A. Mirzazadeh
Zohreh Molamohamadi
Babek Erdebilli
Erfan Babaee Tirkolaee
Gerhard-Wilhelm Weber (Eds.)

Communications in Computer and Information Science 2651

Science, Engineering Management and Information Technology

5th International Conference, SEMIT 2025
Dubai, United Arab Emirates, September 11–13, 2025
Proceedings, Part I

Part 1

Springer

A. Mirzazadeh · Zohreh Molamohamadi ·
Babek Erdebilli · Erfan Babaee Tirkolaee ·
Gerhard-Wilhelm Weber
Editors

Science, Engineering Management and Information Technology

5th International Conference, SEMIT 2025
Dubai, United Arab Emirates, September 11–13, 2025
Proceedings, Part I

Springer

Editors
A. Mirzazadeh
Kharazmi University
Tehran, Iran

Zohreh Molamohamadi
Kharazmi University
Tehran, Iran

Babek Erdebilli
Ankara Yıldırım Beyazıt University
Ankara, Türkiye

Erfan Babaee Tirkolaee
Istinye University
Istanbul, Türkiye

Gerhard-Wilhelm Weber
Poznań University of Technology
Poznań, Poland

ISSN 1865-0929 ISSN 1865-0937 (electronic)
Communications in Computer and Information Science
ISBN 978-3-032-04224-8 ISBN 978-3-032-04225-5 (eBook)
https://doi.org/10.1007/978-3-032-04225-5

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Institutional Mechanisms of Digital Transformation of Accounting and Control in Agribusiness

Volodymyr Lytvynenko[1(✉)], Dmytro Liudvenko[2], Nadiia Tomilova-Yaremchuk[3], Serhii Khomovyi[3], Andrii Nepochatenko[3], and Tamara Hurenko[1]

[1] National University of Life and Environmental Sciences of Ukraine, 15, Heroyiv Oborony Street, Kyiv 03041, Ukraine
lytvenenko.v.s@nubip.edu.ua

[2] National Research Centre "Institute of Agrarian Economics", 10, Heroyiv Oborony Street, Kyiv 03127, Ukraine

[3] Bila Tserkva National Agrarian University, 8/1, Soborna Square, Kyiv Region, Bila Tserkva 09117, Ukraine

Abstract. This article analyses the institutional foundations of digitalising the accounting and control systems in the agricultural sector, considering the current challenges of digitalisation and the growing demand for effective management. It considers the essence and specifics of establishing an institutional framework for integrating digital technologies into the accounting practices of agricultural enterprises. The article highlights the key structural components of this mechanism, its functional characteristics, and its internal connections. The results of research into the impact of digital tools on the transformation of accounting processes are introduced into scientific circulation, focusing on the automation of the collection, processing, transmission and analysis of financial and economic information. Key obstacles to digitalisation have been identified, including a lack of regulatory and legal framework, low digital competence among personnel, and limited access to infrastructure. The potential benefits of digitally transforming accounting and control procedures in agribusiness are substantiated, including reduced accounting costs, enhanced control over resource usage, increased management decision transparency, and improved financial reporting quality. Strategic directions for strengthening the institutional environment to support digital initiatives are proposed, including updating the regulatory framework, investing in digital infrastructure, improving specialist qualifications, and developing public–private partnerships in agri-digitalisation. The results obtained have both scientific and practical value. They can inform state policy on the digital development of the agricultural sector, as well as the modernisation of accounting systems in agricultural enterprises in line with the requirements of the digital economy.

Keywords: Accounting · Digital Transformation · Institutional Mechanism · Agribusiness · Agricultural Sector · Control · Audit · Enterprise Accounting System

A. Mirzazadeh et al. (Eds.): SEMIT 2025, CCIS 2651, pp. 359–378, 2025.
https://doi.org/10.1007/978-3-032-04225-5_23

1 Introduction: The Context of Digital Transformation in Agribusiness

1.1 Statement of the Problem

Presently, given the specific aspects of its historical development, the Ukrainian state urgently requires swiftly implementing significant institutional reforms to stimulate economic growth in the agricultural sector. However, creating such an effective environment for agricultural development has been slow and coupled with substantial deformations caused by individual missteps. Forming a modern institutional structure of the national agricultural sector of the economy necessitates a revision of the strategic pathways of reforming the industry.

The particularities of changes in the rules of business in the agricultural sector, in the face of constant imbalances and profound transformations, destabilise the domestic and foreign agrarian markets and significantly affect the country's overall economic development. Evaluation of the institutional formation process is achievable only in the context of overall transformations of the national economy. Extensive formal changes in the creation of various forms of ownership and management, interaction of conventional and novel economic institutions, restoration of national economic traditions, introducing innovations, and rethinking of the state's role in economic processes accompanied the transition of the agrarian economy to market conditions. Effective integration of the agricultural sector into the global economy demands additional systemic and regulatory design of the digital transformation of accounting and control.

Innovative accounting processes in the current business environment are not only a technical upgrade, but also a comprehensive change in management approaches that require a revision of the traditional role of accounting as an information base for decision-making. However, the domestic agricultural sector faces institutional obstacles in disparate regulatory frameworks, low digital readiness of enterprises, insufficient infrastructure support, and a lack of effective coordination between public and private entities. Despite the high potential of information technology, agribusiness still lacks a coherent formal mechanism that would ensure the systematic implementation of digital accounting solutions. Several domestic agricultural enterprises still have limitations in using modern IT tools for collecting, processing, and analysing accounting information, directly affecting their competitiveness and management efficiency. Therefore, it is essential to study and form an institutional mechanism for the digital transformation of the accounting system in the agricultural sector, which is formed through legal, organisational, educational, and infrastructural aspects. This approach will not only remove existing barriers but also create conditions for sustainable information development of agribusiness. Data processing technologies are developing rapidly, with accounting shaping business processes and undergoing profound transformations. Information technologies modernise traditional accounting operations and approaches and open new prospects for increasing enterprises' efficiency, transparency, and strategic adaptability. The active implementation of innovative IT solutions by businesses, namely cloud technologies, artificial intelligence, and big data analytics, has shaped the analysis of these trends as particularly important for maintaining competitiveness in the economic activities of agricultural entities.

1.2 Analysis of Recent Research and Publications

The dynamic development of economic science in the twentieth century was supported by research within the framework of institutional theory. Despite this, there is still no generally accepted definition of the essence of the concept of "institution". Several economists and practitioners prefer the definition of Jeffrey M. Hodgson: "Institutions are both objectively existing structures that are "somewhere outside" and subjective springs of human activity "in people's minds" [1, p. 13]. It is the "institutions" as stable parameters of human behavior that are the basis of all the diversity of economic and social life.

The development of the institutional theory of accounting as a separate area of scientific research in Ukraine became possible thanks to the efforts of academician V.M. Zhuk, who made a significant contribution to the popularisation of accounting institutionalism and created a scientific school. Representatives of this school use formal analysis as the primary scientific research method. The provisions of T.S. Kuhn's concept enabled the NAAS academician to form an institutional accounting paradigm, where the main factor is the need to expand information support for various social groups outside of business entities. The scientist considers accounting as an institution that reduces uncertainty risks in the socio-economic environment by creating a specific information field [2].

The work of V.M. Zhuk defines the essence of his paradigm as a shift from a management function to an essential socio-economic institution, which demands the involvement of new components and the application of concepts such as "accounting engineering" and "accounting imperialism" in accounting methodology. The scientific conclusions of the scholar form a new institutional accounting theory [2].

As a result of an in-depth study of the developments of representatives of domestic accounting institutionalism, an interesting idea is the study of I.A. Yukhymenko-Nazaruk, who identified a standard normative paradigm formed from the institutional and neo-institutional block. The study demonstrates a new common source of formation of the worldview of accounting scientists, based on the principles of institutionalism in a broad sense [3, p. 60]. According to the author, the construction of such a paradigm will expand the existing scientific findings in the field of accounting by more actively incorporating neo-institutional concepts, which will increase the internal features of the functioning of institutions and help improve their theoretical and methodological foundations.

The trend of transforming accounting practice and increasing its efficiency in the context of modern economic and technological changes is the combination of the institutional mechanism of accounting and digitalisation.

This is confirmed by studies that demonstrate the improvement of economic performance of enterprises, in particular financial indicators such as market value [4] and innovation efficiency [5] Transformation contributes to strengthening non-economic indicators, such as labour force specialisation, sustainability, and enterprises' environmental, social, and governance (ESG) performance [6]. However, it also has a high failure rate. For example, enterprises are subject to operational restructuring and may face problems such as employee resistance [7] and fall into the paradox of digital transformation [8].

Digital transformation is a strategic response to technological development [9] and significant societal and sectoral changes using information and communication technologies. In a review of the conceptual and normative framework, Schallmo et al. [10] defined an enterprise's digital transformation as the application of information technology in operations, innovations in the business model, or digitalisation strategies to create value for companies. On the positive side, digital transformation is essential for incumbent firms to remain competitive [11]. Hence, digital transformation can increase business efficiency. On the negative side, the complex and uncertain nature of information changes leads to the paradox of an organisation's digital transition [11]. The analysis of completed studies demonstrates the impact of digital transformation on specific aspects of the enterprise, such as financial and innovation capacity and profit margin [12].

Several other scientists, such as Bärbel and co-authors [13], using the example of the European Union (Germany, Denmark, the Netherlands), justify the need to digitalise water use systems in agribusiness as a key element of environmental fiscal policy implementation. The researchers emphasise the importance of redistributing revenues from environmental taxation between the levels of the budget system, where the main goal is to finance the digital modernisation of irrigation systems in the agricultural sector.

It is determined that the digitalisation of the agricultural sector is mainly carried out through indirect instruments of state regulation - subsidies, tax benefits, industry support, and affordable lending. However, their practical use is becoming difficult amid the current multifactorial crisis and limited financial resources. As a result, it is necessary to improve the mechanisms of state intervention by expanding the arsenal of tools for regulating the digital transformation of the agricultural sector, taking into account climate challenges.

However, specific issues of the institutional environment of the digital transformation of accounting, which are reflected in the scientific works of several scholars, require further methodological clarification and explanation. The specific features of the development of institutionalisation of the forms of management of the agricultural sector and their impact on the accounting methodology require additional analysis.

1.3 Formation of the Objectives of the Article

The article aims to theoretically substantiate and develop an institutional mechanism for the digital transformation of the accounting system in agribusiness, which will ensure increased efficiency, transparency, and adaptability of accounting processes to the current conditions of the information economy.

Research objectives:

1. To analyse the nature and role of the institutional environment in the process of digital transformation of the agricultural sector.
2. To assess the current state of the regulatory framework and digital infrastructure governing accounting activities in agricultural production.
3. Identify the main challenges and barriers to the digitalisation of accounting in agribusiness.
4. To substantiate the directions for improving the institutional mechanism for stimulating digital transformations in agricultural accounting.

5. To provide practical recommendations for forming an effective institutional environment for the implementation of digital solutions in the activities of agricultural enterprises.

1.4 Research Methods

The theoretical and methodological basis of the scientific description is the work of leading domestic and foreign scholars in the field of harmonisation and standardisation of accounting (in particular, V.M. Zhuk, D. North, and O. Williamson), as well as current legislation and regulations governing accounting activities in the agricultural sector. The interdisciplinary research methodology combines economic, organisational, legal, and information aspects.

The following methods were used to achieve the research goals, clearly defining their role in obtaining the relevant results (Table 1).

Therefore, the methodological instruments utilised made it possible to cover institutional and technological elements of informatisation thoroughly; corroborate a conceptual model of digital accounting; and create recommendations for enhancing the institutional environment of agricultural accounting.

2 Theoretical Foundations of Institutional Change in Accounting and Control

2.1 Basic Ideas of the Institutional Approach to Accounting

The results of 2023 in the field of digital transformation demonstrated significant achievements in the work of the fundraising company UNITED24 with more than $ 0.5 billion raised; the restoration program was launched, as a result of which 34.5 thousand applicants received payments totaling ₴ 3.2 billion, and the Brave1 cluster, which financed 137 developments for ₴ 2.3 billion, etc. At the same time, 39 new e-services were implemented on the Diia portal and app, where the number of service users increased to 19.9 million citizens; ₴ 221.8 million was raised for Ukrainian businesses through the educational and grant programs of the network of Diia. Business and the EU4Business initiative [15]; favorable conditions were created for UAV manufacturers, as a result of which the number of drones on the line of contact with Russian troops increased hundreds of times; 25 thousand Starlink terminals and 900 T Powerwall devices were imported, which guarantee backup power during power outages; the development of fixed Internet and mobile communications resistant to blackouts, etc. [16, 17].

It is affirmed that the ability of the Ukrainian economy to recover rapidly and form the basis for post-war reconstruction is disclosed in the annual reports on the development of the country's digital ecosystems for 2024. It should be noted that one of the primary challenges of the digital transformation of Ukraine's economy was to boost the share of the IT sector in GDP to 10%. The accomplishment of this task presented an opportunity to create an appealing investment environment by opening the market, improving the situation on the labour market, and assuring the transparency of the tax and customs system.

Table 1. Methods of studying the institutional mechanism of digital transformation of accounting and control in agribusiness.

Method	Purpose/application	Results obtained	Limitations
Content analysis	Analysis of scientific sources and documents	The state of theoretical approaches to the digitisation of accounting has been determined	Subjectivity in the selection of sources
Analysis and synthesis	Study of the structure of the institutional mechanism	A model of interrelationships between elements of digitisation has been formed	Requires high-quality input data
Induction and deduction	Construction and verification of hypotheses regarding the development of digital transformation	The logic of introducing digital accounting in the agricultural sector is justified	May not take into account external, unexpected factors
Method of analogies and associations	Comparison of Ukraine's experience with the EU, US, etc.	Best practices of digital accounting identified	Contextual differences between countries
Monitoring and observation	Tracking changes in the functioning of IT systems in agricultural enterprises	Real level of digitalisation established	Limited representativeness of the sample
Institutional analysis	Study of formal and informal institutions	Identification of factors that hinder/support digitalisation	Difficulty in measuring informal institutions
Analysis of institutional changes	Study of the evolution of the role of accounting in the digital age	Modelled dynamics of the transformation of the accounting environment	Difficult to extrapolate in the long term
Comparative legal analysis	Analysis of the regulatory framework	Gaps in the domestic legal framework identified	Requires constant updating
Economic and statistical analysis	Processing of quantitative data on the effectiveness of digital solutions	Positive impact of digitalisation on productivity confirmed	Limited access to comprehensive statistical data
SWOT analysis	Assessment of strengths, weaknesses, opportunities, and threats	Risks and advantages of the institutional mechanism identified	Partially based on expert assessments

(*continued*)

Table 1. (*continued*)

Method	Purpose/application	Results obtained	Limitations
Factor analysis	Assessment of the significance of factors influencing digitalisation	Key drivers of change in accounting identified	Risk of multicollinearity and loss of accuracy
Systemic and comprehensive approaches	Integration of all methods into a single model	Conceptual model of digital transformation of accounting developed	Requires a balance between detail and generalisation

Source: Generalised by the authors based on [2, 3, 14]

The transformation processes in the agricultural sector of Ukraine's economy in the current business environment, particularly in the accounting field, are taking place in digitalisation and the growing influence of institutional changes. It is advisable to introduce institutional approaches to accounting that will allow us to consider it a set of technical procedures and a social institution. Our research reveals that this will assure the stability of economic interaction, decrease uncertainty, and increase the transparency of financial processes.

The institutional foundations of accounting are formed by several legal acts, guidelines, and explanations that regulate its process, where a special place is occupied by the activities of state and non-state institutions in organising and monitoring compliance with the established norms.

The study of institutional theory should be carried out in stages and by a model that will allow the current state of the theory of accounting institutionalism to be studied while providing directions for its improvement (Fig. 1).

Based on the analysis of opinions of several domestic scholars on the current state and prospects of development of the theory of accounting institutionalism, an assessment of its approach has been formed, which is presented in Table 2.

In the course of researching scientific works, we have systematised their main provisions:

1. Accounting as an institution performs the function of registering business transactions, reduces the level of uncertainty in the environment, forms the information field for decision-making, and is part of the institutional structure of society.
2. The accounting and control system is changing under the influence of formal institutions (laws, standards, regulators) and informal ones (traditions, business culture, internal rules of the enterprise);
3. Digitalisation as an institutional change (introduction of digital solutions (ERP systems, cloud services, blockchain, big data analytics) adjusts the rules of accounting, requires new standards, competencies, forms of interaction between business entities and the state);
4. Institutional environment for digital accounting, control and audit, including: legal framework for electronic document management and reporting; infrastructure (data storage and processing systems); professional standards and educational programs;

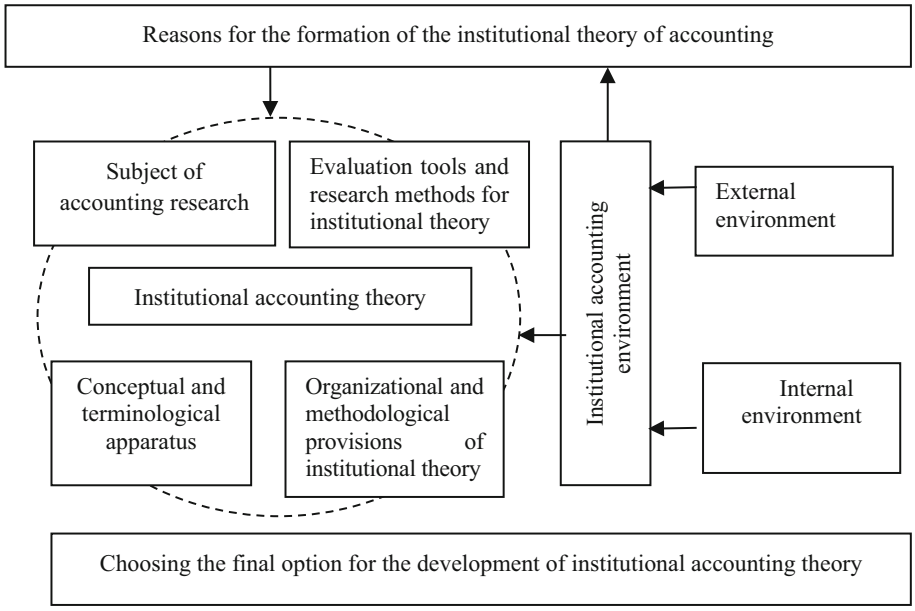

Fig. 1. Main elements of the institutional theory of accounting research. Source: Compiled by the authors based on [18]

digital literacy of accountants; trust in information technology among market participants;

5. Digital accounting as an institutional transition - a movement towards innovative and technological upgrades and game-changing: new roles for accounting staff, control and accountability mechanisms, logic of interaction with tax authorities, banks, and auditors.

Among these provisions, digital technologies occupy a key (perhaps the leading) position, acting as a catalyst for profound institutional changes in accounting, auditing, and management.

In the institutional approach, digitalisation is studied not just as an automation of accounting procedures, but as a profound transformation of the rules, behavioural patterns, and information space in which agribusiness operates. Equally significant in the development of accounting is the change in the roles of individual institutions: the state, professional organisations, enterprises, and education.

2.2 Regulatory and Legal Support for the Digitalisation of Accounting in Ukraine

For a complete understanding of the digital transformation of accounting in Ukraine, let us look at the regulatory acts (Fig. 2) in place.

It has been established that the effectiveness of state institutions in ensuring the digitalisation of accounting and auditing depends on their coordination and a systematic approach to introducing digital innovations: blockchain, artificial intelligence, and cloud services (Table 3).

Table 2. Assessment of the institutional approach to accounting.

No	Author	Description of the Approach
1	Koval M.I., Tsimoshynska O.V., Skyba H.I	Institutionalism contributes to a deeper analysis of the accounting institution by actively using concepts from other sciences. It is a key element of the economic system, functioning as an open and evolving system that operates in a specific environment and undergoes constant reform. Accounting is continuously influenced by the institutional and cultural environment in which it exists
2	Kolesnichenko A	Overcoming the existing crisis in accounting theory is possible through serious interdisciplinary research based on a combination of social and humanitarian sciences
3	Kaminska T.H	Accounting, as a distinct institution (a set of rules and norms), regulates and controls the business activities of enterprises (firms, companies)—all participants of the market (institutional) environment of the economy, both nationally and globally
4	Zhuk V.M	Based on the doctrines of institutional theory, accounting is the professional reflection of processes and phenomena in the life of organisations and the assessment of institutional impacts on such reflection and changes in organisational components
5	Lehenchuk S.F	The institutional approach to accounting theory allows us to explain its current state and development prospects through the interaction of basic economic institutions. It views accounting as part of a complex institutional system, identifies influencing factors, and enables the construction of an institutional accounting model based on users' interests and rules of interaction among them. Institutional synthesis helps identify trends in rule changes
6	Kantsurov O.O	The accounting institution developed in Ukraine is characterised by moderate state regulation, which establishes general principles and methodological approaches. Rules are formed by consensus, aligning with institutional development trajectories, basic institutions, and the national mentality

Source: Generalised by the authors based on [2, 19–23]

New generation digital technologies for agriculture provide several significant benefits: increased labour productivity, investment efficiency, reduced losses, and the emergence of new professions in the agricultural sector.

The introduction of advanced technologies, such as artificial intelligence (AI) and big data analysis, is revolutionising how businesses collect, process, and analyse financial information. Artificial intelligence and machine learning allow automating routine and

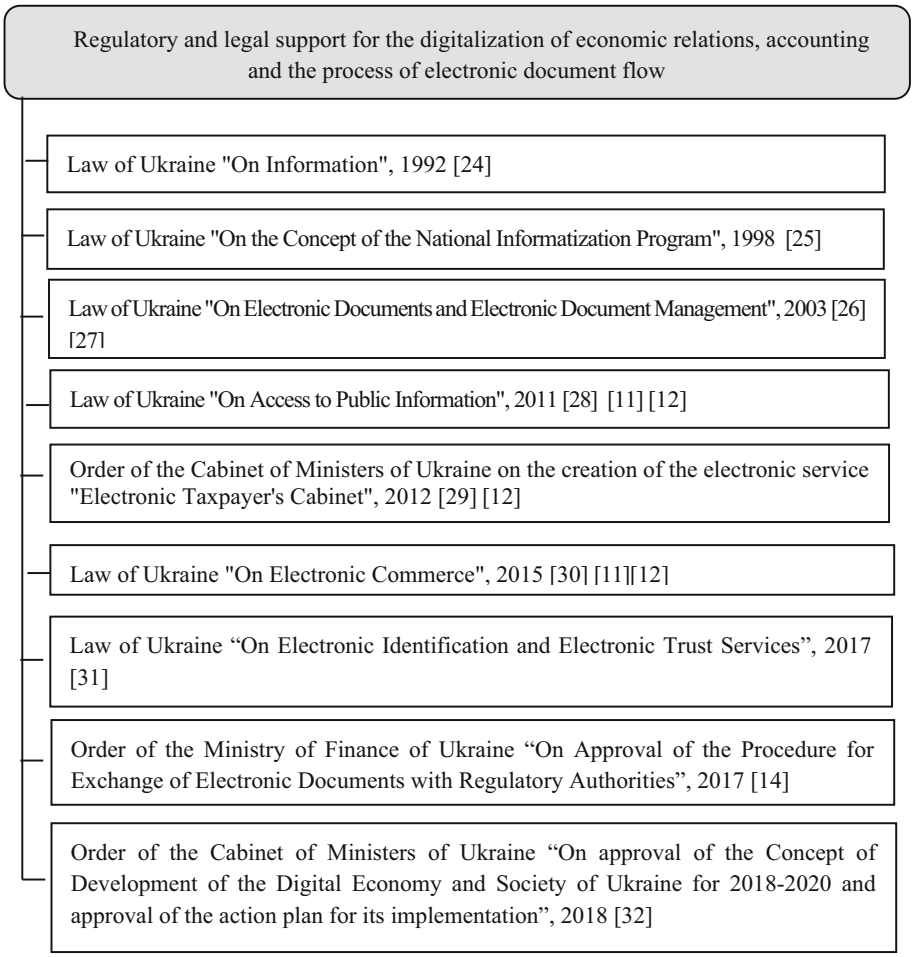

Fig. 2. Regulatory and legal support for the digitalisation of accounting in Ukraine. Source: Systematised by the authors

complex tasks. These include classification and interpretation of large amounts of data, acceleration of information processing, and reduced likelihood of errors [32].

Scientific and technological progress is always driven by the desire to use the means of production more efficiently, where innovations allow for better and faster solutions to specific tasks. Their use in agriculture results in cost reduction, increased productivity, and efficiency of land and business processes.

For example, the current trend in the domestic agricultural sector is uncrewed aerial vehicles for agriculture, which, according to estimates by various analytical companies, is expected to see market growth in the future (Table 4).

Several major research companies in the world similarly predict significant growth in this sector and the leadership of the agricultural sector as a field of application for drones. According to Price Waterhouse Coopers, the market for agricultural drones alone

Table 3. Impact of digital innovations on the efficiency of state institutions.

No	Digital Innovations	Impact on the Efficiency of Public Institutions
1	Cloud Technologies	Their use in accounting requires revising approaches to accounting organisation, internal control, and information security. The transition necessitates the development of new regulations, instructions, and methodological guidelines for organising accounting, document flow, and data archiving. The role of institutions in ensuring accounting is shifting: the importance of technological platforms and network service providers is increasing, while the role of traditional accounting software suppliers is diminishing
2	Blockchain Technology	It has significant potential to transform institutional support for accounting, altering its paradigm and ensuring record immutability, transparency, and trust without centralised control. Implementation requires a new regulatory approach, re-evaluation of control roles, and the formation of new institutions to ensure the functioning and security of distributed ledgers—government institutions' role in accounting regulation changes, embedding some control functions into the technology itself
3	Artificial Intelligence and Big Data Technologies	Require the development of new standards, ethical norms, and regulations to ensure decision-making algorithm reliability. Big data alters approaches to forming accounting information, its analysis, and decision-making, necessitating the adaptation of institutional support. Their use highlights the need for new institutions to enable certification, quality control, and security of such systems

Source: [33]

(excluding aircraft-type drones) is projected to reach $32.4 billion in a few decades. Currently, the UAV market is in the process of formation and growth [34].

2.3 Case Studies and Best Practices in Agribusiness

Such forecasts are based on the popularity of drones in agriculture, the most significant production of which is concentrated in the United States and China, with well-known brands such as XAG and AeroVironment Inc.

Table 4. Analytical companies' forecasts for the use of uncrewed aerial vehicles for agriculture.

Source	Key forecast/estimate	Term/period
Markets and Markets	Expected market growth of 35%	2024
Price Waterhouse Coopers (PwC)	Projected market value – $32.4 billion	By 2027
Goldman Sachs	The agricultural drone segment will become the most accessible	By 2030
Ministry of Agrarian Policy and Food of Ukraine	Innovations will double productivity on farms; the global economic efficiency of drones is about $82 billion	By 2028
Global Market Insights	The agricultural drone market will exceed $1 billion	By 2030
International Association for Unmanned Systems	90% of drones will be used in agriculture and security; the agricultural sector will purchase 10 times more	By 2030

Source: [5]

The movement of digital transformation and technologization of socio-economic and social processes demonstrates that further development of innovations in UAVS is objectively inevitable in all sectors of the economy, and the agricultural market is expected to grow significantly.

Juniper Networks' research has shown that in 2016, up to 48% of commercial drones were used in agriculture. According to analysts, this figure is expected to reach 80% by 2030. In 2016, experts from MarketsandMarkets estimated the market for "agricultural" UAVs at $ 864.4 million, and provided their predictions of a steady annual growth of the industry within 30% (~ $ 4.2 billion) by 2028 [35].

Uncrewed aerial vehicles are used in various agricultural practices: in the field, soil reclamation, agroecology, land monitoring, and protection. They also carry other functional and technological equipment: multispectral and infrared cameras, thermal imagers, etc. The effective use of drones has been further developed in crop production and livestock farming. Their main advantage is simplifying access to other technologies, allowing agricultural holdings and farmers to grow and spend less.

The logical and prospective direction of robotisation of farms is formed as a result of the complete automation of all processes of the production of agricultures. Such innovative projects have been developed and operated around the world. Robofarms automate the main set of measures - from sowing seeds to harvesting in crop production, and a complete cycle of maintenance of the active herd in animal husbandry. The technical staff of the farm controls machines and prevents them from being dispatched without physical intervention. At the same time, data from robotic systems will come directly into the accounting and control system of the enterprise.

According to the study results, the permissible functionality of the UAV means of remote sensing of agricultural land and the limits of their application are presented (Table 5).

Table 5. Analysis of the use of UAVs in agricultural production.

No	Functional Application	Fixed-wing UAV	Satellite	Mobile Tech Units	Quadcopter
1	Determining sown area	+	+	—	+
2	Technological monitoring	+	+	+	+
3	Soil cover assessment	+	+	+	+
4	Determining soil moisture	+	+	—	+
5	Determining sowing uniformity	+	+	—	+
6	Determining field weediness	+	+	—	+

Source: [15, 36]

The results show that some functions are significantly limited by weather conditions, such as determining the uniformity of crops and technological control when using satellite data.

IT agronomy is the most promising in agriculture for using uncrewed aerial vehicles (drones) and a new development stage to solve Precision Farming. The farmer does not deal with a particular set of techniques and technical means but participates in the general concept based on using satellite positioning technologies (GPS), geo-information systems (GIS), accurate mapping of fields, etc. The tasks of the agricultural producer for precision agriculture are complex and cannot be solved without using UAVS.

The classification of accounting and control methods of agricultural production using UAV is presented in Fig. 3.

Therefore, the systematisation of the boundaries of the use of agrodrons depends on the tasks and the goals of their application in the economic process of the enterprise, which, in turn, requires proper organisational, technical, and regulatory support. In this context, the institutional provision of digitalisation is of particular importance, as it is a key factor in the successful introduction of the latest technologies in the accounting processes of agribusiness.

3 Directions for Modernisation of the Institutional Environment as a Factor in the Digital Transformation of Accounting and Control in the Agricultural Sector

The next stage of the study revealed that the institutional provision of digitalisation of accounting and control processes in domestic agribusiness has several challenges, namely:

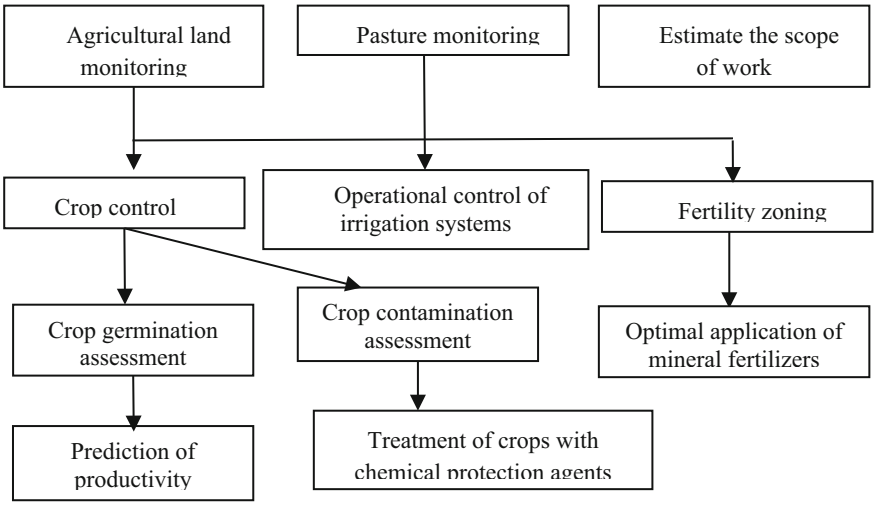

Fig. 3. Classification of accounting and control methods of agricultural production using UAV. Source: [35, 37]

- fragmentation of the regulatory framework;
- insufficient coordination of the actions of different institutions;
- lack of a systematic approach to the introduction of digital innovations;
- non-adaptability of institutional support to the rapid development of digital technologies, which creates legal and organisational gaps;
- insufficient involvement of professional accounting organisations in forming a policy of digitalisation of accounting and control, which reduces the effectiveness of institutional changes.

The inadequate level of digital competence of accountants and auditors is related to the shortcomings of the education and advanced training system.

As a result of the analysis of these problems, the definition of strategic directions of development of institutional support of digital transformation of accounting and control in the domestic agricultural enterprises (Fig. 4) is formed.

The transformation hybrid of institutional mechanisms of accounting and digitalisation characterises a comprehensive approach that contains changes in the regulatory framework, the formation of new technologies, support for state institutions, and the development of professional standards. The purpose of digitalisation is not only to improve the efficiency of accounting at enterprises, but also to ensure its compliance with the institutional requirements of the modern economy.

The main directions of transformation of the mechanism (Fig. 5) are proposed, which will form the best combination with digitalisation of accounting and control.

According to the results of scientific research, the authors developed an institutional mechanism of digital transformation of accounting and control in agribusiness (Fig. 6).

The uniqueness of this study lies in its comprehensive institutional analysis of the digital transformation of accounting and control in the agricultural sector, which is reflected both in the theoretical rationale and in practical recommendations, taking into

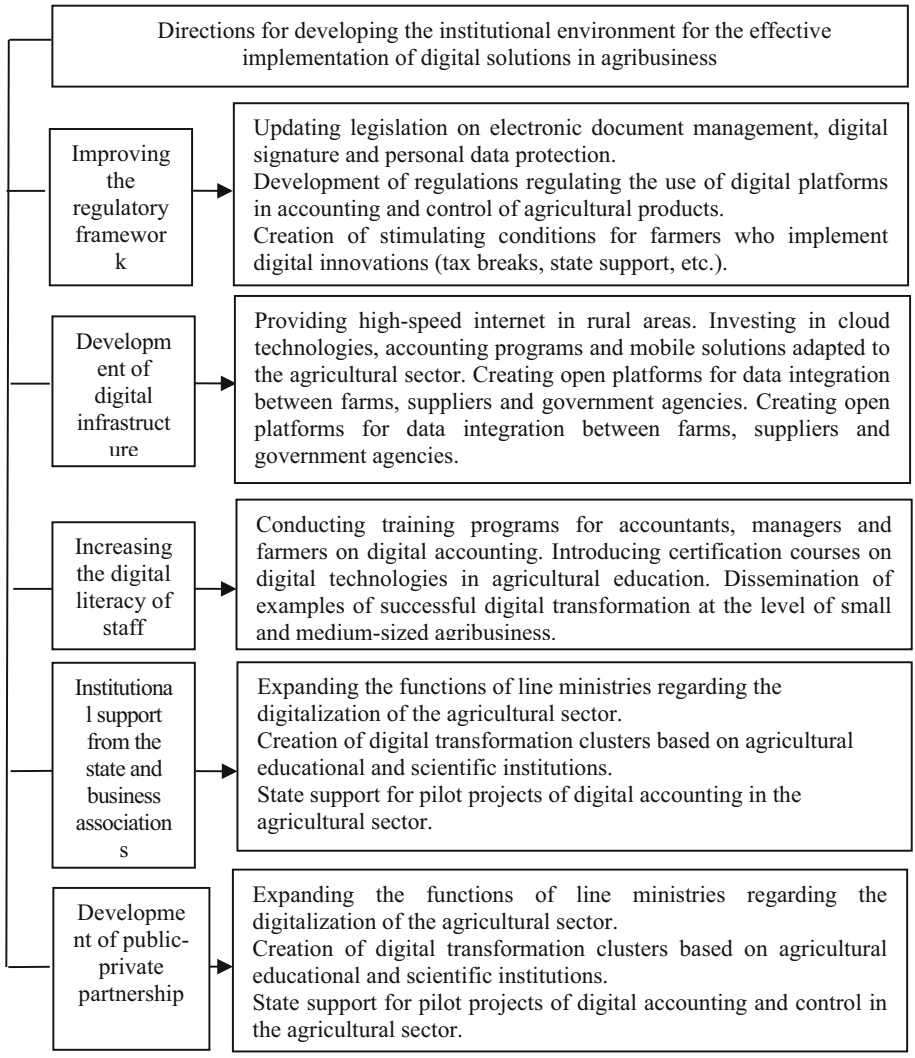

Fig. 4. The main directions of development of the institutional environment for the effective implementation of digital solutions for accounting and control in agribusiness. Source: Developed by authors

account the current challenges of digitalisation. The list of key elements of scientific novelty is defined as follows: an institutional approach to the digitalisation of accounting processes – the authors proposed a conceptual vision that combines technological innovations with the managerial and regulatory environment of agriculture; definition of the structural and functional elements of the institutional mechanism of digital transformation – with a detailed description of interrelationships and functions; systematisation of barriers to digitalisation in the agricultural sector – primarily at the level of regulation, human resources, and IT infrastructure; Formulation of practical directions for

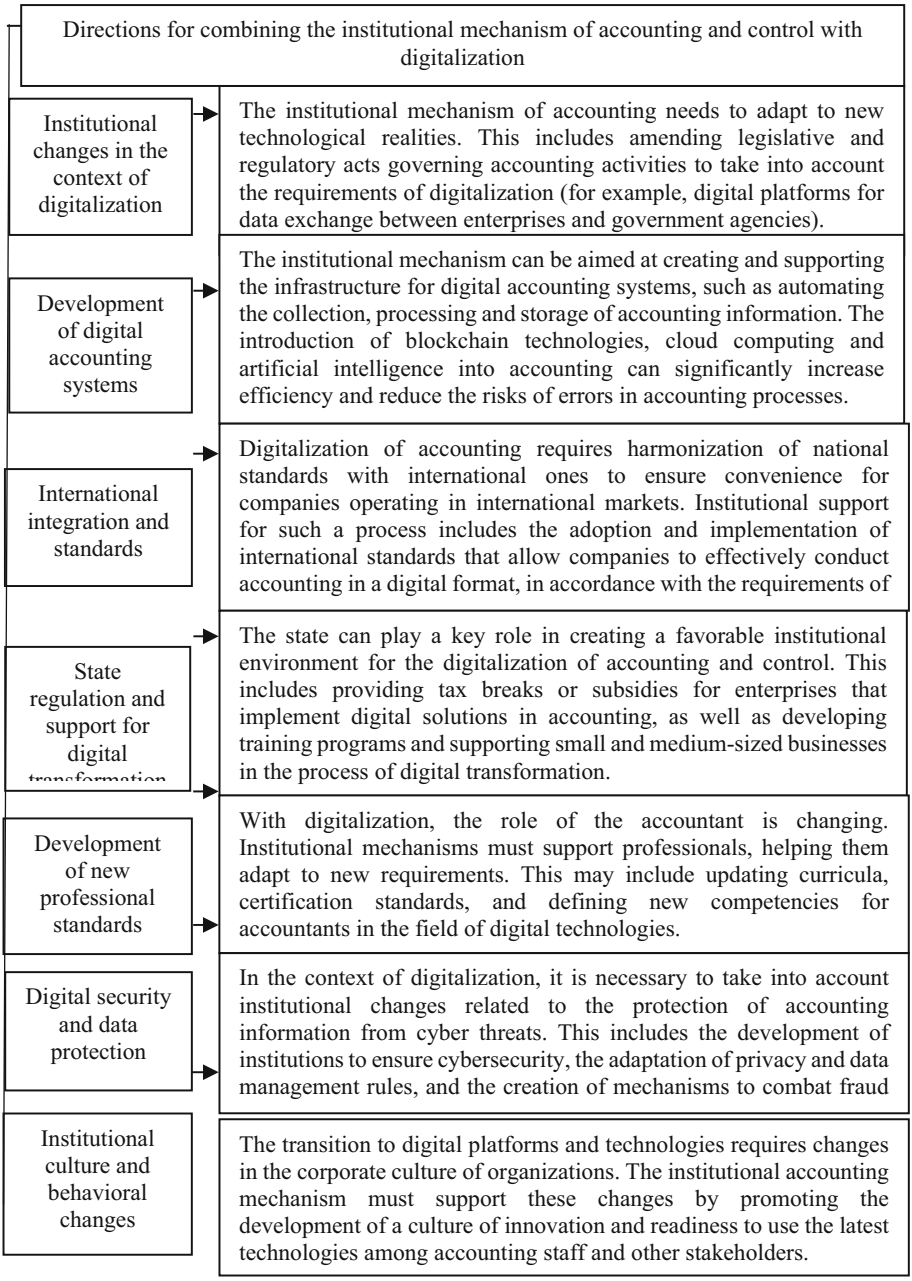

Fig. 5. The combination of institutional accounting mechanisms and control with digitalization. Source: Developed by authors

improving the institutional environment, with an emphasis on modernising the regulatory framework, investment policy, and improving digital literacy. Applied value for digital

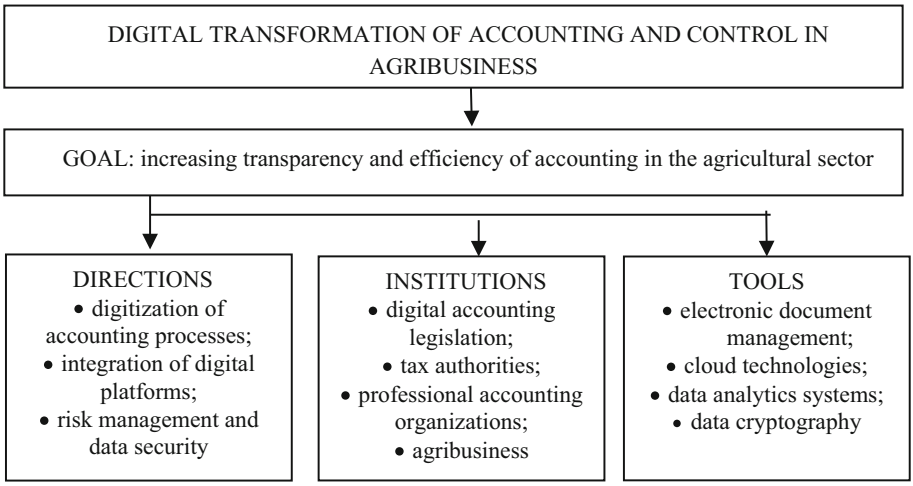

Fig. 6. Institutional mechanism of digital accounting transformation in agribusiness. Source: Developed by authors

development policy: the results will help form a methodological basis for updating state strategies in agri-digitalisation, accounting, and control activities.

Finally, the presented study not only describes the state of the problem but also proposes an institutional model for responding to the challenges of digitalisation, which is a relevant contribution to the development of management science, economics, and agricultural informatics.

4 Conclusions

The digital transformation of agricultural accounting and control processes occupies a special place in the institutional environment, which is the basis for adapting to rapid technological progress and ensuring the stability of business operations systems. It provides many opportunities for automating accounting procedures, increasing the transparency of management decisions, and improving the quality of financial information. At the same time, it requires compliance with the principles of information security, data accessibility, and harmonisation of accounting standards at the international level, considering national characteristics.

An analysis of the current state of institutional support in Ukraine has revealed serious obstacles in the form of a fragmented regulatory framework, weak coordination between state and professional institutions, and insufficient adaptation of legislation to the dynamic development of information technology. The low level of digital competence among accounting personnel is a cause for concern, as it hinders the effective implementation of innovations.

The institutional framework for accounting and control is a complex, multi-level system consisting of formal (regulatory acts, regulatory bodies) and informal elements (professional traditions, ethical norms, institutional trust). Its coordinated and systematic actions are critical to the successful digital transformation of the industry.

International experience shows that institutional modernisation requires cross-sectoral interaction, active participation of professional communities, adequate regulatory support, and widespread implementation of technologies (cloud services, artificial intelligence, and blockchain solutions). The functional roles of institutions are being reviewed, and new regulatory mechanisms are being created.

Strategic horizons for improving the institutional environment of the domestic agricultural sector have been proposed. The priority areas are the modernisation of the regulatory framework, improvement of coordination between institutions, investment in the development of digital infrastructure, improvement of the digital literacy of specialists, activation of the role of professional organisations, and broader integration of Ukraine into global digital spaces.

Implementing the recommended measures will create opportunities to improve the efficiency of accounting and control, strengthen confidence in financial information, and increase the competitiveness of agricultural enterprises. At the same time, digital transformation poses new challenges related to ethics, social responsibility, algorithmic management, and the introduction of artificial intelligence, which requires the formation of appropriate institutional regulation (e.g., transparency standards, data use control mechanisms, etc.).

The remaining challenges are limited access to comprehensive statistical data, uneven digitalisation in different regions of Ukraine, and the dynamics of regulatory changes, which complicate the construction of long-term models. It would be advisable to focus future scientific experiments on empirical analysis of the effectiveness of specific digital solutions in agricultural accounting, the development of ethical standards for digital auditing, and the study of behavioural aspects of the perception of information innovations among specialists.

References

1. Hodgson, G.M.: The Evolution of Institutional Economics. Routledge, London (2004). https://doi.org/10.4324/9780203300350
2. Zhuk, V.M.: Development of Accounting Theory: Institutional Aspect. NSC “IAE”, Kyiv (2018)
3. Yukhymenko-Nazaryk, I.A.: Development of Accounting Theory and Methodology in the Context of Neo-Institutional Theory: Monograph. O.O. Yevenok Publishing, Zhytomyr (2017)
4. Tao, F., Zhu, P., Qiu, C.Z.: Research on the impact of innovative digital technologies on enterprise market value. Quant. Tech. Econ. Res. **40**(5), 68–91 (2023). https://doi.org/10.13653/j.cnki.jqte.20230310.010
5. Galindo-Martín, M.Á., Castaño-Martínez, P.S., Méndez-Picazo, M.-T.: Digital transformation, digital dividends and entrepreneurship: a quantitative analysis. J. Bus. Res. **101**, 522–527 (2019). https://doi.org/10.1016/j.jbusres.2018.12.014
6. Hu, J., Han, Y.M., Zhong, Y.: How corporate digital transformation affects ESG performance: evidence from Chinese listed companies. Ind. Econ. Rev. **1**, 105–123 (2023). https://doi.org/10.19313/j.cnki.cn10-1223/f.20221104.001
7. Hanelt, A., Bohnsack, R., Marz, D., Antunes, M.C.: A systematic review of the literature on digital transformation: insights and implications for strategy and organisational change. J. Manag. Stud. **58**(5), 1159–1197 (2021). https://doi.org/10.1111/joms.12639

8. Danneels, L., Viaene, S.: Unraveling the paradoxes of digital transformation. Bus. Inf. Syst. Eng. **64**(4), 483–500 (2022). https://doi.org/10.1007/s12599-021-00735-7
9. Vial, G.: Understanding digital transformation: a review and research agenda. J. Strateg. Inf. Syst. **28**(2), 118–144 (2019). https://doi.org/10.1016/j.jsis.2019.01.003
10. Shalmo, D., Williams, K.A., Boardman, L.: Digital transformation of business models – best practices, mechanisms, and roadmap. Int. J. Innov. Manag. **21**(8), 1–17 (2017). https://doi.org/10.1142/S136391961740014X
11. Ferreira, J.J., Fernandes, C.I., Ferreira, F.A.: To be or not to be digital is the question: firm innovation and performance. J. Bus. Res. **101**, 583–590 (2019). https://doi.org/10.1016/j.jbusres.2018.11.013
12. Feng, Y.Z., Tao, C.Q.: Can digital transformation promote enterprise performance? From the perspective of government policy and innovation. J. Innov. Knowl. **7**(3), 100198 (2022). https://doi.org/10.1016/j.jik.2022.100198
13. Berbel, J., Borrego-Marín, M.M., Expósito, A., Giannoccaro, G., Montilla-López, N.M., Roseta-Palma, C.: Analysis of water tariffs and taxes in European irrigated agriculture. Water Policy **21**, 806–825 (2019)
14. Ministry of Finance of Ukraine: Order "On Approval of the Procedure for the Exchange of Electronic Documents with Controlling Authorities", No. 557 (2017). https://zakon.rada.gov.ua/laws/show/z0793-17#Text
15. Agroportal.ua: Smart farming. What awaits the AgroTech market in 2024? https://agroportal.ua/agrocheck/inopressa/rozumne-fermerstvo-shcho-chekaye-rinok-agrotech-u-2024-roci
16. Ministry of Digital Transformation of Ukraine et al.: Agreement with international partners on business support programs (2024). https://thedigital.gov.ua/news/mintsifra-minekonomiki-y-ofis-z-rozvitku
17. Ministry of Digital Transformation of Ukraine: Results of the year (2023). https://ms.detector.media/internet/post/33857/2023-12-28-u-mintsyfry-pi..
18. Tkachenko, N.M.: Accounting standards in Ukraine. Bull. Econ. Sci. Ukr. **2**(39), 196–200 (2020). https://doi.org/10.37405/1729-7206.2020.2(39).196-200
19. Kaminska, T.H., Plaksienko, V.Y., Ilchak, O.V.: Accounting as a science: from foundations to a scientific worldview. Center for Educational Literature, Kyiv (2021). http://aapil.ho.ua/phocadownload/MON23_Pylypenko_Accounting%20Architecture_2021.pdf
20. Kantsurov, O.O.: Evolution of the accounting institution. Account. Financ. **3**, 42–46 (2014). http://nbuv.gov.ua/UJRN/Oif_apk
21. Kolesnichenko, A.: Institutional aspects of modernization of the accounting and financial reporting system in the public sector. Rev. Transp. Econ. Manag. **4**(20), 136–143 (2020). https://doi.org/10.15802/rtem2020/228859
22. Koval, M.I., Tsimoshynska, O.V., Skyba, H.I.: State regulation of accounting and financial reporting in Ukraine in the context of harmonization with EU standards. Bull. Univ. Ukraine **3**(30) (2021). https://doi.org/10.36994/2707-4110-2021-3-30-04
23. Lehenchuk, S.F.: Historical Aspects of the Development of Accounting in Ukraine and the World: Monograph. GlobeEdit, Beau Bassin (2020)
24. Verkhovna Rada of Ukraine: Law "On Information", No. 2657-XII (1992). https://zakon.rada.gov.ua/laws/show/2657-12#Text
25. Verkhovna Rada of Ukraine: Law "On the Concept of the National Informatization Program", No. 75/98-VR (1998). https://zakon.rada.gov.ua/laws/show/75/98-%D0%B2%D1%80#Text
26. Verkhovna Rada of Ukraine: Law "On Electronic Documents and Electronic Document Management", No. 851-IV (2003). https://zakon.rada.gov.ua/laws/show/851-15#Text
27. Verkhovna Rada of Ukraine: Law "On Access to Public Information", No. 2939-VI (2011). https://zakon.rada.gov.ua/laws/show/2939-17#Text

28. Cabinet of Ministers of Ukraine: Order "On the Creation of the Electronic Service 'Electronic Cabinet of the Taxpayer'", No. 472-r (2012). https://zakon.rada.gov.ua/laws/show/472-2012-%D1%80#Text
29. Verkhovna Rada of Ukraine: Law "On Electronic Commerce", No. 675-VIII (2015). https://zakon.rada.gov.ua/laws/show/675-19#Text
30. Verkhovna Rada of Ukraine: Law "On Electronic Identification and Trust Services", No. 2155-VIII (2017). https://zakon.rada.gov.ua/laws/show/2155-19#Text
31. Cabinet of Ministers of Ukraine: Order "On Approval of the Concept of Digital Economy and Society Development of Ukraine for 2018–2020", No. 67-r (2018). https://zakon.rada.gov.ua/laws/show/67-2018-%D1%80#Text
32. Akimova, T., Pryymak, S., Kostyakova, A., Usatenko, O., Lytvynenko, V.: The impact of enterprise accounting and control systems innovations on optimising financial reporting analysis in the transition to IFRS. Econ. Aff. **69**(SI), 371–379 (2024). https://doi.org/10.46852/0424-2513.1.2024.39
33. Shkulipa, L.V.: Development of Accounting in Terms of IFRS and Innovative Technologies: Methodology and Practice. TPK "Orchid", Nizhyn (2020)
34. DSLRPros: Agriculture & Farming Drones. https://www.dslrpros.com/agriculture.html. Accessed 09 Dec 2024
35. WeAgro: Agricultural drones: What they are and how to choose one. https://weagro.com.ua/blog/drony-dlya-silskogo-gospodarstva-dlya-chogo-vony-i-yak-obraty/
36. Putsenteilo, P., Dovbush, A.: Main directions of accounting development in the digital economy. Innov. Econ. **3–4**, 140–151 (2021)
37. Liudvenko, D.V., Tomilova-Yaremchuk, N.O., Krupa, N.M., Nepochatenko, A.V., Kaminetska, O.V.: Ways to integrate digitalization into tax management: Experience of domestic and global strategies. Achiev. Econ.: Prospect. Innov. **14** (2025). https://doi.org/10.5281/zenodo.14648946