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MODERNIZATION OF THE NATIONAL ACCOUNTING AND AUDITING SYSTEM USING DIGITAL TRANSFORMATION TOOLS

ABSTRACT

This study aims to develop a concept for modernizing the national accounting policy, considering global trends and technological advancements in the digital economy within the Accounting 4.0 paradigm. The study employed various methods: analytical method (data analysis and collection), documentary analysis (study of regulatory requirements), expert method (study of expert conclusions), scientometric method (assessment of scientific support), comparative analysis (correlation of expert and scientific findings), and synthesis method (formation of modernization concept). The optimal digital transformation tools for the national accounting policy, determined through comparative analysis of expert and scientometric evaluations, include Cloud Computing, Blockchain Technology, Big Data, Artificial Intelligence (AI), Machine Learning (ML), and the Internet of Things (IoT). These technologies enable flexible, secure, and efficient processing of large data volumes, automation of processes, enhanced accuracy and transparency in accounting reporting, and improved decision-making. The study highlights the lack of research on instrumental support for the national accounting and audit system despite the ongoing implementation of the adapted Ukrainian International Financial Reporting Standards eXtensible Business Reporting Language (UA IFRS XBRL). Implementing the modernization concept aligned with the Accounting 4.0 paradigm has the potential to enhance efficiency and quality in accounting and auditing, foster digital economy development, and increase international competitiveness. This can be achieved by introducing modern digital technologies that automate processes, enhance data analytics, and ensure reliability and transparency in accounting and auditing. Such changes will boost productivity, mitigate risks, and enhance confidence in financial reporting.

Keywords: accounting 4.0, Industry 4.0, Cloud Computing, Blockchain Technology, Big Data, Artificial Intelligence, Machine Learning, Internet of Things, national accounting policy, accounting

JEL Classification: M41, M42, O13

INTRODUCTION

Today, Ukraine does not yet have a full-fledged accounting regulatory system that meets the requirements of the global digital economy. There are discrepancies between different legislative acts and regulations, as well as insufficient accounting standards governing the use of digital technologies in financial accounting.

In this context, research and development activities aimed at developing and implementing new accounting standards that take into account the peculiarities of the digital economy and ensure the uniformity and comparability of financial statements are extremely important for Ukraine. They will contribute to the creation of a sustainable and reliable accounting and reporting system that will facilitate economic development and the country's recovery. The development and implementation of new accounting standards that will take into account the peculiarities of the digital economy are extremely important for ensuring reliable and comparable financial reporting. Research and development in this area are crucial for the further development of accounting and reporting in the context of digital transformation. In addition, it is important to unify and standardize financial reporting at the state level, which will help harmonize approaches and

simplify accounting and reporting processes. Ukraine, as a country that is actively developing the digital industry and facing challenges after the Russian armed aggression, also needs to create an appropriate accounting regulatory system that will take into account the peculiarities of the digital economy and contribute to the restoration of the state. The development of national standards and the implementation of the latest automation tools in the accounting and audit system is an important task to ensure the efficient functioning of the economy and achieve sustainable development.

It is worth noting that there is currently no general scheme and strategy for implementing the latest accounting and audit automation tools into the system of national standards that regulate and standardize state accounting policy. This situation is largely due to the lack of practical research on the impact of each of the latest digital solutions that have been formed and developed within the concept of the fourth wave of industrial development. Due to the rather wide range of digital economy tools, there is an urgent need to assess the potential of each accounting and audit automation solution. In view of the identified circumstances, there is a practical need to determine the nomenclature of potential automation tools that will be appropriate for integration into the national accounting policy system.

LITERATURE REVIEW

Due to the rapid development of digital technologies such as artificial intelligence, blockchain, and data analytics, there is a need to create new accounting standards. These technologies have a significant impact on accounting and reporting processes, which requires updating the regulatory framework in this area (Bozhkova & Halytsia, 2022; Pashkevich, von Schéele, Haftor, 2023; Han et al., 2023).

First of all, the use of artificial intelligence and machine learning in accounting opens up new opportunities for automating routine tasks, such as recognizing and classifying financial documents. However, this requires the development of standards that define the methodology for applying artificial intelligence in financial accounting and ensure the reliability and accuracy of the results obtained (Losbichler & Lehner, 2023; Kommunuri, 2022; Cho, Vasarhelyi, Sun & Zhang, 2020).

Second, the use of blockchain technologies and cryptocurrencies requires new approaches to accounting. The blockchain provides security and inaccessibility to changes in financial records, which requires the establishment of standards for recognizing and recording cryptocurrency-related transactions. New accounting standards should take into account the specifics of these technologies, ensuring the uniformity and reliability of financial reporting in the context of cryptocurrency transactions (Bellucci, Cesa Bianchi & Manetti, 2022; Abdullayeva & Ataeva, 2022; Bharti, 2023).

In addition, data analytics and the use of big data require new approaches to the collection, processing, and analysis of financial information. Digital technologies allow for obtaining a large amount of data in real-time, which requires the development of standards that define the methods and procedures for processing such data to obtain adequate financial statements (Akinbowale, Mashigo & Zerihun, 2023; Sun, 2023; Jauhainen & Lehner, 2023).

In general, the development of digital technologies affects accounting and reporting, which requires the development of new accounting standards. These standards should ensure compliance with the peculiarities of the digital economy, ensuring the reliability, accuracy and comparability of financial information.

In the context of the global digitalization of the economy (Buriak & Petchenko, 2021), the issues of regulation, unification and standardization of the accounting reporting system at the state level are unexplored, which is especially relevant for Ukraine, which, in addition to the constant actual development of the digital industry (Prokhorova, Dia-chenko & Babichev, 2023), is currently at the beginning of the path of fundamental changes, the implementation of which is not only the desire of Ukrainians for economic progress but also as a mechanism for the rapid and effective restoration of the state after active hostilities caused by the unprovoked armed aggression of the Russian Federation (Rybalchenko et al., 2022; Buriak et al., 2022; Akymenko et al., 2023).

Relevant publications allow us to form a relevant factual background of the subject area and identify new aspects that require detailed research (Table 1).

Table 1. Analytical overview. (Source: created by the author on the basis of the research papers listed in the table)

Authors	Key findings from the study	Assessment of the impact on the subject area
Abd Razak, Noor & Jusoh (2021)	The authors examine the role of accounting and auditing professionals in the dynamic environment of the digital economy. It was hypothesized that the development of the latest digital technologies, such as big data, analytics, and the Internet of Things, could lead to a reduction in the role of the professional accountant. However, the relevant hypothesis was not confirmed; on the contrary, the role of specialized professionals in the field under study remains high in the foreseeable future. Nevertheless, the authors emphasize the need for gradual adaptation of standard accounting and auditing methods through the development of relevant competencies among accountants (in particular, within the Malaysian economy).	The results of the study establish an important aspect that the development of digital technologies does not reduce the role of professional accountants, but rather their importance remains high in the context of the digital economy. In the context of the development of the system of national regulations in the field of accounting and auditing, practical recommendations are provided for the adaptation of specialized professionals to the implementation of digital economy tools in their professional activities within the framework of regulated legislation.
Alhasana & Alrowwad (2022)	The authors see the need to adapt national accounting standards to the requirements of the digital economy by integrating key technologies such as artificial intelligence, data analytics, and cryptocurrencies. The author notes the need to develop an effective regulatory framework and recommendations for the accounting and reporting of crypto assets, which should be consistent with international standards. Special attention is paid to the risks of external audits of crypto assets. The researchers emphasize the need to develop national accounting standards in the context of the digitalization of the economy.	The results of the study reveal important aspects of modernizing national accounting policy in the context of the digital economy. The conclusions of this study will facilitate the adaptation of national accounting standards to the requirements of digital technologies and contribute to the efficiency, accuracy and transparency of accounting and reporting in the era of digital transformation.
Azizov (2021)	The study points out that the implementation of international financial reporting and auditing standards in the innovation economy requires attention to current problems. The author emphasizes the need to address issues such as compliance with international standards, understanding their application, and ensuring the quality of financial reporting and auditing. The researcher sees the potential for improving the integration of international standards into domestic practices (on the example of the Uzbek economy), which will help to strengthen trust and competitiveness in the innovation economy.	The study demonstrates the factors that impede the systematic implementation of international standards in the field of accounting and auditing, which are not being addressed despite the widespread deployment of enterprises (in particular, in Uzbekistan) that are focused on foreign economic activity. The implementation of international accounting standards is a step towards the widespread introduction and regulation of the digital economy.
Dumitru (2022)	The author notes that the introduction of the European unified electronic format XBRL (Extended Business Reporting Language) in the accounting industry is an important step in simplifying and standardizing the reporting process. In particular, the author sees the potential for appropriate integration of XBRL into the Romanian economy. The author hypothesizes that the implementation of the international accounting standard will allow to obtain practical results: reduce the costs of collecting, verifying and exchanging financial information. The use of XBRL will allow Romanian companies to reduce the cost and time of processing financial statements, and users of financial data will be able to obtain, compare and use data faster and more efficiently, reducing errors and automating the verification of financial information.	The results of this study focus on the need to modernize local accounting and auditing systems by implementing and harmonizing them with relevant international standards, in particular XBRL (which has practical implications, in particular for Romanian enterprises). The study demonstrates the need to introduce a general systematic approach to the formation of national accounting standards, which should be focused on internationally recognized norms.
İşbîl, Köroğlu & Figen (2021)	The authors of the study focus on the need to form a professional staff for the implementation of the international accounting standard XBRL in the Turkish economy through the introduction of relevant educational programs in specialized educational institutions. The results of the study show that many higher education institutions in Turkey do not include XBRL in their curricula, although this system is important in the context of digitalization and changes in financial reporting. The researchers recommend that XBRL be included in mandatory financial accounting courses and that the topic be covered in more detail in senior courses. An important step is to work with computer engineers to expand practical training in the use of XBRL in accounting software programs. The researchers also point to the need to include XBRL in international education standards for professional accountants.	The results of the study highlight an important aspect of the mechanisms for modernizing the national accounting policy by forming a cluster of specialized specialists who have received an appropriate package of knowledge on the use of the international accounting standard XBRL. The established emphasis opens up another set of problems of modernization and the formation of an optimal system of state accounting regulations - the lack of professional staff. To train the necessary specialists, it is necessary to systematize data within the framework of relevant educational programs, which requires additional actions and measures on the way to normalizing, updating and modernizing the state accounting policy.

(continued on next page)

Table 1. Continued

Authors	Key findings from the study	Assessment of the impact on the subject area
Kadirovich & Sharofovich (2023)	The authors have identified the problems of regulating the state accounting policy of Uzbekistan in terms of accounting for intellectual capital, definitions and classification of assets. According to the authors, these problems are the result of the lack of effective harmonization of Uzbekistan's national accounting standards with international accounting regulations. The authors propose the following practical measures: to amend the national accounting standard, to combine the two national standards into a single one, to organize the publication of annual revaluation indicators, to reflect the results of revaluation directly in the capital of enterprises and to use correlation and regression analysis to value formless assets.	The results of the study showed the need to improve national standards to ensure compliance with international norms and improve the quality of financial reporting in Uzbekistan, which can be extended to the economies of other countries. The recommendations contained in the study are of practical interest in the context of systemic modernization of the national accounting policy by digital means of the fourth wave of industrialization.
Lugova et al. (2023)	The authors focus on the processes of digitalization in the accounting sector of Ukraine. In particular, they have identified popular information technologies used in global practice and identified the benefits that these technologies can bring. The authors also identified factors that impede the integration of the digital economy into the Ukrainian accounting industry: imperfect infrastructure and low investment. The authors propose that, in addition to solving these problems, systemic solutions should be applied: training of professional staff and modernization of the national accounting policy with its harmonization with international standards.	The study contains practical results for the subject area and allows to assess the level of modern digitalization of Ukrainian accounting. The results of the study contain benchmarks on the likely means of digital transformation of the system of national accounting regulations, which will be used for comparative analysis in the current study.
Mosteanu & Faccia (2020)	The researchers focus on the role of new digital economy tools, such as FinTech, XBRL, Blockchain, artificial intelligence, cryptocurrencies, etc., which modernize the content of the market economy, which has significantly lost confidence among participants and users due to the negative factors of recent years. In particular, the author examines the impact of FinTech on financial services and notes that the use of innovative financial technologies (listed above) significantly improves the efficiency and quality of financial services by reducing errors and processing time. The use of digital systems allows for process automation, increased transparency, and reduced costs.	The results of the study form a hypothesis about the crisis phenomena in the processes of the market economy, which require urgent modernization, standardization and regulation, including through the implementation of international FinTech system solutions, XBRL in local accounting policy standards. The study also contains results on the use of a possible nomenclature of digital tools that can radically change the internal system processes in the industry under study.
Tulakhodjaeva & Khodjaeva (2021)	The authors focus on the peculiarities of digitalization and ensuring transparency of accounting and auditing on the example of the Uzbek economy. The conclusions of the study show that successful digital transformation contributes to the efficiency, reliability and transparency of accounting and auditing. The introduction of digital technologies, such as electronic document management and blockchain, helps automate processes, improves data storage and processing, and provides quick access to information. The results of the study emphasize the importance of introducing digital tools to ensure transparency and openness in accounting and auditing activities.	The results of this study contribute to the formation of an effective national accounting policy that takes into account the peculiarities of the digital economy, as well as form a paradigm of transparency and reliability in the field of accounting and auditing. The conclusions of the study provide the basis for the development and implementation of policy measures and standards aimed at improving national accounting policy, in particular, the use of digital tools that will contribute to the efficiency, reliability and transparency of accounting and auditing in the digital economy.
Vysochan, Hyk, Mykytyuk & Vysochan (2023)	The authors identify the factors that affect financial reporting in the context of digitalization, including the development of new technologies, changes in business models, and changes in the regulatory environment. The researchers emphasize the functional importance of the financial reporting taxonomy as a coordinate system in the implementation of the international accounting standard XBRL (Extended Business Reporting Language). The financial reporting taxonomy as a financial reporting management tool will help enterprises and regulators to establish uniform standards and classification of financial information, contributing to increased transparency, comparability and analysis of financial statements. The researchers recommend further research and development of a taxonomy of financial reporting taking into account the specifics of the digital economy at the level of both national and international standards.	The study provides insight into the practical mechanisms for the systematic implementation of international accounting standards into national accounting and auditing regulations, in particular through the development and harmonization of the XBRL coordinate system - the financial reporting taxonomy. The use of the taxonomy in the context of modernization and the development of national accounting standards contributes to a harmonious transition from typical local reporting methods to the latest and internationally recognized digital practices.

The general conclusion from the literature review of relevant articles (Table 1) is that digital technologies, such as cloud computing, blockchain, XBRL, and others, are influencing the current state of the accounting and reporting industry, contributing to the speed, efficiency, and quality of financial services. Digital technologies allow the automation of routine tasks, improve access to financial information, and ensure standardization and transparency in the accounting and financial process. However, there are risks associated with errors in the latest digital technologies and the threat of losing confidential data. It is important to prepare future accounting professionals (accountants) to use digital technologies by incorporating appropriate changes in the curriculum. Ukraine, as one of the leading digital countries, also faces digitalization

challenges due to limited investment activity and low quality of education. Future research should focus on improving the quality of accounting education and analyzing the impact of digital technologies on financial activities.

AIMS AND OBJECTIVES

The purpose of the study is to develop a concept for modernizing the national accounting policy, taking into account global trends and modern technological advances in the digital economy within the framework of the Accounting 4.0 (Industry 4.0) paradigm.

Objectives of the study:

- analysis of the existing state system of accounting organization in Ukraine;
- assessment of the likely vectors of development of the state accounting policy and relevant regulatory measures in the national context;
- assessment of the impact of global trends on the likely modernization of the accounting sector;
- development of a concept for the implementation of the Accounting 4.0 concept (Industry 4.0) in the national system of regulatory policy in the field of accounting and auditing.

Research hypotheses:

- Ukrainian national accounting and auditing standards currently require a radical modernization through the implementation of international regulations and harmonization with recognized effective methods and practices, in particular through the integration of the latest tools of the Accounting 4.0 concept (Industry 4.0);
- a large number of means of digital transformation of the accounting sector of the economy lead to a chaotic layering of methods and solutions, which leads to a low level of modernization of the subject area and requires the establishment of optimized nomenclatures of effective accounting and audit automation tools.

METHODS

The following methods were used in the study:

- analytical method: to analyze the existing state system of accounting organization in Ukraine, to assess the vectors of development and the impact of global trends on the accounting sphere;
- documentary analysis: to study relevant legislation, standards and research related to accounting policy and the digital economy;
- expert method: to obtain opinions and recommendations from experts in the field of accounting and auditing on system modernization;
- scientometric method: to assess the level of scientific support for trends and methods of digitalization of the accounting and auditing industry;
- comparative analysis: to compare the results of expert and scientometric analysis of the subject field of research;
- synthesis method: to develop a concept for implementing the Accounting 4.0 concept in the national regulatory policy system.

These methods allow for a comprehensive study, analysis, evaluation, and development of the necessary strategies and recommendations to modernize the accounting sector in line with global trends and the digital economy.

For the expert method, we used analytical data from the following specialized organizations (Table 2).

Table 2. Specialized expert base.

Expert organization	Brief description of the expert organization
Analytics Steps Infome- dia LLP	Analytics Steps Infome- dia LLP is an organization that provides analytical insights and research on the impact of digital transformation on accounting. They provide useful information through their website and blogs that address topics such as technology integration, benefits and challenges of digital transformation in accounting. The organization aims to be a source of knowledge for professionals seeking to keep abreast of the latest developments in digital transformation and accounting (Analytics Steps Infome- dia LLP (2023). https://www.analyticssteps.com/blogs/how-has-digital-transformation-impacted-accounting)
Avenga	Avenga is an international IT company specializing in the digital transformation of financial services. They provide innovative solutions for financial institutions that improve customer experience, ensure data security and optimize business processes. Avenga aims to be a trusted partner for financial institutions in implementing digital innovations and achieving competitive advantage (Avenga (2023). https://www.avenga.com/magazine/digital-transformation-financial-services/?region=ua)
BDO USA LLP	BDO USA LLP is a leading audit, tax and advisory firm in the United States. They specialize in providing services to financial institutions and helping them implement digital transformation. BDO USA LLP provides clients with expert advice and innovative solutions to help them adapt to the dynamic digital environment, improve the efficiency of their processes, and secure a competitive advantage in the financial services market (BDO USA LLP (2023). https://www.bdo.com/insights/industries/financial-services/digital-transformation-in-financial-services)
Consultancy.asia	Consultancy.asia is an online platform with specialized information about the consulting industry in Asia. They provide news, analysis and insights on key consulting trends, including digital transformation for chief financial officers (CFOs) and finance functions. Consultancy.asia acts as a trusted source of information for consulting professionals, helping them to understand the latest trends and strategies that affect financial processes and functions in organizations (Consultancy.asia (2023). https://www.consultancy.asia/news/3969/the-top-digitalisation-trends-for-cfos-and-the-finance-function)
DATAINTELO	DATAINTELO is a leading research and analytics company specializing in providing reports and market research. They offer a wide range of research services, including reports on digital transformation in banking, finance and insurance. DATAINTELO collects and analyzes data to provide its clients with deep insights and an understanding of market trends (DATAINTELO (2023). https://dataintelo.com/report/global-digital-transformation-in-banking-financial-services-and-insurance-market)
Digital Adoption	Digital Adoption is a company that specializes in helping businesses adopt and successfully utilize digital technologies and processes. They provide digital transformation advisory and support services, helping organizations adapt to rapidly changing digital environments and leverage new technologies to improve efficiency and competitiveness (Digital Adoption (2023). https://www.digital-adoption.com/digital-transformation)
FinancesOnline	FinancesOnline is an online resource that provides reviews, comparisons, and analyses of various financial and business tools and technologies. They also focus on collecting and presenting statistics and trends in the field of digital transformation. FinancesOnline provides users with access to up-to-date information on technology, including digital transformation, its impact on business, and various statistics (FinancesOnline (2023). https://financesonline.com/digital-transformation-statistics)
Hitachi Solutions	Hitachi Solutions is a global advisory company that specializes in providing innovative digital transformation solutions and services for financial services. They offer a wide range of solutions, including data analytics, artificial intelligence, blockchain, the Internet of Things, and other technologies to improve the efficiency and innovation of financial institutions (Hitachi Solutions (2023). https://global.hitachi-solutions.com/blog/digital-transformation-financial-services)
Maryville University	Maryville University is a private university located in St. Louis, Missouri, USA. They offer a number of graduate degree programs, including accounting and data analytics programs. The university focuses on the development of students in the field of data analytics in accounting, providing them with the necessary skills and knowledge to effectively use technology and data analysis in the financial industry (Maryville University (2023). https://online.maryville.edu/blog/data-analytics-in-accounting)
Smart Insights (Market- ing Intelligence) Ltd	Smart Insights (Marketing Intelligence) Ltd is a marketing intelligence and consulting company that provides information and advice on digital marketing. They offer strategic insights and tools for marketing leaders, particularly in the financial services industry. Their focus is on researching digital trends and transformation in marketing, providing practical advice and guidance on how to use digital channels, tools and strategies to achieve marketing goals in the financial services industry (Smart Insights (Marketing Intelligence) Ltd (2023). https://www.smartinsights.com/digital-marketing-strategy/financial-services-digital-transformation-for-marketing-leaders)

The analysis of scientific support in the field of accounting and auditing is carried out using scientometrics tools: tools for forming a relevant taxonomic set based on relevant publications in leading scientometric resources (Web of Science, Scopus, Google Scholar, Microsoft Academic, CrossRef, etc.) (Table 3) and tools for taxonomic analysis (Table 4).

CRExplorer, Publish or Perish, and ScientoPyUI are different tools used to analyze scientific publications and measure scientific productivity (Table 3). Given its popularity among researchers, wide coverage of scientific publications, and rich set of metrics, Publish or Perish is an appropriate tool for analyzing scientific productivity and measuring researcher impact. Its main advantage is that it is based on Google Scholar data, which allows you to get a wide-ranging overview of citations and other metrics. Thanks to the easy-to-use interface, researchers can easily access the information they need and create reports and graphs for further analysis. The choice of Publish or Perish is based on its significant contribution to the research community and the ability to effectively analyze scientific productivity.

Table 3. Means of forming a relevant taxonomic set of scientometric research.

Software tool	Brief description of the tool for forming a relevant taxonomic set of scientometric research
CRExplorer	CRExplorer is a scientometrics tool that helps in analyzing and visualizing scientific publications and their relationships. It allows you to track and analyze publications in academic journals, conferences, and other scientific publications. CRExplorer provides graphical representations, statistics, and tools for identifying key topics, authors, and collaborations in research. This tool can be useful for researchers, scholars, and analysts who want to get an overview and analyze scientific publications in their field (CRExplorer (2023)). https://andreas-thor.github.io/CRExplorer
Publish or Perish	Publish or Perish is a free software for analyzing scientific publications developed by Anneke Harzing. It uses data from Google Scholar, Scopus, and Crossref to assess the impact of publications, analyze citations, and research productivity. The tool helps scientists and scholars to obtain information about their academic activities and determine the ranking of their publications (Publish or Perish (2023)). https://harzing.com/resources/publish-or-perish
ScientoPyUI	ScientoPyUI is a graphical user interface for ScientoPy, a tool for analyzing data from scientific publications. It offers a convenient use of ScientoPy features such as data processing, clustering, and keyword discovery. ScientoPyUI allows researchers to efficiently analyze scientific publication data and draw valuable conclusions (ScientoPyUI (2023)). https://github.com/jpruiz84/ScientoPy/blob/master/README.md

Table 4. Means of taxonomic analysis.

Software tool	Brief description of the taxonomic analysis tool
Bibliometrix	Bibliometrix is a software package for analyzing bibliometric data in the R programming environment. It provides a variety of functions for processing and analyzing data from scientific publications, including building scientific productivity indicators, citation maps, collaboration networks, and analysis of classification terms (Bibliometrix (2023)). https://www.bibliometrix.org
CiteSpace	CiteSpace is a software for visualizing and analyzing scientometric data, including scientific publications and citations. It allows researchers to identify key themes, trends, and patterns in scientific data by building graphical networks based on citations (CiteSpace (2023)). http://cluster.cis.drexel.edu/~cchen/citespace
VOSviewer	VOSviewer is a software tool designed for visualizing and analyzing bibliometric data. It allows researchers to identify key themes, relationships, and patterns in large datasets by building graphical networks and maps. VOSviewer can be used to analyze scientific publications, author collaboration, citation patterns, and other bibliometric data (VOSviewer (2023)). https://www.vosviewer.com

In the context of analyzing scientometric data, Bibliometrix, CiteSpace, and VOSviewer are popular tools with a wide range of functions (Table 4). Bibliometrix is a powerful package for analyzing bibliometric data in the R programming environment that provides a wide range of functions for processing, visualizing, and analyzing scientometric data. CiteSpace, on the other hand, is a program with extensive network data visualization capabilities and can be used to identify and analyze key themes, trends, and relationships in scientific publications. However, given its ease of use, multifunctional interface, and extensive visualization capabilities, we recommend using VOSviewer for analyzing scientometric data. VOSviewer allows you to visualize a scientific landscape map, and identify key topics, groups of authors, and connections between them. Its user-friendly interface and powerful analytical capabilities allow researchers to easily develop visualizations, analyze data, and gain insights from scientometric research. VOSviewer was chosen because of its user-friendly interface, rich set of data visualization and analysis features, and widespread use among the scientific community. This tool provides researchers with the ability to easily explore and visualize scientometric data to gain new insights and support decision-making.

To generate and analyze the relevant taxonomy set, a search horizon of 500 specialized publications published in the last five years is used.

Comparative analysis between expert and scientometric analysis of the research field is useful for obtaining a complete and more objective picture of research activity and impact. Expert analysis is based on the knowledge and experience of subject matter experts who assess the importance, relevance, and impact of publications and research. Experts may take into account qualitative aspects such as originality, innovation, and the impact of the research on practice. On the other hand, scientometric analysis uses quantitative metrics such as citations, citation indices, and impact factors to assess the impact of research. This analysis allows you to measure the quantitative impact of publications and identify popular research topics, research communities, and trends in the scientific literature. Comparative analysis allows for comparing the results of both approaches and identifying common points and differences. Expert analysis can complement scientometric data by taking into account the qualitative aspects of research and the broader context. Scientometric analysis, on the other hand, provides objectivity and the possibility of quantitative comparison of research productivity.

Based on the results of the proposed research methodology, a synthesis concept for the implementation of the Accounting 4.0 concept (Industry 4.0) in the national regulatory policy system in the field of accounting and auditing is formed.

RESULTS

The basis of the state regulatory policy in the field of accounting is the relevant regulation (On Accounting and Financial Reporting in Ukraine) and national accounting provisions (standards) approved by the Ministry of Finance of Ukraine for enterprises that are not required by law to prepare financial statements according to international financial reporting standards.

The National Accounting Standard of Ukraine is an important regulatory document that defines the basic principles and rules of accounting in Ukraine. The standards regulate the procedure for preparing financial statements, classification and measurement of assets and liabilities, disclosure of financial information and other aspects of accounting (On Approval of the National Regulation..., 2013). The mentioned national standard has 34 separate provisions (3 of which have expired) (Figure 1).

The existing system of organization and management of accounting reports covers the entire spectrum of economic activity accounting but currently requires modernization in accordance with international experience and successful practices of implementing the latest technological solutions. Taking this aspect into account, Ukraine has formed a vector for the development of the accounting industry (On Approval of the Strategy..., 2018), which, in particular, provides for the transition to the international accounting and auditing system - XBRL (for Ukraine - UA IFRS XBRL) (On Amendments..., 2017; On Approval of the Translation..., 2021; IFRS Taxonomy..., 2023; XBRL..., 2023).

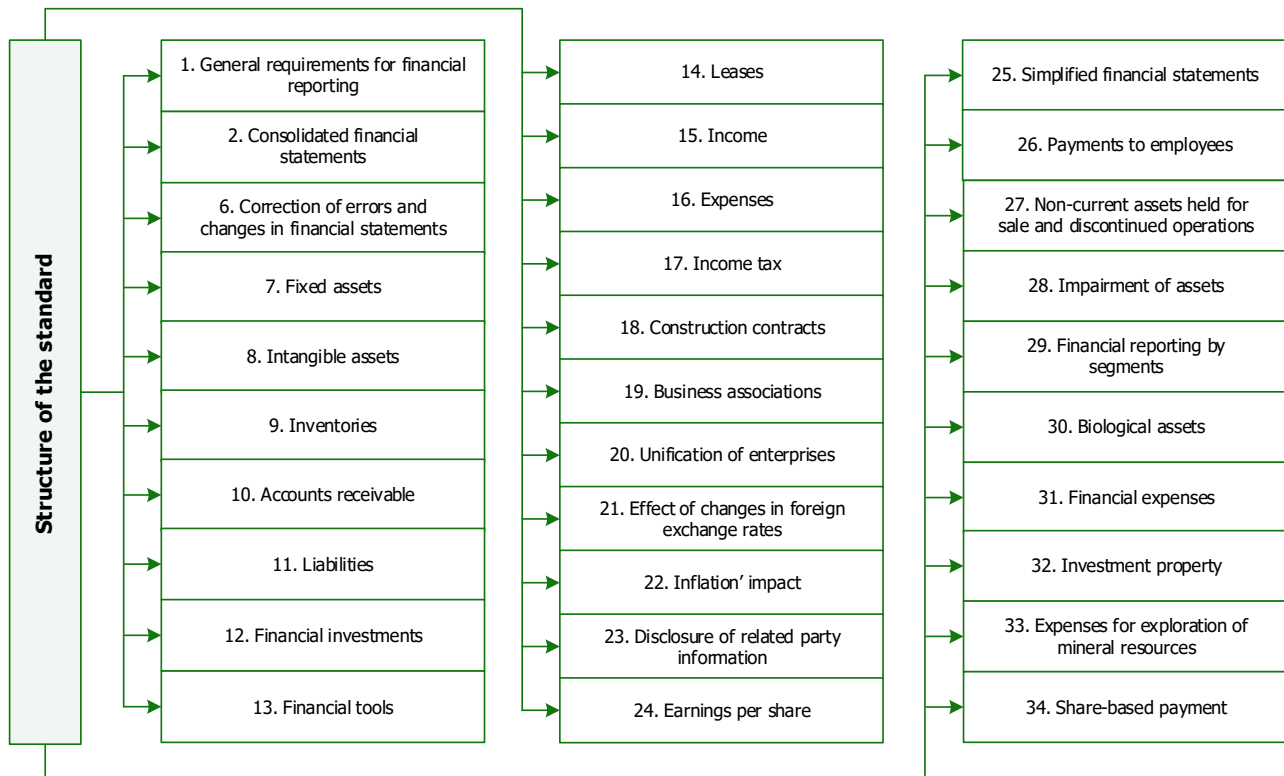


Figure 1. Structure of the National Accounting Standard of Ukraine. (Source: created by the author on the basis of (On Approval of the National Regulation...))

The implementation of UA IFRS XBRL involves specialized state institutions that shape the modernization of the accounting industry of Ukraine within the framework of (Association Agreement..., 2014).

XBRL (eXtensible Business Reporting Language) is a markup language specially designed for the exchange of financial information and reports between computer systems. It allows you to structure and label data in financial reports, ensuring standardization and automated data processing. XBRL is used in financial statements to mark and identify individual elements of financial information using tags, which allows for automatic data analysis and processing. This facilitates the exchange of information, ensures greater accuracy and efficiency in the processing of financial statements, and helps reduce errors. XBRL standardizes financial information and facilitates the comparison and analysis of financial performance. The use of XBRL improves the accessibility and transparency of financial information, contributing to the efficient functioning of the financial market (XBRL..., 2023).

The use of UA IFRS XBRL has several advantages compared to the current accounting system in Ukraine.

First, UA IFRS XBRL ensures standardization and uniformity of financial statements, which simplifies the comparison and analysis of financial indicators between different companies and reporting periods. This contributes to a more accurate and objective comparison of the financial performance and risks of different companies.

Secondly, the use of UA IFRS XBRL facilitates the exchange of financial information between companies, regulators and other stakeholders. This provides quick and efficient access to financial information, facilitating management decision-making and financial analysis.

Thirdly, the use of UA IFRS XBRL helps to reduce the risk of errors and ensure greater accuracy of financial statements. Standardized tags and structured data allow for automating the processing of financial data, avoiding manual input and reducing the possibility of errors.

Finally, the use of XBRL contributes to the transparency and accessibility of financial information, in particular for investors, analysts and regulators. This contributes to increased confidence in financial markets and facilitates decision-making based on objective and comparable data.

Thus, the use of XBRL in comparison with the current accounting system in Ukraine ensures standardization, facilitates the exchange of information, reduces the risk of errors and increases the transparency of financial statements. This helps to improve the efficiency and reliability of accounting, as well as facilitates the processes of analysis and management decision-making (XBRL..., 2023).

It is worth noting that UA IFRS XBRL is a systemic solution that requires a more thorough and detailed study to support the implementation of the global concept of the digital economy Accounting 4.0 (Industry 4.0).

The use of digitalization tools has already had a significant impact on the accounting and auditing industry, including the energy sector. This is confirmed by the analytical findings of industry research, in particular, according to forecasts (Eira, 2023), companies that implement digital reporting and digital audit of economic and business activities expect to receive a revenue of more than half of the world GDP, namely USD 53.3 trillion.

According to the results of the analysis (Digital Transformation in Financial Services..., 2023), it was found that 68% of financial sector companies (i.e., 63% of the total number of business organizations) have a digital transformation strategy. However, only 14% of financial companies are at the stage of implementing digital solutions in their business activities, which is less than the total number of business organizations, which is 23%. Thus, about 54% of financial sector companies, although they have a digital transformation strategy, are in no hurry to implement it and integrate modern digital tools (including accounting and auditing) into their typical business activities.

The tendency of certain mechanisms for the digital conceptualization of the accounting and auditing industry indicates a somewhat declarative nature of comprehensive programs for the modernization of the accounting sector, even among the world's leading companies, which is primarily due to the lack of a clear state policy for each of the countries where the analyzed enterprises are localized. Despite the successful implementation of the XBRL system solution, the global community currently lacks a clear algorithm for applying modern technological solutions that will help optimize the accounting and auditing sector. These factors indicate the need for an in-depth study of the prospects for the use of digital tools of the fourth wave of industrialization Industry 4.0 in the conceptualized Accounting 4.0 system with further normalization and methodological streamlining in the form of relevant national regulatory standards that will ensure unity and efficiency of interaction of all participants in the industry under study.

Taking into account the identified global trends, in the context of modernization of the Ukrainian accounting policy, an actual factual background is formed, which proves the expediency of an in-depth study of the means of development of the Ukrainian accounting business, which should correlate with global trends and absorb the best technological practices within the framework of the Accounting 4.0 concept (Aslanertik & Yardımcı, 2019).

In accordance with the proposed methodological scheme of the study, we will apply the method of expert survey based on analytical reports of specialized organizations (see Table 2), according to which we will establish the nomenclature of digital tools for instrumental support of the processes of implementation of the Accounting 4.0 concept in the system of national standards of state accounting policy (Table 5, Figure 2).

Table 5. Results of the analysis of expert opinions on the impact of certain digital tools on the accounting and auditing industry.

Means of digital transformation of state accounting policy	Analytics Steps Infomedia LLP	Maryville University	FinancesOnline	BDO USA LLP	Digital Adoption	Hitachi Solutions	DATAINTELO	Consultancy.asia	Smart Insights Ltd	Avinga	Frequency of mention	Relative ranking by frequency of mention	Number of times the first leading position was taken	Number of times the second leading position was taken	Number of times the third leading position was taken	Relative ranking by priority
Blockchain Technology	1			6			1	8	1	3	6	0.316	3	0	1	3.6
Cloud Computing	2	2		1	4	1	2		2	5	8	0.421	2	4	0	4.4
Big Data	3	3	1				5	5	3	6	7	0.368	1	0	3	2.1
AI-based automation		1				2				4	3	0.158	1	1	0	1.7
Data analytics		4									1	0.053	0	0	0	0.1
Self-service reporting		5									1	0.053	0	0	0	0.1
Data visualization		6									1	0.053	0	0	0	0.1
Predictive modelling		7			5			4			3	0.158	0	0	0	0.2
Voice recognition		8									1	0.053	0	0	0	0.1
Mobile technology			2								1	0.053	0	1	0	0.6
APIs and embeddable tech			3								1	0.053	0	0	1	0.3
Advanced analytics				3		4		3			3	0.158	0	0	2	0.7
Automation				2	6						2	0.105	0	1	0	0.6
Artificial intelligence (AI)				4	4	3	3	7	4	1	7	0.368	1	0	2	1.9
Internet of Things (IoT)				5	1						2	0.105	1	0	0	1.1
Robotics process automation (RPA)					2			2			2	0.105	0	2	0	1.1
Machine learning (ML)					3			6	5	2	4	0.211	0	1	1	1.0
Biometrics							4				1	0.053	0	0	0	0.1
Smart dashboards								1			1	0.053	1	0	0	1.1

According to the results (Table 5, Figure 2), the digital transformation tools that are most often mentioned in the analysis of expert opinions on their impact on the accounting and auditing industry are as follows:

- *Cloud Computing*: This remedy is also one of the most mentioned and has a great impact on the industry.
- *Blockchain Technology*: According to the analysis, this technology is at the top of the list and has a high priority in accounting and auditing.
- *Big Data*: Analytical findings confirm that big data is essential for digital transformation in accounting and auditing.
- *Artificial Intelligence (AI)*: This tool also has a significant impact on the industry, as AI allows for process automation and improved analytics.

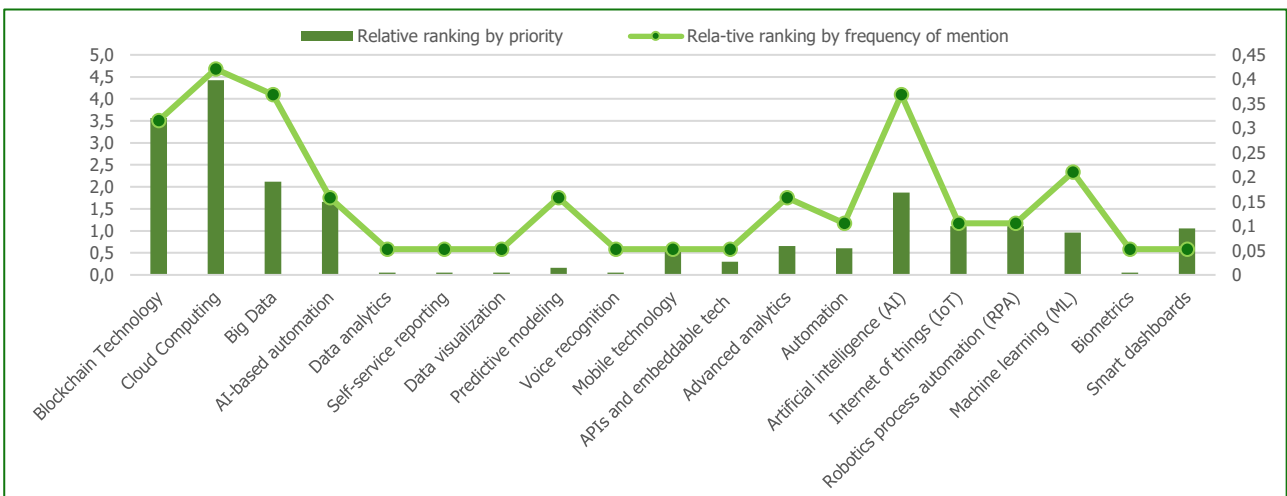


Figure 2. Graphical interpretation of the results of expert opinions on the impact of certain digital tools on the accounting and auditing industry.

Other tools, such as AI-based automation, Data analytics, Predictive modelling, Voice recognition, Mobile technology, APIs and embedded tech, Advanced analytics, Automation, Internet of things (IoT), Robotics process automation (RPA), Machine learning (ML), Biometrics, Smart dashboards, are also mentioned in the study but do not have such a high frequency of mention or priority as the above.

Taking into account the results of the analysis of expert opinions (Table 5, Figure 2), which form a verified basis (Table 2), it can be determined that Blockchain Technology, Cloud Computing and Big Data are considered the main means of digital transformation in the field of accounting and auditing. Accordingly, the relevant national institutions of each state that seeks to develop the industry under study (including Ukraine) should focus their actions on streamlining and regulating the mechanisms for applying the identified digital tools.

In the future, following the proposed research methodology, we will analyze the scientific support of the accounting and auditing industry. Using the Publish or Perish software (which is defined as optimal among similar software tools (Table 3)), we will obtain the corresponding set of taxonomical units selected from 500 relevant publications that were published in the current five-year period (search horizon - 2018 - 2023) (Table 6).

Table 6. Taxonomic set selected from 500 relevant publications on the modernization of national accounting policy in the dynamic conditions of the digital economy. (Source: developed by the author in Publish or Perish software)

Parameter	Value
Query	National accounting and reporting standards in the era of digitalization of the economy
Source	Web of Science, Scopus, Google Scholar, Microsoft Academic, CrossRef
Papers	500
Citations	19866
Years	5
Cites_Year	3973.20
Cites_Paper	39.73
Cites_Author	8091.96
Papers_Author	253.50
Authors_Paper	2.88
h_index	62
g_index	134
hc_index	84
hI_index	18.05
hI_norm	40
AWCR	9489.55
AW_index	97.41
AWCRpA	4054.55
e_index	106.99
hm_index	39.06
Cites_Author_Year	1618.39
hI_annual	8.00
h_coverage	77.0
g_coverage	91.0
star_count	147
year_first	2018
year_last	2023
ECC	19866
acc1	350
acc2	292
acc5	208
acc20	94
hA	43

As a result of the analysis of 500 relevant publications on the modernization of national accounting policy in the dynamic conditions of the digital economy, the following indicators were obtained:

- *Number of citations*: The total number of citations is 19,866. This indicates a high level of interest in this topic in the scientific community;
- *Cites_Year* (Citations per year): The average number of citations per year is 3,973.20, indicating a constant and stable interest in the topic over the past 5 years;
- *Cites_Paper* (Citations per publication): The average number of citations per publication is 39.73, which indicates a high citation rate for articles related to the modernization of national accounting policy in the digital economy;
- *h-index*: an h-index of 62 indicates that there are 62 publications, each with at least 62 citations;
- *g-index*: g-index of 134 indicates that there are 134 publications, each with at least 134 citations;
- *AWCR* (Adjusted Weighted Citation Ratio): The AWCR value is 9,489.55, which indicates a high citation rate for publications on this topic;
- *e-index*: e-index of 106.99 indicates that there are 106 publications, each with at least 106 citations;
- *hA*: hA-index, which is 43, indicates the presence of 43 authors, each of whom has at least 43 publications with a high citation level.

The obtained indicators indicate a wide and high level of research and interest in the modernization of national accounting policy in the digital economy. The general trend is a high interest and activity in the study of the modernization of national accounting policy in the digital economy. The results of the analysis confirm the importance of the topic and the contribution of the authors to the development of this field.

Taking into account the parameters of taxonomic and cluster relations of the obtained taxonomic set, selected from 500 relevant scientific publications in the current search horizon, as in the case of the analysis of expert opinions (Table 5), we use the tool of relative rating gradation (taking into account the previously identified nomenclature of digital tools of Accounting 4.0 (Industry 4.0)) (Table 7, Figure 3).

Table 7. Grading of the relative scientometric rating, taking into account the established nomenclature of means of digital transformation of the state accounting policy. (Source: created by the author of VOSviewer software)

Means of digital transformation of state accounting policy	The power of taxonomic relationships	Relative taxonomic rating	The power of cluster connections	Relative cluster ranking	Relative scientometric rating
Blockchain Technology	4	0.146	3	3.5	1.88
Cloud Computing	4	0.146	1	1.2	0.72
Big Data	11	0.400	6	6.9	3.87
AI-based automation	5	0.182	3	3.5	1.92
Data analytics	2	0.073	2	2.3	1.23
Self-service reporting	1	0.036	1	1.2	0.62
Data visualization	1	0.036	1	1.2	0.62
Predictive modelling	5	0.182	2	2.3	1.34
Voice recognition	1	0.036	1	1.2	0.62
Mobile technology	1	0.036	1	1.2	0.62
APIs and embeddable tech	1	0.036	1	1.2	0.62
Advanced analytics	2	0.073	2	2.3	1.23
Automation	1	0.036	1	1.2	0.62
Artificial intelligence (AI)	22	0.801	12	13.9	7.75
Internet of Things (IoT)	10	0.364	5	5.8	3.26
Robotics process automation (RPA)	1	0.036	1	1.2	0.62
Machine learning (ML)	8	0.291	6	6.9	3.76
Biometrics	1	0.036	1	1.2	0.62
Smart dashboards	1	0.036	1	1.2	0.62

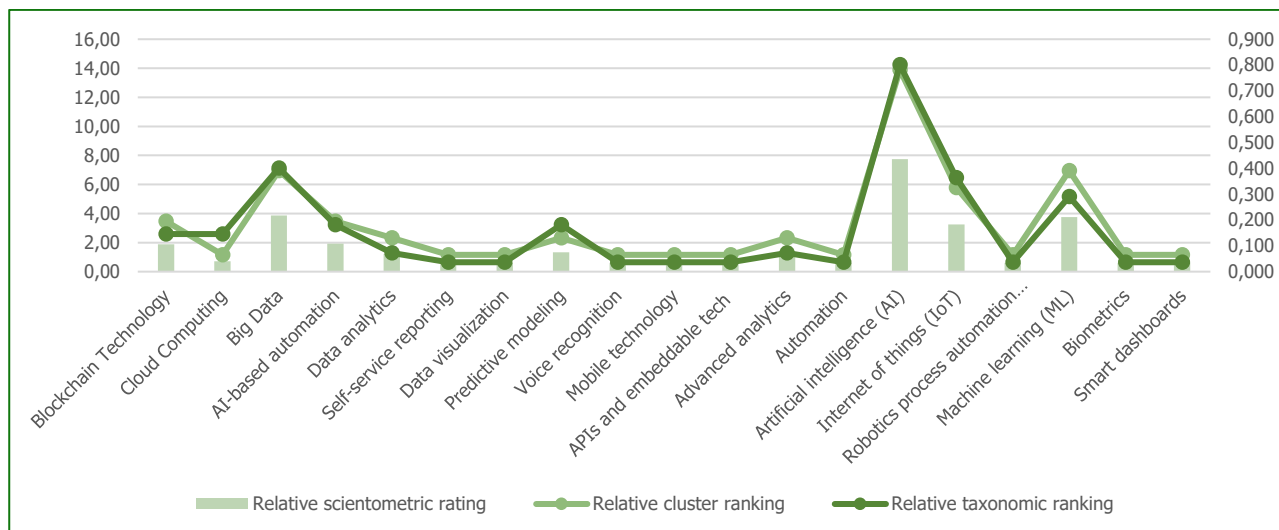


Figure 3. Graphical interpretation of the results of graduation of the scientometric rating of a certain nomenclature of digital tools of the Accounting 4.0 concept (Industry 4.0). (Source: created by the author of VOSviewer software)

According to the comparative analysis of the relative scientometric ranking (Table 7, Figure 10), it was found that Artificial intelligence (AI), Big Data, Machine learning (ML), Internet of things (IoT) and Blockchain Technology are the leading digital transformation tools in the field of national accounting policy.

Thus, it can be concluded that the redistribution of digital transformation tools in the accounting and auditing sector based on the relative scientometric rating differs from the similar distribution based on the expert rating. In particular, there is a clear desire of the scientific community to integrate technologies based on the use of artificial intelligence and machine learning. However, a correlation point has also been identified, which is the use of Big Data analytical tools. This indicates the significance of the analytical capabilities provided by the use of large amounts of data in the field of accounting and auditing.

According to the results of the analysis of the means of digital transformation of the national accounting policy obtained in two iterations of the current study, it is possible to determine the optimal range of technical solutions that can potentially be integrated into the accounting and audit system. Among these solutions, it is worth noting Cloud Computing, Blockchain Technology, Big Data, Artificial intelligence (AI), Machine learning (ML) and the Internet of Things (IoT). These technologies can have a significant impact on accounting and auditing processes, facilitating automation, effective data analysis and improved decision-making: the use of Cloud Computing allows access to data and computing resources from anywhere and reduces the cost of IT infrastructure; the introduction of Blockchain Technology ensures the reliability, integrity and security of accounts and transactions; the use of large amounts of data allows for the analysis and identification of dependencies and trends that can inform strategic decision-making; Artificial Intelligence (AI) and Machine Learning (ML) enable automated data processing, anomaly detection, and predictive analytics, enhancing the accuracy and efficiency of accounting processes; the Internet of Things (IoT) enables the integration of physical devices and sensors, providing real-time data for monitoring and analysis.

Based on the results obtained, the concept of modernization of the national accounting policy, taking into account global trends and modern technological achievements of the digital economy within the framework of the Industry 4.0 paradigm, provides for the integration of the identified digital tools (Cloud Computing, Blockchain Technology, Big Data, Artificial intelligence (AI), Machine learning (ML) and Internet of things (IoT)) into the global system of accounting standards - XBRL.

The concept of modernization of the national accounting policy by digital means includes the following solutions:

- to ensure the full adoption of the XBRL international standard of electronic exchange of financial information at all stages of accounting for economic activity with the formation of the appropriate resource and communication infrastructure with equal state support;

- integration of the optimal nomenclature of digital means: cloud technologies and services - to ensure flexibility and mobility of access, effective storage and processing of large arrays of accounting data with the formation of appropriate interstructural databases with multi-local access; blockchain – to reduce threats to the security of accounting and organizational data (unauthorized access, manipulative and fraudulent changes and substitutions of accounting and financial transaction data, theft of confidential commercial information, etc.); Big Data – for the reduction of routine and same-type accounting operations with the possibility of operational analytics of large data sets; artificial intelligence and machine learning - for automation of accounting and auditing operations and operational analysis of the same type of data that form the basis of large arrays of accounting data; Internet of Things (IoT) - to ensure operational machine communication between devices integrated into the accounting system according to the XBRL standard with the possibility of obtaining relevant accounting data in real time;
- adaptation of specialists to the use of the latest digital solutions of the Accounting 4.0 (Industry 4.0) paradigm: development and implementation of training programs, practical courses, advanced training courses, stress tests, etc.;
- initialization of a broad national conference on the development and modernization of the national accounting policy with digital means and solutions: the involvement of specialized specialists and performers, state regulators and agencies, scientists and designers, and interested representatives of enterprises and businesses for the purpose of prompt editing and making optimal decisions regarding the implementation of national accounting standards adapted to the Accounting 4.0 (Industry 4.0) concept, taking into account the proposals, experience and practical recommendations of each participant of the state accounting system.

The application of the proposed draft concept of the digital modernization of the national accounting policy within the framework of the Accounting 4.0 (Industry 4.0) paradigm will contribute not only to the improvement of the conduct of accounting and auditing operations, but will also increase the competitiveness of both individual enterprises and the state as a whole, which fully satisfies Ukrainian national interests.

DISCUSSION

The analytical iterations conducted to determine the optimal set of digital tools for the digitalization of the accounting and audit system at the national level made it possible to form two corresponding sets of tools:

- according to expert opinion, the optimal set includes the following tools: Cloud Computing, Blockchain Technology, Big Data, Artificial intelligence (AI) and AI-based automation;
- according to scientometric evaluation, the optimal set includes the following tools: Artificial intelligence (AI), Big Data, Machine learning (ML), Internet of things (IoT) and Blockchain Technology.

These results are the basis for the selection and implementation of digital tools in the accounting and auditing system at the national level in order to improve the efficiency and accuracy of these processes.

In accordance with the defined methodology of the current study, we will use the method of comparative analysis to determine the synergistic nomenclature of tools for the digital transformation of the national accounting policy (Table 8, Figure 4).

Table 8. Comparative analysis of the results of expert and scientometric assessment of the optimal nomenclature of tools for digital modernization of the national accounting policy. (Source: created by the author of VOSviewer software)

Means of digital transformation of state accounting policy	Relative ranking by priority (expert)	Relative ranking by priority (expert), %	Relative scientometric ranking	Relative scientometric ranking, %
Blockchain Technology	3.6	17.48	1.88	5.79
Cloud Computing	4.4	21.68	0.72	2.23
Big Data	2.1	10.39	3.87	11.92
AI-based automation	1.7	8.13	1.92	5.90
Data analytics	0.1	0.26	1.23	3.79
Self-service reporting	0.1	0.26	0.62	1.89
Data visualization	0.1	0.26	0.62	1.89
Predictive modelling	0.2	0.77	1.34	4.12

(continued on next page)

Table 8. Continued

Means of digital transformation of state accounting policy	Relative ranking by priority (expert)	Relative ranking by priority (expert), %	Relative scientometric ranking	Relative scientometric ranking, %
Voice recognition	0.1	0.26	0.62	1.89
Mobile technology	0.6	2.71	0.62	1.89
APIs and embeddable tech	0.3	1.48	0.62	1.89
Advanced analytics	0.7	3.23	1.23	3.79
Automation	0.6	2.97	0.62	1.89
Artificial intelligence (AI)	1.9	9.16	7.75	23.83
Internet of Things (IoT)	1.1	5.42	3.26	10.02
Robotics process automation (RPA)	1.1	5.42	0.62	1.89
Machine learning (ML)	1.0	4.71	3.76	11.58
Biometrics	0.1	0.26	0.62	1.89
Smart dashboards	1.1	5.16	0.62	1.89

The comparative analysis of the results of the expert and scientometric assessment of the optimal nomenclature of tools for the digital modernization of the national accounting policy shows the following:

- According to the expert assessment, the following means have the highest priority: Cloud Computing (ranking 4.4), Blockchain Technology (ranking 3.6), Artificial intelligence (AI) (ranking 1.9) and Big Data (ranking 2.1);
- According to the results of the scientometric assessment, the following tools have the highest rating: Artificial intelligence (AI) (ranking 7.75), Big Data (ranking 3.87), Machine learning (ML) (ranking 3.76), and Internet of things (IoT) (ranking 3.26).

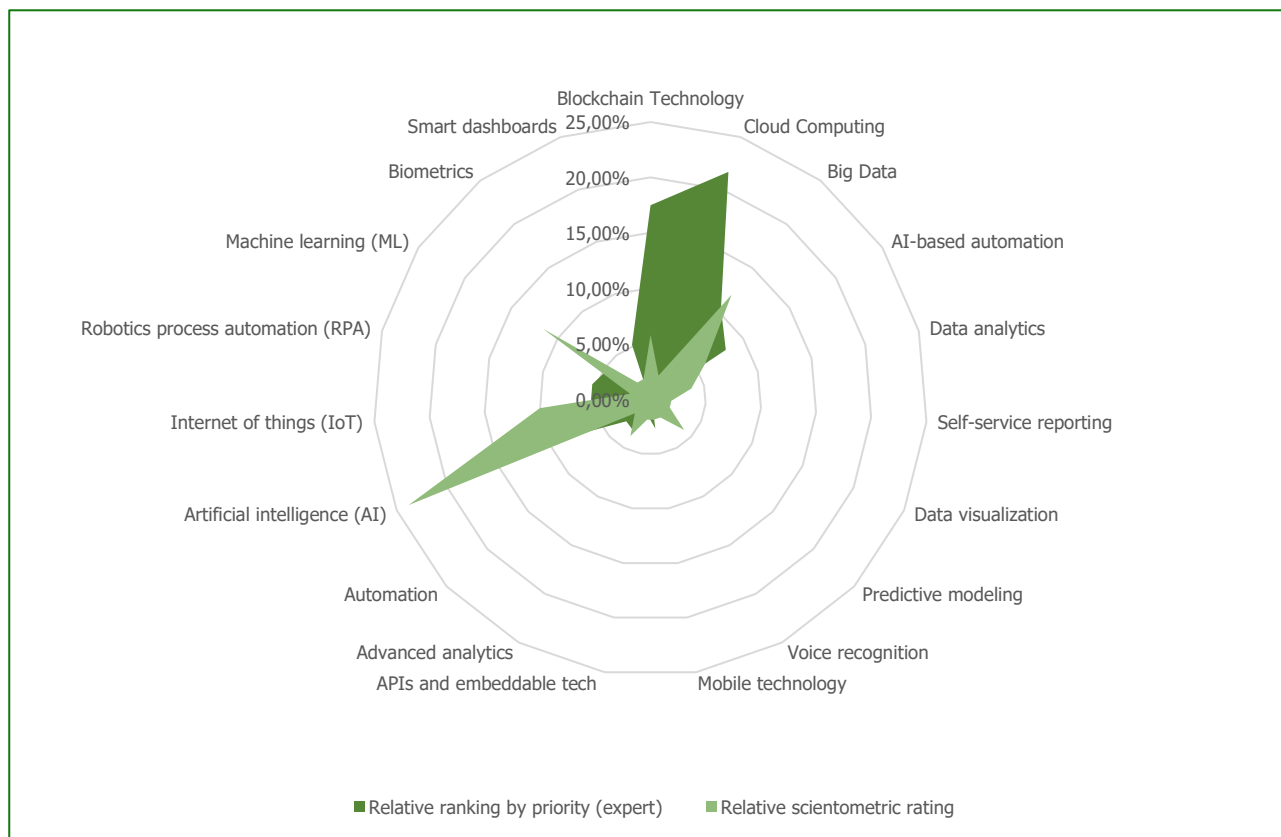


Figure 4. Graphical interpretation of the comparative analysis of the results of the expert and scientometric assessment of the optimal nomenclature of tools for digital modernization of the national accounting policy. (Source: created by the author of VOSviewer software)

It is worth noting that there are differences between expert and scientometric assessments of the priority of certain means of digital modernization. For example, experts identified Cloud Computing and Blockchain Technology as top priorities,

while according to the scientometric rating, their importance is lower. On the other hand, Artificial intelligence (AI) turned out to be a high priority according to both expert and scientometric assessments.

Such discrepancies may be due to the subjectivity of expert assessment and different methods of scientometric analysis. Nevertheless, comparing the results of both assessments allows us to conclude that certain digital modernization tools, such as Artificial intelligence (AI), Big Data and Machine learning (ML), are important and have a significant impact on national accounting policy.

In this case, the expert assessment favours tools that are usually associated with data processing and cybersecurity, such as Blockchain Technology, Cloud Computing, Big Data, and AI-based automation. Instead, the scientometric assessment emphasizes the importance of tools related to the development of artificial intelligence, such as Artificial intelligence (AI), Machine learning (ML), the Internet of Things (IoT) and Blockchain Technology. Thus, expert evaluation is more focused on the practical application of tools in the field of accounting, while scientometric evaluation is based on technological development. Despite some differences, both assessment principles have a common point of convergence - Big Data analytical tools. According to the concept of Accounting 4.0 (Industry 4.0), these tools should be modernized with artificial intelligence and machine learning, which will automate accounting processes and ensure high accuracy and quality of the data recorded.

The discrepancies between scientometric and expert assessments of the nomenclature of tools for the digital transformation of the state accounting policy may be due to several reasons.

First, different methodologies and approaches are used in scientometric analysis and expert evaluation. The scientometric analysis is based on objective data and metrics, such as publications, citations, and impact factors of scientific research. At the same time, expert opinion is based on the subjective experience and knowledge of experts in the field of accounting and digital technologies.

Second, discrepancies may arise due to the different focus of the assessments. A scientometric assessment may be aimed at determining the role and impact of certain digital transformation tools on the development of accounting practices. An expert assessment, on the other hand, may be more focused on the practical application of the tools and their relevance to the current needs of the accounting sector.

Third, the differences may reflect the individual views and experiences of the experts. Each expert may have their own priorities based on their personal understanding and assessment of the value of digital transformation tools. This can lead to different views on the prioritization of individual enablers.

Despite the differences, both approaches have their advantages and importance in the development of specialized national standards. The scientometric analysis provides objective data and indicates technological trends that contribute to the development of accounting practices. An expert assessment, in turn, takes into account practical experience and can reveal nuances that are not reflected in scientometric data.

Given the differences, it is recommended to combine both approaches to develop specialized national standards. Comparison of the results of scientometric analysis and expert assessment will allow for finding a common point of convergence and identifying the most important and priority means of digital transformation for the development of public accounting policy.

The results of the current study correlate with relevant publications (Alhasana & Alrowwad, 2022; Tulakhodjaeva & Khodjaeva, 2021; Kadirovich & Sharofovich, 2023; Azizov, 2021) in terms of identifying industry issues, namely the need to modernize national accounting policy, but these publications do not contain results on the likely vectors of development and implementation of the latest technologies, as proposed in the current study.

There is a coincidence with the publications (Dumitru, 2022; Vysochan, Hyk, Mykytyuk & Vysochan, 2023; Mosteanu & Faccia, 2020; İşbîl, Koroğlu & Figen, 2021) in terms of ensuring the implementation of the international standard for the exchange of financial accounting information XBRL. However, in this study, XBRL is defined as a framework system solution that will provide an information and communication component, which, however, does not determine the mechanisms for implementing the Accounting 4.0 paradigm (Industry 4.0), and therefore, the relevant research focus is shifted to determining the optimal nomenclature of digital tools that have the potential to be integrated into the national accounting and auditing system.

There is a correlation with publications (Abd Razak, Noor & Jusoh, 2021; Lugova et al. 2023) in terms of determining the leading role of digital tools in the modernization of national accounting policy and relevant standardization. However, these publications do not contain practical mechanisms for determining the optimal composition of digital transformation tools.

In contrast, this study provides a reasonable set of digital solutions that should be considered by relevant institutions when developing a new national accounting and auditing standard.

Thus, the results of the current study are broader and more detailed, with practical recommendations for priority-rating gradation of digital tools that have the greatest potential for integration into the system of the national accounting standard based on the XBRL framework solution within the Accounting 4.0 paradigm (Industry 4.0).

CONCLUSIONS

According to the results of this study, an optimal concept for the modernization of the national accounting policy has been established, which provides for the use of the XBRL unitary system for the exchange of financial information as the main organizational and technological solution, in which, according to the results of a comparative analysis of expert and scientific evaluation, the following optimal nomenclature of digital transformation tools should be normalized and integrated:

- **Cloud Computing:** This technology provides access to computing resources, such as computing power and data storage, via the Internet. The introduction of Cloud Computing allows for flexibility, scalability and speed of data processing, which contributes to the effective modernization of national accounting policy by providing access to computing resources;
- **Blockchain Technology:** This technology ensures security, inaccessibility to change and non-duplication of records in digital transactions. Implementation of Blockchain Technology allows to ensure a high level of trust and transparency in accounting policy by creating unchanging and reliable records;
- **Big Data:** This concept refers to the processing and analysis of large amounts of data. The use of Big Data allows to obtain valuable insights and make forecasts based on objective data, which contributes to the improvement of national accounting policy;
- **Artificial Intelligence (AI):** This technology allows computers to perform tasks that usually require human intelligence. The introduction of artificial intelligence helps to automate data processing, identify complex relationships, and increase the accuracy of decision-making;
- **Machine Learning (ML):** It is a branch of artificial intelligence that allows computers to learn from data and improve their performance without direct programming. Implementing Machine Learning allows you to automate data analysis processes, recognize patterns, and make predictions;
- **Internet of Things (IoT):** This concept refers to a network of physical devices (sensors, various devices) that interact and exchange data with each other via the Internet. The introduction of the Internet of Things allows you to collect a large amount of data in real-time, which helps to improve accounting processes and ensure the accuracy and speed of information exchange.

All of these digital tools have great potential for modernizing national accounting policy, providing efficient data processing, process automation, increased accuracy and transparency in accounting reporting, and improved decision-making.

Further research is aimed at detailing the assessment of the impact of individual elements of the formed optimal nomenclature of digital transformation tools on the national accounting and audit system.

ADDITIONAL INFORMATION

AUTHOR CONTRIBUTIONS

All authors have contributed equally

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МОДЕРНІЗАЦІЯ НАЦІОНАЛЬНОЇ СИСТЕМИ ОБЛІКУ Й АУДИТУ З ВИКОРИСТАННЯМ ІНСТРУМЕНТІВ ЦИФРОВОЇ ТРАНСФОРМАЦІЇ

Мета дослідження полягає в розробці концепції модернізації національної облікової політики з урахуванням глобальних тенденцій та сучасних технологічних досягнень цифрової економіки, що відбувається в контексті парадигми Accounting 4.0 (Industry 4.0). У дослідженні використані такі методи: аналітичний (аналіз та збирання даних предметної області), документальний аналіз (дослідженні нормативних вимог до організації предметної області), експертний (вивчення висновків провідних фахівців щодо досліджуваних аспектів), наукометричний (дослідження рівня наукового супроводу предметної області), компаративний аналіз (корелятивне порівняння експертних та наукових висновків), метод синтезу (формування концепції модернізації національної облікової політики). Оптимальна номенклатура засобів цифрової трансформації національної облікової політики визначена за результатами компаративного аналізу експертної та наукометричної оцінки є синергетичною з урахуванням відмінностей кожного зі загаданих методів оцінки. Результати дослідження вказують на те, що модернізація національної облікової політики може бути досягнута за допомогою впровадження таких цифрових засобів: Cloud Computing, Blockchain Technology, Big Data, Artificial Intelligence (AI), Machine Learning (ML) та Internet of Things (IoT). Використання цих технологій дозволить забезпечити гнучкість, безпеку, ефективну обробку великого обсягу даних, автоматизацію процесів, підвищену точність і прозорість в обліковій звітності та поліпшення ухвалення рішень. Незважаючи на те, що наразі українська бухгалтерська справа перебуває на стадії імплементації міжнародної системи обміну фінансовою інформацією (адаптованої до локальних умов) – UA MCFZ XBRL, відсутні дослідження щодо інструментального супроводу національної системи обліку та аудиту. Упровадження концепції модернізації національної облікової політики згідно з парадигмою Accounting 4.0 (Industry 4.0) має потенціал покращити ефективність та якість обліку й аудиту, сприяти розвитку цифрової економіки та підвищенню конкурентоспроможності країни на міжнародній арені. Це досягається за допомогою впровадження сучасних цифрових технологій, які забезпечують автоматизацію процесів, покращену аналітику даних та надійність і прозорість у сфері обліку й аудиту. Такі зміни сприятимуть підвищенню продуктивності, зниженню ризиків та зміцненню довіри до фінансової звітності.

Ключові слова: бухгалтерський облік 4.0, індустрія 4.0, хмарні обчислення, технологія блокчейн, великі дані, штучний інтелект, машинне навчання, інтернет речей, національна облікова політика, бухгалтерська справа

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