, introduce innovative service delivery approaches, and broaden user demographics.

Digital technologies also facilitate citizen participation (Luna-Reyes, 2017) and engagement in the co-production and co-creation of public value (Cordella & Paletti, 2018). The digitalization of tax administration, accounting, and auditing streamlines tax organizations'operations, significantly reduces resource costs, and elevates the economy to a new level. It improves monitoring of tax burdens on businesses, mitigates tax-related risks, reduces the number of on-site audits, and stimulates economic activity (Maksimchuk, Borisova, Ereshchenko, & Klyushin, 2021). These benefits are pivotal in the context of global shifts toward digital transformation, as cloud applications and innovative technologies open unprecedented opportunities for tax optimization (Kononenko, Atamas, Nazarova, Selishcheva, & Kononenko, 2022).

Despite these advancements, several limitations in the literature hinder the understanding of digital tax transformation. Existing studies often highlight the positive impacts of digital technologies on tax administration efficiency but neglect the challenges involved in the transition. For instance, digital taxation

has raised concerns regarding the financial burdens enterprises face during electronic tax system implementation (Yilmaz & Coolidge, 2013) and the adverse effects on tax revenue collection in some contexts (Agrawal, 2020). Additionally, the literature lacks comprehensive exploration of how digital transformation impacts taxpayer-authority relationships and long-term compliance, particularly in emerging economies.

These gaps are significant because they restrict the development of effective digital tax systems. Without a unified framework for integrating digital tools, policymakers struggle to address implementation challenges and maximize potential benefits. Moreover, the lack of attention to empirical data from diverse economic contexts limits the generalizability of existing findings, underscoring the need for further research.

This study seeks to address these gaps by conducting a comprehensive literature review on digital transformation in tax auditing. First, it explores the key concepts, including automation, machine-to-machine (M2M) technologies, blockchain, and artificial intelligence (Vishnevsky & Chekina, 2018; Valentine & Viktoriia, 2018). Then, it identifies critical variables influencing digital tax systems, such as the use of data analytics and machine learning to improve audit mechanisms and taxpayer services (OECD, 2021). Finally, it proposes a theoretical framework for integrating these technologies into tax auditing practices.

The study contributes to the existing body of knowledge by synthesizing recent research and offering actionable insights. It emphasizes how emerging technologies, such as chatbots, predictive analytics, and data-driven audit selection, can enhance the efficiency, accuracy, and inclusivity of tax systems. By addressing key limitations, this work lays the groundwork for more effective policymaking and strategic implementation in digital tax audits.

METHOD

To achieve the set objective, a systematic literature review was used to clarify the concept of tax audit, the digitization of tax administration and the cooperation between the two, as well as to provide an overview of existing theory and suggest guidelines for future research. A search was conducted using Elsevier's Scopus citation database, Web of Science and Google scholar on the existing literature related to our research topic. The initial search criteria were based on the following keywords: « digitalization, tax audit/ control, tax administration, digital taxation, ICT, E-administration, BIG DATA, artificial intelligence, and blockchain» in the titles and abstracts of the articles. The PRISMA flow diagram provides a comprehensive overview of the systematic review process, detailing each phase of study identification, screening, and selection. The process began with the identification of records from multiple sources, including 1,055 entries from databases and additional contributions via other methods. Following the initial screening, the eligible studies were carefully assessed for their relevance and quality. The inclusion criteria focused on management and social sciences, as these are the most promising areas for theoretical research, due to the abundance of empirical evidence. Key reasons for exclusion at this stage included irrelevance to the topic, low scientific quality, and language issues. Ultimately, the process resulted in the inclusion of a focused set of high-quality studies, ensuring the review is both robust and credible. This systematic approach highlights the importance of transparency and precision in synthesizing evidence for the review.
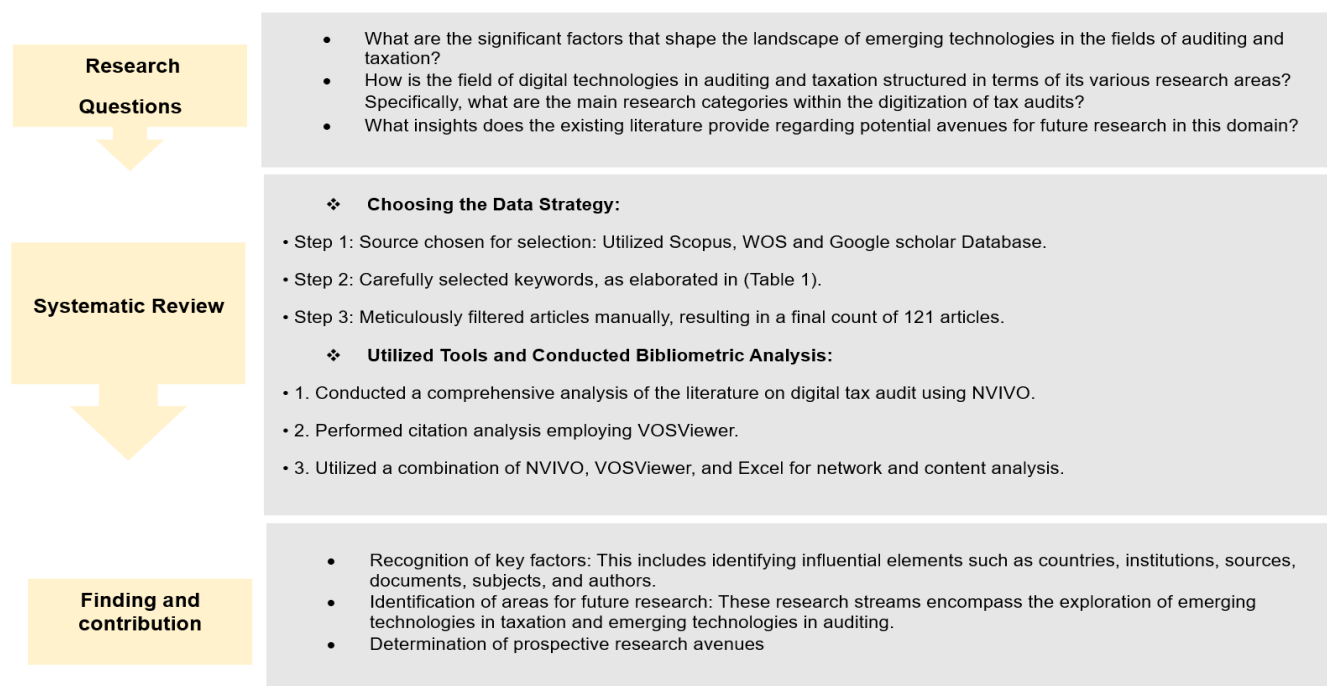
Schema 1. PARISMA flow diagram for the systematic review.
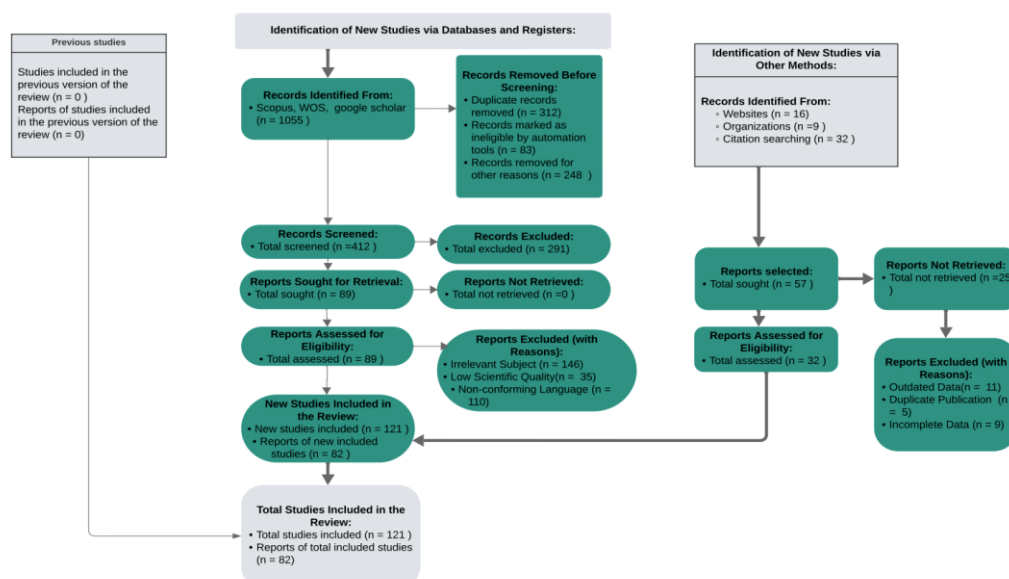
Note: Developed by authors based, on Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. Systematic Reviews, 10(1), 1-11. https://doi.org/10.1186/s13643-021-01626-4

This systematic literature review was conducted according to a clearly defined and pre-specified protocol as per the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines which is strongly relied on to promote the uniformity of reviews as well as their reproducibility (Page et al., 2021). This approach has legislated the steps for searching, selecting, and evaluating pertinent calculations so that the literature is adequately synthesized. In this regard, the study examined the relationship between digital technologies and the tax audit process in a comprehensive manner using bibliometric and qualitative methods. Indeed, systematic reviews hold a prominent place in the opening argument of research credibility in the arguments of the authors such as Moher et al. (2009). The visual representation reduces the verbal aspects of this research presentation and presents the general stages of research which range from the frame of research questions to results and discussion of the contributions.

Schema 2. Research process.

Research Questions	• What are the significant factors that shape the landscape of emerging technologies in the fields of auditing and taxation? • How is the field of digital technologies in auditing and taxation structured in terms of its various research areas? Specifically, what are the main research categories within the digitization of tax audits? • What insights does the existing literature provide regarding potential avenues for future research in this domain?
Systematic Review	❖ **Choosing the Data Strategy:** • Step 1: Source chosen for selection: Utilized Scopus, WOS and Google scholar Database. • Step 2: Carefully selected keywords, as elaborated in (Table 1). • Step 3: Meticulously filtered articles manually, resulting in a final count of 121 articles. ❖ **Utilized Tools and Conducted Bibliometric Analysis:** • 1. Conducted a comprehensive analysis of the literature on digital tax audit using NVIVO. • 2. Performed citation analysis employing VOSViewer. • 3. Utilized a combination of NVIVO, VOSViewer, and Excel for network and content analysis.
Finding and contribution	• Recognition of key factors: This includes identifying influential elements such as countries, institutions, sources, documents, subjects, and authors. • Identification of areas for future research: These research streams encompass the exploration of emerging technologies in taxation and emerging technologies in auditing. • Determination of prospective research avenues

Note. Developped by the authors.

Table 1 highlights the systematic process of keyword selection and document filtering. Through a careful manual review of the identified research papers, the study was narrowed down to 121 highly relevant studies, ensuring alignment with the research objectives and maintaining a focus on quality and relevance.

Table 1. Research process.

Description	Results
TITLE-ABS-KEY (taxes OR taxation OR tax OR audit OR ifrs OR "financial report*" OR "tax audit* administration*" OR "VAT" OR "financial fraud*" OR "evasion*" OR "fiscal control" OR "Annual report*" OR audit process*") AND TITLE-ABS-KEY ("big*data" OR bigdata OR "data mining*" OR "artificial intelligence*" OR "TIC*" OR "digital" OR "digitalization" OR "block*chain" OR "Blockchain" OR "automatization* technology*" OR "E-tax system*" OR "e-services" OR "e-governance" OR "NLP" OR "Neural network models" OR "cognitive technolog*" OR "distributed ledger technology" OR "public sector* technolog*" OR "fourth industr*" OR "industry 4.0" OR "digital reporting*" OR "smart technolog*" OR "emerging technolog*" OR dlt OR "Intelligent visualization*" OR "expert system*" OR "Intelligent detection" OR "digital accounting*" OR "e-declaration*" OR "robot tax") AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "re")) AND (LIMIT-TO (SUBJAREA , "BUSI") OR LIMIT-TO (SUBJAREA , "SOCI") OR LIMIT-TO (SUBJAREA , "ECON") OR LIMIT-TO (SUBJAREA , "DECI") OR LIMIT-TO (SUBJAREA , "MULT")) AND (LIMIT-TO (LANGUAGE , "English" OR frensh)) AND (LIMIT-TO (YEAR , "2010-2023"))	1055
Keywords Plus (ID)	412
Authors	96
Articles	121
Source	95

Note : Search desription, generated from Scopus and Google-Scolar data base by author

FINDING
NETWORK ANALYSIS:
(Scopus database)
In this section, we employ VOSviewer to analyze the dataset, focusing on three main types of analysis: Keyword Mapping, Field Development Over Time, and Topic Trends. This analysis reaffirms the appropriateness of our chosen keywords, as they are the most frequently occurring terms within the dataset and align with the authors' selections. By applying a two-level occurrence threshold, we identify 51 keywords out of a total of 412 words. There are strong connections between key terms related to the digitalization of tax audits, revealing crucial insights and applications. Digital technology and transformation are closely linked, emphasizing the modernization of tax authorities and management processes to enhance efficiency and compliance. The integration of information technology within tax platforms underscores its importance in facilitating efficient audits, with applications in real-time data processing and automated reporting. Notably, the relationship between tax evasion, revenue, and digital platforms indicates the use of sophisticated analytics to combat fraud and boost revenue collection. Additionally, the strategic and organizational perspectives, particularly within the European Union, reflect a global focus on standardizing digital tax audits. The deployment of artificial intelligence for predictive analytics and risk assessment, along with international cooperation and adaptation in response to global events like Covid, further underscores the multifaceted impact of digitalization on tax audits.

The interconnected concepts related to the digitalization of tax audits (figure1), highlighting several key themes. The red cluster focuses on the transformative role of digital technology in modernizing tax control, involving major entities like the European Union and the Russian Federation. The green cluster addresses the financial aspects, emphasizing the impact of digital platforms on combating tax evasion and enhancing tax revenue. The yellow cluster underscores the integration of information technology in managing tax audits, with a specific reference to enterprise management and the influence of countries like China. Lastly, the blue cluster reflects on the organizational perspectives, emphasizing the strategic focus and transformation within tax authorities. Overall, the visualization underscores the multifaceted impact of digitalization on the efficiency, management, and global coordination of tax audits.
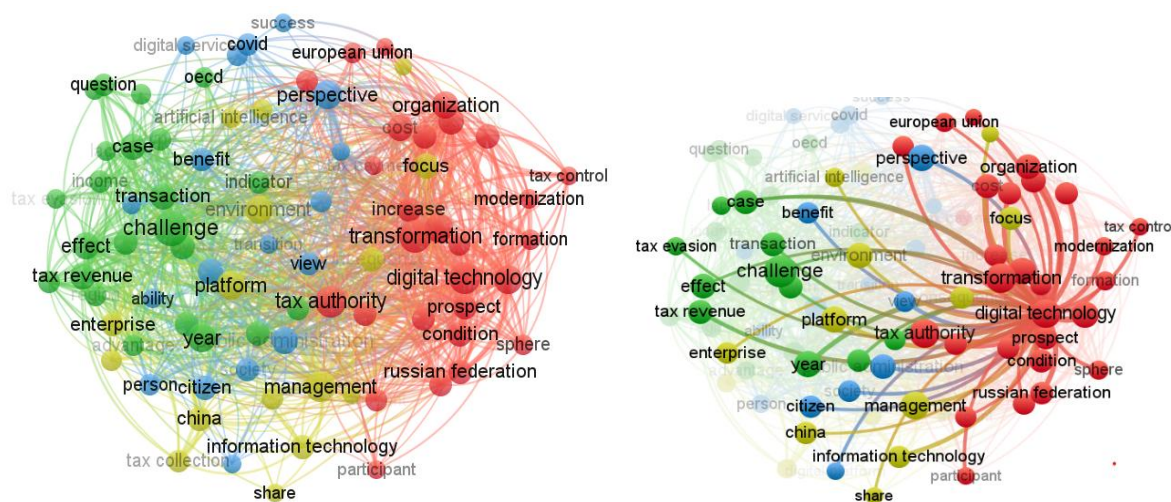
Source: Developed by the authors.
**Figure 1. keyword's map, generated by VOSviower.**

Table 2 highlights key theoretical clusters in the literature on digital transformation in tax audits. The Digital Transformation cluster, based on Digitalization Theory, stresses the importance of technologies like AI, Big Data, and blockchain for improving tax system efficiency and transparency (OECD, 2020). The Challenges and Benefits cluster, grounded in Cost-Benefit Analysis, examines the trade-offs of digitalization, noting both its potential for cost savings and efficiency, as well as the barriers like high implementation costs and data security risks (Böhme et al., 2020). The International Perspectives cluster, informed by Institutional Theory, explores how institutional factors influence the adoption of digital tax systems, with faster adoption observed in countries with supportive regulatory frameworks (Harrison et al., 2018). The Taxpayer Engagement cluster, rooted in Stakeholder Theory, highlights the role of taxpayer cooperation in the success of digital tax systems, emphasizing the importance of transparency and ease of use in improving compliance (Torgler, 2007). Finally, the Emerging Trends cluster, based on the Technology Adoption Model, examines the accelerated adoption of AI and digital tools in tax systems post-COVID, driven by the need for continuity in operations during disruptions (Pereira et al., 2021).

Table 2, summary table of cluster

Cluster	Central Theory	Key Concept	Primary References
Digital Transformation	Digitalization Theory	Technology's role in modernizing tax systems	Key studies on ICT in taxation
Challenges and Benefits	Cost-Benefit Analysis	Balancing costs and operational gains	Studies on efficiency and barriers
International Perspectives	Institutional Theory	Cross-country adoption of digital tax systems	Comparative research by OECD, etc.
Taxpayer Engagement	Stakeholder Theory	Citizen and enterprise roles in compliance	Research on taxpayer satisfaction
Emerging Trends	Technology Adoption Model	AI and crises as catalysts for digitalization	Studies on AI and post-COVID dynamics

Note: Developed by the authors

In the majority of the 121 papers, we observe that most of this scientific production was published between 2018 and 2022. This indicates that the topic of digital transformation has garnered significant attention during this period, likely influenced by the COVID-19 health crisis, which necessitated a shift towards digital services. Figure 2 illustrates the evolution of key concepts in the literature over the past decade. The figure reveals that darker links and nodes represent older discussions, while lighter ones indicate more recent topics. From a technological standpoint, both expert systems and decision support systems were early topics of discussion. However, more recently, the scientific community has shifted focus towards trending topics such as artificial intelligence, big data, and blockchain technology. From an accounting perspective, auditing remains a topic of perennial interest.

Figure 2, Field development over (10 years)

The increase in articles is driven by contributions from 39 countries, with the USA, Russian Federation, and China leading the field (figure 3). These top five nations account for 61% of all published documents and 74% of citations on Scopus, highlighting their dominant role in shaping the discourse. This concentration suggests that while global interest is growing, the topic is still in its early stages, and research efforts are primarily led by a few countries with advanced scientific infrastructures. Expanding contributions from other regions could help diversify and deepen the global conversation on this topic.

Figure 3, Top 10 countries, generated from Scopus database

Citation analysis

Citation signifies the impact of research (Seglen, 1989). Citation analysis states the connection between two documents. Despite the citation as an influential measurement tool, it has been criticized for misrepresenting papers' quality. Nevertheless, it is still the best way to measure certain scientific actors' influence in the scientific field. Figure (4) shows the citation pattern during the past 33 years. The total number of citations is 1059, while the citations' growth was in the last six years, with a percentage of (61%). This study expects that the topic may get more attention in the near future; this appears from the citation growth and the publication volume, as presented in the figure bellow.
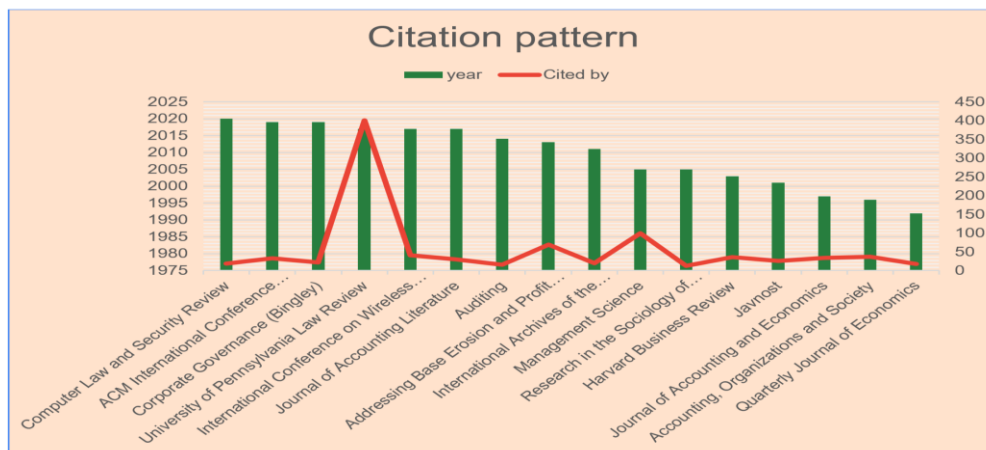
Source: developped by the authors, based on scopus database.
Figure 4, citation pattern generated by Excel

Table 3, presents the most cited articles exported from scopus database. The list of selected journals is given in supple-mentary material. The source of titles does not provide studies from journals "University of Pennsylvania Law Review, Management Science, Accounting, Organizations and Society, Harvard Business Review, Journal of Accounting and Economics, ACM International Conference Proceeding Series, Journal of Accounting Literature, Corporate Governance (Bingley)". These journals are hand searched by using keywords "Tax Audit", "digitalization", "E-tax system", Artificiel Intelligence", "technologies (TIC)", "tax administration", "tax evasion", "fiscal control", "fiscal audit", and "audit judgement" in « scopus ».

"Advances in Accounting Behavioral Research, Auditing, Behavioral Research in Accounting, Cost and Management, Judgment and decision makingresearch in accounting and auditing, International Journalof Auditing, and Journal of Accounting Literature » for these journals are searched by hand using the same keywords in « Google Scholar ».

Table 3, the most cited article.

Authors	Title	Year	Source title	citation	Database
Kroll J.A.; Huey J.; Barocas S.; Felten E.W.; Reidenberg J.R.; Robinson D.G.; Yu H.	Accountable algorithms	2017	University of Pennsylvania Law Review	400	Scopus
Banker R.D.; Chang H.; Natarajan R.	Productivity change, technical progress, and relative efficiency change in the public accounting industry	2005	Management Science	99	Scopus
	Addressing base erosion and profit shifting	2013	Addressing Base Erosion and Profit Shifting	69	Scopus
Chen P.-W.; Jiang B.-S.; Wang C.-H.	Blockchain-based payment collection supervision system using pervasive Bitcoin digital wallet	20	International Conference on Wireless and Mobile	41	Sco

|					
		17	Computing, Networking and Communications		p us
Pentland B.T.; Carlile P.	Audit the taxpayer, not the return: Tax auditing as an expression game	1996	Accounting, Organizations and Society	37	Sco p us
Healy P.M.; Palepu K.G.	How the Quest for Efficiency Corroded the Market	2003	Harvard Business Review	36	Sco p us
Chan K.H.; Chow L.	An empirical study of tax audits in China on international transfer pricing	1997	Journal of Accounting and Economics	34	Sco p us
Faccia A.; Al Naqbi M.Y.K.; Lootah S.A.	Integrated cloud financial accounting cycle. How artificial intelligence, blockchain, and XBRL will change the accounting, fiscal and auditing practices	2019	ACM International Conference Proceeding Series	33	Sco p us
Hux C.T.	Use of specialists on audit engagements: A research synthesis and directions for future research	2017	Journal of Accounting Literature	30	Sco p us
Bassey E.; Mulligan E.; Ojo A.	A conceptual framework for digital tax administration-A systematic review.	2022	Government Information Quarterly	27	Sco p us
Pleger L.E. ; Mertes A. ; Rey A. ; Brüesch C.	Allowing users to pick and choose: A conjoint analysis of end-user preferences of public e-services.	2020	Government Information Quarterly	27	Sco p us
Coronel S.S.	The Media, the market and democracy: The case of the Philippines	2001	Javnost	26	Sco p us
Sewpersadh N.S.	A theoretical and econometric evaluation of corporate governance and capital structure in JSE-listed companies	2019	Corporate Governance (Bingley)	22	Sco p us
Cunningham K.; Walker G.; Stahlke E.; Wilson R.	Cadastral audit and assessments using unmanned aerial systems	2011	International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences - ISPRS Archives	20	Sco p us
Faúndez-Ugalde A.; Mellado-Silva R.; Aldunate-Lizana E.	Use of artificial intelligence by tax administrations: An analysis regarding taxpayers' rights in Latin American countries	2020	Computer Law and Security Review	19	Sco p us
Dubin J.A.; Graetz M.J.; Wilde L.L.	State income tax amnesties: Causes	1992	Quarterly Journal of Economics	18	Sco p us
van Buuren J.; Koch C.; Amerongen N.N.; Wright A.M.	The use of business risk audit perspectives by non-big 4 audits firms	2014	Auditing	16	Sco p us
Jones C.; Thornton P.H.	Transformation in Cultural Industries	2005	Research in the Sociology of Organizations	13	Sco p us

Note : Generated from Scopus database by authors. Conceptual analysis of « Digital transformation »

(By Nvivo)

The concept of digital transformation garnered significant attention in literature, as noted by Vuksić et al. In (2018). Various approaches to defining digital transformation, as outlined by Reis et al. In (2018), have been proposed. Most authors, including Martin (2008) and Westerman et al. (2011), suggest that digital transformation entails leveraging information and communication technology (ICT) to create fundamentally new capabilities in business, government, and people's lives, with a focus on significantly improving performance and business reach. Bannister et al. (2014) emphasize the importance of digitalization in optimizing the public value of government services for citizens, while Janssen and Estevez (2013) highlight its role in enhancing the efficiency of government functions through lean government models. Additionally, Luna-Reyes (2017) points out how digital technologies boost citizen participation, and Cordella and Paletti (2018) underscore their support for client engagement in public value co-production and co-creation.

Autio (2017) defines digitalisation as the application and implementation of digital technologies to processes and frameworks in business and society, resulting in a transformation of business methods and practices. This transformation, termed digital disruption, has a significant impact on the economy, business, and society, as noted by Autio (2017) and Skog, Wimelius & Sandberg (2018). Notably, digitalisation has evolved from merely digitalizing business processes for improvement, such as cost reductions and efficiency enhancement, to encompassing cross-boundary technologies like e-commerce, a digital disruptive technology, as elucidated by Li, Su, Zhang, and Mao in 2018.

Li et al. (2018) further explain that digitalisation induces a transformation in the strategy and structure of organizations, reshaping the flow of information within and outside the entity. This transformation enables organizations, regulators, and administrators to transition their processes to digital platforms, facilitating improved engagements with clients and stakeholders, as articulated by James and Sawyer in (2018).
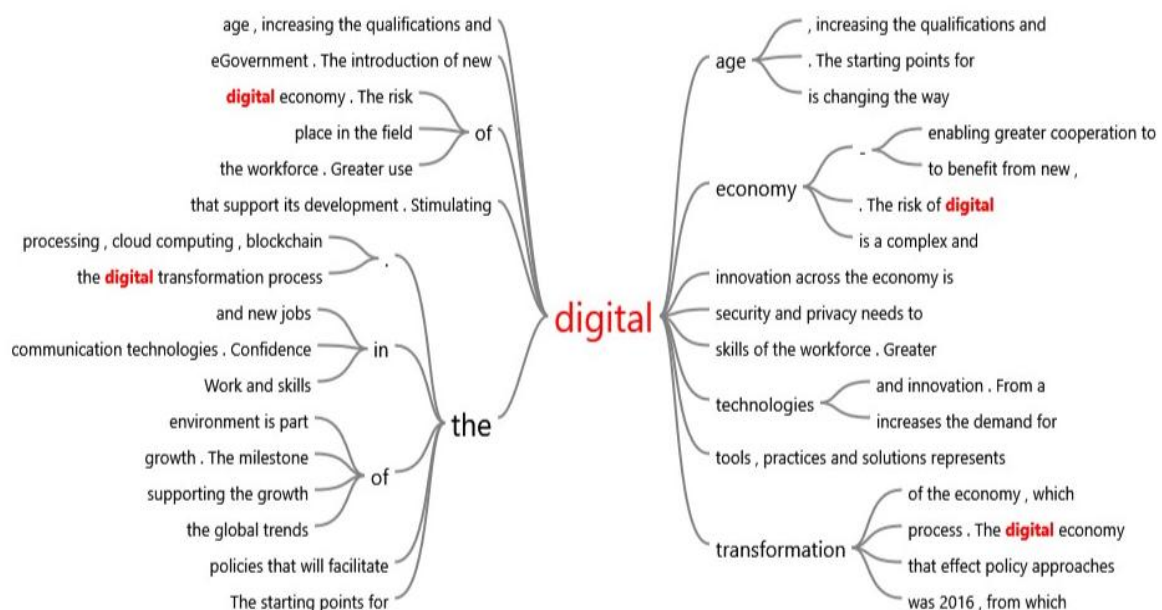
Source: Developped by the authors using NVIVO
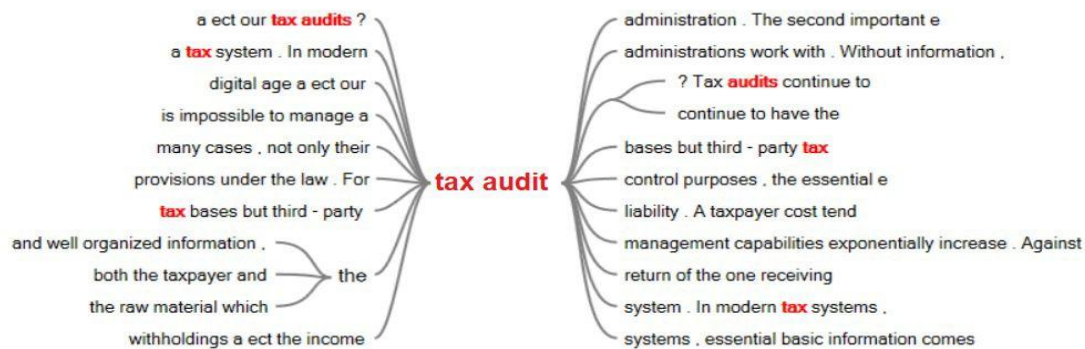**Figure5, Conceptual analysis by NVIVO**

Conceptual analysis of « Tax audit»
(by Nvivo)

According to OECD (2006), a tax audit is an examination of whether a taxpayer has correctly assessed and reported their tax liability and fulfilled other obligations. Digital transformation in tax auditing is often defined as the adoption and integration of Information and Communication Technology (ICT) to enhance the efficiency, accuracy, and effectiveness of tax Marin (2018) and Westerman et al. (2011) suggest that digital transformation involves leveraging digital technologies to create new capabilities within tax administrations, fundamentally altering traditional audit methodologies to improve performance and broaden the reach of tax audits.

One of the key benefits of digital tax audits is their potential to improve tax compliance and reduce fraud. Luna-Reyes (2017) points out that digital technologies facilitate greater citizen participation and compliance through more transparent and accessible audit processes. Furthermore, Cordella and Paletti (2018) underscore the role of digital tools in supporting client engagement, which is crucial for co-production and co-creation of public value. These technologies enable tax administrations to detect discrepancies and fraudulent activities more effectively, thereby enhancing overall compliance.

Source : Developed by the authors.
Figure 6. Conceptual analysis by NVIVO

The (Figure 6) illustrates a comprehensive view of tax audits, highlighting their crucial role in modern tax systems. It emphasizes the necessity of well-organized information from both taxpayers and third parties and points out that tax audits are essential for compliance and managing liabilities. The impact of digitalization is significant, making it challenging to manage tax systems without advanced digital tools. Digitalization enhances management capabilities exponentially, facilitating better information handling, which in turn increases the efficiency and effectiveness of tax audits. This digital shift necessitates that tax administrations adapt to ensure thorough and effective tax control.

LITERATURE REVIEW

Table 4,Selected articles.

Paper	Type of paper	Noteworthy concepts, propositions, and/or empirical results
Victoria M. Ksenda, (2021), Digitalization of Tax Administration: Modern Model and Development Prospects	Empirical study (Quantitative study)	The article outlines a contemporary tax administration system characterized by transparency in tax relations, a functional alignment of tax obligations, and the quality of services offered in a digital environment. This model is seen as contributing to the achievement of budgetary goals and national development priorities.
A.Raikov et al. (2021), Decreasing tax evasion by artificial intelligence.	Empirical study	The article discusses the challenges posed by the digital economy to tax services and the increasing difficulty of controlling value chains. It highlights that digital platforms are enabling non-transparent interactions, making tax avoidance and evasion more prevalent.
Buscha P. A., **, Zinner H.,** **, Øystein S. B., (2018),** Opportunities and challenges of digitized discretionary practices: a public service worker perspective	Empirical study (Qualitative analysis)	The study examines two Norwegian public sector organization: the district court and a tax administration (NTA) office and using case management systems (CMS) to regulate street-level bureaucrats' (SLBs) work. While judges in the district court operate independently with diverse cases, NTA caseworkers specialize in tax matters and report to superior management. This diverse setup enables an analysis of digitized discretionary practices in varied contexts, shedding light on how street-level bureaucrats navigate the changing landscape of public service provision amidst digital tools and institutional logics.
Peláez R., A.; **Sánchez N., P.; García C., Y.(2021)** Tax Regulation on Blockchain and Cryptocurrency: The Implications for Open Innovation	Theorical essay	Examines blockchain technology's impact on taxation and its effects on individuals, companies, and government administrations. Through a bibliometric analysis of research papers from 2015 to 2019, it focuses on tax regulation in the context of blockchain and

		cryptocurrencies. The findings suggest that blockchain can empower open innovation, foster entrepreneurship, regulate economies, enhance the sharing economy, and secure industrial and intellectual property.
Otekunrin A. O., Nwanji T. I., Eluyela D. F., Inegbedion H. and Eleda T., (2021), E-tax system effectiveness in reducing tax evasion in Nigeria.	Empirical study: investigation	Investigate the impact of the electronic tax system (E-tax system) on reducing tax evasion in Nigeria. The E-tax system's effectiveness was measured by actual tax revenues and the level of electronic tax services, while tax evasion was assessed through tax compliance and taxpayers' attitudes toward the E-tax system. The findings demonstrated a significant relationship, indicating that a well-implemented electronic tax system can effectively reduce tax evasion, addressing economic and social issues within the tax administration system.
Maksimchuk O., Borisova N.,. Ereshchenk T., and Klyushin V., (2021), Digital technologies in the tax sphere as a factor in the sustainability of economic activity	Theorical essay	Discusses the impact of digital technologies on tax organizations, with a focus on the Federal Tax Service (FTS) in Russia. Also highlights the use of technology for electronic exchange of tax data with CIS countries and its role in countering illegal capital concealment abroad. The introduction of online cash registers and risk management systems is emphasized, as well as the role of big data in minimizing human errors and tax evasion.
Ahmad F. (2019), A systematic review of the role of Big Data Analytics in reducing the influ-ence of cognitive errors on the audit judgement	Theorical essay	Examines the association between memory processes and auditors' judgment in the context of Big Data (BD) and Big Data Analytics (BDA). The study aims to shed light on the cognitive errors displayed by auditors during the auditing process.
Ahmadi Zeleti F., Walsh G. S., Ojo A., and Mulligan E., (2021), A Case of the Governance of Digital Technology in Tax Administration	Empirical study	The study highlights key capabilities for digital technology governance in tax administration: a decision-making structure with robust management and senior support, critical processes like IT and data management, and essential relational capabilities such as ideation, collaboration, fostering an innovation culture, and providing necessary training.
Atayah F., Alshater O. M. (2021). Audit and tax in the context of emerging technologies: A retrospective analysis, current trends, and future opportunities.	Theorical essay	The bibliometric analysis reviews 154 relevant articles from 89 journals, mainly published since 2015. The USA, Australia, and China are the most influential countries in this research area, with Brigham Young University being the most productive institution.
Strango C., (2021), Does digitalization in public services reduce tax evasion?	Empirical study	Investigates the impact of digitalisation from public services on tax evasion. The article conducts an analysis of correlations and estimations regarding the impact of digitalization of public services on tax evasion in the European Union (EU) from 2015 to 2019.
Murorunkwere, B.F.; Tuyishimire, O.; Haughton, D.; Nzabanita, J.(2022), Fraud Detection Using Neural Networks: A Case Study of Income Tax	Empirical study	Demonstrates the effectiveness of ANNs (Artificial Neural Networks) in identifying income tax fraud and highlights key factors associated with fraudulent activities. These insights have practical implications for tax authorities and contribute to the ongoing efforts to combat tax fraud.

Amirova A. K., Ismailova R. A. (2021), Influence of technology adoption On tax audit in osun state, Nigeria	Empirical study	Examines how technology adoption impacts tax compliance and revenue increase by analyzing demographic data and conducting a simple linear regression analysis. It also employs cost-effectiveness analysis as part of its mixed-method approach.
Basseya E., , Mulligan E. , Ojo A., (2022), A conceptual framework for digital tax administration - A systematic review	Theorical essay	The article points out that existing measurement approaches do not adequately capture the complexity of digital technologies, the various government functions being digitalized, and their impact on all stakeholders. It suggests that a balanced measurement framework is necessary to assess digitalization comprehensively, considering both benefits and risks for all parties involved.
Mu, R.; Fentaw, N.M.; Zhang, L.(2022) The Impacts of Value-Added Tax Audit on Tax Revenue Performance: The Mediating Role of Electronics Tax System, Evidence from the Amhara Region, Ethiopia.	the mixed-method approach qualitative and quantitative data analysis	The findings of the study indicate that despite the region's revenue potential to cover its expenditures, inefficient VAT audit functions, a poor tax education system, insufficient tax resources, and long-serving tax rates have led to inefficient tax revenue performance. The study highlights that VAT audit and tax education significantly impact tax revenue performance.
Dunleavy, P., Margetts, H., Bastow, S., & Tinkler, J. (2006). New public management is dead—long live digital-era governance	Theorical essay	The article discusses the challenges and potential consequences of transitioning to digital-era governance (DEG) in public administration. It emphasizes initial skepticism among social scientists about DEG's transformative potential and cautions that its adoption is not automatic. The article explores various scenarios, including selective adoption, conflicting implementation with existing approaches, and the possibility of DEG falling behind due to slow adaptation.
Sobrino-García, Itziar.(2021). Artificial Intelligence Risks and Challenges in the Spanish Public Administration: An Exploratory Analysis through Expert Judgements.	The semi-structured interview is a qualitative data collection	Explores several aspects of AI (Artificial Intelligence) usage in the Spanish public administration. It addresses three main research questions: the need for a legal definition of AI, the associated risks, and the ability of current Spanish legal mechanisms to address these risks.
Zioło, M.; Niedzielski, P.; Kuzionko-Ochrymiuk, E.; Marcinkiewicz, J.; Łobacz, K.; Dyl, K.; Szanter, R. E-Government Development in European Countries: Socio-Economic and Environmental Aspects	Empirical study	Focuses on analyzing the relationship between the digitalization of public services (e-government) and ESG factors (environmental, social, and economic factors). It examines the impact of the digital revolution on these factors, particularly in 26 European countries, using the E-Government Development Index (EGDI). The study employs various analytical methods, including the TOPSIS method, Perkal index, and the Hellwig method, and is based on Eurostat data from 2003 to 2020.
Momo, F. D. S., & Behr, A. (2021). Blockchain: Effects in transactions costs from information governance.	Mixed approch, (quantitative and qualitative study)	Proposes a model to examine blockchain technology's impact on information governance and transaction costs. It suggests that blockchain can enhance information governance and reduce transaction costs, leading to more efficient and secure economic exchanges. The methodology includes testing hypotheses about blockchain adoption and its effects on these areas.
Eulerich M., Waddoups N., Wagener M., Wood D. A.		Investigates the risks and challenges of adopting robotic process automation (RPA) in

(2023), The Dark Side of Robotic Process Automation (RPA): Understanding Risks and Challenges with RPA		accounting and auditing, contrasting with the prevailing focus on its benefits. Through professional interviews, five key challenges are identified: RPA as a temporary solution, control and security issues, total costs, governance, and potential knowledge loss.
Joseph F. Brazel, T. Carpenter, C. Gimbar, J. Gregory Jenkins, K. L. Jones; Recent Research on the Identification, Assessment, and Response to Fraud Risks: Implications for Audit Practice and Topics for Future Research.	Theorical essay	Discusses recent academic research related to auditors' consideration of fraud in financial statement audits. It emphasizes the importance of identifying fraud risk factors, assessing fraud risk, and responding to these risks. The research highlights the evolving landscape of fraud risk identification and assessment in auditing and underscores the importance of auditors' judgment, technology, and teamwork in effectively detecting and responding to fraud risks.
María A. Agustí & Manuel O. P. (2023) Big data and artificial intelligence in the fields of accounting and auditing: a bibliometric analysis	Theorical essay	Discusses the use of bibliometric analysis to review and organize the literature related to artificial intelligence (AI) and big data (BD) in the fields of auditing and accounting. The analysis combines two techniques: bibliographic coupling and co-word analysis. Bibliographic coupling examines the similarity between articles based on shared references, while co-word analysis creates a network of concepts to identify research trends.
Faúndez-Ugalde, Mellado S. R., E.-Aldunate L.(2020), Use of artificial intelligence by tax administrations: An analysis regarding taxpayers' rights in Latin American countries	Theorical essay	Discusses how tax administrations in Latin American countries, including Chile, Peru, Brazil, Colombia, Ecuador, Argentina, and Mexico, use AI mechanisms to detect tax fraud and assess non-compliance risks. AI tools like clustering algorithms, neural networks, and Bayesian networks model taxpayer behavior using data from tax returns, financial ratios, and historical behavior.

Note: Recent contributions selected for the systematic review of the literature by authors.

The literature collectively underscores the transformative impact of digitalization on tax audits, highlighting both opportunities and challenges (table 4). Digital technologies enhance transparency, reduce tax evasion and fraud, and improve the efficiency of tax administration through better data management and advanced analytics. However, the integration of these technologies also brings challenges, such as the need for robust governance frameworks, the management of risks associated with AI, and the requirement for significant investment in technological infrastructure. Overall, the reviewed studies provide a comprehensive understanding of how digital tools and technologies are reshaping tax administration, offering valuable insights into best practices, potential pitfalls, and future directions for research and practice. This literature review emphasizes the importance of continued innovation, collaboration, and strategic management to fully realize the benefits of digitalization in tax audits.

Table 5, synthesis of the literature (Key Themes and Trends)

Key Themes and Trends	Relevant Studies	Synthesis
Digitalization and Transparency	Ksenda (2021), Otekunrin et al. (2021), Maksimchuk et al. (2021)	Digital technologies enhance transparency in tax administration, promoting accountability and aiding in achieving budgetary goals. The use of electronic data exchange and electronic tax systems has been shown to improve tax compliance and reduce evasion.
Combatting Tax Evasion and Fraud	Raikov et al. (2021), Mcrorunkwere et al. (2022), Ahmadi Zeleti et al. (2021), Faúndez-Ugalde et al. (2020)	Advanced digital tools, particularly AI, are increasingly used to detect and reduce tax evasion and fraud. These tools help in creating models of taxpayer behavior, improving the efficiency of tax authorities in identifying fraudulent activities.

Technological Integration and Management	Buscha et al. (2018), Zeleti et al. (2021), Atayah & Alshater (2021)	The integration of digital tools into tax administration requires robust management frameworks. Studies highlight the importance of decision-making structures, IT management, and the impact of digital tools on public service workers' strategies.
Blockchain and Cryptocurrencies	Peláez-Repiso et al. (2021), Momo & Behr (2021)	Blockchain technology has the potential to enhance information governance and reduce transaction costs, fostering open innovation and regulating economies. This technology can play a significant role in transforming tax administration.
Big Data and AI	Ahmad (2019), Agustí & Orta-Pérez (2023)	Big data and AI are critical in improving the accuracy and efficiency of tax audits. These technologies help reduce cognitive errors in audit judgments and provide deeper insights into taxpayer behavior.
Governance and Public Administration	Dunleavy et al. (2006), Sobrino-García (2021), Zioło et al. (2021)	Effective governance frameworks are essential for managing the digital transformation in tax administration. These studies explore the challenges and risks associated with AI and digital tools in public administration and emphasize the need for robust regulatory frameworks.

Note : Developed by the authors.

DISCUSSION

The rapid proliferation of emerging technologies within contemporary markets has significantly impacted the realm of taxation. A total of 51 studies have explored the implications of big data, blockchain, and artificial intelligence on the field of taxation. The predominant focus in the existing literature revolves around the utilization of advanced technologies in various facets of tax administration, encompassing processes such as filing, auditing, and the identification of non-compliance cases.

Within the literature's first sub-theme, 10 studies delve into the effects and utilization of big data in addressing tax evasion. The emergence of big data has introduced both challenges and opportunities to tax systems globally (Wang, 2017). Presently, online trading serves as a pertinent source of data, offering policymakers valuable insights into monitoring consumption trends, bolstering tax authorities' oversight of the market, and gauging the effectiveness of existing tax policies (Gao et al., 2020). Additional research indicates that social media platforms have contributed to increased tax evasion, allowing taxpayers to augment their consumption budgets and showcase an elevated lifestyle to their social network connections (Gamannossi & Rablen, 2020). We can cite the importance of automation and cognitive modeling through deep neural networks in addressing the complex issue of tax fraud and the role of the use of AI, especially in cases with uncertain time lags between events, to enhance tax administration (Raikov et al. (2021)). Similarly, the role of machine learning in detecting tax fraud, especially in high-risk areas, underscoring AI's ability to differentiate fraudulent cases and calculate the probability of fraud. The literature also underscores the global significance of AI in taxation, who discusses its role in increasing efficiency, transparency, and systematic processing of tax data while contributing to the fight against tax evasion (Huang (2018)).

Tax authorities have increasingly employed extensive data analysis to identify potential instances of non-compliance or tax evasion. As a result, the Internal Revenue Service (IRS) has initiated the use of big data sourced from online platforms and social media to ascertain taxpayers' adherence to tax rules and regulations (Houser & Sanders, 2018). However, the utilization of taxpayers' private data for compliance assessments has raised concerns about aligning tax rules and regulations to safeguard taxpayers' data privacy. An intriguing benefit of automated taxpayer compliance is the mitigation of human discrimination risks, as machines do not differentiate between taxpayers based on factors like race, sex, color, religion, or political affiliations.

The development of big data technology has given rise to practical applications of artificial intelligence (AI) and machine learning (ML) to manage vast datasets. Consequently, the second sub-theme explores the role of AI in taxation across 21 articles. Researchers began examining the efficiency of fuzzy logic in identifying suspicious tax transactions as early as 1992 (Shnaider & Kandel, 1992). Fuzzy technology demonstrated its efficiency in predicting business income tax, providing a foundation for identifying non-compliance by comparing actual filed taxes with fuzzy logic predictions. Among the studies consulted in this literature review, a comparative analysis covering 50 states to assess the consequences of online sales on tax collection and policy coherence in the United States, recommended the integration of emerging technologies in tax collection, audit, and monitoring (Best & Teske (2007)). This demonstrates that technological integration in tax control has become a necessity highlighting the performance of the tax administration.

Moreover, complex and voluminous transactions create opportunities for businesses to manipulate their taxes, leading to the development of various technologies to enhance tax authorities' effectiveness (Ruan et al. (2019).

Technologies such as the Taxpayer Interest Interacted Network (TPIIN) (Tian et al., 2016), 3TI method (Ruan et al., 2019), TAXNET technology (Didimo et al., 2018), and automatic online risk analysis (Sobotka & Vrana, 2007) have proven to be robust tools for detecting suspicious transactions and tax avoidance at both business and individual levels. However, this technological advancement has raised concerns about unemployment in the era of AI and ML.

Numerous studies have presented evidence supporting the imposition of an additional tax on enterprises incorporating AI and ML into their operations. This measure is designed to fund practical solutions addressing the rising unemployment rates resulting from the integration of robots and automation in business processes (Gasteiger & Prettner, 2020; Ionescu, 2019; Zhang, 2019).

The third sub-theme focused on exploring the application of blockchain technology in taxation. The adoption of blockchain technology in digital currencies has spurred researchers to investigate its potential application in the field of accounting (Coyne & McMickle, 2017). This sub-theme comprises only six studies that examine the impact of blockchain technology on taxation, specifically its use in controlling and monitoring Value Added Tax (VAT). These studies have found that blockchain technology enhances the transparency of VAT records and improves the VAT collection mechanism (Alkhodre et al., 2019; Bentley, 2019; Kollmann, 2019). Despites, blockchain technology is still in the developmental stage, it may encounter challenges in tax applications, such as identifying reverse charge mechanisms (Merkx (2019)). However, the shortcomings of blockchain can be mitigated through the implementation of better governance in the tax process.

The fourth and last sub-theme highlights the critical side of digitalization in tax audit domain, the authors' opinions collectively highlight critical aspects and challenges related to the digitalization of tax audit processes. It is important to adopt a strong strategy for data security, privacy, and regulatory compliance (Kolbenhayerová and Křížová (2021)). The digital service providers should prioritize the protection of clients' personal data and minimize the use of such data to prevent unsolicited use.

Moreover there are many security risks associated with the integration of artificial intelligence and big data communication technology in tax audits (Zhou L. (2019)), like the risk of network hacking and low security levels in tax information systems, wich is a significant concern. Frequent hacking attacks in the financial system pose a substantial risk to tax authorities.

The adoption of Robotic Process Automation (RPA) in tax audits also presents challenges that need careful consideration by accounting practitioners (Eulerich, Waddoups, Wagener, and Wood (2023)). To solve that problem, Internal and external auditors conducting RPA control assessments need a better understanding of these challenges to effectively address them and use digital technologies in optimizing the activities of tax organizations, especially in combating informal employment, tax evasion, and the economic activities of criminal organizations. In summary, after a deep analysis of the total reviews we can confirm that digitalization is seen as a critical tool in enhancing state security and revenue collection.

FUTURE REASERCHS

The rapid advancement of emerging technologies has garnered significant attention among various stakeholders. This evolution is reshaping the landscape of the accounting profession, as highlighted by Ahmad (2019). In light of these transformative changes, it becomes imperative to delve deeper into this domain for a more comprehensive understanding. To this end, a preceding content analysis has proven invaluable, not only in identifying areas where further research is needed but also in charting a course for future investigative endeavors.

Within the sphere of auditing, the initial sub-category revolves around big data, which prompts several noteworthy questions. These questions encompass various unexplored aspects, including the influence of big data on the efficiency of the audit process, the competencies required by auditors to navigate this landscape, the potential enhancements to auditing standards, and the comparative evaluation of audit profession efficiency across different countries concerning the adoption of big data in audit procedures.

The second sub-category delves into the utilization of Artificial Intelligence (AI) in the auditing profession, raising a series of six pivotal inquiries. These inquiries pertain to the value that AI can bring to auditing firms and their clientele, the augmentation of precision and management of audit evidence by auditors, as well as the scrutiny of the accuracy of clients' financial reports via auditor evidence.

Furthermore, this study identifies promising research prospects in the application of blockchain in auditing, with noticeable gaps in the literature regarding blockchain governance (Momo, F. D. S., & Behr, A. (2021), its potential to streamline government bureaucracy, the relevance of internal controls, and their implications for auditors' assessments.

In a broader exploration of pertinent technologies such as Big Data, AI, and blockchain, the utilization of big data in taxation largely focuses on its alignment with tax regulations. Yet, unexplored terrain includes the mitigation of data quality risks and the influence of big data on the online behavior of taxpayers on social media platforms. Additionally, there is a notable absence of studies that investigate the role of social media as a primary source of big data for tax authority operations, especially in developing countries. In the sub-category examining AI in tax administration, it delves into the impact on the job stability of tax agents and the potential for collaborative efforts with IT companies in the development of tax-related AI technologies. Significantly, no

studies have ventured into exploring AI's role in the resolution of tax disputes in courts or have delved into the challenges and opportunities associated with utilizing virtual tax agents.

Concludingly, research opportunities in the realm of blockchain technologies in taxation center around their contribution to facilitating tax compliance, the necessary adaptations of existing tax regulations to accommodate blockchain technology within tax administration, and the multifaceted challenges that will inevitably arise. The study also aims to dissect how blockchain technology accurately identifies different types of income, presenting a comprehensive set of questions as outlined in Table 6.

Table 6, Future questions reaserch.

Main issue	Sub-category	Future question reaserchs
Digitalization of tax audit	**Big Data in Auditing**	▪ How does the adoption of big data impact the efficiency of audit processes, and what factors contribute to this influence? ▪ What competencies and skills do auditors need to effectively navigate the realm of big data, and how can these competencies be developed and enhanced? ▪ In what ways can auditing standards be optimized to accommodate the utilization of big data, and what challenges may arise in this process? ▪ How does the efficiency of audit professions vary across different countries when integrating big data into audit procedures, and what factors contribute to these variations?
	Artificiel intelligence in auditing	▪ What is the quantifiable value that AI brings to auditing firms and their clients, and how can this value be measured and maximized? ▪ How does AI technology enhance the precision of audit procedures, and what are the best practices for effectively managing audit evidence with AI assistance? ▪ In what ways can AI be employed to scrutinize and validate the accuracy of clients' financial reports through auditor evidence, and what benefits and challenges does this present?
	Blockchain in auditing	▪ What are the most effective governance structures and mechanisms to ensure the secure and transparent use of blockchain technology in auditing practices? ▪ How can blockchain technology be harnessed to streamline government bureaucracy in the context of auditing, and what are the implications of such streamlining? ▪ What are the potential challenges and opportunities associated with the utilization of blockchain in auditing, and how can these challenges be effectively addressed and leveraged?

Note: Future questions reaserch, adapted from our dissusion about digitalization of tax audit, by authors

CONCLUSION

This systematic review of the literature has provided a comprehensive overview of the evolving landscape of tax administration and audit in the digital age. The synthesis of recent research and publications has highlighted the critical role of emerging technologies, particularly Artificial Intelligence (AI) and blockchain, in reshaping the strategies to combat tax fraud and enhance tax administration.

In the realm of digital tax audits, the literature provides insights into the transformative impact of new technologies. The adoption of digitalization, machine learning, blockchain, and robotization in tax administration is acknowledged as a means to expedite processes, reduce costs, and enhance resource optimization. The evolving nature of tax audits, driven by digitalization, is characterized by unprecedented global changes that have the potential to bridge information divides and expand markets. This transformation introduces various methodologies, including machine learning-based and graph-based techniques, offering a diverse range of approaches to tax audits.

The critical aspect of digital tax audits is also addressed, emphasizing the importance of data security, privacy, and regulatory compliance. The authors call for a robust protection of personal data and effective mitigation of security risks associated with the integration of technology. Security concerns, particularly in the context of artificial intelligence and big data, highlight the need for vigilant measures to prevent hacking attacks and safeguard tax information systems. Additionally, the adoption of Robotic Process Automation (RPA) in tax

audits is recognized as a promising avenue, but it also comes with its set of challenges, necessitating a better understanding among accounting practitioners and auditors.

In summary, this review highlights the consensus among authors on the pivotal role of emerging technologies in modernizing tax administration and combating tax fraud. However, it also underscores the importance of effective implementation and the need to address potential challenges associated with digitization. The future research prospects identified in the review encompass various dimensions, including the impact of big data, AI, and blockchain in tax policy, transformation, harmonization, and digitalization to mitigate the shadow economy. These promising avenues for future research will contribute to a more comprehensive understanding of the evolving landscape of tax administration and audit in the digital age.

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