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FINANCIAL AND ACCOUNTING SUPPORT FOR SUSTAINABLE DEVELOPMENT OF UKRAINIAN AGRIBUSINESS: THEORETICAL FUNDAMENTALS AND PRACTICAL ANALYSIS

COLLECTIVE MONOGRAPH

DNIPRO
2026

Ministry of Education and Science of Ukraine
Dnipro State Agrarian and Economic University

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UDC 336 : 338 : 631 : 657
F 59

Reviewers:
Svitlana SHULGA – Doctor of Economic Sciences, Professor, Vice-Rector for Scientific and Financial and Economic Work, National Academy of Statistics, Accounting and Auditing (Kyiv)
Natalia ZDYRKO – Doctor of Economic Sciences, Professor, Director of the Educational and Scientific Institute of Economics, Vinnytsia National Agrarian University (Vinnytsia)
Igor VINICHENKO – Doctor of Economic Sciences, Professor, Head of the Department of Economics, Dnipro State Agrarian and Economic University (Dnipro)

Editors-in-Chief:
Halyna PAVLOVA – Doctor of Economic Sciences, Professor, Dean of the Faculty of Accounting and Finance, Dnipro State Agrarian and Economic University (Dnipro)
Natalia VASYLIEVA – Doctor of Economic Sciences, Professor, Deputy Dean for Research, Dnipro State Agrarian and Economic University (Dnipro)

Recommended by the Academic Council of Dnipro State Agrarian and Economic University (Meeting Minutes No. 10 dated 25.06.2026).

Authors:
Halyna PAVLOVA, Olha HUBARYK, Oleksandr ATAMAS, Alona MINKOVSKA, Mariya BARDADYM, Svitlana KACHULA, Larysa BROVKO, Oksana VODOLAZSKA, Oksana PAVLENKO, Anna SIRKO, Ilona SOLODOVNYKOVA, Olena LYSA, Lesia VASILIEVA, Tatiana MACHAK, Olena DUBYNA, Tetiana SAVANCHUK, Olga SERHIIENKO

Financial and accounting support for sustainable development of Ukrainian agribusiness: theoretical fundamentals and practical analysis: collective monograph / edited by H. Pavlova and N. Vasylieva. Dnipro: Maksymovska Y. A., 2026. 392 p.

ISBN: **978-617-8674-06-9**

The monograph is focused on scientific, methodical and practical aspects of financial and accounting support for the sustainable development of the agricultural sector in Ukraine. The collective monograph was published within the framework of the state budget research topics "Modern accounting and taxation mechanism in enterprise management: analytical, organizational, informational and control aspects" (state registration number 0125U004355), "Financial support for structural modernization and innovative development of agroindustrial production in Ukraine" (state registration number 0124U000027).

The monograph is intended for policymakers and stakeholders in agriculture, accountants, tax officials, banking and finance specialists, agricultural managers, farmers, researchers and postgraduate students in agricultural economics.

UDC 336 : 338 : 631 : 657

ISBN: **978-617-8674-06-9**

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PREFACE

Achieving long-term sustainability in agriculture remains a pressing global imperative that requires innovative integration across finance and accounting. By bridging advanced theory with real-world application, this monograph offers a roadmap for navigating the vital transformation of Ukrainian agribusiness.

Chapter 1 “Problems and prospects for the development of an integrated accounting system to ensure the economic sustainability of enterprises” addresses the following issues.

The conceptual foundations of modern accounting define its role in the process of managing the economic activities of enterprises. The study examines the fundamental principles of accounting, its functions, and methods for monitoring and summarizing financial information. Particular emphasis is placed on the relationship between accounting processes and management decision-making, as well as on the importance of reliable information for effective control and planning. This material is of practical value for students, finance professionals, and accountants seeking to understand contemporary approaches to accounting.

The section substantiates the formation of an accounting and analytical paradigm for managing export operations according to IFRS standards as a strategic tool for ensuring the economic stability of the enterprise. It has been proven that the modern approach requires a transition from retrospective control to the modeling of future cash flows based on the concept of "transfer of control" (IFRS 15) and effective management of currency risks (IAS 21). The authors propose a five-stage model of contract analysis, systematize key export functions and indicators of sustainability. A comparative analysis of national and international standards revealed critical gaps in the practice of accounting for exchange rate differences. The proposed recommendations make it possible to minimize the impact of external shocks, optimize capital and increase the solvency of exporters in conditions of global volatility.

The section is devoted to the strategic transformation of non-financial reporting of the agricultural sector of Ukraine in the context of the global transition to ESG principles and sustainable development. Particular attention was paid to the challenges of a full-scale war and the need to adapt management to the conditions of martial law. The work justifies the use of the GRI 13 industry standard as a key methodological tool for harmonizing Ukrainian practice with the requirements of European standards. The creation of a single digital data ecosystem based on Ag Tech technologies is proposed, which ensures the accuracy and verifiability of sustainable development indicators. The scientific novelty lies in the adaptation of the concept of "just transition" to the conditions of military transformation and the development of algorithms for the integration of financial and non-financial information. The practical implementation of the results will allow Ukrainian agricultural enterprises to attract international financing and ensure competitiveness during sustainable recovery.

The essence of the integration of financial, managerial and strategic accounting as the basis of effective management of the enterprise has been studied. The importance of

an integrated accounting system for improving the quality of management decisions is substantiated. The influence of digitization, international standards and ESG-approaches on the development of accounting is revealed. It has been proven that the integration of accounting subsystems ensures the economic stability of the enterprise.

To improve the quality and completeness of accounting information, it is advisable to establish a clearer classification of expenses related to the sale of products. In this context, it is reasonable to introduce, at the legislative level, a structured classification of such expenses into relevant groups. This will contribute to improving the methodology for their accounting treatment, increasing transparency, and ensuring a more effective organization of both synthetic and analytical accounting. The proposed classification corresponds to the list of expenses defined in PAS 16 “Expenses,” which indicates its consistency with the current regulatory framework and the absence of contradictions with established requirements. At the same time, given the diversity of business processes, enterprises have the right to adapt and specify the composition of selling expenses in accordance with the specifics of their activities and organizational structure. This allows them to make quality management decisions.

Chapter 2 “Modern financial technologies and digital finance: practical and theoretical aspects” covers the following topics.

The principles of implementing impact-oriented budgeting in the agricultural sector of Ukraine as a tool for transitioning from financing processes to sustainable development results are studied. The role of digitalization in ensuring the effectiveness of state support is determined. Approaches to "green" labeling of budget expenditures and the implementation of a system of impact indicators are proposed to stimulate the ecological transformation of the industry and strengthen food security.

The section examines the European Union's budgetary policy as a strategic instrument for integration and global competitiveness. It analyzes the evolution of the Multiannual Financial Framework, the transition toward new own resources (CBAM, plastic tax), and the historic role of the NextGenerationEU recovery plan. The research focuses on how the EU budget balances national interests with supranational goals like the Green Deal and digitalization. Special attention is given to audit mechanisms and the financial implications of future EU enlargement.

The investment strategy of insurance companies is studied as a tool for ensuring financial stability and increasing the efficiency of operations. The state of the insurance market of Ukraine, the structure of investment portfolios and regulatory restrictions on the investment of reserves are analyzed. It has been proven that the digitalization of asset management and the implementation of the Solvency II standard will contribute to the development of the insurance sector and the recovery of the Ukrainian economy.

The research is focused on synergic tools and financial technologies of insurance companies in the digital economy, reveals the role of InsurTech solutions in increasing the efficiency of insurance activities, optimizing risk management and digitalizing insurance services. The world experience of implementing innovative technologies in insurance is analyzed using the example of leading countries and companies. Special attention is paid to

the legal aspects of regulating digital insurance technologies, in particular, issues of data protection, smart contracts and cybersecurity. The study also grounds strategic directions for the insurance market development under conditions of digital transformation of the economy.

The section examines the mechanisms of financial support for Ukraine's agricultural sector through the implementation of process automation technologies under wartime conditions and during post-war recovery. It analyzes the evolution of the concept of financial support, classifies automation technologies by levels and stages of the production cycle, and evaluates their impact on cost reduction, productivity growth, and risk minimization. Special attention is paid to state programs such as "eRobota" grants and the "5–7–9%" preferential lending scheme, as well as international instruments, venture capital, leasing, and supply chain finance. The subsection proposes an integrated "Automation – Credit – Subsidy" model and presents scenario-based projections of automation adoption and financial outcomes until 2030. It substantiates that automation serves as a strategic tool for enhancing the financial stability, competitiveness, and sustainability of Ukrainian agribusiness.

The section explores digital operational resilience as a key determinant of financial system stability under intensifying cyber threats. It highlights the shift from static cybersecurity models to adaptive approaches focused on operational continuity. A multidimensional framework and a composite index (DOR) are proposed for resilience assessment, with the Ukrainian case providing an empirical validation environment.

Financial technologies are a key driver of the transformation of modern banking activities, enabling the transition to digital models of customer service. Their implementation allows banks to improve operational efficiency, expand the range of services, and ensure competitive advantages in the market. The experience of foreign and Ukrainian banks demonstrates that the integration of financial technologies is a necessary condition for the development of the banking sector in the digital economy.

Chapter 3 "Formation and enhancement of information and analytical support for enterprise management" is devoted to such problems.

The theoretical and practical aspects of accounting and cost analysis of the enterprise are investigated in the section. The economic essence of costs, their classification and significance in the management system of the enterprise's activities is revealed. The introduction of accounting by responsibility centers, the use of modern methods of cost calculation, improvement of the internal control system, and improvement of information and analytical support for cost management are proposed.

This study examines the improvement of accounting and analytical support for accounts receivable management in ensuring enterprise economic stability. It identifies key shortcomings in existing approaches and justifies the need for their transformation. The research proposes enhanced methods of accounting, monitoring, evaluation, and forecasting. Special attention is paid to analytical tools for assessing credit risk and financial performance. The findings show that improved information support enhances decision-making and reduces risks. Overall, optimizing accounting and analytical processes is essential for effective financial management and sustainable enterprise development.

During the study, the economic essence of the accounting and analytical provision of payroll calculations was revealed; defined types, forms and systems of labor remuneration; the documentation of the company's payroll calculations was investigated; the procedure for accounting for accruals and withholding of wages at the enterprise is characterized. An assessment of the analytical support of payroll calculations was carried out; directions for improving the accounting and analytical provision of labor payment calculations are proposed.

The essence of the concepts of “costs” and “management” has been examined, and the role of accounting and analytical information in the cost management system has been determined. Five main stages for improving the existing information and analytical support of cost management, as well as its target orientation, have been identified. The key elements for implementing a cost management policy within the management system of business entities have been proposed.

This section investigates the theoretical and applied principles of implementing specialized agricultural terminology translation within an enterprise's information monitoring system. The structural and semantic features of agricultural terminology are analyzed based on English and German language materials, and their impact on translation processes and data processing is identified. The study characterizes the primary translation strategies and transformations that ensure the adequacy and functionality of translation within agricultural discourse. The mechanisms for integrating translation processes into information systems are revealed, and the role of terminology standardization is substantiated. A conceptual model for translation implementation is proposed, along with criteria for evaluating its effectiveness. Furthermore, the author formulates practical recommendations for optimizing translation processes within the activities of agricultural enterprises and substantiates the importance of translation as a tool for improving the quality of information support for management decisions.

We express our deep gratitude to the reviewers of the collective monograph:

Svitlana SHULGA – Doctor of Economic Sciences, Professor, Vice-Rector for Scientific and Financial and Economic Work, National Academy of Statistics, Accounting and Auditing (Kyiv),

Natalia ZDYRKO – Doctor of Economic Sciences, Professor, Director of the Educational and Scientific Institute of Economics, Vinnytsia National Agrarian University (Vinnytsia),

Igor VINICHENKO – Doctor of Economic Sciences, Professor, Head of the Department of Economics, Dnipro State Agrarian and Economic University (Dnipro).

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CHAPTER 1. PROBLEMS AND PROSPECTS FOR THE DEVELOPMENT OF AN INTEGRATED ACCOUNTING SYSTEM TO ENSURE THE ECONOMIC SUSTAINABILITY OF ENTERPRISES

1.1. THE CONCEPTUAL FRAMEWORK OF MODERN ACCOUNTING

Halyna Pavlova,
Doctor of Economic Sciences, Professor,
Dean of the Faculty of Accounting and Finance,
Dnipro State Agrarian University of Economics, Dnipro, Ukraine

In today's business environment, accounting information serves a much broader purpose than simply recording business transactions. It acts as a vital tool for organizing management processes and can be viewed as an economic resource that takes on the characteristics of an intangible asset or an element of know-how. At the same time, its value is not determined by itself, but rather by its adaptation to the information needs of various user groups. This is precisely what drives the accounting system's increasing focus on forward-looking, predictive goals and support for managerial decision-making.

It is appropriate to view the evolution of accounting in Ukraine as a sequence of historical stages, each of which reflects changes in the economic environment and social relations:

- the pre-literate (pre-Slavic) period;
- the establishment of accounting practices during the era of Kievan Rus';
- the development of accounting in western Ukrainian territories;
- the formation of accounting approaches during the 15th–19th centuries;
- the transformation of accounting in the 20th–21st centuries.

In the early stages, even before the formation of Slavic statehood, elements of accounting in the territory of modern Ukraine developed under the influence of ancient traditions, particularly in Greek city-colonies. At the same time, within the Trypillian culture, specific approaches to counting and recording economic processes emerged, which can be viewed as precursors to accounting systems.

During the period of Kievan Rus' (from the 9th century), accounting practices were primarily practical in nature and were linked to the collection of tribute, the management of resources, and the recording of trade transactions. In the early stages of state formation, simple forms of recording revenues in the form of payments in kind (fur, wax, honey) were used, carried out within the framework of the "poludde" system. Subsequently, tax obligations of the population were systematized, in particular through the establishment of payments based on economic units ("dim" or "ralo"), as well as the introduction of specialized levies (customs duties, transport fees, maintenance of the princely court, etc.).

During the reign of Prince Volodymyr, the Kyiv state achieved significant economic and political development, accompanied by the strengthening of centralized administration, the expansion of trade ties, and the increasing complexity of economic relations. This, in turn, created the conditions for further refinement of accounting

procedures and the development of more systematic approaches to the accounting of resources and revenues (Kuzminskyi, 1990).

The introduction of Christianity in Kievan Rus' was a key factor in the development of the conceptual foundations of accounting in the Ukrainian lands. This event contributed to the active development of education, literacy, and scientific knowledge, particularly mathematics, which remains the foundation of the accounting system to this day. It was during this period that the conditions were created for the transition from primitive forms of recording economic transactions to more organized information practices.

The further development of the state under the reign of Yaroslav the Wise (1019–1054) was accompanied by the institutionalization of socio-economic relations. The collection of laws known as "Ruska Pravda" established the foundations of legal regulation of property, although in practice the resources of the state and the prince were viewed as a single entity. The absence of clearly regulated tax mechanisms and the concentration of economic power led to the formation of a specific accounting model oriented toward centralized control. This, in turn, laid the groundwork for a unified regulatory approach to record-keeping and its subordination to a hierarchical management system.

The organization of accounting activities during this period was directly linked to the activities of the princely administration. Record-keeping was supervised by officials, in particular the seal-bearer—the head of the princely chancellery, who was responsible for drafting official documents and safeguarding state symbols. Such centralization contributed to the formation of the concept of accounting as an instrument of state governance.

During the reign of Vladimir Monomakh, economic relations underwent a certain degree of systematization, particularly in the area of lending. The regulations governing the granting of loans and setting permissible interest rates contributed to the development of accounting methods for recording financial transactions and monitoring their execution.

The training system also had a significant impact on the development of accounting practices. In Kievan Rus' and later in the Principality of Galicia-Volhynia, record-keeping and accounting skills were developed through the training of scribes who performed administrative and accounting functions. Monasteries served as centers of knowledge development, where educational, scientific, and economic activities converged. It was here, under the influence of the Byzantine tradition, that the intellectual foundations of the future accounting system in Ukraine were formed.

Thus, the historical development of accounting practices during this period demonstrates that the conceptual foundation of modern accounting was shaped by a combination of state regulation, legal norms, educational processes, and the practical needs of economic management (Shvets, 2008).

The development of the conceptual foundations of modern accounting is largely based on historical approaches to the organization of accounting processes, particularly those that emerged in monastic economies. Accounting in such institutions was conducted according to the principles of the cameral system and covered key economic objects: cash,

revenues, expenses, and liabilities. Even at this stage, elements of information structuring can be traced: the distinction between debit and credit entries, and the maintenance of separate journals for recording revenues and expenses. At the same time, the accounting system did not yet have a comprehensive and systematic nature, remaining at the level of simple bookkeeping, although the prerequisites for the application of double-entry bookkeeping were gradually emerging.

The development of economic activity at princely courts and in monasteries led to increased requirements for the accuracy and accountability of record-keeping. This contributed to the formation of the primary elements of accounting techniques: the division of ledgers according to the flow of resources, as well as the introduction of inventory procedures to monitor the availability of property and funds. Thus, accounting began to perform not only a recording function but also a control function, which is an important component of its modern concept.

Significant transformations in accounting practices occurred during the period of Tatar-Mongol rule, when changes in the tax system and administrative management influenced the organization of accounting. The introduction of poll tax and the conduct of population censuses effectively marked the emergence of an inventory-based approach to accounting for human resources as a taxable entity. This underscores the gradual expansion of the scope of accounting and its adaptation to new economic conditions.

In the 14th–15th centuries, the intensification of trade contributed to the increasing complexity of financial relations and required a more structured system of monetary accounting. Specialized accounting practices emerged in the commercial environment, including the maintenance of cash books with a clear division into receipts and expenditures, detailing transactions by dates, amounts, counterparties, and the grounds for payments. This approach reflects the gradual formation of principles for documenting and analyzing accounting information.

The further development of credit relationships, particularly the spread of deferred-payment sales, led to the emergence of banking institutions and financial instruments such as promissory notes. This, in turn, necessitated the development of specialized accounting for financial liabilities, which became an important step in the establishment of modern financial reporting.

Thus, the evolution of accounting practices during this period demonstrates a gradual transition from simple forms of recording business transactions to a more complex, structured system geared toward the needs of management, control, and financial analysis. It was precisely these historical preconditions that laid the foundation for the conceptual framework of modern accounting, integrated into the European economic space.

An important stage in the formation of the conceptual foundations of accounting in Ukraine was the period of the formation and development of the Cossacks in the late 15th century. The economic activities of the Zaporizhzhia Sich, which combined military, commercial, and financial elements, necessitated a structured accounting system. The diversity of revenue sources—ranging from military spoils and trade operations to tax

payments and state funding—required a systematic approach to recording, summarizing, and controlling economic information.

The organization of accounting at the Sich attests to the existence of sophisticated management practices. Accounting functions were entrusted to specialized officials responsible for the preservation and movement of resources. Records were kept in designated ledgers, which documented revenues, expenses, the flow of cash and physical assets, as well as the results of economic activity. Separate registers were used to track harvests, resource consumption, and other operations, indicating the gradual formation of an analytical accounting system. The final stage of the accounting process involved preparing reports and submitting them to governing bodies, underscoring the importance of accounting as a tool for control and decision-making.

In the 16th–18th centuries, the development of the accounting system took place amid the close integration of the economy of the Ukrainian lands with the financial systems of European states, particularly the Polish-Lithuanian Commonwealth and the Russian Empire. This facilitated the adoption of organizational forms and methods of accounting, but at the same time limited the formation of an autonomous national accounting system due to the centralization of financial management.

The ideas of the European—and particularly the Italian—school of accounting had a significant influence on the development of accounting theory in Ukraine. The dissemination of scholarly works on accounting theory, particularly those that substantiated the principles of double-entry bookkeeping and the rational organization of accounting procedures, contributed to raising the level of professional training among those engaged in the field of accounting. This laid the foundation for the transition from empirical practices to a more systematic and scientifically grounded accounting practice.

Thus, the development of accounting during the Cossack era and under the influence of European traditions reflects a gradual transformation of accounting approaches toward greater systematization, regulation, and orientation toward management needs. It is precisely these features that became important components of the conceptual foundation of modern accounting (Plaksienko et al., 2019).

The conceptual framework of modern accounting in Ukraine took shape under the influence of profound socioeconomic transformations and integration into the European economic space. As early as the 17th century, a unified metric system was introduced within the Polish Kingdom, which facilitated the standardization of measuring economic transactions and improved the accuracy of accounting information. The active development of trade and monetary circulation led to the spread of credit relations, the use of promissory notes and banking instruments, which, in turn, required the improvement of accounting procedures and an increase in their analytical capabilities.

During the period when Ukrainian lands were part of the Austro-Hungarian and Russian Empires, European scientific schools, particularly the German accounting tradition, had a significant influence on the development of the accounting system. Its methodological approaches, focused on clear account organization, systematicity, and control, were actively implemented in the operations of banks, cooperatives, commercial

enterprises, and other economic entities. This contributed to the formation of a professional accounting community and the development of the institutional foundations of accounting.

In the 19th century, the further development of accounting theory was linked to the emergence of academic schools that systematized accounting methods. In particular, approaches were proposed for organizing accounts, maintaining accounting records, creating reserves, and reporting financial results. These innovations laid the foundation for modern accounting principles, including the structuring of information, double-entry bookkeeping, and the consolidation of data in financial statements.

In the early 20th century, the development of the accounting system was uneven and largely dependent on historical circumstances. Periods of economic growth were accompanied by improvements in accounting methods and the expansion of their scope of application, while wartime events disrupted the consistency of accounting and reporting. At the same time, the rise of the cooperative movement contributed to the spread of accounting knowledge, the emergence of specialized literature, and the development of professional training.

Civil society and professional organizations played a significant role in shaping the distinctive features of Ukrainian accounting by promoting the use of the Ukrainian language in business correspondence and fostering the development of a unique accounting tradition. Institutional development, particularly the establishment of audit and oversight bodies, ensured greater reliability of accounting information and its alignment with user needs.

Radical changes in the concept of accounting took place in the 20th century amid the transformation of the economic system. Accounting acquired a clearly defined control function and was oriented toward ensuring the preservation of state property, planning, and regulation of economic processes. Its main tasks became the timely reflection of the state of resources, providing information for management, and integrating data into the national accounting system.

Thus, the historical development of accounting demonstrates a gradual evolution from a tool for recording business transactions to a complex information system that supports management, control, and strategic planning. The combination of these transformations formed the conceptual foundation of modern accounting, which is oriented toward the needs of various users and integrated into the global economic environment. With the transition to a new economic policy, the importance of accounting grew. During this period, accounting was tasked not only with exercising control over the preservation of socialist property but also with promoting the development of commodity-money relations, ensuring the identification of the results of the self-financing activities of enterprises and organizations, and facilitating their profitable operation. The government paid significant attention to improving accounting. Its decisions consistently addressed the need to strengthen the role of accounting as an important source of information about the economic activities of enterprises and trusts and to develop effective

methods for controlling the rational expenditure of funds allocated by the state for their production activities.

Planned targets began to play a leading role in accounting; attention was focused on monitoring their fulfillment, and emphasis was placed on accounting as a means of implementing economic planning and austerity measures, as well as combating bureaucracy. Two mutually exclusive demands were placed on accountants: to strengthen control and to reduce reporting. In the first case, this meant increasing planned and reported indicators; in the second, it meant reducing them (Law of Ukraine "On Accounting and Financial Reporting in Ukraine",1999).

The conceptual foundation of modern accounting has been shaped by evolutionary changes in the methods, organization, and technical infrastructure of accounting processes. A defining feature of this development has been the gradual refinement of the accounting system's tools, manifested in the transition from traditional ledgers to more flexible and functional forms of accounting.

An important stage was the widespread adoption of card-based forms of quantitative and sum-based accounting and the accounting of settlement transactions, which ensured greater analytical depth and faster information processing. The further development of the accounting concept is linked to the emergence of new organizational forms, particularly systems in which the basic element is not the balance sheet as a summary indicator, but the primary information carrier – the journal card. This approach laid the foundation for the modern understanding of accounting as an information system focused on primary data and its subsequent transformation.

The automation of accounting processes has had a significant impact on the development of the modern concept of accounting. From the use of simple computing devices, such as adding machines, to the introduction of accounting machines, the technological foundation of accounting has taken shape. This laid the groundwork for the modern digitization of accounting, where information systems play a key role in ensuring the accuracy, speed, and analytical depth of data processing.

In the further development of accounting, the expansion of its functions became of significant importance, particularly the development of operational accounting as a management tool. At the same time, attempts to integrate various types of accounting (financial, operational, and statistical) contributed to the realization of the need to create a unified enterprise information system that aligns with modern concepts of management and financial accounting.

Conceptual transformations also affected the theoretical foundations of accounting. There was a rethinking of its subject matter and scope of application—from accounting for the activities of an individual enterprise to a broader macroeconomic context. At the same time, the distinction between accounting theory and practice was overcome, which contributed to the formation of accounting as a comprehensive scientific and practical discipline. Double-entry bookkeeping began to be viewed as a methodological tool used to record business transactions, rather than as a universal law.

The introduction of new forms of organizing the accounting process played a significant role in the development of the concept of modern accounting, particularly the daily balance sheet, which ensured the timely receipt of information about the enterprise's financial condition. The spread of graphical methods (in particular, charts and document flow diagrams) contributed to greater clarity and efficiency in managing information flows.

Further development has been linked to the mechanization and automation of accounting, which has led to a decline in the role of traditional information carriers and a shift toward new technological solutions. The development of computing technology and its integration into accounting practices laid the foundation for modern information systems for accounting and management.

The evolution of accounting forms—from the memorandum-order form to the journal-order form, and later to automated systems—reflects a gradual transition to more efficient and rational methods of summarizing accounting information. In particular, the introduction of the journal-ledger form with the credit principle of record-keeping became an important step toward the systematization of data and the enhancement of accounting's analytical capabilities.

In summary, it should be noted that the modern conceptual framework of accounting has emerged as a result of the integration of methodological, organizational, and technological changes. It is based on the principles of systematicity, information orientation, automation, and adaptability to management needs, which ensures its effective functioning in a dynamic economic environment (Kuzminskyi et al., 1993).

As part of the development of the conceptual framework for modern accounting, the establishment of a professional training system in the field of comprehensive mechanization and automation of accounting processes has taken on significant importance. This facilitated the transition from traditional forms of accounting to machine-oriented systems, which ensured faster information processing, the centralization of accounting functions, and their technological standardization.

The further development of accounting technologies in the 1970s and 1980s was characterized by the widespread introduction of tabular-automated forms of accounting, which became an important stage in the transition to modern information systems. Since the 1990s, there has been an active introduction of interactive automated accounting systems, which involve interactive user interaction with accounting systems—a key feature of the modern digital accounting environment.

A significant milestone in the development of accounting in Ukraine was the reform carried out at the end of the 20th century. The primary goal of this transformation was to bring the national accounting system into line with the requirements of a market economy and international financial reporting standards. As part of these changes, a new chart of accounts was introduced, accounting ledgers were improved, and financial reporting forms were modernized, laying the foundation for harmonizing accounting practices with international approaches.

The adoption of the Law of Ukraine "On Accounting and Financial Reporting in Ukraine" was a decisive step in establishing the institutional foundations of modern accounting. According to the law, accounting is defined as a mandatory system for providing information on the activities of enterprises, on the basis of which financial, tax, statistical, and other reports are prepared. The law establishes that the owner or management of an enterprise is responsible for organizing accounting, and defines the key accounting principles, which are implemented through national standards.

Ukraine's attainment of independence served as a catalyst for the formation of its own scientific paradigm of accounting, which focuses on combining international experience with the national characteristics of the economy. During this period, the Ukrainian school of accounting is actively developing, represented by leading scholars who have made significant contributions to the development of the theory, methodology, and practice of accounting, analysis, and auditing.

The modern conceptual framework of accounting is also largely shaped within regional academic schools, each of which has its own academic specialization and research priorities. In particular, the Kyiv school focuses on the development of the theoretical and methodological foundations of accounting, analysis, and auditing; the Kharkiv school—on accounting and control issues in specific sectors of the economy; the Zhytomyr school—on economic control issues; the Luhansk school – on the economic analysis of the utilization of production potential; the Lviv school – on the improvement of the theory and practice of economic analysis; the Odesa school – on the accounting of investments and fixed assets; and the Ternopil school – on the comprehensive development of accounting, analysis, and auditing, as well as the training of scientific personnel.

Thus, the modern conceptual framework of accounting in Ukraine has taken shape as a result of the convergence of technological evolution, institutional reforms, and the development of academic thought. It is based on the principles of automation, standardization, integration of information flows, and a focus on the needs of effective management in a market economy.

In the context of shaping the conceptual framework of modern accounting, the development of regional scientific schools plays a significant role, as they ensure the refinement of methodology and the adaptation of accounting approaches to the specifics of the national economy. In particular, the Dnipro scientific school, founded by V. Ya. Plaksienko, focuses its research on developing methodological and organizational foundations for building a system of accounting, reporting, and information and consulting support for auditing activities, especially in the agricultural sector. This aligns with the modern concept of accounting as an integrated information system oriented toward management and decision-making needs.

Alongside this, other regional academic schools – those in Vinnytsia, Volyn, Zaporizhzhia, Rivne, Sumy, and Kherson – are also showing active development, a trend driven by both the economic characteristics of these regions and the academic initiatives

of their founders. Their activities contribute to the expansion of the scientific field of accounting and the formation of a multi-vector model for its development.

Research into the evolution of accounting allows us to identify key patterns in its transformation and determine directions for further improvement. The Ukrainian scientific school of accounting develops in close interaction with global traditions, particularly the Italian, French, German, and Anglo-American schools, which facilitates the integration of the national accounting system into the global economic space. At the same time, the Eastern European (particularly Russian) accounting tradition has historically had a significant influence on its formation, which has shaped certain features of accounting methodology and organization.

The modern conceptual model of accounting in Ukraine is based on the need to harmoniously combine national characteristics with international standards. Effective economic development is impossible without a properly organized accounting system that ensures the transparency, reliability, and relevance of information for all user groups, particularly in the context of integration into the European economic area.

According to the legislative approach, accounting is viewed as a comprehensive information process encompassing the identification, measurement, recording, accumulation, summarization, storage, and transmission of data regarding the enterprise's activities. This approach reflects the modern understanding of accounting as a key element of the management information infrastructure, aimed at ensuring that both internal and external users make informed management decisions.

Thus, the conceptual framework of modern accounting is shaped by the development of academic schools, international integration, institutional changes, and digitalization, which ensures its transformation into an effective tool for managing socioeconomic processes (Law of Ukraine "On Accounting and Financial Reporting in Ukraine",1999). Within the framework of establishing the conceptual foundation of modern accounting, the definition provided should be considered primarily in the context of financial accounting, since this type of accounting focuses on the activities of an individual business entity and culminates in the preparation of financial statements as the primary information product.

At the same time, the modern concept of accounting entails the need to distinguish between and, at the same time, integrate its various subsystems. In particular, a comparative analysis of financial and management accounting is important. In current regulatory interpretations, management accounting is often equated with internal accounting; however, within the framework of the modern scientific approach, such an equating is somewhat simplistic.

Conceptually, management accounting has a much broader scope, as its functional purpose and level of development depend directly on the management hierarchy. It can be implemented not only at the level of an individual enterprise or its structural units, but also extend to the level of enterprise groups, industries, local communities, and even the national economy. This allows us to view management accounting as a multi-level

information system designed to support management decision-making at various economic scales.

In contemporary academic literature, a common approach divides accounting structurally into financial and managerial accounting. This division reflects the evolution of accounting from a purely recording function to a comprehensive information and analytical system that provides both external and internal users with relevant information.

Therefore, within the conceptual framework of modern accounting, financial and managerial accounting should be viewed not as isolated subsystems, but as interrelated components of a single management information system that operates on the principles of integration, adaptability, and user-centricity (Plaksienko et al., 2019, p. 9). We do not share this view, since management accounting generally encompasses internal control, forecasting (planning), performance analysis, operational information, a portion of statistical data (for analysis), and so on. The highest level of such accounting is the System of National Accounts (SNA), that is, macroeconomic statistics.

Therefore, to define the essence (core) of accounting, one should refer to the historical classification of types of business accounting, specifically its division into operational, financial, and statistical accounting (Kuzminskyi, 1990, pp. 13–17). These types of accounting provide a comprehensive overview – or, more precisely, the formation—of information regarding the economic activities of individual business entities, their associations, and industries, as well as the state of the country's economic development as a whole. Therefore, to formulate a more precise definition of accounting specifically, economic accounting should be defined as the quantitative reflection and qualitative characterization of all phenomena of economic life. One should not specify the purpose of this reflection in the general formulation (Nimchynov, 1977, p. 8) or single out the process of social reproduction within it (Shvets, 2008, p. 6), as this narrows the scope of economic accounting.

When distinguishing accounting from business accounting, it is important to note its distinctive features compared to other types of accounting, as well as established approaches that will not be altered by political (class-based), national, or other specific factors. Based on this, we consider it appropriate to include in the definition only the system of comprehensive, monetary, and documentary recording of economic events. The remaining characteristics in the definition of accounting (Kuzminskyi, 1990, p. 8; Kuzminskyi et al., 1993, p. 6; Legenchuk, 2021, p. 16; Bilousko and Belenkova, 2006, pp. 5–6) will pertain to specific types of accounting (financial, managerial, tax), national peculiarities of practice (organization, techniques, methodologies), and should be considered variable, albeit important for certain sectors of the economy or during specific periods of its development. This assertion is reflected in research in the field of neuroaccounting. The application of the concept of neuroaccounting confirms the need to identify components in accounting that constitute the hard core and are not subject to change as it evolves (Petruk, 2005, p. 62).

Modern accounting is based on historically developed practical activities, the primary purpose of which was to document and systematize economic facts, thereby

facilitating the generation of economic information. With the development of writing and information technology, accounting practice gradually transformed into a theoretical system. The subject of this theory is the information about economic activity itself, as well as the methods of obtaining, processing, and using it for managerial and financial decisions. At the same time, a clear distinction must be made between accounting as a scientific category and the discipline of "Theory of Accounting," the subject of which some researchers define as a set of procedures aimed at identifying, measuring, storing, and transmitting information regarding economic transactions (Legenchuk, 2021, p. 34). Such confusion often arises when developing educational standards, where the discipline "Theory of Accounting" is identified first, followed by "Accounting" and other related courses. Without delving into the details of the history of training specialists in this field, it is worth focusing separately on understanding accounting as a science. The modern scientific perspective supports the definition according to which accounting is viewed as the study of the system for collecting, processing, and presenting accounting information to support managerial and financial decisions (Nimchynov, 1977, p. 5). However, the definition of accounting should not be limited solely to its application in managing specific sectors of the economy. Some economists and practitioners view it exclusively as a function of management science, which leads to an underestimation of accounting's key role – its control function. A refined scientific definition of accounting is formulated as the study of a system for collecting, summarizing, and using information about economic activity for the purpose of control and management at various levels.

This definition methodologically builds upon the concept of accounting as an academic discipline, since modern scientific approaches generally distinguish a separate object of study – a phenomenon, a process, or a significant component thereof (Legenchuk, 2021, p. 34; Plaksienko, 2007, p. 98). The subject of study in accounting is viewed as a partial component of the object of study – a set of theoretical, methodological, and practical aspects within the defined object. From a philosophical point of view, this is based on the understanding that accounting, as a distinct economic science, generally studies economic activity as a whole. At the same time, a specific study or a particular issue identifies a certain aspect of economic activity as an independent object. In this context, individual elements of phenomena or processes analyzed in accordance with the research objective are formulated as the subject of research – a partial reflection of the general object.

The relationship between the subject and the object depends on the level of detail in the study and may vary under the influence of standardization or unification of general or national methodological and procedural approaches in scientific or educational work. Such factors are considered variables in defining the subject of accounting.

Particular attention should be paid to the monetary measurement of the volumes of phenomena, assets, capital, and individual processes. Some researchers believe that only the national currency should serve as the monetary measure, which underscores the importance of a standardized approach to the assessment and reflection of economic facts (Shvets, 2008, p. 14; Legenchuk, 2021, p. 168; Mykhailov et al., 2007, p. 30). In the

context of economic globalization, the use of international payment systems and virtual currencies, the general definition of accounting should not single out any specific type of payment instrument. The use of a monetary measure in accounting is not so much about assessing the volume of assets, property, or capital as it is about providing a summary and comparative analysis of these elements over time or within the economic landscape. This also applies to the documentary recording of business transactions. Some economists and practitioners believe that documentary recording may gradually be replaced by digital technologies; however, this approach fails to account for the cause-and-effect relationship: first, a document is created (even in electronic form), and only then is the accounting data summarized.

Even a brief definition of any science, including accounting, should reflect the fundamental essence of its subject matter and the focus of its methodology. From this perspective, the subject matter of accounting encompasses all economic activity as a collection of facts of economic life, which constitutes its foundation or "core." As for the method of accounting, the concept of "documentary recording in monetary terms" emphasizes the unity of specific methods and techniques that ensure the reliability and generalizability of information about economic processes. That is why, in a generalized form, the definition of the subject of accounting (as well as all economic sciences) should refer to economic activity as a whole. By examining economic activity, accounting generates information about all its facts (the existence and movement of assets, the scale of economic processes, ownership relationships and changes, the volume of financial flows, etc.) (Bilousko and Belenkova, 2006, pp. 6–8; Mykhailov et al., 2007, pp. 39–40). At the same time, it is necessary to immediately highlight the specificity of accounting in reflecting economic life, in particular the classification of accounting objects as part of its subject into economic resources (assets) and the sources of their formation (liabilities). Other classification criteria—such as characteristics of the economic cycle, functional purpose, reproduction, etc.—are not mandatory for inclusion in the basic definition of the subject of accounting.

For the course "Accounting" as an academic discipline (or "Theory of Accounting"), it is sufficient to use two classification categories for economic resources: by physical composition and location within economic activity, as well as by source of origin, ownership, and intended use.

Under the first classification, the objects of accounting are the means and objects of labor themselves, means of circulation—including cash, production costs, and other processes and activities—as well as non-current and other assets. The second classification takes into account the ownership, sources of origin, and intended use of these objects, which form independent objects of accounting.

This classification is a key factor in defining the subject of accounting, as it provides the methodological basis for applying the fundamental elements of the accounting method: balance sheet summarization and double-entry bookkeeping. Graphically, it can be represented in a coordinate system, where the X-axis shows groups of economic resources by composition and location, and the Y-axis shows the sources of their

formation. It is into this system that the understanding of the elements of the method and the unity of various types of assets and liabilities as objects of accounting is integrated.

To fully reveal the economic essence of each group of accounting objects, some instructors and scholars identify additional categories within the subject of accounting, including business processes, financial results, business entities, and others.

The economic process, as an object of accounting, is two-sided in nature. On the one hand, it includes the consumed portion of materials, tools, and labor itself (costs), which are treated in the accounting system as assets—inventory, work in progress, or the finished product. On the other hand, it is the result of the process. In production, the result is not only a new material good (product or commodity) but also intangible services and work, such as "output," "completion of work," or "provision of services" (educational, scientific, medical, managerial, defense, etc.).

In the first classification, these accounting items are classified as sources of economic resources (liabilities), which are not always taken into account when preparing the balance sheet as a form of the "Statement of Financial Position." Similarly, the sales process includes the carrying amount of the products or goods sold and the selling expenses, and the result is sales revenue, which is also considered a source of funds (liability).

Financial and investment expenses associated with the acquisition or creation of real or portfolio items are classified as assets. At the same time, the outcomes of these expenses—gains, interest, dividends, sales proceeds, and other income—constitute sources of funds (liabilities).

From an accounting perspective, the economic substance of financial results—profit and loss—should be analyzed more deeply than simply as the mathematical difference between the revenues and expenses of a particular process or activity. Although profit is calculated as the excess of income over expenses, it is important to consider the composition of the income generated (which reflects an increase in assets and a decrease in liabilities) and the expenses incurred to support it (which is accompanied by a decrease in assets and an increase in liabilities).

If the total amount of income exceeds the amount of expenses, it is necessary to determine the economic nature of the additional funds (assets) obtained as a result of the activity. If the previous assets already had their sources, the source of the new assets is precisely the profit.

In the event of a loss, where expenses exceed revenues from a particular process or activity, it should be taken into account that the economic resources consumed and the increase in liabilities already had their own sources, owners, or intended purpose. The economic nature of the loss should be understood as the amount of assets not received. In other words, in accounting, a loss serves as a notional indicator of assets that were not obtained as a result of a specific process or activity. It is important to consider this when preparing the balance sheet as a key element of the accounting method.

With regard to business entities—companies, organizations, institutions, establishments, etc.—as objects of accounting, accounts receivable and accounts payable

should be included in assets or liabilities, taking into account their economic nature. Accounts payable represent a source of assets temporarily borrowed by the enterprise (liabilities), while accounts receivable represent withdrawn or non-current assets that have their own sources within the enterprise.

The third classification approach does not contradict accounting theory; on the contrary, it provides a clearer and more detailed understanding of the nature of individual accounting items. It enables us to view the same real or virtual objects, grouped according to different criteria, in order to obtain generalized information for analytical activities and managerial decision-making, scientific research, or methodological conclusions.

This approach is also supported by the fact that, among the elements of the accounting method, in particular the double-entry method, there is the concept of requirements, which reflects the interrelationship between assets and liabilities in the process of recording business transactions (Petruk, 2005, p. 94).

Subsequently, when considering economic activity as the subject of accounting, it is necessary to broaden the understanding of the composition of its objects as a multidimensional space, where the same components are represented in a specific plane depending on the purpose of the study and the classification criteria. The list of these characteristics is constantly expanding, which is especially important when refining the definition of the object of study in management accounting. In this case, each classification criterion is based on the need to control the availability, condition, and intended purpose of new (under national legislation) or borrowed accounting items, as well as to ensure the provision of information to various levels of management for decision-making.

In scientific research, a method is defined as a set of tools, techniques, and rules, the observance of which guarantees the attainment of scientifically valid results. The foundation of methodology, understood as the doctrine of methods for understanding the object of study, comprises general scientific approaches: dialectical, historical, and systemic, as well as the methods of induction and deduction.

When formulating the accounting method, some scholars identify four components: chronological and systematic observation, measurement of economic resources and processes, recording and systematization, synthesis of information, and reporting. Subsequently, these techniques are divided into eight elements of the method: documentation, inventory, valuation, costing, accounts, double entry, balance sheet, and reporting. We support the view that only these elements should be identified, without further subdivision into specific techniques, since each element has its own significance and is interrelated with the others, with the exception of double entry, which loses its meaning without a system of accounts.

Particular attention should be paid to the precision of the wording of the name and the definition of each element of the method. For example, the element “documentation” is often described as written evidence of the performance of a business transaction, a means of capturing simultaneously performed transactions, the use of source documents, or a set of document forms. However, the key element of the method should be precisely

the documentation of business transactions, i.e., the use of a specific document (technical medium) to record an individual transaction, whereas the documentation system pertains to the methodology of the separate academic discipline "Organization of Accounting" (Vasylieva et al., 2017, pp. 22–23), where it is defined as primary accounting. Sometimes, the definition of documentation is practically combined with the definition of a document as written evidence of the performance of a business transaction, which confers legal status on it (Mykhailov et al., 2007, p. 61). Such and similar approaches to the definition of documentation lack a general methodological foundation, as changes in the legislation of individual countries at different points in time result in revisions to the wording, and therefore the legal component of documents may change or be lost altogether, whereas the informational component, representing the initial stage of information formation, will retain its meaning from a historical perspective. This is particularly important in the context of automating production and other technological processes, automating the workplaces of both managers and accountants, and digitizing and computerizing accounting processes (e.g., meters on milk pipelines, lathes, and other machinery, gas stations, bank-client systems, etc.). Therefore, we consider the most acceptable (consistent) definition of documentation to be the process of recording changes in the composition of accounting items to ensure their comprehensive and continuous control.

This definition implies the use of documents as a means of primary observation of business transactions and as the basis for their recording in accounting. Accounting documents serve as confirmation of the transaction, and the substance of the transaction is disclosed through the relevant details, which form the basis for the subsequent consolidation of economic information. This definition remains relevant in any business management system and at various levels of automation and digitalization of accounting and economic processes.

Inventory, as an element of the accounting method, is defined based on its characteristics as a means of confirming the actual condition of accounting items. It differs from the inventory used in auditing, review, or other forms of economic control (with the exception of internal control in management accounting). Inventory counting is defined as the process of determining the actual existence and condition of business resources (assets), as well as the amount of capital and liabilities (payables), in order to confirm the accuracy of accounting data.

Since, during an inventory count, discrepancies may be identified in the storage of valuables and other inventory items, as well as errors in record-keeping, the term "audit" should be avoided in the definition, and the concept of "comparison" should be used instead.

Some scholars (Mykhailov et al., 2007, pp. 287-288) view inventory counting as a tool that complements the documentation system, arguing that certain business processes cannot always be promptly recorded in source documents and fully reflected in accounting (e.g., natural losses, damage to assets, etc.). Within the conceptual framework of modern accounting, this approach partially reflects the functional purpose of inventory, but does not fully capture it as an independent element of the accounting system.

It is not advisable to agree with the position of combining inventory and documentation into a single procedure of primary or chronological and systematic observation. From the perspective of the logic underlying the accounting process, inventory counting does not fall within the initial stages of information generation. On the contrary, it serves as a tool for confirming the reliability of accounting data regarding the existence, value, and condition of accounting items that have already been reflected in the accounting system and have undergone the appropriate processing stages.

At the same time, inventory counting is intrinsically linked to the documentation system through the use of specialized forms – inventory lists, comparative data, and inventory reports. This underscores its informational interaction with documentation, but does not equate it with documentation.

A key feature of inventory counting as an element of the conceptual framework of accounting is the combination of documentary and physical control methods. Specifically, the actual existence of assets is established through direct observation (weighing, measuring, inspecting, etc.) after they have been recorded in the accounting system, whereas the valuation of liabilities (accounts receivable, accounts payable, and other liabilities) is supported by documentation—based on data from counterparties, accounting certificates, and statements.

Therefore, within the conceptual framework of modern accounting, it is appropriate to consider inventory not as a form of documentation but as an independent method of factual control aimed at ensuring the reliability, completeness, and objectivity of accounting information.

Within the conceptual framework of modern accounting, it is advisable to define valuation without placing excessive emphasis on the process of its implementation, which traditionally includes components such as appraisal and the selection of value in accordance with the requirements of accounting standards. At the same time, this does not diminish the importance of the valuation methodology, which should remain a key focus of attention in both the educational process and academic research. The valuation methodology is of particular importance for accounting and management practitioners, as it is this methodology that ensures the adaptation of accounting information to management objectives at the macro and micro levels. The application of different valuation approaches is determined by the objectives set for the accounting system in specific economic conditions and within the framework of national regulation. A key milestone in the development of the conceptual foundations of accounting was the rethinking of the role of valuation in the second half of the 20th century, when leading professional organizations shifted the focus of academic research from the predominance of asset valuation models to an emphasis on the usefulness of accounting information for management decision-making. This approach laid the foundation for the modern accounting paradigm, in which valuation is viewed not only as a technical measurement tool, but also as an important element in generating relevant and reliable information for users. Translated with (Petruk, 2005, p. 22).

Within the conceptual framework of modern accounting, it is important to clearly distinguish between the categories that constitute the content of the accounting system. In particular, economic benefits (according to Ukrainian Accounting Standards (UAS)) are not direct objects of accounting but rather characteristics that determine the appropriateness of recognizing and measuring assets and liabilities.

In this context, it is particularly important to distinguish between the concepts of cash as an object of accounting and the monetary unit as a universal tool for aggregating information. Cash is a specific object of accounting that must be reflected in financial statements, whereas the monetary unit of measure enables the comparison, aggregation, and interpretation of diverse accounting data.

Therefore, when teaching accounting disciplines and conducting research, it is advisable to focus specifically on the fundamental difference between these categories, which contributes to a deeper understanding of the nature of accounting information.

Thus, in the conceptual dimension, monetary valuation is not considered an independent element of accounting or other economic sciences, but rather serves as a necessary prerequisite for its functioning. It is precisely the existence of a monetary measure that enables the accounting process, the generation of aggregated information, and its subsequent use for making management decisions (Shvets, 2008, p. 133). Within the conceptual framework of modern accounting, it is advisable to clearly distinguish between valuation, as a fundamental element of the accounting method, and the digitalization of economic information. Valuation performs a substantive function: it enables the consolidation of information, which is heterogeneous in terms of its economic nature and measurement units, obtained through primary observation. In contrast, digitalization is of a purely technical nature and serves as a method for presenting, processing, and transmitting already generated accounting information, without affecting its economic substance.

From a conceptual standpoint, cost accounting is an independent element of the accounting method, which plays an important role in the system for generating accounting information. Its purpose is to evaluate the results of business processes, in particular by determining various types of value (cost, fair value, normative value, etc.). At the same time, costing is closely interrelated with valuation, as it effectively reflects the reverse aspect of this process: the aggregated costs incurred at a particular stage of the capital cycle are correlated with the results obtained and allocated among the costing objects. Within the structure of the costing process under the modern accounting concept, it is advisable to distinguish two key stages: first, the grouping of costs based on defined characteristics in accordance with management objectives and accounting policies; second, the calculation of the cost per unit of products, goods, works, or services. This approach ensures that cost indicators are determined in an analytical and well-founded manner.

Therefore, within the conceptual paradigm of modern accounting, valuation, costing, and digitalization are considered as interrelated but functionally distinct components: valuation and costing shape the economic substance of accounting information, while

digitalization ensures its effective functioning in the digital economy (Mykhailov et al., 2007, p. 62). Within the conceptual framework of modern accounting, these provisions primarily relate to the first stage of costing: the grouping of costs according to the stage of the capital cycle, the objectives of accounting, and the level of generation of accounting information. It is at this stage that the analytical foundation is laid for the subsequent determination of the value of accounting items.

In particular, in financial accounting, costs are grouped by economic elements or types of activity, which enables the generation of aggregated information for external users. In contrast, in management accounting, the approaches to cost grouping are more detailed and flexible: costs are organized by cost accounting items, responsibility centers, types of production, periods, processes, orders, etc., depending on the information needs of management and the specific nature of management decision-making.

Thus, within the conceptual framework of modern accounting, this cost grouping should be viewed as a form of aggregating information by accounting objects, which ensures the relevance, analytical nature, and purposefulness of the accounting data. This, in turn, provides the necessary foundation for the next stage of costing: determining the cost per unit of products, works, or services.

Other scholars define costing or cost calculation as an element of the method (Legenchuk, 2021, p. 50; Hnatyshyn and Prokopyshyn, 2016, p. 33). Within the conceptual framework of modern accounting, it should be noted that similar or closely related approaches to defining costing have been established in different periods through official instructions, regulations, recommendations, and methodological guidelines on planning, cost accounting, and cost calculation. At the same time, such formulations typically narrow the scope of cost accounting, focusing primarily on its second component—allocating costs between cost accounting objects and determining the cost of goods sold.

In the conceptual dimension of modern accounting, this approach is limited, as it does not fully take into account the analytical and generalizing functions of cost accounting. In this context, it is advisable to interpret costing more broadly – as a process (method) for grouping costs at various stages of the capital cycle and simultaneously determining the cost of purchased, manufactured, or sold products, goods, works, and services.

Without delving into a detailed classification of costing methods and techniques for calculating the cost per unit of production, it is important to emphasize the need to retain the category of "cost" in its definition. Within the framework of the modern accounting concept, it is precisely cost price that serves as a key tool for comparing the individual costs of an economic entity with socially necessary, average, normative, or international indicators, thereby ensuring the soundness of management decisions and enhancing the efficiency of economic activities.

Accounting accounts and double-entry bookkeeping are identified as the most specific (and perhaps key) elements of accounting science. From the perspective of the independent application of these method elements, they can indeed be combined into a

single process: the recording and classification of data for the purpose of systematizing it (Legenchuk, 2021, p. 49), or the ongoing grouping of accounting items and their interrelated reflection in the accounts (Kuzminskyi, 1990, p. 43). Such a combination makes sense from the perspective of the practical application of these elements. However, in the educational process and academic research, it is precisely the specificity (reality) of these virtual elements that should be taken into account, as each of them, while playing a common role in generating accounting information, has a clear purpose and justification.

Within the conceptual framework of modern accounting, it is appropriate to consider an accounting account as a tool for representing individual accounting items or homogeneous groups of such items, grouped according to certain economic characteristics. Its main purpose is to record and summarize changes (movements) within these items. Therefore, an account should be defined as a means of systematizing and continuously summarizing information about changes in accounting items.

The further classification of accounts, as well as the use of standard and working charts of accounts, ensure the methodological consistency of the accounting process and justify the need to systematize information according to the relevant areas. In doing so, the national, historical, and institutional characteristics of the development of accounting systems, which define the content and practical application of accounts, are taken into account.

In the conceptual framework of modern accounting, double-entry bookkeeping is considered one of the key achievements of economic science, which enabled the establishment of accounting as an independent academic discipline. Its essence lies in recording each business transaction in at least two accounts—on the debit side of one account and on the credit side of the other—with the same amount, thereby ensuring the internal consistency of the accounting system.

At the same time, the essence of double-entry accounting is not limited to the technical method of recording transactions. Its scientific foundation is based on the objective duality of economic processes: each transaction results in simultaneous and equal changes in at least two accounting items. Given the division of accounting items into assets and liabilities, this duality is reflected in a system of accounts that operates on the principles of debit and credit.

Thus, the system of accounts and double-entry bookkeeping together form the methodological foundation of accounting, combining its technical, methodological, and theoretical aspects. It is on the basis of an understanding of the economic nature of items and the dual nature of business transactions that an accounting model (accounting entry) is developed, which ensures an adequate representation of economic processes.

This logic also underlies the design and operation of modern automated accounting systems, where the principles of double entry and the system of accounts are transformed into data processing algorithms. This enables the further development of accounting and its adaptation to new items, business conditions, technological changes, and regulatory requirements.

1.2. ACCOUNTING AND ANALYTICAL PARADIGM OF EXPORT OPERATIONS MANAGEMENT UNDER IFRS WITHIN THE ENTERPRISE ECONOMIC SUSTAINABILITY STRATEGY

Olha Hubaryk,
Ph.D. in Economics, Associate Professor,
Head of the Department of Accounting, Taxation
and Management of Financial and Economic Security,
Dnipro State Agrarian and Economic University, Dnipro, Ukraine

In the context of the global integration of domestic business into the world economic space, the management of export operations is transformed from a purely technical sales procedure into a strategic tool for ensuring the viability of the enterprise. The formation of an accounting and analytical paradigm based on International Financial Reporting Standards (IFRS) becomes a necessary condition for creating a transparent information environment capable of maintaining the economic stability of a business entity in conditions of high volatility of foreign markets.

The economic sustainability of an exporting enterprise directly depends on the quality of income identification and currency risk assessment, which requires strict compliance with IFRS 15 and IAS 21 regulations (Ministry of Finance of Ukraine, 2024). As evidenced by modern studies, the paradigmatic approach to accounting allows one to consider export activity not as a collection of individual shipments, but as a holistic system of cost and financial flow management (Holov, 2021, pp. 210-215).

At the same time, the dynamics of changes in the international environment require flexibility and prognostic orientation from the company's analytical apparatus. The integration of IFRS tools into the strategic management system allows you to level the negative impact of exchange rate differences and optimize the tax burden, which is critical for maintaining solvency in the long term (Krupka, 2022, pp. 45-48). Thus, the development of an accounting and analytical model adapted to the strategy of economic sustainability is a priority task for modern economic science. Analysis of recent research and publications. The issues of IFRS implementation and their impact on the quality of financial reporting are widely covered in the works of S. Golov, Ya. Krupka, and N. Vygovska. The issue of strategic management of export potential was studied by such scientists as V. Zhiglei and O. Petruk. However, despite the depth of existing developments, the integrated approach to the formation of an accounting and analytical paradigm, which combines the requirements of international standardization with the goals of strengthening the economic stability of the exporter, remains insufficiently developed. The purpose of the article is the theoretical substantiation of the components of the accounting and analytical paradigm and the development of practical recommendations for the management of export operations according to IFRS within the framework of the implementation of the economic sustainability strategy of the enterprise.

The formation of a strategy for the economic stability of a modern enterprise in the conditions of global transformations requires a review of traditional approaches to

information support for management. In this context, the category "paradigm" in accounting and analysis acts not only as a set of technical techniques, but as a whole system of scientific views, standards and methods that determine the vector of the enterprise's development in foreign markets.

The accounting and analytical paradigm of export operations management is based on the synergy of three components:

1. regulatory component (IFRS): ensures unification and relevance of data for international stakeholders;

2. analytical component: transforms accounting data into strategic indicators (KPI) of export activity;

3. strategic component (economic sustainability): determines the limits of acceptable risks and target profitability benchmarks.

As S. Holov notes, the paradigm of accounting in the modern era is shifting from "historical value" to "fair value" and "capital management" (Holov, 2021, pp. 88-92). For the exporter, this means that IFRS accounting ceases to be a tool for postmortem control of past events and becomes a basis for modeling future cash flows. In particular, the application of the concept of transfer of control over an asset, laid down in IFRS 15, allows management to clearly identify the moment of income, which is critical for maintaining liquidity and sustainability (International Accounting Standards Board, 2023).

The economic sustainability of the enterprise within the framework of this paradigm is considered as the ability of the business entity to maintain its integrity and develop under the influence of destabilizing factors of the external environment. Export operations, on the one hand, strengthen such sustainability through the diversification of sales markets, and on the other hand, they create specific threats: currency fluctuations, complex logistics chains and regulatory barriers.

The methodological complexity of building such a paradigm lies in the need to integrate the principles of IAS 21 regarding the reflection of the impact of exchange rate changes into the overall financial management system (Ministry of Finance of Ukraine, 2024). Exchange rate differences in the conditions of an unstable national currency can both significantly improve the financial result and become the cause of a hidden loss of capital. Therefore, the analytical component of the paradigm should include hedging tools and stress testing of export contracts (Zhihlei, 2016, pp. 140-145).

Thus, the accounting and analytical paradigm of export management according to IFRS is a multi-level structure, where accounting ensures reliability, analysis - validity, and strategy - focus on economic sustainability.

The modern accounting paradigm of export management is based on the concept of "transfer of control", which has replaced the outdated concept of "transfer of risks and rewards". According to the provisions of IFRS 15 "Revenue from contracts with customers", the moment of recognition of export revenue is directly correlated with the financial stability of the enterprise, since early or late recognition of income distorts indicators of liquidity and return on capital (International Accounting Standards Board, 2023).

In order to build an effective system for managing export operations within the framework of the sustainability strategy, the company must implement a five-stage model of analysis of each foreign economic contract:

Stage 1: identification of the contract with the foreign buyer. At this stage, accounting is intertwined with legal analysis. To ensure economic sustainability, it is important that the contract has a commercial meaning and there is a high probability of receiving compensation. In conditions of market volatility, the analytical service should assess the counterparty's credit rating even before the specification is signed (Holov, 2021, pp. 112-115);

Step 2: Identify performance obligations. An export contract is often complex and may include: supply of goods, freight, insurance, commissioning. The accounting paradigm requires the separation of each "unit of accounting." If the company sells the goods on CIF (Incoterms 2020) terms, then delivery is a separate obligation for which revenue can be recognized over time, rather than at the time of shipment. This approach allows more accurate distribution of expenses and income between reporting periods;

Stage 3: determination of the transaction price. This is a key element of sustainability management. The price of an export contract often contains variable components: retro bonuses, volume discounts, penalties for delay. IFRS requires that the "expected value" or "most probable amount" be estimated. For a sustainability strategy, this means a transition from fixing the nominal amount of the invoice to realistic forecasting of the net cash flow (Krupka, 2022, pp. 67-70);

Step 4: Allocation of transaction price to performance obligations. If the contract is complex, the price is divided in proportion to the prices of separate sales. This prevents manipulation of the financial result and gives a real picture of the marginality of each component of the export order;

Stage 5: recognition of revenue when (or as) the obligation is fulfilled. In export, this is a critical moment. The use of Incoterms (EXW, FCA, CPT, FOB, etc.) defines the point of transfer of control. For example, under FCA conditions, control passes at the moment of transfer to the carrier, and under DAP - at the moment of delivery to the buyer. The IFRS accounting paradigm requires the accountant not just to see the cargo customs declaration (VMD), but to analyze the terms of delivery to reflect income in the correct period (Ministry of Finance of Ukraine, 2024).

Such detailing of the accounting process creates a reliable analytical foundation for managing economic stability: management receives information not about "shipped grain or metal", but about fulfilled obligations backed by real rights to receive funds. This allows you to optimize working capital and avoid cash gaps, which is vital for maintaining stability in the face of external shocks.

The study of the accounting and analytical paradigm is impossible without a deep rethinking of the economic essence of export. In the classical sense, export (from the Latin exporto - export) is considered as the sale of goods to foreign entities with export beyond the customs border for income. However, within the framework of the strategy of economic stability, the export operation is transformed into a complex financial and legal

category that performs a number of strategic functions.

We systematized the key export functions that form the foundation of the company's sustainability (Fig. 1.2.1):

- economic: provision of SKV for servicing debts and importing technologies;
- integration: involvement in the international division of labor;
- stimulating: activation of internal innovations to meet world standards;
- regulatory and social: stabilization of the labor market and fulfillment of state macroeconomic goals.

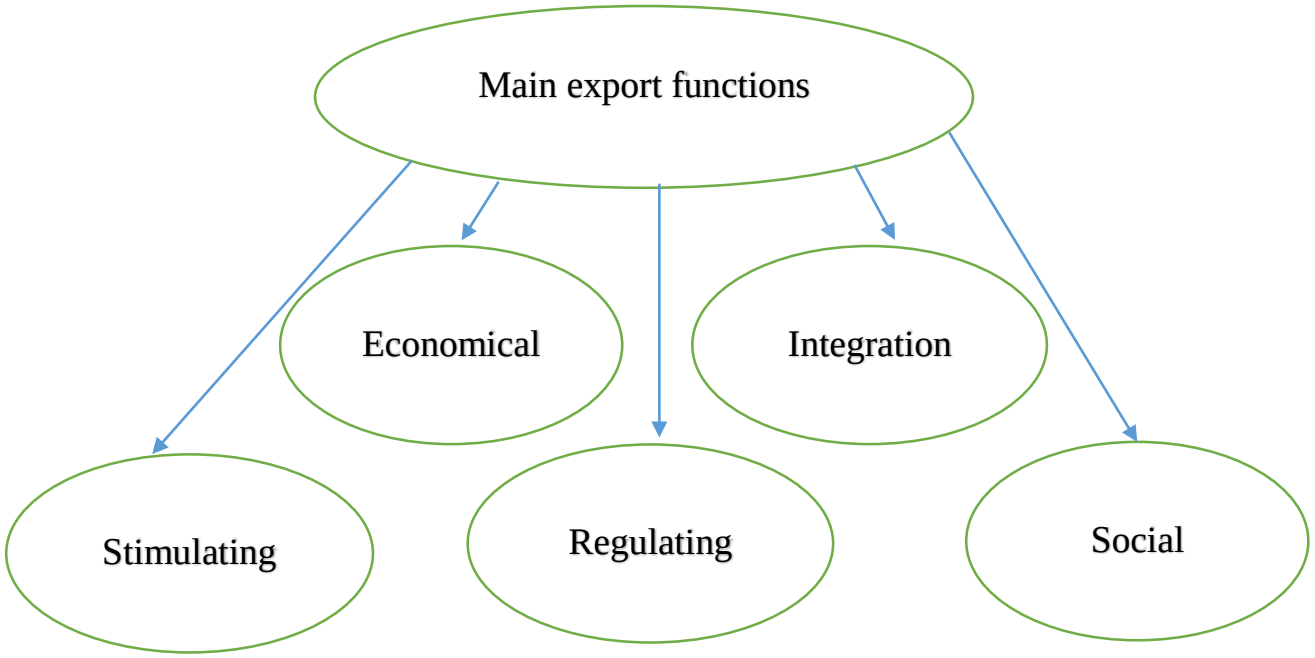


Fig. 1.2.1. Key export functions

The discussion regarding the export model is of particular importance. As noted by M.I. Melnyk and N.R. Synyura-Rostun, the current state requires a transition from a commodity model to supporting industries with high added value (Melnyk and Synyura-Rostun, 2023). From the standpoint of the accounting and analytical paradigm, this means a change in the object of analysis: from the control of physical volumes of raw materials to the analysis of the intellectual component and marginality of high-tech exports.

The economic characteristics of export operations within the scope of our study are considered at two levels:

macro level: formation of the balance of payments and strengthening of the national currency:

micro-level: obtaining SQV, which allows the enterprise to level currency risks through the mechanism of "natural hedging" (comparison of foreign currency income with foreign currency costs for imports).

Fig. 1.2.2 shows the value of exports from the perspective of macroeconomics and microeconomics.

An important difference between exports and domestic operations, which requires specific reflection in IFRS accounting, is the complexity of pricing. The price of the export contract is formed not only on the basis of costs (cost-plus method), but under the influence of the basic terms of delivery of Incoterms 2020. The choice of terms (for example, between EXW and DDP) radically changes the structure of the cost price and the moment of recognition of the asset, which directly affects the indicators of financial independence.

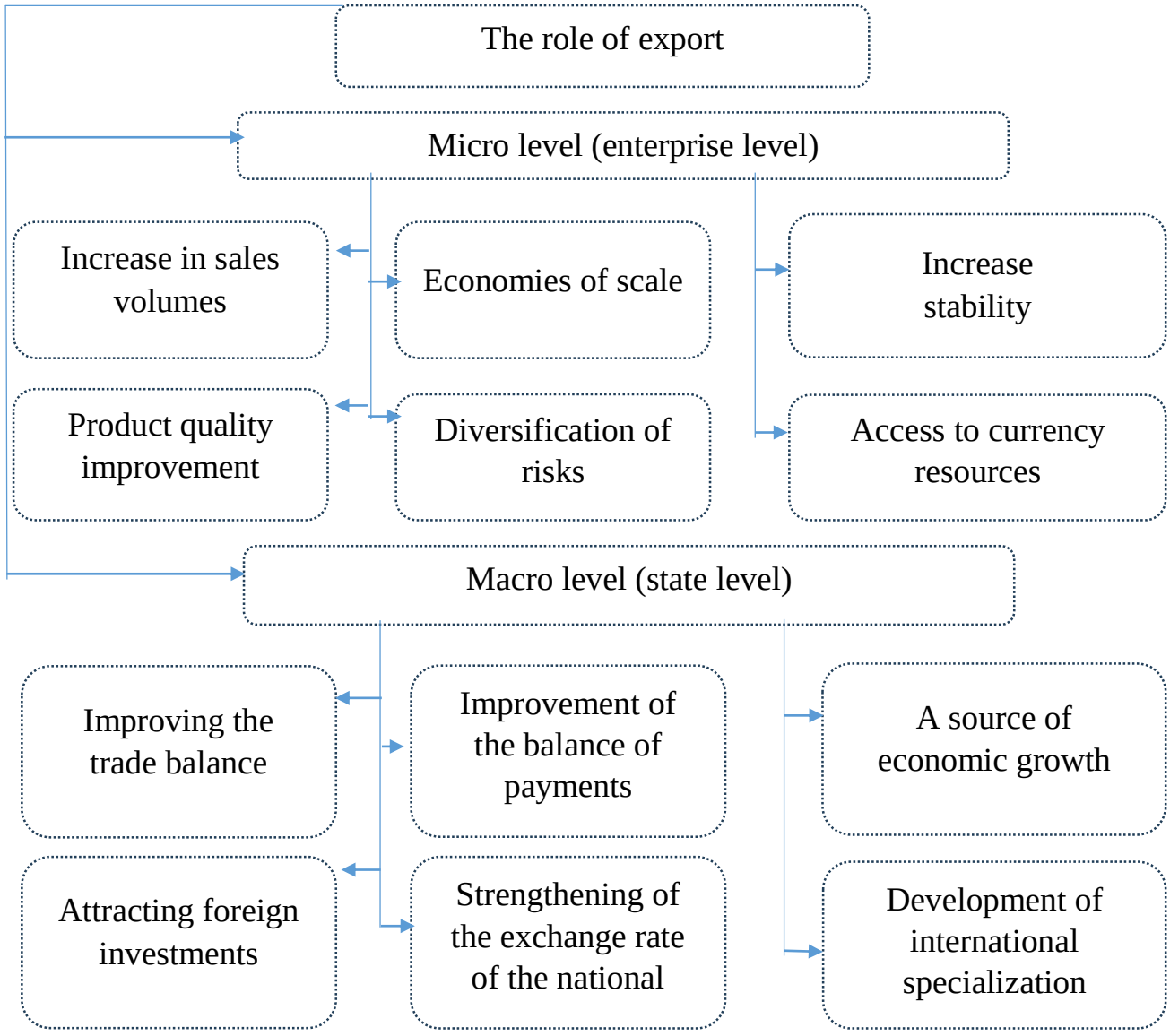


Fig. 1.2.2. The role of export at the macro and micro level

The efficiency of an export operation in the IFRS system is defined not simply as a positive difference between revenue and expenses, but as the ability to generate a net cash flow, taking into account the time value of money and currency risks. As emphasized by V.G. Lopatovskyi, export efficiency today is characterized by processes of self-

organization and flexibility (Lopatovskyi, 2022). From the point of view of analysis, this requires the implementation of a system of stress testing contracts for changes in exchange rates and logistics costs.

The effectiveness of the accounting and analytical paradigm of export management directly depends on the relevance of the classification of accounting objects. Traditional approaches to the grouping of export operations (by subject, methods and forms of calculations) under the conditions of application of IFRS acquire a new meaning, since each feature determines the specifics of revenue recognition and assessment of sustainability risks.

We have proposed an extended classification of export operations adapted to the requirements of strategic management:

1. By subject of sale: trade in goods vs trade in services. This is the basic division that in the IFRS system determines the choice of revenue recognition model according to IFRS 15:

- when exporting goods, income is most often recognized at a "point in time" - when control passes to the buyer according to Incoterms;

- when exporting services (especially in the IT sector, which is emphasized by I.I. Gavrylyuk), income is often recognized "over time" as the service is provided. For economic stability, this means a more even distribution of cash flows and the absence of sharp fluctuations in profits;

2. By methods of implementation: direct and indirect export:

- direct export (directly by the manufacturer) provides the company with a higher margin, but entrusts the accounting service with all the risks of the external environment: from logistics to customs. From the standpoint of sustainability analysis, direct export requires the creation of a powerful internal audit and currency control service;

- indirect export (through intermediaries) allows you to minimize operational risks, however, accounting under IFRS raises the question of identifying the role of the enterprise: "Principal" or "Agent". If the company acts as an agent, it recognizes only the commission as income, which significantly changes the revenue indicators in the reporting.

3. According to the form of payments: advance payments, letters of credit, collection, open account. The choice of payment form is a key lever of liquidity management:

- advance payments strengthen sustainability as much as possible, but in IFRS accounting they create "contract liabilities" that are not income until the moment of shipment;

- letters of credit minimize the commercial risk of non-payment, but require additional costs for banking services, which must be clearly reflected in the financial costs of the period;

4. By territorial orientation: export to the EU vs. export to the "third world" countries. Orientation to the EU market requires the accounting system to fully converge with IFRS and strictly adhere to environmental and social standards (ESG reporting). This expands the accounting paradigm from purely financial indicators to non-financial sustainability

indicators;

5. By terms of execution: short-term and long-term export contracts. Long-term contracts (mechanical engineering) require the use of methods for assessing the degree of completion of works. In the conditions of war, as noted by N.S. Stanasiuk and Palisa A.Ya., long-term planning is complicated, which forces the accounting paradigm to shift towards dynamic budgeting and monthly review of estimated values (impairment test) for assets involved in such contracts.

Summarizing, it can be argued that the classification of export operations in the accounting and analytical paradigm is not just a formal grouping, but a tool of segmental analysis. Each export segment has its own risk profile and its impact on the company's capital, which is critically important for the implementation of the economic sustainability strategy.

Building an accounting and analytical paradigm of export management requires a deep understanding of the multi-level regulatory system, which in Ukraine covers foreign economic, currency, customs and tax aspects. As noted by the Law on Foreign Economic Activity, the economic essence of exports remains stable, but the conditions for its implementation are undergoing significant transformations under the influence of European integration processes (Verkhovna Rada of Ukraine, 1991).

For the formation of a strategy of economic stability, the choice of a methodological basis is critically important: national standards (P(S)BO) or international (IFRS). We conducted a comparative analysis of key regulatory acts that determine the logic of displaying exports in the accounting system (Table 1.2.1).

Table 1.2.1

Comparative analysis of regulatory support for export accounting

Object of regulation	P(S)BO (National approach)	IFRS (International Paradigm)	Impact on economic stability
Recognition of income	P(S)BO 15: focus on the transfer of risks and benefits	IFRS 15: focus on transfer of control (5-step model)	IFRS provides more accurate timing of revenue recognition in complex supply chains
Exchange rates	P(S)BO 21: fixing the exchange rate on the date of the operation	IAS 21: concept of functional currency (may differ from hryvnia)	Allows to avoid distortion of reporting due to artificial devaluation/revaluation of the hryvnia
Accounts receivable	Assessment at net realizable value (actual losses)	IFRS 9: expected credit loss (ECL) model	The prognostic approach of IFRS allows capital to be reserved in advance for non-payment risks
Object of regulation	P(S)BO (National approach)	IFRS (International Paradigm)	Impact on economic stability

The Tax Code of Ukraine occupies a special place in the regulatory system. The application of a zero VAT rate (Article 195 of the PKU) is a powerful incentive for exporters, as it opens up access to budget compensation, which is a direct source of replenishment of working capital. At the same time, the IFRS paradigm requires the

analytical service to carefully monitor transfer pricing (Article 39 of the PKU). Observance of the "arm's length" principle is not only a tax requirement, but also a tool to protect against capital laundering through related non-residents.

Currency regulation (ZU "On Currency and Currency Transactions") and control over settlement deadlines (180 days according to NBU Resolution No. 5) form strict time frames for the export cycle. In the accounting and analytical paradigm, these limitations are transformed into indicators of the duration of the financial cycle. Violation of these terms leads to the imposition of a penalty, which directly worsens the financial stability of the enterprise.

An innovative element of the modern paradigm is the use of factoring and hedge accounting tools. Ukraine's accession to the UNIDROIT Convention allows exporters to effectively use factoring to instantly convert receivables into cash, which is critical in martial law conditions. Hedge accounting under IFRS 9 allows for the neutralization of earnings volatility caused by exchange rate fluctuations, making financial statements more predictable for investors.

The analytical component of the proposed paradigm is the connecting link between the recording of economic transactions according to IFRS and the formation of a sustainability strategy. As practice shows, the simple implementation of regulatory norms does not guarantee the survival of an enterprise in foreign markets without a deep assessment of currency resources and competitiveness.

We have systematized a system of indicators that should be used to evaluate export activity, dividing them into three functional blocks:

1. Block of volumes and market position:

- export revenue (in foreign currency and hryvnia equivalent) – a basic indicator of scale of operations;
- export quota (*Ke*) - the ratio of the volume of exports to the total volume of sales. This indicator determines the degree of integration of the enterprise in the world market and the level of its dependence on the external situation;
- competitiveness index - allows you to compare the company's pricing policy with its global peers.

2. Block of financial and currency efficiency:

- export profitability (*Re*) – the ratio of profit from export to the full export cost;
- currency efficiency – an indicator reflecting the return of each unit of expenditure in the national currency in the form of net currency income;
- the coefficient of coverage of imports by exports is a strategic indicator of currency self-sufficiency, which is the foundation of economic stability.

Traditional methods (horizontal, vertical and trend analysis) make it possible to reveal the dynamics of changes and the cost structure according to Incoterms. However, in the conditions of high uncertainty caused by war, comparative analysis (benchmarking) becomes especially important. As noted by V.S. Olikhovskyi, comparison of own indicators with industry averages is necessary to identify areas of inefficiency.

The modern accounting and analytical paradigm goes beyond retrospective analysis

and includes prognostic techniques:

- SWOT analysis of export potential: allows you to balance strengths (for example, certification according to EU standards) with threats from the external environment (logistics blockades, changes in customs regimes).

- PESTEL analysis: an extended model that includes political, economic, social, technological, as well as legal (Legal) and environmental (Environmental) factors. For the exporter, this is critical in the context of the implementation of the carbon import adjustment mechanism (CBAM) in the EU.

- matrix modeling (ABC/XYZ-analysis): the integrated application of these methods allows to classify the export portfolio. "AX" category products (high revenue share and stable demand) form the core of sustainability, while "CZ" category needs immediate disinvestment or restructuring.

Thus, the integration of modern analytical methods into the IFRS accounting system turns reporting into a "road map" of strategic development, providing the company with the ability to quickly adapt to changes in the global economic space. Analysis of the practice of accounting organization at domestic exporting enterprises allows us to identify a number of systemic problems that become a barrier on the way to the formation of an adequate accounting and analytical paradigm. Based on the study of business entities exporting to the EU countries and Moldova, we have identified critical risk areas.

1. The problem of the discreteness of the calculation of exchange rate differences. A typical violation of the requirements of P(S)BO 21 and IAS 21 is the recalculation of monetary items only on the date of repayment of the debt, ignoring the balance sheet date. As shown in Fig. 1.2.3, this approach leads to distortion of the financial result of the reporting period. Within the framework of the strategy of economic stability, this is unacceptable, because the management receives unreliable information about the impact of currency fluctuations on the capital of the enterprise.

2. Insufficient analytical depth of accounting. Most enterprises use the standard subaccount 362 "Settlement with foreign buyers" without sufficient detail. For effective export management according to IFRS, it is advisable to implement multi-level analytics:

- by geographical segments (countries);
- according to maturity (aging report);
- according to Incoterms.

The lack of such information makes it impossible to carry out high-quality benchmarking and operational management of receivables.

Export duty in Ukraine is applied to a limited list of goods, in order to protect national resources and/or support domestic production. The list of goods to which the export duty is applied is established by separate laws.

Each export transaction is registered and reflected by a number of primary documents, which are the basis for accounting records, currency and customs control. At the stage of entering negotiations with the buyer, the result of the agreement is the conclusion of a foreign economic contract. For accounting purposes, the conclusion of a contract is the basis for conducting business transactions, a document in which prices,

Incoterms conditions, and the order of settlements are recorded.

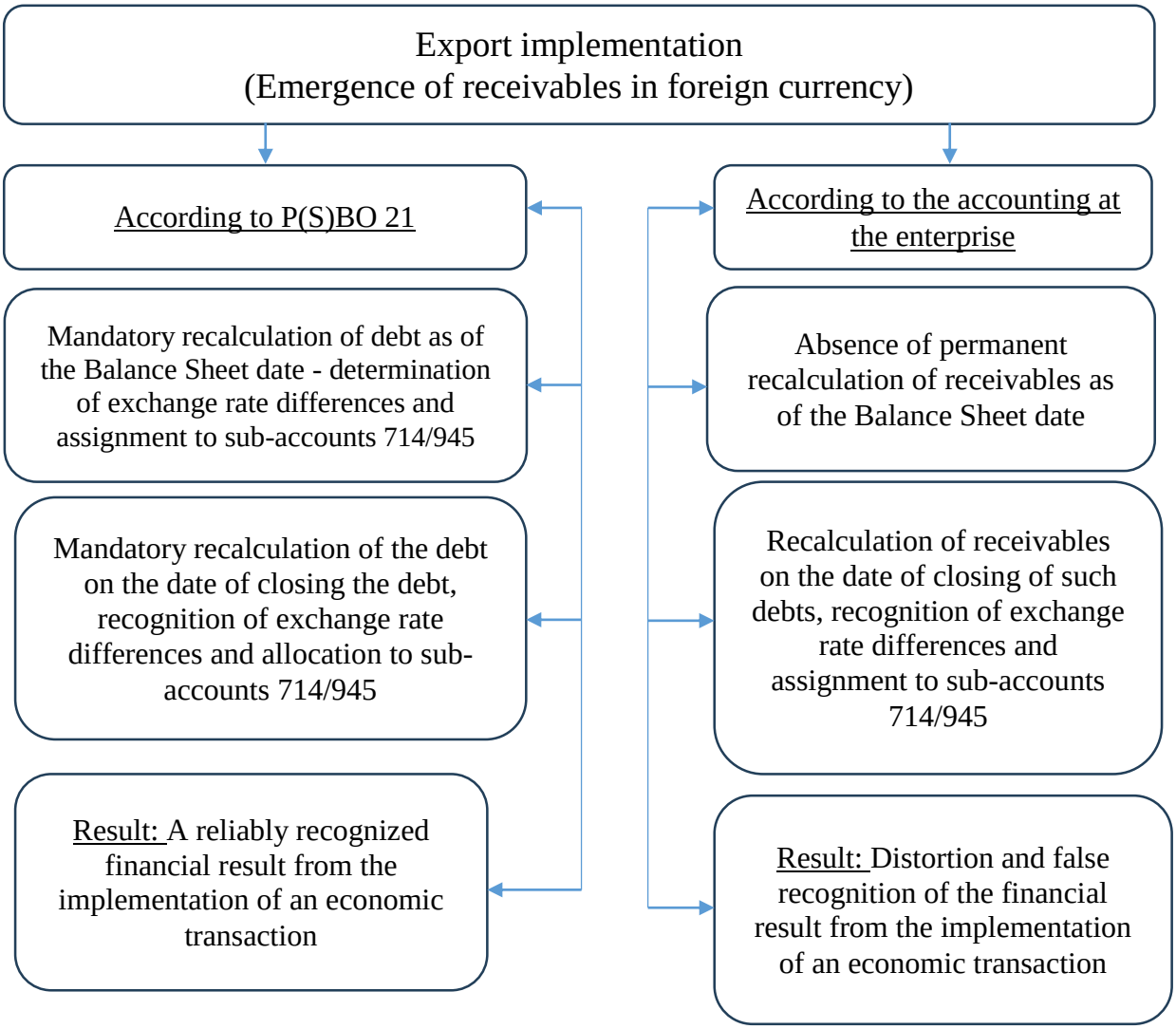


Fig. 1.2.3. Recalculation of receivables

The first document during sales is an invoice, which records the assortment and prices of the products sold, or in some cases a proforma invoice (proforma-invoice, a preliminary invoice provided by the seller to the buyer before the actual shipment of the goods; such an invoice is not obligatory for payment, it describes the details of the future agreement).

The transportation of goods is made out by an International consignment note, CMR (from the French Convention relative au contract de transport international de Marchandise par Route - international consignment note, is one of the most important documents in the international transportation of goods; it confirms the fact of concluding a contract between the consignor and the carrier, records the basic information about the cargo, its transportation, the responsibilities of the parties). The document is drawn up and filled out in accordance with the requirements established by Article 6 of the Convention.

Confirmation of the fact of the export transaction for the purpose of zero-rate VAT taxation and currency control is carried out at the expense of correct customs clearance of the transaction. At the time of declaration of goods moving across the customs border of Ukraine, a customs declaration (currency and customs declaration) is submitted to the customs authority.

The procedure for filling out the declaration is defined by the Instruction on the procedure for filling out the cargo customs declaration.

The basis for posting currency revenue and calculating exchange rate differences on the date of receipt of funds in foreign currency is a bank statement on the company's foreign currency account. The calculation of exchange rate differences when carrying out export operations in Ukraine is regulated. Accounting standards, namely NP(S)BO 21 "Effect of changes in exchange rates".

The analysis of foreign economic activity of the enterprise should begin with the study of turnover and balance information on account 362 "Settlements with foreign buyers", accounting for which is carried out by non-residents, by currencies and contracts (Fig. 1.2.4 Analysis of accounting of settlements with non-resident buyers). The company does not analyze separately by country.

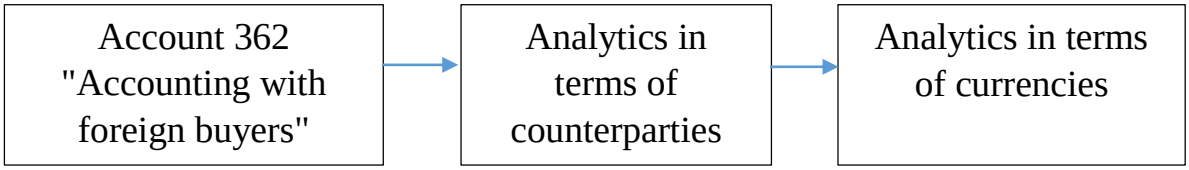


Fig. 1.2.4. Analytics of accounting of settlements with non-resident buyers

When analyzing the primary documents on the accounting of export operations and getting acquainted with the accounting in the automated program, it was found that the accounting is done only on the general sub-account 362 for non-residents, currencies and contracts, without sufficient detail. Since the implementation of export operations requires constant control and analysis, it is advisable to introduce more detailed analytical accounting in order to obtain more information from analytical accounting registers. For example, the analytical part can be expanded by adding accounting by terms of execution or by individual implementations in order to clearly distinguish and understand, for example, how much time the buyer has left to pay for the shipped products or which of the implementations have been paid and for which there is a receivable. The lack of detailed operational information for management analysis significantly complicates benchmarking and decision-making. In modern conditions, the result of conducting benchmarking on a regular basis is an increase in the efficiency and rationality of business processes, an increase in competitiveness, and faster and more optimal management decision-making. Analytical accounting, which is currently valid at the enterprise, is shown in Fig. 1.2.5. Analytical accounting with non-resident buyers.

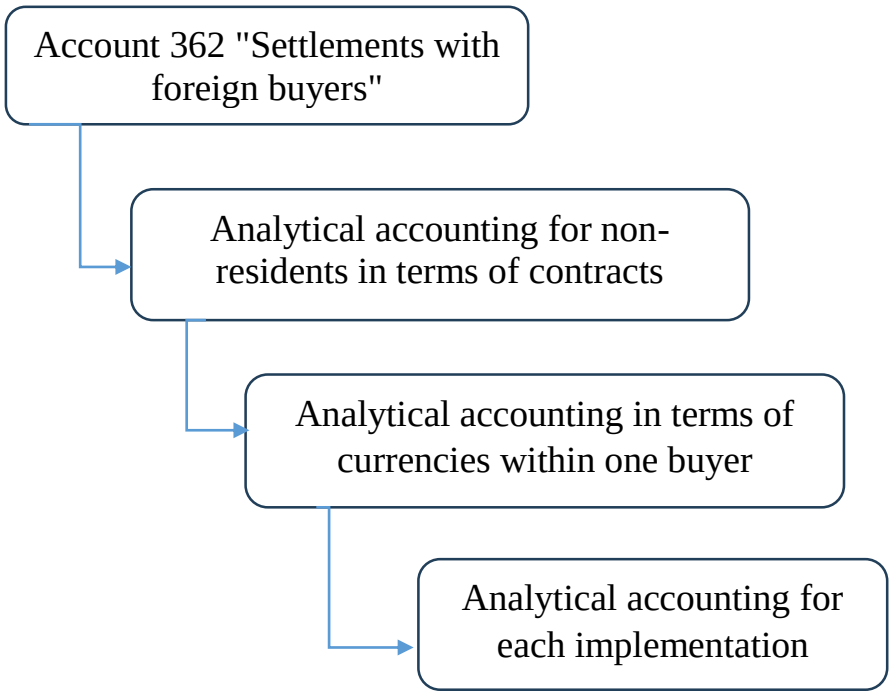


Fig. 1.2.5. Analytical accounting with non-resident buyers

3. Technological gap: manual vs automated accounting. Despite the use of systems such as M.E.Doc and "Electronic Cabinet", a significant part of calculations of exchange rate differences and currency control at enterprises is still carried out manually or in external spreadsheet editors (Excel). This creates a high risk of "human error". We have systematized a comparative analysis (Table 1.2.2), which proves that the automation of downloading NBU exchange rates and calculating ECL (expected losses) is a necessary condition for ensuring the reliability of reporting.

A practical study of the structure of implementation and payments (on the example of the markets of Poland and Romania) shows that the level of payment under contracts can vary from 0.7% to 100%. A low percentage of payment (for example, for individual counterparties – less than 52%) indicates the accumulation of overdue debt, which requires the immediate formation of reserves for expected credit losses in accordance with IFRS 9. This is a key aspect of maintaining financial stability, as it allows for a realistic assessment of the net value of assets.

Table 1.2.2

Comparative characteristics of accounting models of export operations

Criterion	Traditional model (manual/semi-private)	Innovative model (IFRS-oriented)
Currency supervision	Maintained in external registers, penalty risk (180 days)	Automatic monitoring of deadlines in the ERP-system
Exchange rate differences	Late calculation, distortion of the result	Operational recalculation for each reporting date
Assessment of debtors	At historical cost (principle of prudence)	The ECL (expected loss) model under IFRS 9

The effectiveness of accounting and analytical support directly depends on the quality of document flow and the level of process automation. At domestic enterprises, where the accounting service is often small (for example, the chief accountant on outsourcing and the accountant), the organization of accounting for foreign economic activity (FET) should be as clear and systematic as possible.

Each export transaction is registered with a number of primary documents, which are the basis for accounting records, currency and customs control. We have systematized the key stages of documentation that make up the foundation of information support:

- foreign economic contract: the basic document that fixes the prices, Incoterms conditions and the settlement procedure;
- Invoice and Proforma invoice: confirm the range, cost and intentions of the parties;
- international TTN (CMR): confirms the fact of the transfer of the cargo to the carrier in accordance with the requirements of the Convention;
- cargo customs declaration (VMD): legal confirmation of the fact of export of goods, necessary for the application of 0% VAT and the implementation of currency supervision.

The modern accounting paradigm involves the integration of these documents into the digital environment through the M.E.Doc, Electronic Cabinet and Client-Bank systems. However, despite the technical possibility of automation, in practice there remains a significant "technological gap" between traditional approaches and IFRS requirements. Table 1.2.3 shows the comparative characteristics of these models.

As shown in Table 1.2.3, the traditional model creates a high risk of "human error", especially in terms of currency control. Of particular concern is the trend found in practice to recalculate receivables only on the date of debt repayment, which directly ignores the requirements of P(S)BO 21 and IAS 21 regarding mandatory revaluation at each balance sheet date. Such a distortion of the financial result reduces the overall economic stability of the enterprise.

Table 1.2.3

Comparative analysis of manual and automated accounting of export operations

Criterion	Manual accounting (typical practice)	Automated accounting (target model)
Entering exchange rates	Manually, requires daily monitoring by the NBU	Automatic download from NBU API
Calculation of exchange rate differences	Using formulas, high risk of error	Automatic recalculation on the balance/repayment date
Currency control	In external registers (Excel), the risk of missing 180 days	Automatic notifications about deadlines
Timeliness	Depends on load (often delayed)	Operational display at the time of bank statement
Validity of data	Low due to untimely valuation of monetary items	High, ensures the relevance of reporting

To illustrate the problems of payment discipline and justify the need to switch to analytical accounting according to IFRS 9 standards, we analyzed the real state of calculations in the section of importing countries (Table 1.2.4).

Table 1.2.4

Analysis of export indicators by non-residents and countries (typical data)

№	Country	Currency	Sale amount, UAN	Amount of payment, UAN	% of payment	Income deficit
1	Moldova	EUR	13813470.77	12267181.57	88.8%	-1546289.20
2	Poland	PLN	7199742.44	3792729.24	52.7%	-3407013.20
3	Poland	PLN	623980.32	623980.32	100.0%	0.00
4	Romania	EUR	736744.01	736744.01	100.0%	0.00
5	Czech Republic	EUR	12612.66	88.29	0.7%	-12524.37
In total		EUR	14562827.44	13004013.87	89.3%	-1558813.57
In total		PLN	7823722.76	4416709.56	56.45%	-3407013.20

The analysis in Table 1.2.4 shows the existence of critical risk zones. In particular, on the Polish route, the payment level is only 52.7%, and for certain counterparties in the Czech Republic, it is lower than 1%. Within the IFRS paradigm, such indicators are a direct indicator for the immediate formation of a provision for expected credit losses (ECL) according to IFRS 9.

Without the introduction of detailed analytical accounting by terms of execution (aging report), management loses the ability to timely identify the threat of violation of the 180-day period of currency supervision. Therefore, the transition to automated analytical accounting is not just a technical improvement, but a strategic necessity to preserve the capital of the exporting enterprise.

The study of the dynamics of export operations of domestic enterprises in the period 2023-2025 allows identifying a specific development model: "extensive expansion of markets under the conditions of deferred payments." As the analysis showed, the growth of sales volumes is often accompanied by the accumulation of receivables, which poses a threat to liquidity.

One of the key benefits of the transition to IFRS 9 is a change in the approach to the assessment of receivables. If the national standards are focused on ascertaining the fact of delay, then IFRS 9 requires the preventive accrual of a reserve. Based on the received data on payment discipline in terms of currencies (euro vs zloty), we propose the implementation of a segmented reservation matrix:

- segment of high discipline (EUR currency): where the volume of payments is almost equal to the realization, the reservation ratio can be minimal (0.5-1%);

- the segment of currency risks and low discipline (PLN currency): where there is a systematic increase in debt, it is necessary to apply an increased ratio of expected losses (5-15%).

This approach allows you to clear the balance sheet of "toxic" assets and show the real capital of the enterprise, which is critical for attracting international investment and lending.

Analysis of the structure of currency baskets confirms that the diversification of markets (Poland, Moldova, Romania, Czech Republic) leads to the complication of the accounting process. We highlight the following methodological recommendations to ensure sustainability:

- definition of the functional currency: for enterprises where the main revenue is generated in euros, it is advisable to consider the possibility of using the euro as a functional currency in accordance with IAS 21. This will allow to level the impact of inflationary fluctuations of the hryvnia on financial reporting;

- hedging of cash flows: the use of IFRS 9 tools for accounting for hedging operations allows you to "freeze" the exchange rate for future currency revenue, which is especially relevant for long payment terms recorded in the statements (more than 180 days).

Since the study revealed the risks of "human error" in manual record keeping, we propose the concept of "Digital Controlling of the ZED". It involves the automation of three critical points:

- synchronization with NBU exchange rates for correct calculation of exchange rate differences on the balance sheet date (accounts 714/945);

- automated Aging Report (report by terms), integrated with the system of notifications about the maximum terms of currency supervision (in accordance with Resolution of the NBU No. 5);

- monitoring of receivables limits for each non-resident to prevent excessive concentration of risk in one market.

The analysis and study of the organization of accounting and the analysis of economic indicators and the organization of the work of the accounting service of enterprises show that, despite the long-term and successful conduct of foreign economic activity in the part of export operations, there are significant shortcomings in the methodology and organization of the accounting and analytical process at the enterprise. These problems necessarily create risks of financial loss (due to possible losses and exchange rate fluctuations) and may lead to a decrease in the reliability of management information.

Analysis of primary documents and accounting registers allows to identify such problems as delays in displaying exchange rate differences, problems with documentary confirmation of export, insufficient analytical accounting and manual data entry (Fig. 1.2.6).

After studying the work of the enterprise and carrying out an analysis of the organization of accounting work, 4 main directions were determined, according to which

ways of improvement were developed and proposed for implementation at the enterprise (Fig. 1.2.7).

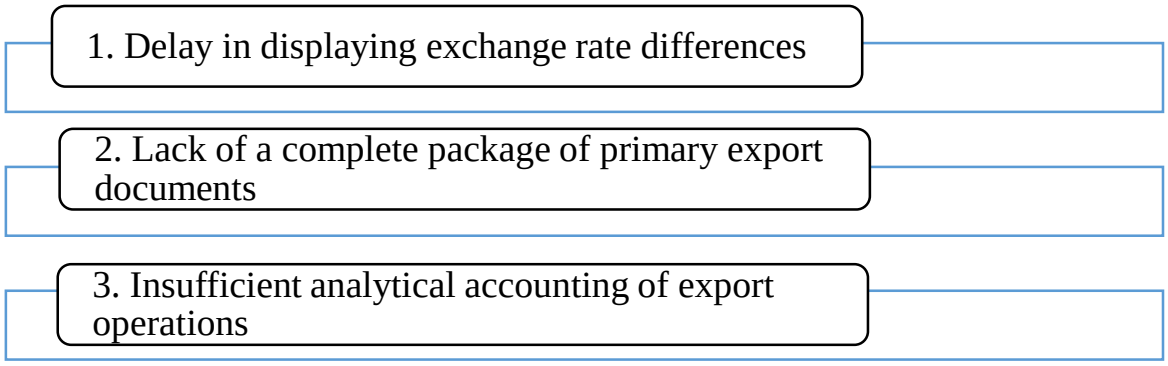


Fig. 1.2.6. Problems and shortcomings of accounting for export operations at enterprises

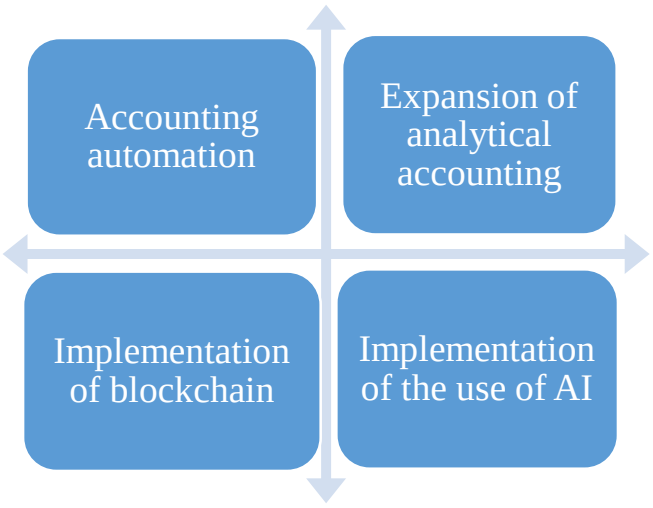


Fig. 1.2.7. Solving the problems of accounting for export operations for enterprises

Accounting automation. Since it was determined that one of the key problems at the enterprise is the use of manual accounting methods, which are characterized by an increased risk of making mistakes, duplication of information and an increase in time spent on information processing, to eliminate it, it is advisable to implement several significant changes in the organization of accounting, aimed at automation of accounting, integration of modules and the use of document templates for checking mandatory details. The main steps of automation are depicted in Fig. 1.2.8.

The implementation of ERP systems ensures the automated creation of primary documents, customs declarations, registers of tax invoices and other documents used by the company in accounting. The result of the implementation of such systems is a reduction in the number of errors, acceleration of information processing, increase in the

accuracy of accounting data, formation of complete packages of documents for each operation.

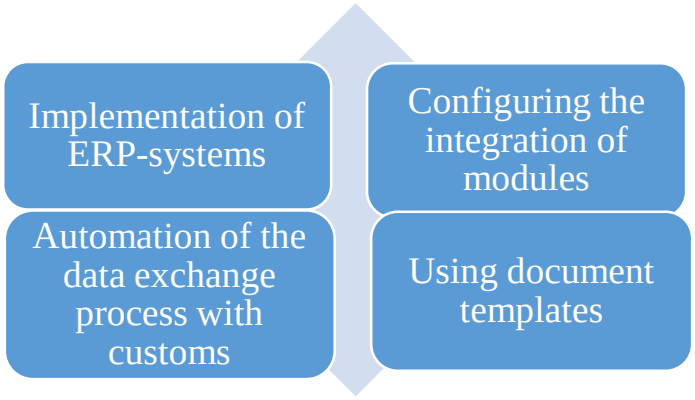


Fig. 1.2.8. The main steps of improving the automation of accounting at enterprises

The advantages of implementing ERP systems are as follows:

1. automation and optimization of business processes (the use of ERP systems automates routine operations and standardizes business processes);

2. combining data into one information system (the system combines data from all departments of the enterprise in a single centralized database, eliminating obstacles between blocks of data from different departments);

3. increasing the accuracy and availability of data. Centralized data management ensures high accuracy of information and access to relevant data in real time, which is important for making management decisions;

4. improvement of decision-making (the management receives full transparent information about all operations taking place at the enterprise, which allows making more reasonable strategic and operational decisions based on up-to-date data);

5. reduction of operating costs (optimization of the use of production resources, inventory management, management and production processes allows to reduce the costs of inventory, production and marketing);

6. strengthening control and security (systems provide the opportunity to use built-in control mechanisms, delineation of access rights, which increases data security and compliance).

Configuring the integration of modules is an important stage in the automation (improvement of automation) of accounting, the main purpose of which is to ensure a unified information system and eliminate the need for double data entry. The integration of modules consists in their established interaction so that the data entered in one module can be automatically displayed and updated in another. Having studied the structure, departments and principles of the enterprise, you can select separate modules "Warehouse", "Sales" and "Purchasing" and establish integration between them for quick and convenient transfer of data between employees and departments of the enterprise.

Automation of the data exchange process with customs. Provided that the enterprise will increase the volume of exports, it is advisable to automate the data exchange

mechanisms between the enterprise's accounting system and the information resources of the customs authorities, in particular, such as the "One-stop shop for international trade" and ASUAR (automated risk analysis and management system). Such integration will ensure the reliability of accounting data due to automation of data exchange, optimization of document flow and acceleration of customs clearance of export operations. The "One Window" system allows enterprises to upload accompanying documents to various government bodies through a single electronic channel. The integration of the company's accounting program with the service provides automated formation and transmission of structured data in standardized forms.

The use of document templates is an element of accounting automation (improvement of automation), which consists in the use of template document forms in template conditions. Templates are unified forms of various documents in which the structure, form, and text are defined, and a place is allocated for inserting variable data. In order to carry out exports, the enterprise can use templates of contracts with non-resident buyers, with pre-written Incoterms conditions and invoices, which will help to avoid or reduce the number of errors during the preparation of documents and reduce the time of the employee for the preparation of a package of documents.

The expansion of analytical accounting as one of the elements that can be used to improve the state of accounting entry at the enterprise is designed to expand the array of information that the accounting service can provide to management in order to make the latter correct and more reasoned strategic and operational decisions. After studying analytical accounting, which is conducted at the enterprise, 2 additional areas of analytics were identified that could provide valuable information for management personnel, namely, analytics by geography and analytics by assortment. The detailed rationale for the introduction of additional analytical sections is shown in Table 1.2.5.

Table 1.2.5

Expansion of analytical accounting at enterprises

№	Analytical section	What is useful for the company
1	Country of counterparty/ region of the world	Allows the enterprise to promptly manage geopolitical and currency risks; makes it possible to assess the impact of economic sanctions and/or trade barriers. It helps to determine more profitable or risky regional directions.
2	Product group	It helps the enterprise to determine which groups of goods (or individual goods) provide the enterprise with the greatest profit in exports. This will give the enterprise the opportunity to make management decisions that will be directed to the development of a profitable group of goods (goods).

Expanding analytical analysis will give the enterprise the advantage of effective liquidity risk management. The introduction of accounting by the countries of non-resident buyers will provide the company with the opportunity to forecast its further export

activity based on existing data on the performed operations and their level of profitability. The introduction of analytics by products and/or product groups will allow the enterprise to carry out a more detailed analysis, to identify those groups of products, the volume of production of which is expedient to expand due to their profitability and demand for them.

Blockchain technology as a means of improving the state of accounting and analysis at the enterprise is quite effective due to the high level of security and information storage. From the point of view of entering and accumulating data, the blockchain is a decentralized database, each of the blocks (records) of which contains data about the operation, a cryptographic hash of the previous block, a time stamp, and a digital signature of the participant. After adding a block of information, it can no longer be changed without the consent of the majority of network participants (or without owning 51% of the computing power), so the use of the blockchain ensures the immutability, transparency of data and provides the ability to verify any transaction by any network user at any time. For the enterprise, this will mean that the information that was recorded and saved as an information block – all these documents and events will be recorded and saved in the blockchain system (Fig. 1.2.9).

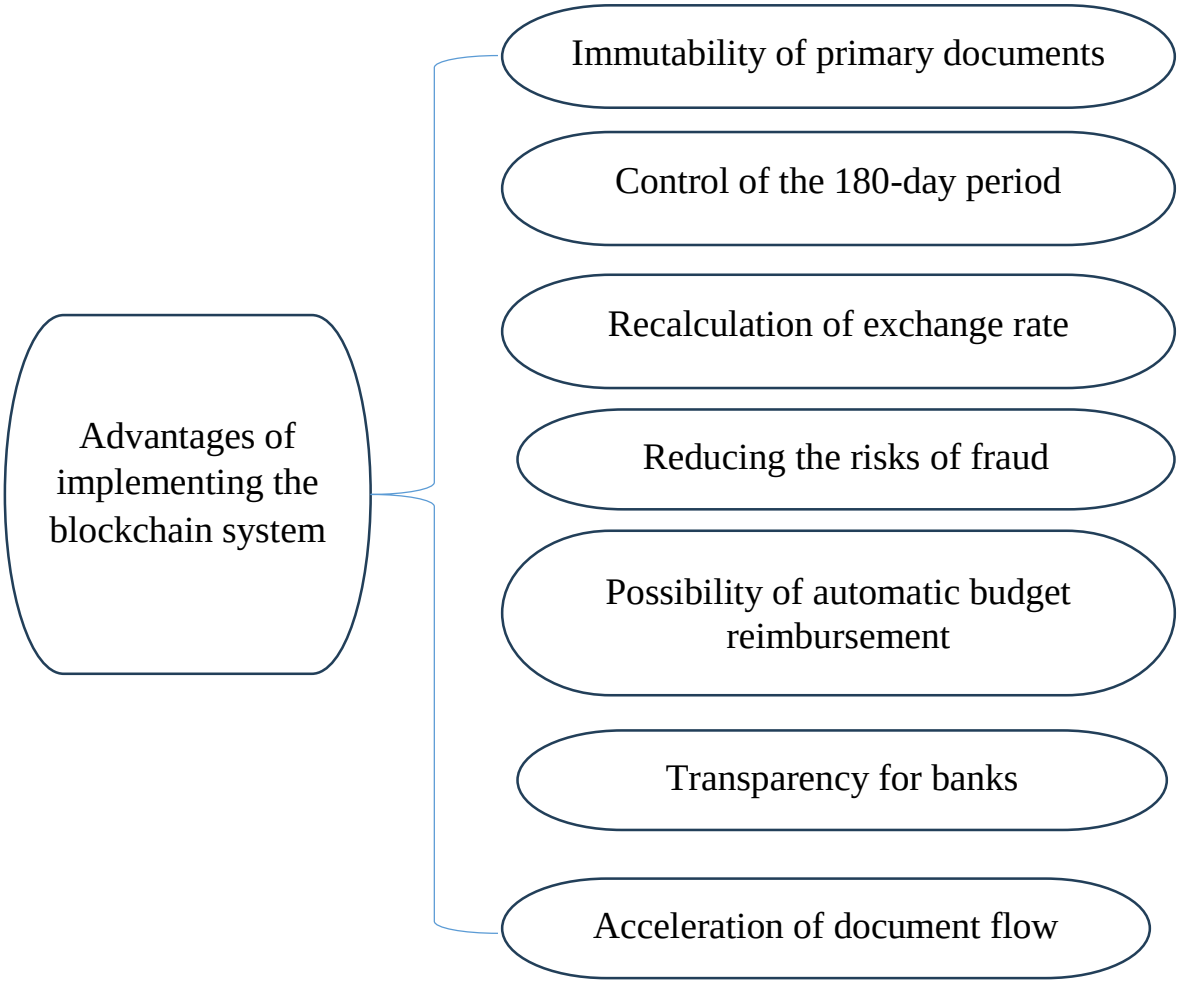


Fig. 1.2.9. Advantages of implementing the blockchain system for export operations at enterprises

Fig. 1.2.9 lists the key advantages of using the blockchain system. The immutability of primary documents is that the document that was uploaded by one of the system participants is available to all other participants in the form in which it was saved in the system and changes can be made to it only after obtaining the consent of the majority of participants. Automatic control over the 180-day period is necessary so that the company automatically receives a notification about the need to make payment for previously received goods or even block subsequent shipments in case of violation of current legislation (180 days is the deadline for making payments for export operations).

Instant recalculation of exchange rate differences will provide the enterprise with reliable information about the state of calculations in foreign currency, taking into account fluctuations and changes in exchange rates (the exchange rate must be converted on each balance sheet date and on the date of making calculations). Since none of the participants in the system can replace the document or content of the transaction without the knowledge of the others, the risk of fraud is reduced. The possibility of automatic budget reimbursement: the country is working on the development of a blockchain system, where the state in the form of the tax/customs service and the exporter will be able to participate. Transparency for banks: since all information about the transactions carried out is unchanged and transparent, the company has more chances to receive financing, factoring, letter of credit. Acceleration of document flow will reduce the accounting service's time spent on processing data on export operations and will provide an opportunity to quickly provide data on the status of implementation or the stage of export operations at the request of the management.

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Despite a number of advantages that the implementation of blockchain technology brings to the enterprise, such a decision carries a number of significant challenges and disadvantages that must be taken into account at the decision-making stage, which are shown in Fig. 1.2.10. First of all, this is the high initial cost of implementing the technology, which depends on the scale of the enterprise on integration with existing ERP systems, but still remains quite high for domestic economic entities. Since the

implementation of operations using blockchain technology requires the participation of all parties (supplier, buyer, customs broker), the consent and technical readiness of all system participants to use the blockchain system for conducting activities is required.

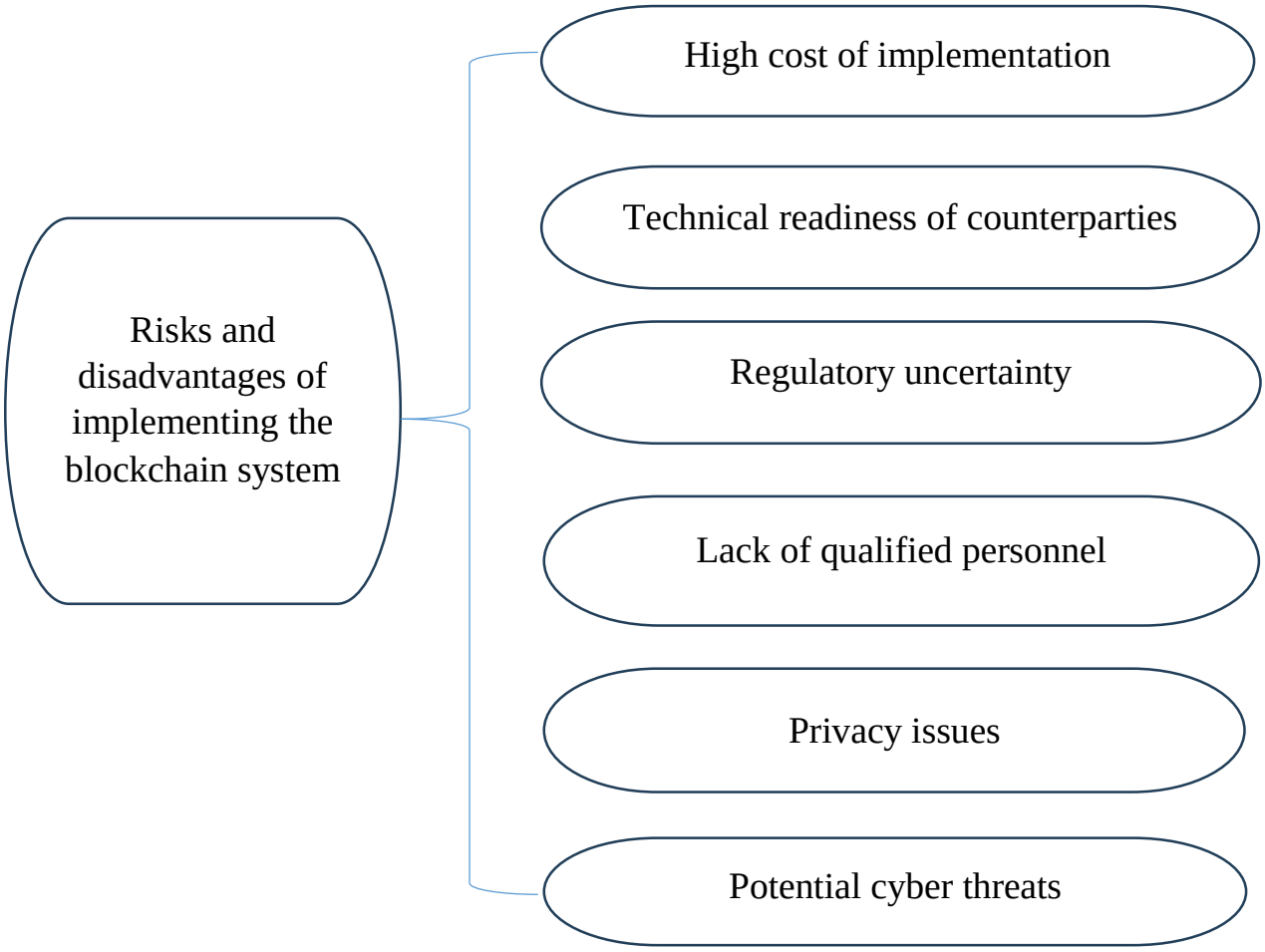


Fig. 1.2.10. Risks and disadvantages of implementing the blockchain system for export operations at enterprises

At the legislative level, there is no clear regulation of the use of blockchain in accounting. There is no information on whether data and documents from the blockchain system have the same legal force as an electronic or physical document. The lack of any legal regulation and explanations from the state's point of view regarding the use of the blockchain system complicates the process of its implementation and in some places serves as a reason for refusing to implement the technology. Given the fact that the blockchain system is quite new and not quite popular among domestic business entities, there are not enough specialists with the necessary knowledge in this area on the labor market. If the enterprise decides to implement blockchain technology, it will most likely need to expand the staff and hire an employee of the appropriate orientation or spend time and money on training existing personnel on the subject of keeping records in the system. One of the main disadvantages of the system is the lack of a sufficient level of privacy:

all data in blockchains are available to all system participants, although some information may be private. Since the system is fully automated, there is always a risk of a cyber threat. Cyber threats can lead to direct financial losses and breach of data integrity.

The implementation of artificial intelligence (AI) in the financial and accounting processes of the enterprise, in particular in the part of foreign economic activity, is a modern and effective method of automating accounting and analysis. Such a step can be called less risky than a full-scale blockchain and easier to implement. AI can be used to automate decision-making, forecasting and anomaly detection, which in turn increases the accuracy and speed of management decision-making in response to received information. The main areas of application of AI are shown in Fig. 1.2.11.

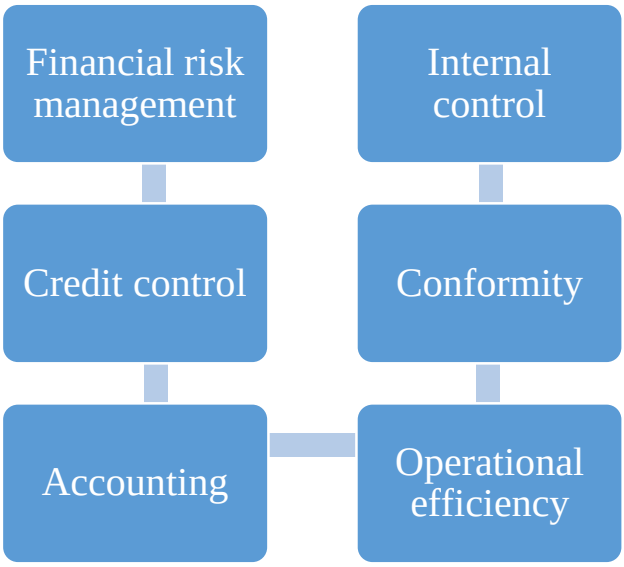


Fig. 1.2.11. Fields of application of AI in accounting at enterprises

Financial risk management using AI is characterized by minimization of currency risks, optimization of payment terms, forecasting of exchange rates based on historical data. As for credit control, here, with the help of AI, it is possible to perform an automatic assessment of the credit risk of a non-resident based on publicly available information, which can help to quickly and objectively make decisions about interaction with counterparties. AI can be programmed to automatically classify transactions and recognize documents. Despite the fact that the use of AI does not completely replace the work of an accountant, it significantly reduces manual data entry and speeds up the accounting process. When performing internal controls with the help of AI, anomalies and fraud can be detected through transaction monitoring. Early warning of potential internal errors or fraud can save the enterprise from losses and damages. With the use of AI, it is possible to analyze the terms of contracts for compliance with the company's internal standards and the current legislation of the country. Such a function is especially important if the enterprise does not use template forms of documents and/or frequently changes the terms of settlements under contracts. The use of AI in performing repetitive operations,

such as downloading statements, downloading documents from the accounting program, reduces the time for processing these documents and frees up staff time. The analysis of the export activity of enterprises makes it possible to determine the trends in the development of the foreign economic activity of the enterprise as an exporter of raw materials and products, to identify reserves for increasing the effectiveness of the activity and helps the management apparatus to make successful strategic decisions.

From the turnover and balance information on account 362, it can be seen that the company started export activities in 2023 with small volumes of sales and one non-resident buyer with whom payments are made in euros. A total of 398,579.33 euros worth of goods was shipped in 2023, while no payment was received for the goods.

In 2024, there was a significant increase in export volumes and the first payments from non-resident buyers were received. Calculations in 2024 were made in euros and Polish zlotys. In total, during the year, goods were sold for a total amount of 5,715,481.56 in euros and 1,184,728.63 in zlotys. Since the company had a large debt at the beginning of the year, less payments were received from non-residents during the year than was realized during the period, at the end of 2024 the company had large receivables from settlements with non-residents for each customer in the amount of 1,026,010.61 euros and in Polish zlotys in the amount of 657,131.89.

During the first 3 quarters of 2025, the company significantly increased the volume of export sales, and payments from buyers increased proportionally. With the total volume of sales in euros at 7,036,078.07 and in zlotys at 4,795,616.76, payments totaled in euros at 7,095,813.40 and in zlotys at 2,387,926.54. Debt as of 30.09.2025 was 966,275.28 in euros and 3,064,822.11 in Polish zlotys.

The export activity of the enterprise shows a rapid growth rate, which may indicate changes in the policy of the enterprise towards export operations and entry into international markets. From the beginning of the enterprise's export activities in 2023 to the end of the third quarter of 2025, the enterprise increased the volume of sales abroad several times. It is monitored that payments from suppliers for previously received goods are delayed, but stable.

Since the company carries out export operations in different currencies, a comparative analysis of sales and payments from buyers in different currencies during the period of the company's export activities was carried out.

In Fig. 1.2.12, it is observed that the main volume of export operations, starting from 2023, the company carries out in euros, this is primarily due to the expansion of sales markets and the establishment of relations with buyers from different countries. The volume of payments in euros is almost equal to the volume of sales, which indicates a high level of financial discipline of counterparties and quick receipt of funds for sold products. In turn, transactions in Polish zlotys, although they have been carried out since the beginning of export activities, are lower compared to transactions in euros. There is lower financial discipline and the level of payment for shipped goods in Polish zlotys compared to euros. In general, the company demonstrates positive dynamics of development and expansion of the volume of export operations, however, there is a

permanent indebtedness in accounts with non-residents, regarding which the company should strengthen control over the terms of debt repayment.

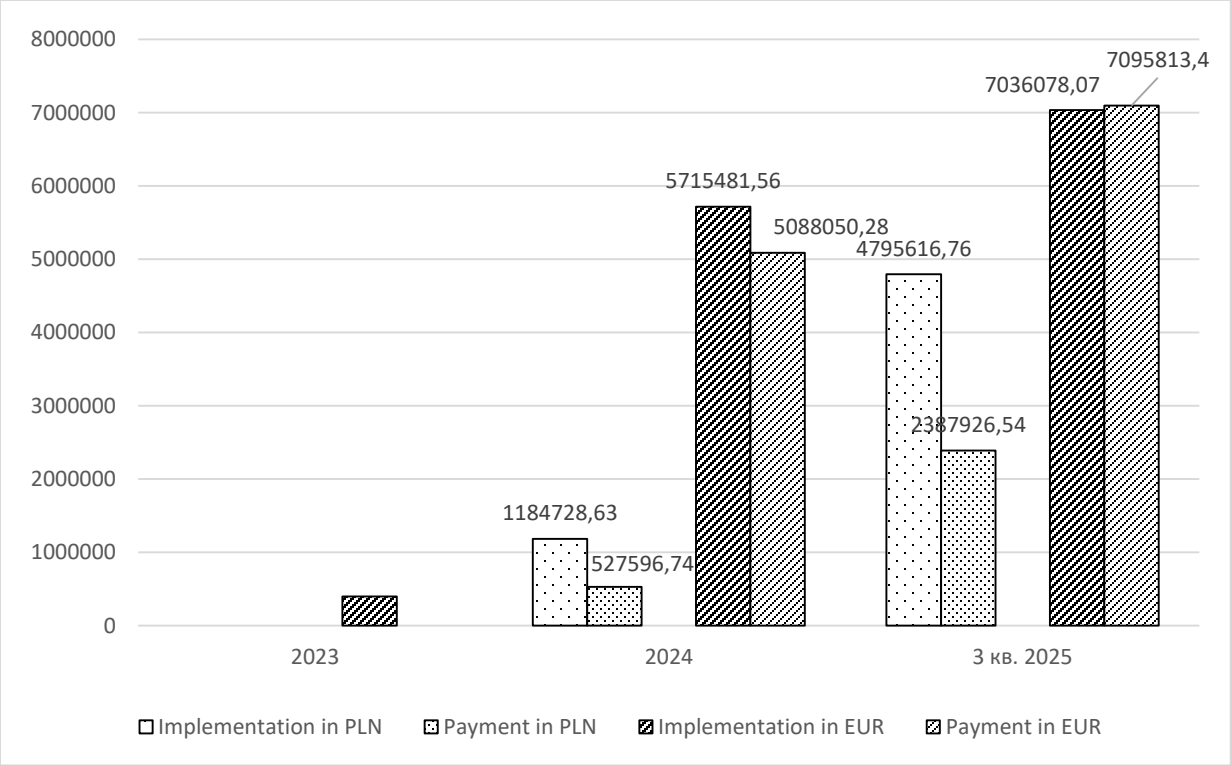


Fig. 1.2.12. Volumes of sales and payments of the enterprise for export in terms of currencies

Since in 2025 there will be a significant expansion of sales markets compared to 2024, it is advisable to analyze the structure of the enterprise's export activity in order to determine potential export directions. In 2023, the company worked with only one buyer from Poland, only the sale was carried out, there was no payment, the currency of the settlement was the euro. In 2024, one more buyer appeared from Poland and one from Moldova.; the leader in terms of sales volume and closing of receivables was Moldova, the currency of payments is the euro.In 2025, at the time of the analysis, the company worked with one more buyer from Romania and one from the Czech Republic; in terms of volume of sales and repayment of receivables from export operations, Moldova is again in the lead, the currency of payments is the euro. As for the structure of export operations by nomenclature, it is no different from sales on the domestic market, the enterprise equally sells soap, detergents and raw materials for the manufacture of detergents on the domestic and cross-border markets.

The forecasting of development prospects is carried out taking into account the problems and trends identified at the enterprise.

Timely forecasting is important for minimizing currency and credit risks, improving

the company's performance and increasing competitiveness. Extrapolation analysis is suitable for short- and medium-term forecasting, provided there are no drastic changes in the external environment. Since it was found that the enterprise works in different currencies, the analysis should be carried out separately for each currency, so that additionally it is possible to see that the calculations for each currency grow faster. Fig. 1.2.13 shows the dynamics of the increase in sales volume in foreign currencies. As can be seen from the figure, the actual data on implementations are even higher than the forecasted ones, which indicates an accelerated rate of growth of the volumes of implementation. The trend line indicates the development of exports to increase the amount of profit.

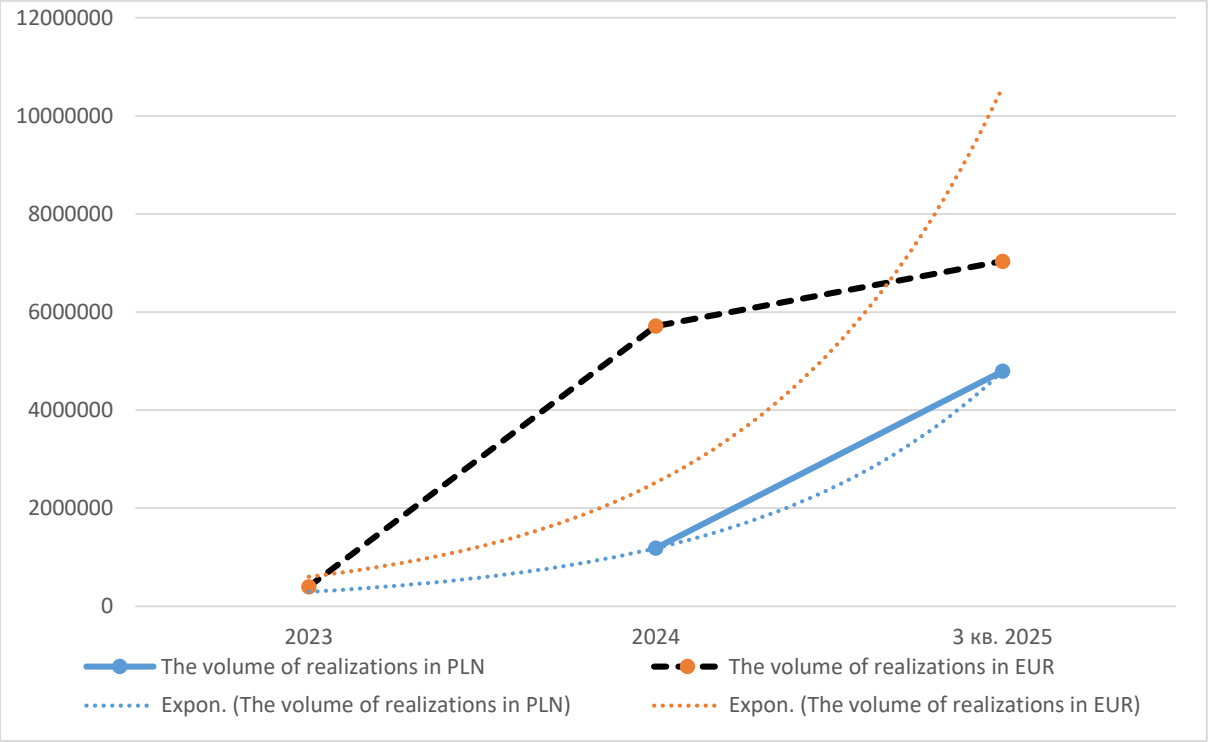


Fig. 1.2.13. Change in the volume of the enterprise's sales in currencies

In order to understand the strengths and weaknesses of the enterprise, internal resources and to orientate on them for forecasting the future activity of the enterprise, a SWOT analysis was conducted (Table 1.2.6).

High product quality is a very important advantage for entering international markets, and access to foreign markets provides a basis for growth and expansion of sales markets. However, on the other hand, a constant high level of receivables creates the risk of non-return of funds and reduces liquidity. As can be seen from the trend line and the conducted analysis, the growth of sales volume is one of the biggest opportunities of the company at the moment. Since settlements with buyers are carried out in foreign currency, there is a risk of currency fluctuations, which can negatively affect the financial results of

the enterprise. The impact of war is the biggest risk for the enterprise, it affects all spheres of the enterprise, it is the most unpredictable.

Table 1.2.6

SWOT analysis of export activities of enterprises

Strengths	Weaknesses
High quality of the product Own production Growth of export volumes Financial stability Adaptability Access to foreign markets	Constantly high level of receivables Partially manual accounting of exports
Threats	Possibilities
Currency fluctuations The impact of the war	Expanding export volumes due to entering new markets and/or increasing supply volumes Automation

In order to assess macroeconomic external factors that the company does not control and cannot influence, and to identify global risks and opportunities, a PEST analysis was conducted (Table 1.2.7).

Table 1.2.7

PEST analysis of export activities of enterprises

Political	Economical
EU integration (+) Impact of war (-) Political instability (-)	Growth in demand for the company's products in the EU (+) Inflation (-)
Social	Technological
Trend for ecological products (+) Labor shortage (-)	Automation of accounting and production processes for risk forecasting (+)

The country's policy is aimed at integration with the EU, which creates favorable conditions for conducting export activities through the simplification of customs procedures, which is an opportunity for the growth of export volumes for the enterprise. The influence of the war as the main threat according to the conducted analysis carries risks for logistics, production facilities and the enterprise as a whole. Political instability can lead to unpredictable changes in legislation, tax regulation and exchange rate stability, which have a significant impact on the state. The growth in demand for products, as evidenced by the increase in sales volumes, confirms the company's high potential on the market. Inflation is a significant threat to enterprises, as rising prices for raw materials,

energy sources, and logistics increase the cost of production and reduce the profitability of exports. The labor shortage is a limitation that restrains the expansion of production and activity of the enterprise as a whole. Automation of accounting is considered as an opportunity that can help the enterprise to solve, first of all, problems in the area of accounting for export operations, such as automated control with accounts receivable and manual accounting.On the basis of the conducted analyses, using the SWOT matrix, taking into account the company's capabilities and threats, several ways of increasing the effectiveness of the company's export activities have been developed:

- diversification of sales markets: the conducted research shows that the company is dependent on several main foreign buyers, which in the future may negatively affect management decision-making and the independence of the company as a business entity. The main goal of diversifying sales markets is to reduce dependence on Poland and Moldova;

- currency risk hedging: taking into account the unstable situation within the country, the impact of exchange rate differences on the financial result of export operations, it is advisable for the enterprise to implement currency risk hedging, thereby fixing the current exchange rate for the future;

- automation of export operations: reduction of errors, saving of human potential and labor costs, avoidance/minimization of fines due to timely payment (180-day period) - all this will help the enterprise to strengthen the system of internal control and accounting.

Implementation of the developed recommendations will provide the enterprise with increased financial stability and predictability of activity. In particular, diversification of sales markets will minimize commercial risk, currency risk hedging will protect the financial result from exchange rate fluctuations, and automation of export operations will increase operational efficiency and reduce costs for maintaining the accounting department, strengthen internal control.The use of all of the above will prevent the realization of the projected growth potential of export volumes.

Therefore, the study of the legal framework and conducting a study of the organization, methods of accounting and analysis of export operations made it possible to get acquainted with the theoretical foundations of export activity, determine the practical state of accounting and analytical support of foreign economic activity in the part of export activity at the enterprise and develop recommendations for its improvement. In the process of performing the work, all the tasks defined at the beginning of the study were comprehensively solved, which made it possible to achieve the set goals and solve the set tasks, namely:

1. it is determined that export is a fundamental macroeconomic category that reflects the processes of export of goods (services, capital) outside the borders of the national economy; export of goods is the sale to foreign entities of economic activity for the export of goods beyond the customs border of the country for the purpose of obtaining income. The main functions of export: stimulating, economic, regulatory, integration,

social.

2. the regulatory framework for the implementation and accounting of export operations is complex and determined by customs and tax legislation, norms, and resolutions. The basic legislation of export activity in Ukraine includes Law "On Foreign Economic Activity" No. 959-XII dated 16.04.1991, Law "On Currency and Currency Operations", resolutions and norms of the National Bank of Ukraine;

3. methodical approaches to the analysis of the enterprise's export activity include analytical accounting by counterparties and operations, however, it is not sufficiently detailed, therefore there is a risk of distortion of analytical data;

4. the analysis of the financial and economic characteristics of the enterprise shows that the enterprise is profitable and operates in Ukraine and abroad; actively expands volumes and sales markets. The organization of the accounting service at the enterprise is structured and efficient, consisting of a chief accountant who works under the terms of a civil law contract and an accountant who works in the company's staff.;

5. accounting of export operations at the enterprise is carried out in accordance with the current legislation of Ukraine; accounting is kept on account 362 "Settlements with foreign buyers" for each counterparty, contracts and individual transactions. Export operations are carried out in two foreign currencies: Euro and Polish zloty. There is no automatic control over the terms of settlements with non-residents and automatic recalculation of exchange rate differences at the enterprise, which is a critically important shortcoming of the organization of accounting for export transactions.

6. directions for improving the organization and methods of accounting for the enterprise's export operations have been determined, such as increasing the level of automation of accounting, implementing the use of AI and blockchain, expanding analytical accounting due to the introduction of analytical accounting by country and product range;

7. the dynamics and structure of the enterprise's export activity were analyzed and it was determined that the development of the enterprise in terms of export activity is quite intensive, but there is a large amount of permanent receivables, which requires additional constant control by the enterprise's management; the efficiency of the enterprise's export activity is defined as highly profitable, export activity is defined as a strategic factor of the enterprise's competitiveness and financial stability;

8. a set of measures aimed at maximizing profit from export activity was formed, key directions for increasing the effectiveness of export activity were proposed, such as diversification of sales markets, hedging of sales markets, automation of accounting for export operations.

An important aspect of the further development of the accounting and analytical paradigm of managing export operations is its integration with the strategic controlling system of the enterprise. In today's conditions, it is not enough just to form reliable financial statements according to IFRS – the key task is the transformation of accounting

data into a management decision support system in real time. This involves a transition from post-facto analysis to preventive risk management, in particular currency, credit and logistics risks.

From the point of view of economic sustainability, the accounting and analytical system should perform not only an informational, but also a signaling function. In particular, the early identification of trends in the growth of receivables, deterioration in the payment discipline of non-residents or changes in the structure of foreign currency receipts allows the enterprise to promptly adjust its export policy. In this context, the implementation of internal control systems, integrated with analytical modules of ERP systems, which provide continuous monitoring of key performance indicators, becomes particularly relevant.

In addition, the modern paradigm of export management should take into account the concept of business value (value-based management). This means that every export operation should be evaluated not only from the point of view of accounting profit, but also from the point of view of creating added value for the enterprise. The use of indicators of economic added value (EVA), discounted cash flows (DCF) and sensitivity analysis allows for a more objective assessment of the impact of foreign economic activity on long-term financial stability. Digitization of accounting and analytical processes as a fundamental driver of improving the efficiency of export operations management requires special attention. The integration of big data (Big Data), artificial intelligence and automated information processing systems allows to significantly expand the analytical capabilities of the enterprise. In particular, forecasting of exchange rates, risk assessment of counterparties and modeling of foreign market development scenarios can be carried out on the basis of machine learning algorithms, which increases the accuracy and speed of management decision-making.

At the same time, the introduction of innovative technologies requires proper methodological support and adaptation to the requirements of international financial reporting standards. This involves the development of internal regulations that would harmonize automated accounting processes with the principles of IFRS, in particular regarding the recognition of income, valuation of financial instruments and display of currency differences.

The further development of the accounting and analytical paradigm of export operations management consists in its transformation into an integrated strategic management system that combines financial accounting, analytics and digital technologies. This approach ensures not only increased transparency and reliability of reporting, but also creates prerequisites for the formation of a stable competitive position of the enterprise on international markets in the long term.

Thus, the conducted research allows us to form a holistic vision of the accounting and analytical paradigm of managing export operations as a key tool for ensuring the economic stability of the enterprise in conditions of global instability. It was established

that the transformation of the traditional accounting system in the direction of its integration with analytical and strategic components creates a qualitatively new basis for making managerial decisions.

It has been proven that the application of IFRS provides not only an increase in the transparency of financial reporting, but also forms a methodological basis for effective management of export activities. Using the principles of IFRS 15 and IAS 21 allows enterprises to more accurately determine the moment of revenue recognition, adequately assess currency risks and ensure the reliability of financial results. This, in turn, helps increase the level of trust on the part of investors and partners and strengthens the company's competitive position on international markets.

Special attention is paid to the need to transition from retrospective accounting to proactive analytics focused on forecasting and risk management. The introduction of modern analysis tools, in particular scenario modeling, benchmarking, SWOT and PEST analysis, allows timely identification of threats and opportunities, ensuring the enterprise's adaptability to changes in the external environment. In this context, the accounting and analytical system acts not only as a source of information, but as a strategic management resource.

It is substantiated that increasing the efficiency of export activity is impossible without improving the organization of accounting, in particular by automating processes, expanding analytical sections and introducing digital technologies. The use of ERP systems, elements of artificial intelligence and other innovative solutions helps to increase the accuracy of accounting data, reduce the risk of errors and ensure the efficiency of management information. Summarizing the results of the research, it should be noted that the proposed approach to the formation of an accounting and analytical paradigm for managing export operations provides a comprehensive solution to the problems of increasing financial stability, the efficiency of resource use, and the competitiveness of the enterprise. The implementation of the developed recommendations will allow business entities not only to adapt to modern challenges, but also to form stable prerequisites for long-term development in the conditions of integration into the global economic space.

So, summing up everything that has been said, it can be confidently stated that the chosen topic is of great importance and requires further consideration. It not only reveals important aspects of modernity, but also encourages you to think about your own views and values. It is through the awareness of such questions that our attitude towards the world and the future is formed.

Therefore, it is extremely important not to remain indifferent, but to strive for development, analysis and improvement. This is the only way to achieve harmony and contribute to positive changes in society. In addition, it should be remembered that every small step in this direction is important and gradually forms large results that affect the overall development of humanity. This is a guarantee of a conscious and responsible future for everyone.

1.3. IMPLEMENTATION OF GLOBAL REPORTING INITIATIVE (GRI) STANDARDS IN THE AGRICULTURAL SECTOR OF UKRAINE AS A TOOL FOR SUSTAINABLE RECOVERY AND EUROPEAN INTEGRATION

Oleksandr Atamas,
Doctor of Economic Sciences, Associate Professor,
Associate Professor of the Department of Accounting, Taxation and Management of Financial and Economic Security,
Dnipro State Agrarian and Economic University, Dnipro, Ukraine

The modern architecture of the global economy is undergoing a fundamental transformation, where traditional financial indicators of profit and profitability cease to be the only measures of successful business. Today, the value of a company increasingly depends on its ability to manage non-financial risks and demonstrate transparency in environmental, social and corporate governance (ESG) issues. At the heart of this transparency is the GRI (Global Reporting Initiative) standards system, which has become a universal language that allows organizations to report on their impacts on the economy, environment and people in a clear and comparable way.

For the agricultural sector of Ukraine, this issue is gaining strategic importance. Being the “breadbasket of the world” and a key contributor to global food security, domestic agribusiness is simultaneously one of the most vulnerable to climate change and anthropogenic impact. However, today, an unprecedented factor has been added to these traditional challenges - a full-scale war. Soil degradation, land consolidation, water scarcity, and mass migration of the rural population have given Ukrainian farmers the task of not only surviving, but also of radically changing approaches to management and reporting.

The relevance of this study is due to the fact that non-financial reporting according to GRI standards is becoming a kind of “entrance ticket” to international capital markets for Ukrainian companies. Leading financial institutions, such as the European Bank for Reconstruction and Development (EBRD), the International Finance Corporation (IFC), and the World Bank, are increasingly considering the availability of a high-quality ESG report as a prerequisite for providing preferential financing and grants for recovery. Moreover, the European integration vector of Ukraine’s development requires businesses to be ready to implement the CSRD Directive (Corporate Reporting on Sustainable Development) and ESRS standards (Sustainable Development Reporting Standards). In this context, the GRI 13 industry standard: “Agriculture, Aquaculture and Fishing Sectors 2022” acts as the most relevant methodological tool that allows harmonizing Ukrainian practice with global requirements. Despite the significant interest in the topic of sustainable development, the issue of practical implementation of GRI 13 in conditions of martial law and the need "just transition" for lost land resources remains insufficiently covered in the scientific literature. There is an urgent need to develop algorithms that would allow combining financial, managerial and non-financial information into a single digital data ecosystem.

The object of the study is the process of forming non-financial sustainable development reporting at enterprises in the agricultural sector of Ukraine.

The subject of the study is the theoretical and methodological principles and practical tools for applying the GRI 13 industry standard in combination with universal and thematic standards in the context of military risks and digital transformation.

The purpose of the work is to scientifically substantiate and develop practical recommendations for the implementation of the GRI reporting system and the transparent recovery tool, increasing investment attractiveness and ensuring the competitiveness of Ukrainian agricultural enterprises in the global market.

To achieve the set goal, a set of scientific methods was used: system analysis - to study the structure of GRI standards and their interconnection; comparative analysis - to compare the requirements of GRI and European ESRS standards; statistical and economic analysis - to assess the dynamics of land and resource losses; case study method - to analyze the practical experience of leading Ukrainian agricultural holdings; modeling method - to develop the structure of an integrated data management system.

The scientific novelty of the study lies in adapting the concept of "just transition" (Just Transition) to the conditions of the military transformation of the agricultural sector and substantiating the role of digital technologies (AgTech) in ensuring the reliability of non-financial indicators. The practical significance of the results obtained lies in the possibility of their use by agricultural enterprises to prepare sustainable development reports that meet the requirements of international investors and contribute to the sustainable recovery of the industry.

The theoretical and methodological principles of sustainable development reporting are the foundation for understanding how modern business transforms its transparency from purely financial indicators into a comprehensive system of non-financial data disclosure. In the context of our study, we want to explain why the GRI Standards are not just a “report format” but a deep impact management methodology.

The GRI (Global Reporting Initiative) methodology is based on the concept of sustainable development, defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The main goal of reporting according to the GRI standards is to provide transparency on how an organization contributes or plans to contribute to sustainable development.

In theory, this means a transition from “shareholder capitalism” (focused on profit) to “stakeholder capitalism”, where the report becomes a tool for dialogue with investors, communities, employees and regulators. For Ukraine, which will enter the recovery process, this transparency is critical for attracting international capital, which requires confirmation of the ethics and environmental friendliness of business.

The modern GRI methodological framework, updated in 2021, consists of three interconnected levels, which provides flexibility and at the same time strict comparability of data:

1. Universal Standards:

- GRI 1: Foundation 2021 - defines reporting requirements and principles. These are the "rules of the game", without compliance with which the report cannot be considered prepared in accordance;

- GRI 2: General Disclosures 2021 - contains requirements for disclosing information about the structure of the organization, its management, strategy and policies. This creates a context for understanding the scale of impact.

- GRI 3: Material Topics 2021 - step-by-step instructions for identifying material topics.

2. Sector Standards - help companies not to "get lost" in a multitude of indicators, focusing them on topics that are most significant for their industry.

3. Topic Standards - contain specific disclosure requirements for individual topics (biodiversity, emissions, occupational health and safety, etc.).

The concept of “Impact Materiality” is a central methodological concept. Unlike financial materiality, which considers the impact of external factors on the value of a company, GRI focuses on the impact of companies on the world.

Effect “Determination of the impact” that an organization has, or may have, on the economy, the environment and people (including human rights). Impacts can be actual or potential, negative or positive, short-term or long-term.

The methodology “Assessment of the significance of adverse impacts” requires assessing them according to three criteria: scale (how serious the impact is), scope (how widespread it is) and irreversibility (how difficult it is to correct the consequences). For potential impacts, a probability criterion is added.

This approach allows Ukrainian agricultural enterprises to scientifically substantiate the priority of restoring certain resources, for example, focusing on irreversible soil degradation as a result of hostilities.

In order for non-financial reporting to be reliable (creditworthy), the organization must apply eight reporting principles as a guarantee of information quality, defined in GRI 1:

- Accuracy - information must be sufficiently detailed and correct;

- Balance - the report must reflect both positive and negative aspects of the activity. You cannot hide the facts of water pollution, focusing only on charity;

- Clarity - accessibility of information to users;

- Comparability - the ability to compare the company's results with previous years or other organizations;

- Completeness - coverage of all significant impacts and providing a complete picture for the reporting period;

- Sustainability context - reporting on impacts in relation to regional or global boundaries (for example, water use in water-scarce regions of Ukraine);

- Timeliness - regularity of report publications;

- Verifiability - the ability to verify data by external auditors.

Due Diligence methodology. GRI integrates the reporting process with the risk management process. Due diligence is an ongoing process through which an organization

identifies, prevents, mitigates and reports on how it addresses its negative impacts. This shifts the emphasis from “reporting as a result” to “reporting as a reflection of a management system”. It is important to emphasize that the implementation of GRI standards encourages agribusiness to create real impact management policies, and not just collect statistics once a year.

The theoretical and methodological principles of GRI became the basis for the development of the European Sustainable Development Standards (ESRS), which are mandatory under the CSRD Directive. Although ESRS implements the concept of “dual materiality” (impact on the world + financial risks for companies), the part related to impact is almost completely harmonized with GRI. For the agricultural sector of Ukraine, using GRI today is a strategic preparation for future EU requirements. This allows companies to build a data collection system that will be compatible with the European digital space now.

A separate aspect is the application of the “reasons for omission” principle. If certain data are unavailable due to war (for example, the condition of land in a combat zone), the GRI methodology allows you to remain “in compliance” if the organization clearly explains the reason for the lack of data and describes plans for obtaining it. This makes the GRI system viable even in crisis conditions, ensuring maximum honesty before stakeholders.

The theoretical and methodological principles of sustainable development reporting according to GRI standards are based on the priority of external influence, systematic management through due diligence and strict adherence to the principles of information quality. The implementation of this methodology in the agricultural sector of Ukraine is not only a transparency tool, but also a mechanism for modernizing management, which is critically important for sustainable recovery and full integration into the EU single market.

The GRI 13: Agriculture, Aquaculture and Fishing Sectors 2022 standard has become a response to the global challenges of food security, climate change and the protection of human rights in supply chains.

The architecture of the standard and the logic of its application are not just a list of indicators, but an industry "filter" that helps companies identify the most significant impacts. Its architecture is built to cover the entire production life cycle: from soil preparation to harvesting and primary processing.

According to the GRI framework, the reporting structure for each topic within the industry standard includes:

1. Topic Management (Disclosure 3-3): A description of how the company manages the impact.

2. Thematic Standards Indicators: References to generic standards (e.g. GRI 304 for biodiversity).

3. Additional Sectoral Guidance: Specific advice for the agricultural sector.

4. Additional Sectoral Disclosures: New indicators not included in the generic standards (e.g. pesticide use by toxicity levels).

The standard identifies 26 topics that, based on multilateral expert research, have been identified as most relevant to the sector. They can be grouped into three blocks:

- Environmental Block (Topics 13.1–13.8): Emissions, climate adaptation, biodiversity, conversion of natural ecosystems, soil health, pesticide use, water and waste.
- Social block (Topics 13.9–13.22): Food security and safety, animal welfare, community and indigenous rights, working conditions, child and forced labor, living wages, and economic inclusion.
- Economic and management block (Topics 13.23–13.26): Supply chain research, public policy, anti-competitive behavior, and anti-corruption.

For Ukrainian agribusiness, this list is a roadmap for modernization. For example, the topic "Living wages" (13.21) becomes critical for maintaining human resources in the post-war recovery.

According to Requirement 3-b in GRI 1: Foundation 2021, the organization is required to use relevant industry standards, if they exist. This means:

1. The "Report or Explain" principle

If an agricultural holding claims to report "in accordance with GRI", it must verify each of the 26 GRI 13 topics. If a topic (for example, "Animal Welfare") is recognized as immaterial for a company engaged in purely crop production, it must officially explain this in the GRI Content Index.

2. The requirement of European markets.

Since Ukrainian agricultural holdings (Kernel, MHP, Astarta) are public companies or attract loans from the EBRD and IFC, compliance with GRI 13 becomes a condition for their financial stability and access to capital.

3. Preparation for ESRS (European Sustainability Reporting Standards).

The GRI 13 sectoral approach is very close to the future EU sectoral standards, so its use is a "training" before full integration into the regulatory field of the European Union.

4. In-depth analysis of key topics (Example).

Topic 13.5: "Soil Health". The standard highlights that 80% of agricultural land suffers from erosion.

Impacts. Agricultural activities can accelerate erosion 10-100 times compared to natural processes through plowing, mechanical compaction and overgrazing.

Reporting requirement. The company must describe its soil management plan, including minimum tillage methods (no-till, strip-till), approaches to fertilizer optimization and combating salinization or oxidation.

For Ukraine, where a significant part of the black soil has been affected by shelling and mining, this section of the report becomes a tool for recording environmental damage.

In the agricultural sector, the topic of ecology in sustainable development reporting is the most intertwined: climate change affects water availability, and intensive water use and emissions degrade ecosystems. However, it is biodiversity that is today becoming the new "climate" in reporting - a topic that requires the most detailed scientific approach and new methods of data collection.

The agricultural sector is both a significant source of emissions (especially methane and nitrogen) and the most climate-vulnerable sector. GRI reporting requires Ukrainian companies to disclose not only direct emissions (Scope1), but also energy (Scope2) and supply chain emissions (Scope3), which is mandatory for exports to the EU under the CBAM mechanism (Carbon Border Management Mechanism) (Climate (Topics 13.1 and 13.2)).

Agriculture consumes about 70% of the world's freshwater. GRI reporting focuses on water abstraction in water-stressed areas. For Ukraine, where the war has destroyed irrigation systems and the Kakhovka hydroelectric power station, the GRI methodology becomes a tool for assessing the risks of water scarcity for future harvests (Water (Topic 13.7)).

The Biodiversity theme (GRI 101 and GRI 13) in the agricultural sector (Topic 13.3) covers the impact on genetic diversity, animal and plant species, and entire ecosystems. With the release of the new GRI 101: Biodiversity 2024 standard, reporting requirements have become much stricter and more science-intensive.

The key drivers of the display of biodiversity costs in the agricultural sector according to GRI 13 and the impact on nature are reflected through several key channels:

- growing a limited number of crops reduces agrobiodiversity, makes the system vulnerable to pests and requires more pesticides, which closes the cycle of degradation;
- excess nitrogen and phosphorus from fertilizers lead to eutrophication of water bodies, making them unsuitable for aquatic organisms.

The methodology of the updated GRI 101: Biodiversity 2024 standard, which becomes mandatory from 2026, changes the approach to reporting. Companies will report on their facilities located in or near environmentally sensitive areas. This includes the territories of the Emerald Network of Ukraine, reserves and areas of high biodiversity value. It is necessary to clearly indicate the area of converted land, the volume of water withdrawals and the amount of pollutants introduced in relation to specific locations. Companies must describe changes in the state of the ecosystem (size and condition) for the base year and the reporting period. This requires the use of tools such as satellite data or field studies. The concept of "Natural Ecosystem Conversion" for Ukrainian agribusiness is extremely acute. The standard requires reporting on the area of ecosystems converted after a certain "cut-off date". This allows international buyers to be sure that Ukrainian corn or soybeans are not grown on the site of recently destroyed protected steppes or forests.

The Mitigation Hierarchy of GRI 13 and GRI 101 requires companies to adhere to a clear sequence. For example, refusing to lease land bordering reserves, using precision farming technologies to reduce chemical loads, recultivating land or creating ecological corridors for species migration, creating new natural areas instead of those where the impact could not be avoided.

It is also necessary to emphasize that reporting according to GRI standards is now becoming a tool for Ukraine to record ecocide.

Destruction of the ecosystem due to mining, fires and flooding (as in the case of the Kakhovka reservoir) directly affects the biodiversity indicators of agricultural holdings operating in these regions.

Reporting on these costs according to international methodology allows you to form an evidence base for future reparations and attracting grants for "green" restoration.

GRI standards (Disclosure 101-8) introduce the concept of dependence on nature. Agribusiness must report on how it impacts the services it depends on: pollination by insects, natural water purification, soil moisture retention. If bees disappear due to the use of pesticides (Topic 13.6), the company loses the ecosystem service of pollination, which leads to a decrease in yield.

The environmental dimension of reporting in the agricultural sector is transforming from a general description of environmental policy to a precise mapping of impacts on biodiversity. The use of GRI 13 and GRI 101 allows Ukrainian agribusinesses to integrate into the European Biodiversity Strategy by 2030 (EU Biodiversity Strategy). This is not only a requirement of investors, but also a strategic necessity for preserving Ukraine's natural capital, which is the basis of its food and economic power.

The full-scale war has transformed Ukraine's black soil from an asset into an ecological disaster zone, requiring fundamentally new approaches to accounting and restoration. The scale of damage to the land fund is currently estimated at over 8.3 million hectares, which is almost 20% of the total area of agricultural land. The figure of 8.3 8.3 million hectares is given in the reports of the KSE Institute and the Ministry of Agrarian Policy. This data set is heterogeneous and, according to the GRI 13.5 methodology, should be broken down into specific categories for adequate assessment of damage and restoration planning.

Of the above-mentioned volume of land, a significant part remains inaccessible for cultivation, which, according to GRI 13.9, creates direct risks for global food security.

According to the State Emergency Service and international organizations, Ukraine has become the most mined country in the world. More than 170,000 sq. km of territory are considered potentially contaminated with mines and unexploded ordnance, a significant part of which is agricultural land. The cost of just one hectare can range from $3,000 to $30,000, making the economic burden of soil restoration unprecedented.

Satellite imagery studies have shown thousands of craters in fields. Each 155-mm shell explosion ejects up to 1 ton of soil, completely destroying the fertile layer in the radius of the explosion. This is a direct loss of "soil capital", which is classified as an irreversible declaration in the GRI system.

Soil analyses in areas of intense fighting show an excess of background concentrations of heavy metals by dozens of times. For example, the content of lead, cadmium and arsenic often exceeds the maximum permissible standards by 10-30 times, which makes products from such lands potentially dangerous according to the GRI topic 13.10 (Food safety).

For non-financial reporting, these statistical data should be integrated into the structure of Topic 13.5 (Soil health). Companies are recommended to classify pollution according to the following methodology:

- mechanical pollution (the presence of debris from machinery, concrete, metal, which prevents traditional cultivation);
- chemical pollution from explosives (residues of TNT, hexogen and their decay products, which are toxic to soil microflora);
- pollution with fuel and lubricants (consequences of fuel spills, which lead to hydrophobicity of the soil and the death of biota).

In the context of our study, it is important to consider losses not simply as statistics, but through the prism of the GRI 13 methodology (Topic 13.5: Soil health), which allows structuring the chaotic consequences of war into clear categories of soil degradation.

According to the logic of the GRI 13.5 standard, soil health is determined by its ability to function as a living ecosystem. War destroys this ability in several ways, which can be classified for non-financial reporting. First, this is physical degradation: soil compaction by heavy military equipment and mechanical destruction of the structure as a result of explosions. Shell craters do not simply mix the layers of the earth, they destroy the humus horizon, the formation of which takes centuries. Secondly, this is chemical pollution, which the standard usually considers due to excessive use of fertilizers or pesticides, but in war conditions it is supplemented by heavy metals (lead, cadmium, arsenic) and explosive residues. These toxins change the chemical state of the soil, which, according to GRI 101-7, leads to a complete or partial loss of ecosystem functions.

The methodology for recording these losses according to GRI standards is based on a comparison of the state of biodiversity and soils between the base year and the current reporting period (Disclosure 101-7). For Ukrainian agricultural enterprises, the base year logically serves as 2021 - the last period of peaceful management.

Using Topic 13.5: Soil health indicators, companies can document changes in soil composition, fertility levels, and the area of land withdrawn from circulation. This creates a structured data set, where every hectare of 8.3 million hectares has its own “digital footprint” of damage. This approach transforms a corporate report from an ordinary document into a legally significant evidence base. When an agricultural holding records specific areas of pollution and areas of ecosystems converted to an unusable state in a GRI 101 and GRI 13 report, it actually prepares the ground for future claims for reparations.

The use of non-financial reporting for ecological restoration has another important aspect - transparency for international donors and investment funds. The restoration process of 8.3 million hectares requires enormous funds, and international institutions (EBRD, World Bank) will give preference to those projects where the damage is recorded according to a methodology that they understand. Reporting according to the GRI 101: Biodiversity 2024 standard allows you to describe not only the fact of damage, but also a recovery plan through impact mitigation: from demining and cleaning to reclamation and returning land to a “healthy ecosystem” state.

Thus, the interpretation of data on the impact of the war in the sustainable development report allows the Ukrainian agricultural sector to solve three strategic tasks. First, this is an accurate inventory of damaged assets according to internationally recognized categories of soil health. Second, the creation of a verified database to prove the facts of ecocide and calculate the amounts of reparations in international courts. Thirdly, this is the formation of a strategy for "green" recovery, where every step of land clearance and rehabilitation is transparent and accountable. This approach makes Ukrainian agroholdings understandable partners for the civilized world, turning the tragedy of land destruction into a systematic process of their scientifically based revival.

In our research, it is necessary to pay special attention to the human dimension - the concept of Just Transition and social sustainability.

In the conditions of Ukraine, where the agricultural sector is going through a double transformation (green recovery and adaptation to the realities of war), this section becomes critically important for substantiating the social license for the activities of agroholdings.

According to the definition of the International Labor Organization (ILO), which underlies the GRI standards, a just transition means greening the economy in a way that is as fair and inclusive as possible for all stakeholders, creates opportunities for decent work and "leaves no one behind".

Just transition is not only about climate, but also about how agribusinesses support workers and communities during the transition to sustainable production methods, digitalization and recovery from the devastation of war.

The new GRI 102: Climate Change 2025 standard introduces a special Disclosure 102-3 (Just transition), which requires organizations to report on specific quantitative and qualitative indicators of the impact of their transition efforts on people.

For the Ukrainian agribusiness sector, this disclosure includes the following mandatory elements:

- workforce dynamics: reporting on the total number of new employees, laid off and, most importantly, displaced employees. In the context of the agribusiness sector, this may refer to employees who have switched from traditional agriculture to work with precision agriculture technologies or renewable energy (biogas plants).

- upskilling and retraining: the number of employees who have been trained to work in a low-carbon economy. This allows companies to reduce layoffs by adapting existing staff to new technological requirements.

- wages and living wage: reporting on the share of employees whose wages meet or exceed the cost of living. This is a fundamental indicator of social sustainability, ensuring that the transition to sustainable practices does not occur at the expense of reducing people's well-being.

The agricultural sector of Ukraine is a city-forming one for many territorial communities. The GRI 102-3 standard requires companies to: list locations where the activities of organizations (or their transformation) affect local communities; report on the percentage of locations where agreements have been reached with communities to protect

their interests. This directly correlates with the GRI topic 13.12 Local communities, which emphasizes that agribusinesses should engage with communities to understand their vulnerabilities. In times of war, the social resilience of communities depends on the ability of agribusiness to maintain infrastructure, create jobs for veterans and internally displaced persons, and ensure food security at the local level.

A just transition to GRI reporting for the agricultural sector in Ukraine has its own specifics and a "military" component. Special attention in reporting should be paid to the reintegration of veterans, i.e. the adaptation of jobs and retraining programs for former military personnel returning to the agricultural sector. Since the war has changed the demographic composition of the rural workforce, the GRI standards (in particular, the breakdown of data by gender in 102-3) help track which companies provide equal opportunities for women in agricultural production.

According to the GRI 102 guidelines, the lack of adequate transition planning can lead to negative consequences: loss of livelihoods, food insecurity, and violations of fundamental labor rights. For example, the sale of assets by a holding company without taking into account obligations to employees or the transfer of production to another region without the support of the community left behind may be considered a violation of the principles of just transition.

The implementation of GRI standards, in particular disclosure on just transition, allows Ukrainian agro-industrial companies to demonstrate to European partners and investors that their recovery is not only "green", but also socially responsible. This creates a foundation for the social sustainability of the country, where business is not just a producer of products, but also an active participant in building an inclusive and fair economy.

It is also necessary to separately highlight the topic of occupational health and safety for personnel (Topic 13.19) within the framework of the GRI 13 standard, which traditionally focuses on the risks associated with working with heavy machinery, worker fatigue and the impact of agrochemicals. However, for the agricultural sector of Ukraine, the full-scale war added a critical, existential level of danger - the mine threat and the presence of unexploded ordnance (Unexploded Ordnance) in the fields. Implementation of the mine safety reporting methodology within the framework of GRI 403: Occupational Health and Safety 2018 is becoming not only a requirement for transparency, but also part of the survival strategy and social responsibility of business.

The methodology for reporting on mine safety in the GRI 403 structure should be considered as a "significant work-related hazard", and includes several key stages integrated into thematic disclosures:

1. Hazard identification and risk assessment (Disclosure 403-2):

The company needs to describe the process of identifying areas that are potentially contaminated. This includes cooperation with government agencies and specialized mine action operators. In reporting according to the Global Reporting Initiative standards, the company needs to disclose: what digital tools (satellite images, drones with magnetometers) are used for initial scanning of fields; how hazardous areas are marked

and access to them is restricted for employees and equipment; what percentage of the company's land bank is classified as "high-risk areas".

Mine safety training for workers (Disclosure 403-5) should be a mandatory module in the annual training system. The annual report will need to report the number and proportion of workers (especially machine operators and field workers) who have received certified training in explosive detection and behavior when detecting them. What protocols are in place in the event of a suspicious object being detected (notification and work stoppage system).

This section should also describe technical protection measures, which include reporting for Ukrainian agricultural holdings on the number of units of agricultural machinery equipped with mine protection, the use of unmanned tractors and combines in areas with residual risk.

This section discloses existing programs for insurance of life and health of employees against military operations. The company is obliged to keep separate records of incidents related to mine explosions. It is important to separate standard industrial injuries and injuries resulting from military operations, which will allow analyzing the effectiveness of the implemented safety measures and forming a basis for reparations.

To increase verifiability (Verifiability principle in GRI 1), Ukrainian companies are recommended to refer to the compliance of their internal procedures with the International Mine Action Standards (IMAS). The generated report should contain information on the status of the lands:

1. Non-technical Survey (NTS): Results of non-technical survey of territories.
2. Technical Survey: Data from technical survey and clearance.
3. Land Release: Land areas that have been officially declared safe and returned to circulation.

Reporting on mine safety has a deep social implication. If an agricultural enterprise transparently and reliably describes its efforts to protect people, it automatically strengthens its social license to operate. This is critically important for the communities living in these areas.

According to Topic 13.12 (Local communities), agricultural enterprises should report on how demining activities help restore safety not only in the fields, but also in the surrounding areas used by the community. This creates a positive indirect economic impact and contributes to the sustainable recovery of the region.

The methodology for reporting on mine safety within the framework of GRI 13.19 turns non-financial reporting into a tool for managing critical risks of war. For the Ukrainian agricultural sector, this is a way to build trust from workers, insurance companies and international investors. Transparency in land clearance and personnel protection is the foundation for a "green" and safe recovery of Ukraine, which fully complies with the principles of sustainable development and the requirements of European integration.

Such an approach will allow recording the unique experience of Ukraine, which in the future may become part of global standards for occupational safety in post-conflict regions.

In the context of post-war reconstruction and integration into the European market, the topics of food safety (Topic 13.10) and waste management (Topic 13.8) are becoming not just operational tasks for the Ukrainian agricultural sector, but also fundamental components of a sustainable development strategy. These two topics are closely intertwined; it is impossible to guarantee food safety without a clean environment, which, in turn, depends on effective waste management and prevention of soil and water pollution.

According to the definition of the World Health Organization, about 600 million people fall ill annually due to the consumption of poor-quality food. For the agricultural sector of Ukraine, which is a global supplier of food, the topic of food safety today is gaining unprecedented urgency. The GRI 13: Agriculture, Aquaculture and Fishing Sectors 2022 methodology requires companies to report not only on the absence of incidents, but also on a system of efforts to prevent pollution at all stages - from field to table.

The main aspects of reporting on topic 13.10 are:

1. Health and Safety Impact Assessment (GRI 416-1):

- companies should disclose information on how they assess risks at each stage of the product's life cycle. For Ukraine, this includes monitoring the content of heavy metals (lead, cadmium) and explosive residues in products grown in the de-occupied territories.

2. Certification (Disclosure 13.10.4):

- an important indicator is the percentage of production facilities certified according to international standards such as GlobalG.A.P., ISO 22000, FSSC 22000. This is a marker of trust for European retailers.

3. Product recalls (Disclosure 13.10.5):

- transparent reporting on the number and volume of recalled batches of goods indicates the quality of the control system and the ability of companies to respond promptly to threats.

Food security in wartime also depends directly on traceability (Topic 13.23). Destruction of warehouses and interruption of cold chains of logistics create risks of development of pathogenic bacteria (salmonella, listeria). Reporting according to GRI standards helps companies to document their investments in autonomous storage systems and digital quality monitoring tools, which is critical to ensure the continuity of exports.

The agricultural sector generates huge volumes of waste (Topic 13.8) - from organic residues of crop and livestock farming to plastic packaging and hazardous containers from pesticides. The GRI 306 Waste 2020 standard suggests that companies change the focus from simple disposal to managing waste as a resource.

The standard must describe the input materials and processes that lead to the generation of waste. It is important to separate organic waste (manure, straw), which has the potential for recovery, from hazardous waste (agrochemical packaging, used

lubricants). It is also necessary to indicate how the company converts waste into value. Using manure to produce biogas, or straw as biofuel, allows not only to reduce methane emissions, but also to ensure the energy independence of the enterprise in conditions of deficit in the energy system.

The standard (GRI 306-4) requires indicators of what part of the waste was recycled or reused. This is a key indicator of the transition to a circular economy model, which is actively supported within the European Green Deal.

A separate challenge for Ukraine is the management of waste resulting from hostilities: destroyed equipment, construction debris from destroyed buildings and contaminated land, which actually become a specific type of waste. The GRI methodology allows for a structured accounting of such impacts, which is necessary to attract international assistance for the ecological rehabilitation of territories.

The relationship between topics 13.8 Environmental cleanliness and 13.10 Food safety is obvious: improper waste management (for example, natural landfills or leaching of fertilizers from storage facilities) leads to contamination of groundwater and soil, which automatically makes agricultural products unsafe.

Reporting according to the Global Reporting Initiative standards allows Ukrainian agroholdings to demonstrate a holistic approach to risk management. This creates a reliable basis for European integration, since the EU requirements for food safety and waste management are among the most stringent in the world. Transparency on these issues is not only a requirement of regulators, but also a strategic advantage that allows Ukrainian agribusiness to gain a foothold in premium markets as a responsible and reliable supplier of quality food.

In the context of Ukraine's post-war recovery and its strategic course towards membership in the European Union, the Governance section in reporting according to GRI standards is becoming not just a formal section, but a fundamental one an indicator of institutional maturity and business ethics. For international investors such as the World Bank and the European Bank for Reconstruction and Development, transparency in anti-corruption, competition and lobbying is a critical prerequisite for providing capital. Topics 13.24 (Public Policy), 13.25 (Anti-competitive Behaviour) and 13.26 (Anti-Corruption) within the GRI 13 standard form the integrity triangle on which trust in the Ukrainian agricultural sector is based.

Corruption in the agricultural, aquaculture and fisheries sectors has a devastating impact that goes far beyond financial losses. It erodes the government’s ability to curb harmful practices such as illegal logging or overfishing. The GRI 13 standard highlights that corrupt practices are often linked to the use of land and other natural resources. In Ukrainian realities, this is of particular importance in the context of land reform and water resources management.

Companies must report on the number and percentage of transactions checked for corruption (Disclosure 205-1). In the agricultural sector, this applies to the processes of registering land rights, obtaining permits for special water use or quotas for fishing.

Agricultural enterprises must demonstrate that their anti-corruption policies are communicated not only to management personnel, but also to all employees and business partners (Disclosure 205-2).

Transparent recognition of confirmed cases is regulated by the section (Disclosure 205-3), according to which it is necessary to provide a description of the measures taken, which will be a test of honesty before all stakeholders.

It is important to understand that corrupt actions can hide illegal transactions that lead to the loss of natural ecosystems. For example, bribing officials to ignore illegal plowing of protected lands or falsifying records of fish catches, which directly threatens biodiversity. Thus, anti-corruption reporting is an integral part of the country's environmental protection.

The agricultural market of Ukraine is characterized by the coexistence of large agricultural holdings and a significant number of small farms. In such a structure, there is a risk of abuse of a dominant position. Topic 13.25 "Anti-competitive behavior and market fairness" focuses on actions that restrict competition: price fixing, coordination of bids in tenders or the creation of geographical quotas.

The standard pays special attention to monopsony situations, when a limited number of large buyers dictate conditions to thousands of small producers. This leads to the establishment of purchase prices below the market level, which deprives small farmers of the opportunity to receive income (Topic 13.21) and have the opportunity to reproduce. Reporting under GRI 206: Anti-competitive Behavior 2016 requires disclosure of any legal claims for anti-competitive practices. This is an opportunity for Ukrainian businesses to demonstrate that their market power is being used ethically and does not hinder economic inclusion.

Agribusiness is a powerful lobbyist that influences the formation of public policy in the areas of ecology, food security and subsidies. Standard 13 recognizes that business participation in politics can be beneficial for society, but it also carries risks of “state capture” or unequal representation of interests.

Reporting on topic 13.24, based on GRI 415: Public Policy 2016, is based on transparency regarding the completeness of reporting on financial or other support for political parties or candidates, a description of the positions that the company lobbies before the government. In the context of the restoration of Ukraine, this applies to lobbying for environmental standards, rules for the use of GMOs, pesticides and the distribution of budget subsidies. Relevant lobbying should be aimed at the development of the entire sector, and not only at obtaining narrow corporate benefits. For example, supporting legislation that promotes the “green transition” or simplifies access to infrastructure for small farmers demonstrates the company’s strategic thinking and commitment to sustainable development goals.

The fight against corruption, competition and public policy form the foundation for a transparent recovery of the agricultural sector. It is necessary to emphasize that ethical governance creates a “protective umbrella” for all other aspects of sustainable development. Without transparency in government and business, it is impossible to ensure

a fair distribution of resources for soil recovery (Topic 13.5) or to guarantee respect for human rights in supply chains.

For Ukrainian agroholdings, the implementation of these standards is a strategic step towards full integration into the European regulatory field. This allows companies to already now develop a compliance system that meets the requirements and expectations of global investors. Transparency in governance issues transforms Ukrainian agribusiness from a "risky asset" into a reliable partner, which is critical for the long-term sustainability and prosperity of the country.

The "Human Rights and Labor Ethics" block in the GRI 13 standard is one of the most significant components of the social impact of agribusiness. In the context of Ukraine's integration into the European Union, this section becomes critical, as it directly correlates with the new Directive on Due Diligence for Corporate Sustainable Development. For the Ukrainian agricultural sector operating in conditions of war, it is not just reporting, but a mechanism for protecting human capital and ensuring social justice.

In Ukraine, where land relations are complex and dynamic, reporting on topic 13.13 "Land Rights" should demonstrate the company's respect for property and use rights. The organization should report on how its activities affect local communities' access to natural resources. This includes not only the lease of shares, but also the impact on access to water or forests.

According to the GRI methodology, companies should describe their approach to protecting land rights holders from persecution. In martial law, this also applies to transparency in relations with unit owners who are in a war zone or who are internally displaced persons.

The availability of effective tools for resolving land disputes is a key indicator of ethical governance.

The war radically changed the demographic landscape of the Ukrainian countryside. The mobilization of a significant part of men led to the fact that women began to master professions that were traditionally considered male. Reporting on topic 13.15 should reflect the efforts of agricultural companies to overcome gender gaps in wages and ensure equal opportunities for career growth. This should include supporting women's rights to education and professional development in agricultural specialties.

Particular attention is paid to veterans, people with disabilities and internally displaced persons. The enterprise should describe programs for adapting workplaces and psychological support, which is an integral part of social resilience.

Although for the official agricultural sector of Ukraine, information on Topics 13.16 and 13.17 "Eradicate forced and child labor" is not widespread, the GRI standards consider them as high-level risks in global supply chains.

Companies should report on how they screen their suppliers and contractors for the use of forced or child labor. This is particularly relevant for seasonal work (fruit picking), where a significant number of temporary workers are involved. The reporting should also

cover the working conditions of seasonal workers, preventing practices of document retention or illegal deductions from wages.

The right of workers to organize and bargain collectively is a fundamental human right. (Topic 13.18 “Freedom of association and collective bargaining”).

In the context of industry transformation and the introduction of new technologies, dialogue between the employer and trade unions is a guarantee that the interests of workers will be taken into account. The reporting should include data on the percentage of workers covered by collective agreements and conditions relating to labor safety, pay and social guarantees.

In order for the human rights block to be credible, it should be based on an independent due diligence process. This means that the company does not just declare values, but constantly identifies, prevents and mitigates negative impacts on people.

The implementation of standards from this block allows Ukrainian agroholdings to meet the requirements of European investors and regulators, strengthen their reputation in international markets, create a safe and fair environment for their employees, which is critically important for restoring the country's human resources potential.

This block is a logical continuation, as it transforms abstract concepts of "ethics" into specific indicators and management actions that can be measured and verified.

The topic of pesticide use and adaptation to climate change are two sides of the same coin in modern agribusiness. On the one hand, we are trying to protect crops from pests, and on the other - we are forced to adapt to a world where these same pests are becoming more aggressive due to warming, and ecosystems are more vulnerable to chemicals. For Ukrainian agricultural sector, which is striving for integration into the European Union, these issues are critical due to the “Farm to Fork” strategy, which requires a radical reduction in the use of pesticides.

Pesticides help us fight plant diseases and weeds, but the price of this fight is often too high for the environment and human health. The GRI 13 Agriculture, Aquaculture and Fishing Sectors 2022 standard requires companies not only to report on the volume of purchased chemicals, but also to conduct an in-depth analysis of toxicity and impact on ecosystems.

According to the recommendations of the World Health Organization, companies should report on the volume and intensity of pesticide use, dividing them into levels: extremely hazardous, highly hazardous and those that are unlikely to pose an acute threat. For Ukrainian agricultural producers, this means the need to completely abandon drugs that are banned in the European Union, but can still occur on the domestic market.

Integrated Pest Management is the “core” of the GRI 13 methodology. The company must describe its pest management plan, where chemical intervention is only a last resort. Priority is given to biological methods, crop rotation and the use of resistant varieties.

Pesticides that kill pests are often fatal to bees, birds and beneficial insects. Reporting under the GRI 101: Biodiversity standard requires disclosure of how the use of chemicals affects pollinators on which crops depend. This creates a direct dependency: by destroying biodiversity today, we undermine our own productivity tomorrow.

People who work with pesticides are at the highest risk. Reporting should include a description of staff training, the availability of protective equipment and health monitoring.

The agricultural sector of the Ukrainian economy is in a state of “double vulnerability”: we are struggling with the consequences of war and at the same time experiencing climate shifts - droughts, dust storms and unpredictable frosts. Topic 13.2 “Climate adaptation: building resilience in a changing world” focuses on how an organization adjusts its processes to survive in these conditions.

The new GRI 102: Climate Change 2025 standard requires companies to have a clear adaptation plan. This is not just a description of risks, but a list of specific actions: implementing a precision irrigation system, using “no-till” technology to retain moisture in the soil, and diversifying crops.

One of the key adaptation methods is the use of varieties that are resistant to heat and water shortages. Companies must report on how they are changing their seed stock to cope with new climate realities. Climate adaptation should not come at the expense of people. If a company decides to re-specialize in a region due to climate change, it should report on how this will affect workers and local communities. Will they be retrained? Will they get new jobs? Adaptation also includes preserving forest belts and natural ecosystems on the holdings' territory. This helps to regulate not only the microclimate in the fields, but also to absorb emissions, which is the company's contribution to mitigating climate change. The connection between the use of pesticides and climate change is direct, as temperature changes lead to the appearance of new pests in regions where they have never been, which provokes farmers to use even more chemicals, which in turn worsens the condition of soils and reduces their ability to retain moisture, making plants even more vulnerable to drought.

Reporting according to the Global Reporting Initiative standards helps break this vicious circle. It forces companies to look at these processes systematically. This is especially important for Ukraine in the context of the "Green Recovery". We have a unique opportunity not just to rebuild what has been destroyed, but to create a new generation of agricultural sector: with minimal chemical load and high resilience to climate challenges. Transparent reporting on these efforts is the best way to prove to international partners and investors that Ukrainian agribusiness is ready for the future as part of a single European family.

The topic of animal welfare (Topic 13.11) within the framework of the GRI 13 “Agriculture, Aquaculture and Fishing Sectors 2022” standard covers the physical and mental state of animals during their breeding, housing, transportation and slaughter. For the Ukrainian agribusiness sector, which seeks to expand its presence in the European Union, this block becomes a critical indicator not only of business ethics, but also of food safety and operational efficiency.

Reporting on this topic is based on the internationally recognized concept of the “Five Freedoms”, which requires organizations to provide animals with:

- freedom from hunger and thirst;

- freedom from discomfort (by providing an appropriate living environment);
- freedom to engage in natural behavior;
- freedom from fear and stress.

The Global Reporting Initiative (Topic 13.11) methodology requires companies to provide detailed descriptions of their animal welfare management practices in the following areas:

1. Housing and living space.

The company must report on its housing policy. This is particularly relevant for intensive livestock farming, where space constraints (cage, stall) can lead to the impossibility of natural behavior and the development of disease. Transparent reporting on the transition to cage-free or free-range housing systems is a significant advantage for international investors.

2. Responsible use of antibiotics and veterinary care

The overuse or misuse of antibiotics in livestock farming is a major factor in the development of antimicrobial resistance, which the World Health Organization has recognized as one of the greatest threats to global health.

Farmers should describe their commitment to the prudent use of antibiotics (refusal of their use as growth promoters or as prophylaxis without medical indications).

It is important to disclose the role of veterinarians in herd health planning and the use of anesthesia for painful manipulations (dehorning, castration, branding).

3. Transport and humane slaughter

Transport and slaughter processes are the most stressful stages. GRI 13 requires a description of policies on the duration of transport and methods of stunning before slaughter. For aquaculture, it is specifically emphasized that slaughter methods by asphyxiation or ice shock that do not meet the standards of the World Organization for Animal Health are unacceptable.

A quantitative indicator of success is the percentage of products certified according to independent animal welfare standards. Companies must publish the results of external audits confirming compliance with the stated policies (Disclosure 13.11.2 Certification and audits).

An additional indicator is introduced for aquaculture enterprises - survival rate. Companies must report on the level of mortality and its main causes (diseases, water quality, stress). This allows to assess the welfare not only of the fish, but also the environmental sustainability of the farm, as high mortality often indicates systemic problems in management.

Animal welfare directly affects other relevant topics. For example, the use of chemicals to combat parasites (such as lice in some fish species) can negatively affect non-target species in the water body (Topic 13.3). On the other hand, healthy animals kept in proper conditions are less vulnerable to zoonotic infections (salmonellosis, influenza), which is the key to food safety ((Topic 13.10).

The implementation of GRI (Global Reporting Initiative) standards in the field of animal welfare allows Ukrainian meat, milk and fish producers to reach the level of

transparency required by the modern global consumer. This is the way to modernize farms, reduce biological risks and strengthen export potential. Reporting on topic 13.11 demonstrates that Ukrainian agribusiness shares the European values of humane treatment of animals and is responsible for product quality at every stage of production.

Our research allows us to assert that the implementation of GRI (Global Reporting Initiative) standards, in particular the GRI industry standard 13 “Agriculture, Aquaculture and Fishing Sectors 2022”, is not just a technical requirement for reporting, but a strategic tool for transforming the agricultural sector of Ukraine. In the conditions full-scale war and subsequent reconstruction, these standards become a "common language" between Ukrainian business, international investors and European regulators.

In the face of the existential challenges of war and the ambitious goal of European integration, these standards become the foundation for building a new business model - transparent, ethical and highly efficient. The implementation of GRI 13 “Agriculture, Aquaculture and Fishing Sectors 2022” forces Ukrainian agricultural producers to move from reactive crisis management to proactive impact management. This means integrating ESG indicators (environmental, social and governance) into the core of business strategies. Transparent disclosure of information on risk management, such as mine safety (Topic 13.19) or disruption of logistics chains, demonstrates the institutional resilience of the company to international partners. This forms a “social license to operate”, which in the conditions of recovery becomes more expensive than material assets, as it is based on the trust of communities, the state and investors.

The social block of standards acquires particular importance. In conditions of large-scale migration and personnel shortages, the real wage methodology (Topic 13.21) and inclusive practices become tools for returning Ukrainians home. Reporting according to the Global Reporting Initiative standards allows companies to document the creation of decent working conditions, veteran rehabilitation programs and gender equality. This turns the agricultural sector into an attractive employer for young people, which is critical for maintaining the viability of rural areas and forming a sustainable middle class.

The study found that waste management (Topic 13.8) and food security (Topic 13.10) in the context of a circular economy open the way to energy autonomy for the industry. The use of organic waste for biomethane production not only reduces the environmental burden, but also ensures energy security for enterprises in times of instability of the energy system. Reporting on these processes according to GRI standards makes Ukrainian companies ideal candidates for “green” investments from European Union funds supporting the European Green Deal.

The Anti-Corruption Unit (Topics 13.24–13.26) ensures that resources allocated to Ukraine’s recovery are used efficiently and transparently. For the agricultural sector, which has traditionally faced challenges in the land sector, the implementation of the GRI Anti-Corruption Protocols is a public commitment to European values, harmonizing Ukrainian business practices with the requirements of the CSRD Directive, effectively removing barriers to entry into premium Western European markets.

Ukraine's post-war recovery should not be a simple return to pre-war performance. It should be based on the principles of "Building Back Better". Using GRI standards allows agribusinesses to systematically manage their impacts on the environment and society. For example, the Soil Health (Topic 13.5) and Biodiversity (GRI 101) reporting methodologies provide tools for assessing and rehabilitating land damaged by hostilities. Transparency in these matters is key to attracting targeted funding for ecological rehabilitation of territories.

For Ukrainian agribusiness, the path to the European Union lies through compliance with the European Sustainability Reporting Standards (ESRS). Our research has shown that the structure and logic of GRI 13 "Agriculture, Aquaculture and Fishing Sectors 2022" is almost fully compatible with the requirements and CSRD Directives. The implementation of the GRI "Global Reporting Initiative" today allows companies to build the necessary data architecture, which will significantly reduce the costs of transitioning to mandatory European reporting in the future. This provides Ukrainian exporters with a competitive advantage in the EU market, where traceability of products (Topic 13.23) is becoming a critical requirement.

In the monograph section, we revealed how Ukraine-specific challenges - such as mine risk and demographic changes - are integrated into the global methodology. GRI reporting allows companies to document their efforts to protect workers and communities. The implementation of the concept of a "living wage" (Topic 13.21) and the inclusion of veterans is a guarantee of preserving human capital and social stability in rural areas.

The governance block (Topics 13.24–13.26) is critical for overcoming corruption risks and ensuring the integrity of recovery processes. Transparent reporting on anti-corruption measures and ethics of interaction with state bodies is an "exit ticket" to the capital of international financial institutions (World Bank, EBRD). This creates conditions for reducing credit rates and increasing the investment rating of both an individual company and the sector as a whole.

The study emphasizes that the transition to high-quality reporting is impossible without the implementation of AgTech technologies. The use of satellite monitoring, IoT sensors and ERP systems ensures the implementation of the Verifiability principle. This transforms the GRI world from a marketing document into a dynamic management tool that allows real-time tracking of progress in achieving sustainable development goals.

Ukraine has a unique chance to become a world leader in the implementation of innovative reporting methods on mine safety, climate adaptation in conditions of destroyed infrastructure and support for food security in conditions of war, which may become part of future global standards. The implementation of the Global Reporting Initiative standards in the agricultural sector of Ukraine is an investment in long-term sustainability. This is the path from "survival" to "sustainable prosperity." Creating a transparent, ethical, and environmentally responsible agricultural industry will allow Ukraine not only to restore its status as the "breadbasket of the world," but also to become a model of modern, sustainable agricultural production within the European community.

1.4. INTEGRATION OF FINANCIAL, MANAGEMENT AND STRATEGIC ACCOUNTING AS THE BASIS OF ECONOMIC STABILITY OF THE ENTERPRISE

Alona Minkovska,
Ph.D. in Economics, Associate Professor,
Associate Professor of the Department of Accounting,
Taxation and Management of Financial and Economic Security,
Dnipro State Agrarian and Economic University, Dnipro, Ukraine

The economic stability of the enterprise is one of the key characteristics of its functioning in the conditions of the modern market economy, especially taking into account the high level of uncertainty caused by globalization processes, digitalization and military-economic challenges in Ukraine as of 2026. In modern economic science, economic sustainability is considered as a complex category that reflects the ability of an enterprise to ensure stable functioning, adapt to changes in the external environment, and achieve strategic goals in the long term.

According to modern scientific approaches, the economic sustainability of the enterprise is an integral characteristic of its activity, which is formed under the influence of financial, production, management and institutional factors. In particular, the scientific publications of 2024-2025 emphasize that the key core of economic stability is financial stability, which determines the ability of an enterprise to maintain a balance between assets and liabilities, to ensure solvency and investment attractiveness.

It should be noted that the economic sustainability of the enterprise is much broader than the financial one, as it also includes the ability to effectively use resources, introduce innovations, ensure competitiveness and respond to risks. In this context, economic sustainability is the result of the integration of various management subsystems, including financial, managerial and strategic accounting.

From the point of view of regulatory and legal support of the activities of enterprises in Ukraine, the regulations of the Verkhovna Rada of Ukraine, in particular the laws of Ukraine "On accounting and financial reporting in Ukraine", the Budget Code of Ukraine, as well as annual laws on the state budget, play an important role in the formation of economic stability. For example, the Law of Ukraine "On the State Budget of Ukraine for 2025" defines the sources of financial support for the economy that affect macroeconomic stability and, accordingly, the stability of economic entities.

In addition, in today's conditions of significant influence of war risks and economic turbulence, it is important to take into account state strategies to support financial stability. In particular, the analytical materials of 2026 indicate that even under the conditions of crisis factors, the financial stability of the economy can be maintained thanks to institutional mechanisms, international aid and adaptability of business (Govorukha, 2025).

The economic essence of the enterprise's sustainability is manifested through the following main characteristics: the ability to self-finance and maintain liquidity; resistance

to external and internal risks; efficiency of resource use; ensuring business continuity; focus on long-term development and strategic growth.

In the scientific literature, several approaches to the interpretation of the economic sustainability of the enterprise are distinguished:

1. static approach - considers sustainability as a certain state of equilibrium of the enterprise.

2. dynamic approach - emphasizes the ability of the enterprise to adapt to changes and restore balance.

3. systemic approach - defines economic stability as the result of the interaction of all subsystems of the enterprise.

The system approach is the most relevant in the context of the integration of accounting subsystems, since it is the consistency of financial, managerial and strategic accounting that allows the formation of a complete information base for making management decisions.

The economic stability of the enterprise is formed through the totality of its components, among which the key ones are:

– financial stability is a basic component of economic stability, which characterizes the financial condition of the enterprise, its solvency, liquidity, capital structure and ability to generate profit. Financial sustainability is assessed using a system of financial indicators based on accounting data;

– production (operational) stability - determines the ability of the enterprise to ensure the continuity of the production process, effectively use production facilities and maintain the appropriate level of product quality;

– investment stability - characterizes the enterprise's ability to attract investments, implement innovative projects and ensure long-term development;

– organizational and management stability - related to the effectiveness of the management system, the quality of decision-making, the level of development of management accounting and strategic planning.

– socio-economic stability - reflects the level of social responsibility of the enterprise, personnel stability and the ability to ensure proper working conditions;

– market stability (competitiveness) - characterizes the company's position on the market, its ability to maintain or expand market share, adapt to changes in demand and the competitive environment.

It is important to emphasize that all these components are interrelated and interdependent. For example, financial instability can lead to a decrease in investment activity, which, in turn, will negatively affect the production and market stability of the enterprise.

In today's conditions of digital transformation and integration of accounting systems, the informational component of economic stability is of particular importance. The integration of financial, management and strategic accounting allows:

– ensure timeliness and reliability of information;

– improve the quality of management decisions;
– improve forecasting of financial results;
– reduce the level of risks.

Thus, the economic sustainability of an enterprise is a multidimensional category that reflects the enterprise's ability to operate stably and develop in a dynamic environment. It is formed under the influence of a complex of internal and external factors and is ensured through the effective integration of accounting and management subsystems. That is why the study of the theoretical foundations of economic sustainability is a necessary prerequisite for further analysis of the mechanisms of integration of financial, management and strategic accounting as a basis for improving the efficiency of the enterprise.

In the modern conditions of economic development, which are characterized by a highly dynamic external environment, digitalization of business processes and increased competition, the issue of clear demarcation and at the same time integration of financial, managerial and strategic accounting becomes especially relevant. Each of these subsystems performs specific functions, has its own information boundaries and is aimed at different groups of users, but only their coordinated functioning ensures the formation of a high-quality information base for achieving economic sustainability of the enterprise.

Financial accounting is a basic component of the company's accounting system, which is regulated by national and international standards. In Ukraine, its management is determined, in particular, by the Law of Ukraine "On Accounting and Financial Reporting in Ukraine" № 996-XIV, as well as by National Accounting Regulations (Standards) (NP(S)BO) and International Financial Reporting Standards (IFRS), which are used by public companies and enterprises of public interest.

The main functional purpose of financial accounting is the formation of reliable, complete and unbiased information about the financial status, results of operations and cash flows of the enterprise. Such information is used by external users – investors, creditors, government bodies, counterparties.

The information boundaries of financial accounting are determined by the following characteristics:

– orientation to past events (retrospective nature);
– high level of standardization and regulation;
– aggregation of indicators;
– limited detail for internal analysis;
– periodicity of reporting (quarterly, annual).

At the same time, modern trends (in particular, the introduction of integrated reporting and ESG approaches) expand the traditional boundaries of financial accounting, including non-financial indicators that reflect the sustainability of the company's development (Sklyaru and Vovk, 2024).

Unlike financial accounting, management accounting does not have strict regulations and is formed according to the needs of a specific enterprise. Its methodological

foundations are based on international approaches set forth, in particular, in the recommendations of the Chartered Institute of Management Accountants and the Institute of Management Accountants.

The functional purpose of management accounting is to provide internal users (managers of various levels) with relevant information for: activity planning; control of budget execution; making operational management decisions; evaluation of the effectiveness of structural divisions.

Management accounting has the following information features:

- orientation to both past and future events;
- high detail of information;
- flexibility of data submission methods and forms;
- use of non-financial indicators (productivity, quality, time);
- lack of mandatory standardization.

In the conditions of digitalization of business (in particular, implementation of ERP systems, BI analytics), management accounting is transformed into a decision support system in real time, which significantly expands its information boundaries.

Strategic accounting is a relatively new direction that arose as a response to the need to integrate accounting information with strategic management processes. Its conceptual foundations are developed in the works of such scholars as Robert Kaplan and David Norton, in particular within the concept of the Balanced Scorecard.

The functional purpose of strategic accounting is:

- information provision of strategic planning;
- assessment of the company's competitive position;
- analysis of the external environment;
- formation of long-term goals;
- control of strategy implementation.

The information boundaries of strategic accounting are much wider compared to other subsystems: orientation to the future (forecasting nature); use of both financial and non-financial indicators; involvement of external information (market trends, behavior of competitors); integration with analytical and strategic tools (SWOT, PEST, KPI).

In the context of modern challenges (martial law in Ukraine, global economic risks, energy instability), strategic accounting takes on special importance as a tool for ensuring adaptability and sustainability of the enterprise.

Financial, managerial and strategic accounting differ in a number of key criteria, Table 1.4.1. Despite the differences, all three subsystems are mutually complementary elements of the single information system of the enterprise. Integration of financial, management and strategic accounting involves: coordination of information flows; a single methodological base; use of digital platforms; ensuring continuity of information between management levels.

Modern scientific research emphasizes that it is the integrated accounting system that allows to achieve synergy between short-term operational decisions and long-term

strategic goals. Thus, financial, managerial, and strategic accounting have different functional purposes and information boundaries, but their effective integration is a necessary condition for the formation of a complete system of information support for enterprise management. In today's conditions, this kind of integration ensures increased transparency of activity, the validity of management decisions, and the firm's resilience to external challenges.

Table 1.4.1

Comparative characteristics of accounting subsystems

Criterion	Financial accounting	Management accounting	Strategic accounting
Users	External	Internal	Internal (senior management)
Orientation	The past	Past + future	The future
Regulation	High	Low	Absent
Detailing	Generalized	Detailed	Analytical
Data type	Financial	Financial + non-financial	Integrated (including external)

In modern conditions of the functioning of enterprises, which are characterized by a high level of uncertainty, the digital transformation of the economy and the integration of Ukraine into the European economic space, the role of high-quality information management support is growing. Traditional approaches to accounting, in which financial, managerial and strategic accounting function separately, no longer meet business needs. That is why the concept of an integrated accounting system is being formed as a holistic approach to the processing and use of economic information.

The essence of the integrated accounting system is the combination of different types of accounting into a single information model that provides not only the recording of economic transactions, but also analytical support for management decisions and strategic development of the enterprise. Such a system allows you to avoid information gaps, increase the consistency of indicators and form a holistic vision of the business entity's activities.

It is important to note that the formation of integrated accounting systems in Ukraine takes place within the current legal framework, in particular in accordance with the Law of Ukraine "On Accounting and Financial Reporting in Ukraine", which defines the general principles of accounting and financial reporting. At the same time, international financial reporting standards (IFRS), the updated Conceptual Framework for Financial Reporting, as well as approaches to integrated reporting developed within international initiatives (IIRC, GRI, ESRS) have a significant impact. In the context of European integration, these requirements are gradually becoming an integral part of the accounting practice of Ukrainian enterprises.

The transition to an integrated accounting system requires compliance with certain principles that ensure its effective functioning. First of all, it is about the formation of a single information space in which all accounting data are accumulated and processed in a coordinated manner. This avoids duplication of information and increases its reliability. At the same time, it is important to focus on the relevance and timeliness of information,

because modern management requires prompt access to analytical data.

Along with this, the integrated system must be flexible enough to adapt to changes in the external environment, in particular legislative innovations or transformations of the enterprise's business model. Of particular importance is the reconciliation of financial and non-financial indicators, which meets modern requirements for disclosure of information on sustainable development and ESG factors. Thus, the accounting system goes beyond the traditional financial dimension and begins to perform broader functions related to strategic management.

When considering the integration of accounting subsystems, it is advisable to pay attention to its multi-level nature. At the methodological level, the approaches to assessment, classification and display of economic operations are coordinated, which creates the basis for the formation of a single system of indicators. This, in turn, contributes to the consistency of financial and management accounting.

The next, organizational level, is related to the construction of the management structure of accounting processes. Within this level, the functions of units, the responsibilities of employees and mechanisms for coordinating their activities are determined. An important aspect is the formation of effective communication between various services of the enterprise, which ensures the continuity of information flows.

No less important is the informational level of integration, which involves combining data within a single information system. Modern enterprises are actively implementing ERP solutions that allow integration of accounting, finance, logistics and other business processes. This creates a basis for the formation of consolidated information and its further analysis.

The final is the strategic level, at which accounting information is used to form long-term goals, plan and control their achievement. It is at this level that accounting is integrated with the strategic management system, which ensures the company's orientation towards sustainable development.

The effectiveness of the functioning of the integrated accounting system is largely determined by the mechanisms of interaction of its components. At the center of this interaction is a single database that acts as a source of information for all subsystems. Based on it, a system of indicators is formed, which is used both for financial reporting and for internal analysis.

An important role in ensuring interaction is played by budgeting and controlling tools, which allow you to combine the planned and actual indicators of the enterprise's activity. Through these mechanisms, constant monitoring of results and adjustment of management decisions is carried out. In parallel, a system of key performance indicators is formed, which ensures coordination of operational actions with strategic goals.

The development of integrated reporting, which combines financial and non-financial aspects of the enterprise's activity, deserves special attention. This approach is in line with modern international trends and contributes to increasing business transparency. The use of analytical systems (BI) allows you to deepen data analysis, simulate various development scenarios and increase the validity of management

decisions (Karzun, 2025).

As of 2026, the development of integrated accounting systems is under the influence of a number of important trends. In particular, artificial intelligence technologies are actively being implemented, which automate routine accounting operations and expand the capabilities of analytics. At the same time, the requirements for disclosure of information about sustainable development are growing, which necessitates the integration of ESG indicators into the accounting system. Another important factor is the harmonization of Ukrainian legislation with European reporting standards, which increases the requirements for the quality of accounting information. Therefore, the concept of an integrated accounting system is a logical stage in the development of accounting science and practice. Its implementation ensures consistency of information flows, increases the quality of management and creates prerequisites for achieving economic sustainability of the enterprise. In the conditions of modern challenges, such a system becomes not only an accounting tool, but also a strategic resource for business development.

In the modern conditions of the functioning of enterprises, which are characterized by a highly dynamic external environment, increased competition, digitalization of business processes and the need for operational decision-making, the formation of a single accounting and analytical space is of particular importance. Such a space acts as an integration platform for financial, managerial and strategic accounting, ensuring the integrity of information flows, their coherence and relevance for different levels of management. The basis of its construction is a systemic approach, which allows accounting to be considered not as a collection of isolated subsystems, but as a single complex dynamic system.

The system approach involves considering the accounting and analytical support of the enterprise as an open system that interacts with the external environment, adapts to changes and provides feedback. In the context of integration of accounting subsystems, this means the need to coordinate methodological, organizational, and informational aspects of financial, managerial, and strategic accounting. It is important that such integration is not limited to the technical unification of information systems, but involves a deep conceptual unity of approaches to the formation, processing and interpretation of data.

From the standpoint of the system approach, the accounting and analytical space of the enterprise is formed as a multi-level structure, where each level performs specific functions, but at the same time is subordinated to the general goal - ensuring the economic stability of the enterprise. Financial accounting is aimed at external users and is regulated by legal acts, in particular the Law of Ukraine "On Accounting and Financial Reporting in Ukraine" No. 996-XIV (as amended as of 2026), as well as international financial reporting standards (IFRS), which are mandatory for public companies. Management accounting, in turn, has an internal orientation and is formed in accordance with the needs of management, while strategic accounting provides information support for the long-term

development and competitive position of the enterprise.

A systemic approach requires the harmonization of these subsystems through a single information base, which is achieved through the implementation of modern digital solutions, such as ERP systems, BI platforms and analytical tools. In this context, the provisions of the Law of Ukraine "On Electronic Trust Services" and regulations on the digital transformation of business, as well as the recommendations of the Ministry of Finance of Ukraine on the automation of accounting, are of particular importance. It is also important to take into account European approaches, in particular the requirements of EU Directive 2013/34/EU and its updates related to non-financial reporting and sustainable development.

A unified accounting and analytical space should ensure not only the integration of data, but also its quality, timeliness and analytical value. This is achieved through the standardization of accounting procedures, the unification of directories, the introduction of uniform principles for the classification of costs and revenues, and the use of end-to-end performance indicators. Scientific literature emphasizes that the consistency of information is a key factor in management effectiveness. At the same time, modern studies emphasize the need to integrate financial and non-financial indicators, which is especially relevant in the context of the transition to the concept of sustainable development.

The system approach also assumes the existence of clearly defined relationships between the elements of the accounting and analytical space. This means that the data generated within financial accounting should be available for management analysis, and the results of strategic accounting should be taken into account when forming financial statements and planning activities. Such interaction is ensured through the construction of a single information architecture, which includes databases, analytical modules and interfaces for users of different levels.

Data management plays a special role in the formation of a single accounting and analytical space. In today's environment, companies operate with significant amounts of information coming from various sources, including internal systems, markets, partners, and government agencies. According to the recommendations of international organizations, in particular IFAC and OECD (2022-2024), effective data management involves their structuring, ensuring security, as well as the use of analytical tools to identify patterns and forecasting.

An equally important aspect is the organizational component of the system approach. The construction of a unified accounting and analytical space requires appropriate changes in the management structure of the enterprise, in particular strengthening the role of financial services, creating analytical units, as well as developing personnel competencies. In this context, the provisions of professional standards, in particular the recommendations of ACCA and CIMA regarding the development of management accounting and analytics, are relevant.

Taking into account the challenges of the state of war and the post-war recovery of the economy of Ukraine, the systematic approach to the integration of accounting

subsystems acquires additional importance. Enterprises must ensure the flexibility and adaptability of accounting systems, the ability to quickly respond to changes in legislation, tax policy and market conditions. This is confirmed by modern studies of Ukrainian scientists who emphasize the need to transform accounting and analytical systems in the direction of digitization and integration. Thus, the systematic approach to the construction of a single accounting and analytical space of the enterprise ensures the integrity, coherence and efficiency of management information support. It allows you to integrate various accounting subsystems into a single structure, which contributes to improving the quality of management decisions, strengthening the economic stability of the enterprise and ensuring its long-term development.

Revealing the theoretical foundations of the integration of accounting subsystems allows you to form a holistic view of the essence, principles and prerequisites of combining financial, managerial and strategic accounting into a single system. The generalization of scientific approaches and methodological provisions creates the basis for further research into the practical aspects of such integration. In this context, financial accounting, which acts as a basic information platform that ensures the formation of reliable and standardized data, is of particular importance. Its role, functions and capabilities in integration processes should be considered in more detail.

Financial accounting in modern business conditions is a fundamental component of an enterprise's information system, which ensures not only the recording of economic transactions, but also forms the basis for the integration of managerial and strategic accounting. Its importance is especially growing in conditions of economic instability, globalization and increased requirements for business transparency. It is through financial accounting that unified, reliable and comparable information is formed, which is used by both internal and external users.

Regulatory and legal regulation of financial accounting in Ukraine is based on a combination of national legislation and international standards, which ensures harmonization of the accounting system with European and world practices. The key document that defines the legal basis of accounting organization is the Law of Ukraine "On Accounting and Financial Reporting in Ukraine" (as amended, as of 2026). This law enshrines the basic principles of record-keeping, requirements for financial reporting, and also defines the range of entities that are obliged to apply international standards.

An important aspect is that the legislation of Ukraine provides for a differentiated approach to the application of accounting standards depending on the category of the enterprise. In particular, large enterprises, enterprises of public interest, as well as entities operating in international markets, are required to apply International Financial Reporting Standards (IFRS). This contributes to increasing the investment attractiveness of Ukrainian companies, ensures transparency and comparability of financial data at the international level (Koval and Lyshak, 2024).

The national regulations (standards) of accounting (NP(S)BO), approved by the Ministry of Finance of Ukraine, remain the basis for accounting by small and medium-

sized enterprises. They are built taking into account the principles of international standards, but adapted to the national economic environment. At the same time, in recent years, there has been a tendency towards the gradual convergence of NP(S)BO with IFRS, which is manifested in the introduction of changes to standards, updating of the terminology and methodology of valuation of assets and liabilities.

As of 2026, the digitization of accounting and reporting will become especially important, which will also be reflected in the legal framework. Electronic forms of financial reporting are being actively implemented in Ukraine, in particular through the electronic reporting system and integration with state registers. An important role in this process is played by the provisions of the Tax Code of Ukraine, which regulate the procedure for submitting financial information for taxation purposes, as well as determine the relationship between accounting and tax accounting.

International institutions also have a significant influence on the standardization of financial accounting, in particular the International Financial Reporting Standards Board (IASB), which develops and updates IFRS. In 2023-2025, a number of changes were made to international standards, including disclosures about liabilities related to climate risks and improved approaches to the valuation of financial instruments. These changes are gradually being implemented in Ukrainian practice, which indicates the integration of the national accounting system into the global economic space.

Particular attention should be paid to the principles on which financial accounting is based, since they ensure its functioning as an information platform for integration. Such principles include prudence, full disclosure, enterprise autonomy, continuity of operations, accrual and matching of income and expenses. Their observance guarantees the formation of reliable information that can be used for management decisions and strategic planning.

In the context of the integration of financial, managerial and strategic accounting, it is important to emphasize that it is financial accounting that provides a single methodological base. It forms standardized information that can be transformed for internal management needs. For example, financial reporting data is used to analyze performance, assess risks, forecast financial results, which are key elements of strategic management.

In addition, the standardization of financial accounting helps to increase the level of trust on the part of external users, such as investors, creditors, government bodies. In modern conditions, this is of critical importance for ensuring the economic stability of the enterprise, since access to financial resources largely depends on the transparency and quality of financial information. Accordingly, compliance with regulatory requirements becomes not only an obligation, but also a strategic necessity.

An important element of regulatory regulation is also the system of monitoring compliance with accounting standards. In Ukraine, control functions are performed by both state bodies, in particular the Ministry of Finance and the State Tax Service, and independent auditors. The Law of Ukraine "On the Audit of Financial Statements and

Auditing Activities" defines the requirements for conducting an audit and provides an additional level of verification of the reliability of financial information. This contributes to the strengthening of trust in financial reporting and increases its value as a source of information for integrated management.

Modern scientific research confirms that effective integration of accounting systems is impossible without clear standardization of financial accounting. In particular, in the works of Ukrainian scientists, for example, F. F. Butynets, S. F. Golov, L. V. Napadovskaya, it is emphasized that it is financial accounting that provides the basic information infrastructure that allows for coordination of different levels of enterprise management. International studies also emphasize the need to harmonize standards as a prerequisite for effective corporate governance.

Therefore, the regulatory framework and standardization of financial accounting form the basis for its functioning as a basic information platform of integration. They ensure the unity of the methodology, the reliability of the information and its suitability for use in management and strategic accounting. In modern conditions, their role is only growing, since the ability of the enterprise to adapt to changes in the external environment and ensure its economic stability depends on the quality of financial information.

Financial accounting in modern business conditions is not only a tool for recording economic transactions, but also a basic information platform for forming a holistic view of the economic sustainability of the enterprise. It is the financial reporting, formed in accordance with the current legal requirements, that accumulates systematized, standardized and compared information, which allows to assess the financial condition, performance results and development prospects of the economic entity.

In Ukraine, the Law of Ukraine "On Accounting and Financial Reporting in Ukraine" No. 996-XIV (with changes as of 2026) remains the key normative act regulating the preparation of financial statements. It defines the legal principles of regulation, organization and management of accounting and preparation of financial statements. At the same time, enterprises of public interest, as well as a significant part of medium and large companies, apply International Financial Reporting Standards (IFRS), which ensure a high level of transparency and comparability of data in a global environment.

The informational potential of financial reporting is revealed through its ability to satisfy the needs of various groups of users in making economic decisions. Qualitative characteristics of information such as relevance, reliability, timeliness, completeness, and comparability are of particular importance for assessing the sustainability of an enterprise. It is these characteristics that determine how effectively financial reporting can be used to analyze an enterprise's ability to withstand internal and external challenges.

Financial statements, including the balance sheet (statement of financial position), statement of financial results (statement of comprehensive income), statement of cash flows and statement of equity, form a comprehensive information field for assessing various aspects of sustainability. Through the structure of assets and liabilities, it is possible to assess the financial independence of the enterprise, the level of its liquidity

and solvency. Financial performance data reflects operational efficiency and the ability to generate income, which is a key condition for long-term sustainability. Information about cash flows allows you to assess the real ability of the enterprise to fulfill its obligations, regardless of accounting estimates and accruals.

A special role in modern conditions is played by the concept of continuity of activity (going concern), which is enshrined in both national accounting provisions (standards) and IFRS (in particular, IAS 1 "Presentation of financial statements"). Assessment of the ability of the enterprise to continue its activities in the future without the need for liquidation or a significant reduction in the scope of activities is a central element of the analysis of its sustainability. Financial statements in this context act as the main source of information for identifying signs of financial difficulties, such as chronic losses, negative cash flows or excessive dependence on external financing.

In 2026, the integration of financial and non-financial information becomes especially important, which is connected with the development of the concept of sustainable development and the introduction of reporting standards in the field of ESG (Environmental, Social, Governance). Although financial reporting is traditionally focused on displaying financial indicators, its informational potential is expanded due to the disclosure of additional data in the notes, in particular, regarding risks, uncertainties, accounting estimates and judgments of management personnel. This allows for a more in-depth assessment of the company's sustainability not only from a financial, but also from a strategic point of view.

An important aspect of the information potential of financial reporting is the possibility of financial analysis. The indicators of liquidity, financial stability, business activity and profitability are calculated on the basis of the reported data. For example, the autonomy ratio allows you to assess the level of financial independence, while coverage ratios reflect the ability of the enterprise to meet short-term obligations. Taken together, these indicators form a quantitative basis for assessing resilience and identifying potential threats.

However, the informational potential of financial reporting is not absolute and has certain limitations. In particular, financial statements are based on historical cost and accounting estimates, which may reduce their ability to reflect current market conditions. In addition, a large part of important information, in particular regarding innovation potential, quality of management or reputational risks, remains outside the boundaries of traditional financial reporting. That is why in modern conditions the value of integrated reporting, which combines financial and non-financial indicators, is increasing.

In Ukrainian realities, taking into account the state of war and macroeconomic instability, financial reporting acquires additional importance as a tool for assessing the adaptability of enterprises to crisis conditions. It allows you to find out how effectively the company manages resources, whether it is able to maintain liquidity in difficult conditions and whether it has the potential for recovery and development. At the same time, special attention should be paid to the disclosure of information about the risks

associated with the disruption of supply chains, currency fluctuations and changes in the regulatory environment.

Therefore, financial reporting is a key element of the company's information infrastructure, which provides the basis for the integration of financial, managerial and strategic accounting. Its informational potential consists in the ability to form a holistic view of the financial state and results of the enterprise, providing the possibility of a comprehensive assessment of its economic stability. At the same time, the effective use of this potential requires a combination of financial reporting data with analytical tools and non-financial information that corresponds to modern trends in the development of accounting and reporting.

Financial accounting in the modern enterprise management system performs the fundamental role of an information base that ensures the formation of unified, regulated and comparable financial reporting over time. At the same time, despite its regulatory certainty and high degree of standardization, financial accounting has a number of significant limitations in the context of strategic enterprise management. These limitations necessitate the integration of financial accounting with management and strategic accounting within a unified decision support information system.

First of all, it should be noted that financial accounting is mainly focused on retrospective reflection of economic transactions. Its methodological basis, enshrined in the International Financial Reporting Standards (IFRS), in particular in the Conceptual Basis of Financial Reporting of the IFRS Foundation (updated version applicable in 2025-2026), provides for the formation of information for external users — investors, creditors, regulators. In Ukraine, these provisions are implemented through the Law of Ukraine "On Accounting and Financial Reporting in Ukraine" No. 996-XIV with subsequent amendments, as well as through national accounting regulations (standards) and harmonization with international requirements.

However, the strategic management of the enterprise requires a much wider information field than that which can be provided by financial reporting. The main limitation of financial accounting is its historical focus. Financial reporting data reflects already completed operations, while strategic decisions are mostly future-oriented, including forecasting market changes, evaluating development alternatives, and creating competitive advantages. Thus, the time lag between the occurrence of economic events and their reflection in financial statements reduces the operational value of such data for strategic management.

In addition, financial accounting is limited by the principle of recognizing and evaluating assets and liabilities exclusively in monetary terms. This means that a significant part of strategically important factors remains outside the scope of financial reporting. It is, in particular, about intellectual capital, the quality of management processes, the level of innovation, customer loyalty, reputational assets and other intangible factors that, in the conditions of the knowledge economy, play a key role in the formation of the long-term value of the enterprise. Despite the gradual expansion of

requirements for the disclosure of information about intangible assets according to IFRS (in particular, IAS 38 "Intangible assets"), a significant part of such resources is not recognized in the balance sheet due to the impossibility of their reliable monetary assessment.

Another significant limitation of financial accounting is its regulatory rigidity and standardization. Financial reporting is formed according to clearly defined rules, which ensures its comparability and reliability, but at the same time limits its adaptability to the information needs of a specific management level. Strategic management, on the contrary, requires flexible, multidimensional and often non-financial information, which may include scenario development models, analysis of market trends, behavioral characteristics of consumers, assessment of the competitive environment. Such data go beyond regulated financial reporting.

It is also important to consider that financial accounting is not focused on cause-and-effect relationships between economic processes. It records the results, but does not always allow identifying the factors that caused them. For example, a decrease in profitability may be recorded in financial statements, but the causes of this phenomenon - changes in consumer behavior, ineffectiveness of marketing strategy or technological lag - remain outside the boundaries of financial accounting. Such information incompleteness is critical for strategic management, as it makes it impossible to build effective management responses (Lagodienko, 2024).

In modern conditions, especially taking into account the digital transformation of business and the spread of ESG-approaches to management (Environmental, Social, Governance), financial reporting is increasingly considered as only one of the elements of integrated reporting. International practice, in particular the IFRS Foundation's framework approaches to integrated reporting and the Global Reporting Initiative (GRI) standards, emphasize the need to combine financial and non-financial indicators to form a complete picture of enterprise value creation. However, classical financial accounting remains only partially integrated into these processes.

An additional limitation is the orientation of financial accounting to the principle of prudence and historical cost, which can lead to an underestimation of the real economic value of the company's assets in conditions of inflation or rapid technological change. In a strategic context, this makes it difficult to adequately assess the potential of the enterprise, since the book value of assets does not reflect their real ability to generate future cash flows.

It should also be emphasized that financial accounting does not provide a sufficient level of detail for making managerial decisions at the level of business units or individual products. Its aggregated nature, which is necessary for external reporting, reduces the usefulness of information for strategic planning of the company's internal development. That is why management accounting tools are actively used in modern management practice, which allow detailing costs, analyzing the profitability of responsibility centers and modeling alternative development scenarios.

In the context of the Ukrainian regulatory environment, it is worth noting that the adaptation of the national accounting system to the requirements of the European Union, which is ongoing in accordance with the provisions of the Association Agreement between Ukraine and the EU, also does not eliminate the fundamental limitations of financial accounting as a strategic management tool. Even under conditions of full harmonization with IFRS, financial reporting remains a tool mainly for external communication and not for internal strategic analysis.

Therefore, financial accounting, despite its regulatory certainty, reliability and universality, cannot be considered as a self-sufficient information base for strategic enterprise management. Its limitations in time, content, methodological and functional aspects necessitate integration with managerial and strategic accounting. It is this kind of integration that makes it possible to form a comprehensive information system capable of ensuring the adoption of sound management decisions in the long term and increasing the economic stability of the enterprise in conditions of an unstable external environment.

The modern stage of economic development, characterized by high turbulence of market conditions, digitalization of business processes and growing requirements for the transparency of financial information, leads to the transformation of financial accounting from a traditional registration system into a multidimensional analytical platform. In the context of the integration of financial, management and strategic accounting, it is financial accounting that acts as the basic information core, which forms the primary evidence base for further analytical processing, interpretation and strategic use of data.

The expansion of the analytical capabilities of financial accounting in modern conditions occurs not only due to the improvement of the methodology of accounting estimates, but also due to the integration of digital technologies, the harmonization of national standards with international ones (in particular IFRS/IFRS), as well as the strengthening of requirements for non-financial and management analytics, which is formed on the basis of financial data. In Ukraine, these processes are supported by the provisions of the Law of Ukraine "On Accounting and Financial Reporting in Ukraine" No. 996-XIV as amended, as well as the implementation of International Financial Reporting Standards in accordance with the orders of the Ministry of Finance of Ukraine and the practice of applying IFRS, approved by the International Accounting Standards Board (IASB).

One of the key directions of expanding the analytical potential of financial accounting is the deepening of its interpretative function through the development of a multidimensional data representation system. Traditional financial statements based on historical value are gradually supplemented by fair value estimates in accordance with IFRS 13 "Fair Value Measurement", which allows for a more accurate reflection of the economic reality of the enterprise. This creates prerequisites for the formation of analytics focused not only on recording past events, but also on assessing potential risks and future cash flows.

An important vector is also the development of integrated financial analytics based on the concept of "advanced reporting", which includes elements of management analysis,

ESG indicators and indicators of sustainable development. In 2026, this trend is largely determined by the implementation of EU approaches to corporate sustainability reporting (in particular CSRD – Corporate Sustainability Reporting Directive), which also affect Ukrainian enterprises, especially those integrated into international value chains. As a result, financial accounting gradually goes beyond the purely monetary dimension, forming analytical models capable of combining financial and non-financial indicators in a single information system.

Digitalization of accounting processes and implementation of big data processing technologies, artificial intelligence and machine learning are an essential direction of expanding the analytical capabilities of financial accounting. The use of such tools allows for automated classification of operations, forecasting of financial results, as well as detection of anomalies in financial flows. This increases the analytical value of accounting information, as it provides a transition from descriptive analytics to predictive and prescriptive (Mazurik, 2025).

Within the modern practice of financial accounting, the segmentation of information is becoming more and more important. In accordance with the requirements of IFRS 8 "Operating Segments", enterprises are required to disclose information by operating segments, which creates a basis for a deeper internal analysis of the efficiency of individual areas of activity. The extension of this approach in management practice allows for the formation of detailed analytical panels (dashboards), which provide management with operational information for decision-making.

A separate important direction is the improvement of risk assessment and accounting methods. Modern financial accounting increasingly integrates a risk-oriented approach, which involves taking into account credit, market, liquidity and operational risks when forming financial statements. In particular, IFRS 9 "Financial Instruments" introduces the expected credit loss (ECL) model, which significantly increases the analytical depth of financial information. This allows enterprises not only to record actual losses, but also to forecast potential financial risks, which is critical for ensuring economic stability.

In the context of integration processes, the development of interoperability of accounting systems is of particular importance. The use of XBRL (eXtensible Business Reporting Language) standards ensures unification of financial information presentation and simplifies its automated processing by both internal and external users. This creates conditions for the formation of a single information space in which financial accounting becomes not only a source of data, but also a platform for analytical interaction between different levels of enterprise management.

Another important direction is the strengthening of the predictive function of financial accounting. Traditionally, accounting was retrospective in nature, but modern requirements for enterprise management require the use of accounting data for the formation of forecasted financial statements. This is implemented through the implementation of scenario analysis, budget planning and cash flow modeling. According to the IASB's Conceptual Framework for Financial Reporting, the usefulness of information is determined by its ability to influence users' economic decisions, which

directly stimulates the development of predictive analytics.

Equally important is the direction of harmonization of financial and management accounting on the basis of unified information bases. In modern ERP-systems (SAP, Oracle NetSuite and others), financial data are automatically integrated with operational indicators, which allows forming a complex analytical picture of the company's activity. This contributes to the reduction of information asymmetry between management levels and increases the speed of decision-making.

Thus, the expansion of analytical capabilities of financial accounting takes place in a multi-vector direction, covering methodological, technological and regulatory aspects. As a result, financial accounting is transformed into a key information and analytical platform that provides data integration for the purposes of management control and strategic planning, forming the basis of the economic stability of the enterprise in conditions of an unstable external environment.

Financial accounting, acting as a basic information platform of integration, ensures the formation of unified, normatively regulated and comparable information about the financial state and results of the enterprise. It is he who creates the primary array of data that reflects actual business operations and serves as the basis for external reporting and general assessment of the economic condition of the business entity.

At the same time, only financial information is not enough to make effective management decisions in a dynamic environment, as it is mostly retrospective in nature and has limited options for detailing internal processes. This necessitates the development of management accounting as the next level of the information system, which transforms financial accounting data into analytical tools for planning, control and performance evaluation

In the modern conditions of an unstable economic environment, increased competition and high dynamics of external influences, management accounting acquires the status of a key tool for internal information support of the enterprise. In contrast to financial accounting, which is mainly focused on the formation of regulated external reporting, management accounting provides flexible, detailed and prompt formation of information for the needs of management. This is what determines its critical role in making tactical and operational management decisions that directly affect the level of economic stability of the enterprise.

Management accounting serves as the informational basis of current activity regulation, providing management with relevant data on costs, revenues, profitability of products, efficiency of business processes and centers of responsibility. Its fundamental difference lies in its focus not only on recording past results, but also on supporting future management decisions. Within the integrated accounting system, it transforms financial accounting data into a form suitable for analytical use, ensuring their timeliness and adaptability to the needs of different levels of management.

From a tactical management perspective, management accounting plays a key role in providing mid-term decisions related to cost optimization, pricing, and resource utilization. The analysis of the cost of production is of particular importance, which allows

you to assess the effectiveness of individual areas of activity and determine reserves for increasing profitability. In modern practice, this is complemented by the use of more accurate calculation methods, in particular, approaches focused on the distribution of costs by types of activities, which provides a deeper understanding of the cost structure and facilitates the adoption of informed management decisions.

An important element of the management accounting system is budgeting, which has turned from a financial planning tool into a continuous process of financial modeling. In modern conditions, companies are increasingly using flexible forecasting models that allow for quick updating of financial indicators taking into account changes in the external environment. This increases the adaptability of management and contributes to the strengthening of economic stability, as it provides the possibility of timely response to deviations from the planned parameters.

Operational decisions of the enterprise are directly based on the data of management accounting, which performs the function of an early warning system. Due to the constant monitoring of expenses, income and financial results, the management gets the opportunity to identify negative trends at the initial stages and prevent their development. This is especially important in conditions of high market volatility, when the speed of decision-making becomes one of the determining factors of competitiveness.

The system of responsibility centers, which ensures decentralization of management and personification of responsibility for performance results, is of significant importance. Its integration with the processes of budgeting and internal reporting allows not only to monitor the implementation of planned indicators, but also to form motivational mechanisms aimed at achieving the strategic goals of the enterprise. In modern conditions, such a system is supplemented by the evaluation of non-financial indicators, which meets the requirements of modern corporate management.

Digitization significantly changes the functional role of management accounting. The use of ERP systems, analytical platforms and data processing technologies allows for the integration of financial and management information in a single information environment. This contributes to the transition to the concept of a "single source of data", which minimizes information discrepancies and increases the reliability of management decisions. In addition, the automation of accounting processes provides the possibility of forming analytics in real time, which significantly increases the efficiency of management.

In modern practice, internal reporting is becoming a central element of the management accounting system. It is transformed from a tool for recording results into a mechanism for continuous monitoring of the enterprise's activity, combining financial and operational indicators. The integration of risk management into the structure of internal reporting, which corresponds to COSO approaches and modern international practices, is of particular importance. This makes it possible to assess not only the efficiency of the activity, but also the level of its stability, taking into account the influence of external and internal risks.

An important trend is the multi-level nature of internal reporting, which provides

information support at the operational, tactical and strategic levels. In combination with the concept of a balanced system of indicators, it allows forming a comprehensive assessment of the company's activity, which takes into account both financial results and factors of long-term development.

In the context of the regulatory environment of Ukraine, management accounting is characterized by a high level of flexibility, as it is not regulated by strict standards. At the same time, its development is based on the provisions of the Law of Ukraine "On Accounting and Financial Reporting in Ukraine" and is consistent with the requirements of international financial reporting standards, which creates prerequisites for the integration of various accounting subsystems.

Coordination of financial and management accounting indicators, which ensures the formation of a single information field of the enterprise, is of particular importance. This involves the harmonization of approaches to the recognition of income and expenses, the synchronization of analytical indicators and the use of integrated information systems. As a result, management decisions are based on reliable and consistent data, which reduces the risk of information conflicts and increases management efficiency.

Therefore, management accounting forms a complex system of information support, which provides a combination of planning, control and analysis in a single management cycle. Its toolkit allows the enterprise to adapt to changes in the external environment, optimize the use of resources and maintain a stable level of economic efficiency. At the same time, to ensure long-term sustainability, it is necessary to expand the horizon of analysis and integrate internal information with factors of the external environment. This is what causes the transition to strategic accounting, which combines financial and non-financial data and forms an informational basis for achieving sustainable competitive advantages of the enterprise.

Modern operating conditions of enterprises are characterized by a high level of uncertainty, increased global competition, financial shocks and acceleration of technological changes. In such conditions, separate types of accounting — financial, managerial and strategic – can no longer be considered in isolation, since their effectiveness largely depends on the degree of mutual integration. The formation of an integrated accounting system becomes a key factor in ensuring the economic stability of the enterprise, as it allows combining retrospective, current and prospective information in a single information environment.

The normative basis of such processes in Ukraine is the Law of Ukraine "On Accounting and Financial Reporting in Ukraine" No. 996-XIV, as well as the implementation of International Financial Reporting Standards (IFRS), which ensures the unification of approaches to the formation of financial information. At the same time, the development of digital technologies, in particular ERP systems and XBRL reporting, creates the prerequisites for the formation of a single integrated information platform of the enterprise that meets the modern requirements of corporate governance and European trends in reporting transparency (in particular, in the context of the EU CSRD).

The integration of financial, management and strategic accounting significantly

affects the ability of the enterprise to maintain financial stability and solvency, as it provides a more accurate and timely reflection of financial flows and obligations. Traditional financial accounting, focused on historical data, in combination with management accounting allows for the formation of an operational picture of cash flow, which is critically important for liquidity assessment.

The application of integrated approaches ensures the reconciliation of data on expenses, income and liabilities in real time, which increases the accuracy of cash flow forecasting. This is especially relevant in the context of the implementation of IFRS 9 "Financial Instruments", which provides for a model of expected credit losses, which directly affects the assessment of the financial stability of the enterprise and its counterparties.

In the modern practice of financial management, the integration of accounting systems allows to reduce the risks of cash gaps, optimize the structure of working capital and increase the efficiency of liquidity management. As a result, the company gains the ability to maintain solvency even under the conditions of an unstable external environment.

An integrated accounting system is an important risk management tool, as it provides a comprehensive view of internal and external influencing factors. In the conditions of growing geopolitical and economic instability, in particular for Ukraine, the ability of enterprises to quickly respond to risks is a determining factor for their survival. Thanks to the integration of accounting data, the company gets the opportunity to form a multi-level system of risk analysis, which combines financial indicators with operational and strategic indicators. This corresponds to modern approaches to risk-oriented management, enshrined in international financial reporting standards and COSO ERM (Enterprise Risk Management Framework) recommendations.

Of particular importance is the use of scenario analysis, which is based on integrated data and allows modeling the consequences of changes in macroeconomic parameters, currency fluctuations or changes in supply chains. This approach increases the adaptability of the enterprise, as it provides the possibility of early adjustment of the financial and operational strategy.

One of the key advantages of an integrated accounting system is the formation of a single information space for making management decisions. Consolidation of financial, management and strategic data allows to reduce information asymmetry between different levels of management and ensures consistency of decisions within the entire organization.

In modern ERP systems (such as SAP S/4HANA, Oracle NetSuite), the integration of accounting modules allows you to automatically generate analytical reports that combine financial results with operational performance indicators. This creates the basis for a transition from reactive to proactive management, where decisions are made not only based on past data, but also based on predictive models.

Improving the quality of strategic planning is also an important aspect, as integrated information allows assessing the long-term consequences of management decisions.

According to the IASB's Conceptual Framework for Financial Reporting, the usefulness of information is determined by its ability to influence the economic decisions of users, which directly confirms the importance of an integrated approach.

The integrated accounting system is not only a tool of internal management, but also a strategic resource for the formation of competitive advantages of the enterprise. In the modern economy, competitiveness is determined by the speed of information processing, the accuracy of analytics, and the company's ability to adapt to market changes.

Thanks to the integration of accounting systems, the enterprise gets the opportunity to form unique analytical competencies that allow more efficient use of resources, optimize costs and increase the profitability of operations. In addition, the transparency and reliability of financial information provided by an integrated approach increases the level of confidence of investors and creditors, which is an important factor in access to capital (Melnyk, 2025).

In the context of global trends, the integration of ESG indicators into the accounting system that meets the requirements of CSRD and international standards of sustainable development is of particular importance. This allows enterprises not only to increase the efficiency of their activities, but also to form a positive image of a responsible business entity, which is an important component of a long-term competitive strategy.

Thus, the integrated accounting system acts as a key factor in strengthening the economic stability of the enterprise, ensuring the synergy of financial, managerial and strategic dimensions of information. It increases financial stability and solvency, ensures adaptability to external risks, improves the quality of management decisions and forms long-term competitive advantages. In today's conditions of digital transformation and harmonization with international standards, such integration becomes not just an advantage, but a necessary condition for the sustainable development of enterprises.

The development of an integrated system of financial, managerial and strategic accounting in Ukraine takes place in the conditions of a complex combination of transformational processes of the economy and gradual harmonization of the national accounting system with international requirements. At the same time, in practice, the integration of accounting subsystems is held back by a number of methodological and regulatory barriers that significantly affect the quality and consistency of information flows.

One of the key problems remains the conceptual gap between financial and management accounting. National regulations (standards) of accounting, approved by the Ministry of Finance of Ukraine, are mainly focused on the formation of regulated financial reporting for external users, while management accounting is not formally regulated by a single regulatory framework. This leads to different approaches to the recognition, assessment and classification of costs and revenues, which complicates the formation of a single analytical platform of the enterprise.

An additional barrier is the incomplete implementation of International Financial Reporting Standards (IFRS) concepts into national practice. Although large enterprises and public companies already apply IFRS in accordance with the Law of Ukraine "On

Accounting and Financial Reporting in Ukraine" No. 996-XIV, at the level of medium and small businesses, there is an orientation towards simplified accounting models that do not always provide sufficient analytical depth.

An important methodological limitation is also insufficient unification of approaches to strategic accounting. In Ukrainian practice, it is mostly considered as an extension of management accounting, while in international literature (in particular, the approaches of Kaplan & Norton and modern concepts of strategic management accounting), it acts as a separate system that integrates financial and non-financial indicators of the external environment. This creates a gap between theoretical approaches and practical implementation.

No less significant is the regulatory challenge associated with the digital transformation of accounting. Although electronic reporting formats are gradually being introduced in Ukraine (in particular, XBRL within the requirements for companies submitting reports to the Center for the Collection of Financial Reporting at the NKCPFR), unified standards for data integration between accounting systems remain fragmented. This limits the possibilities of automated analytics and end-to-end integration of accounting subsystems (Panchenko and Hrynyavskyi, 2024).

One of the key prerequisites for the effective integration of accounting systems is the availability of a sufficient level of professional competences in the field of financial, managerial and strategic accounting. In Ukraine, staffing in this area remains heterogeneous, which creates additional challenges for the implementation of integrated approaches.

For a long time, the traditional system of training accountants in institutions of higher education was mainly focused on financial accounting and tax reporting. At the same time, the modern requirements of the labor market require mastering the skills of financial analysis, strategic planning, working with ERP systems and digital data processing platforms. This creates a gap between educational programs and practical business needs.

An additional challenge is the rapid growth of the role of digital technologies in accounting. The use of SAP, Oracle NetSuite, and Microsoft Dynamics 365 systems requires not only knowledge of accounting standards, but also basic competencies in the field of information technology, data analytics, and cyber security. However, the level of digital literacy of a significant part of specialists remains insufficient for the full use of such tools.

A positive trend is the gradual professionalization of the accounting field through international certifications (ACCA, CIMA, CPA), which orient specialists to an integrated approach to financial and management analysis. At the same time, their spread in Ukraine remains limited due to the cost of education and insufficient institutional support.

The strategic direction of the development of the integrated accounting system in Ukraine is further harmonization with international financial reporting standards and corporate governance practices. This process is determined both by the requirements of European integration and by the need to increase the transparency and investment attractiveness of Ukrainian enterprises.

A key role in this process is played by the introduction of IFRS as a basic standard for enterprises of public interest, as well as the gradual expansion of the scope of their application. An important step is the adaptation of national standards to the IASB updates, in particular in terms of financial instruments, leases and fair value measurement.

A separate direction of harmonization is related to the implementation of non-financial reporting standards, in particular the CSRD (Corporate Sustainability Reporting Directive) requirements, which form a new paradigm of integrated reporting. This means a gradual transition from exclusively financial information to a comprehensive presentation of ESG indicators that directly affect the strategic assessment of the enterprise.

An important element is also the development of integrated reporting in accordance with the concept of the International Integrated Reporting Council (IIRC), which involves the combination of financial and non-financial factors of value creation. For Ukraine, this opens up prospects for the formation of a single information space, where financial, management and strategic accounting function as interconnected elements.

Digital transformation is one of the key drivers of the development of an integrated accounting system, as it provides the technical possibility of combining various accounting subsystems into a single information platform.

Modern trends indicate the active implementation of artificial intelligence and machine learning technologies in accounting processes. They allow you to automate the initial processing of documents, the classification of business transactions and the generation of analytical reports. This significantly reduces the influence of the human factor and increases the speed of management decision-making.

An important direction is the development of Big Data technologies and predictive analytics, which allow the use of large arrays of financial and non-financial data to forecast the financial results of an enterprise. In combination with cloud technologies, this creates the possibility of forming dynamic models of financial stability.

A separate role is played by the development of electronic reporting and the XBRL standard, which ensures the unification of financial information presentation. Its further expansion in Ukraine will contribute to the integration of enterprise accounting systems with state information resources and international databases.

No less important is the issue of cyber security and protection of credentials. As digitization progresses, the risks of unauthorized access to financial information increase, requiring the implementation of modern data protection systems, including blockchain technologies to ensure the immutability of accounts.

Thus, the development of an integrated accounting system in Ukraine is restrained by a number of methodological, regulatory and personnel challenges, but it has significant potential for transformation in the conditions of European integration and digitalization of the economy. Further harmonization with international standards, the development of professional competences and the introduction of modern digital technologies form the basis for the creation of a single analytical system capable of ensuring the economic sustainability of enterprises in the long term.

1.5. MANAGEMENT ACCOUNTING FOR SALES EXPENSES

Mariya Bardadym,
Ph.D. in Economics, Associate Professor,
Associate Professor of the Department of Accounting,
Taxation and Financial and Economic Security Management,
Dnipro State Agrarian and Economic University, Dnipro, Ukraine

The conditions of fierce competition for consumers compel businesses not only to produce high-value goods and services but also to ensure their optimal delivery in a manner that meets customer requirements and expectations. This helps maximize profits, build competitive advantages, and ensures the viability and growth of the business.

Since sales activities are the primary source of financial resources (cash inflows), their effectiveness depends largely on the amount of costs incurred in carrying them out. The amount of these costs influences the pricing of goods, consumer perception, the feasibility of sales transactions, profit margins, the seller's image, and other important aspects of the company's operations.

Sales expenses have been studied by economic science from various perspectives: accounting and statistical compilation of financial results of business entities; general management and specific areas of management; marketing; and assessment of the effectiveness of this type of expense (Plaksiienko and Romanchenko, 2019).

The ambiguity of views on sales expenses and the lack of a systematic description of them make it difficult to adequately understand their economic significance and to objectively assess other aspects of their management. This is also due to a number of unresolved issues regarding the nature of sales activities themselves, despite numerous studies by L. Balabanova, A. Balabanitsa, N. Gavryshko, A. Klyuchnyk, T. Lukyanets, M. Oklander, O. Provolotskaya, V. Khrupovich, O. Yamkova, and many others.

An enterprise's sales activities (SA) are an integral part of its organically unified complex of activities and are aimed at satisfying the needs and requirements of product buyers. By concluding the business cycle, it significantly shapes the enterprise's overall performance, its image, and its success in the market.

Effective coordination of actions in the field of product sales must be based on a clear understanding of its substantive meaning. Numerous scholars offer various interpretations of the essence of sales activities. The first explanations of its significance were provided by scholars at the Harvard Business School, who believed that "sales activities exist to profitably satisfy consumer demands" (Lebedenko, 2021), emphasizing its profit-oriented focus. However, the emphasis on taking consumer needs into account, although a necessary condition for achieving positive results, leaves the economic essence of sales activities partially unexplained.

Akimova, N.S., Toporkova, O.V., Naumova, T.A., focusings on sales as a structural component of an enterprise, merely notes the existence of a sales subsystem without elaborating on its nature, functions, and elements (Akimova et al., 2018). The identification of this subsystem highlights the existence of a corresponding cost center

and the need to monitor its effectiveness within the overall management system.

Agreeing with this position, Kovalenko, H.O., Chukina, I.V. details the components of a manufacturing enterprise's sales subsystem (distribution, goods movement, and sales), explains its functioning, and describes its functions and operations. The author pays particular attention to production operations, logistics, and product sales, which are linked to changes in the forms of value and ownership (Kovalenko and Chukina, 2021) and are crucial for understanding the nature of sales activity costs.

Further, Kovalenko, H.O., Chukina, I.V. defines sales activities as a systematic process of organizational and economic operations with marketing and logistical aspects, aimed at achieving economic results and "forming a positive image of the enterprise in the market" (Kovalenko and Chukina, 2021).

Thus, sales activities (SA) are essentially the process of carrying out specific operations within the sales system. S. Mochernyi demonstrates a comprehensive approach to analyzing them, focusing primarily on post-production operations (Tubolets, 2012). In contrast, Tubolets', K.H. emphasizes the marketing component of sales, highlighting the company's focus on consumer needs.

Viter S.A. and Viter Z.D equate the concepts of "sales" and "sales activities" based on their intended purpose – satisfying consumers and generating profit for the company. At the same time, sales are considered in two aspects: in a broad sense – as a technological process with specific operations – and in a narrow sense – as the qualitative conditions for its implementation (knowledge, skills, competencies) (Viter and Viter, 2016).

To distinguish between the concepts of "sales" and "sales activities," scholars propose defining sales activities in a broad sense as "distribution," supplemented by sales planning processes, and in a narrow sense as "sales" (Viter and Viter, 2016). Similar interpretations are found among other researchers, who understand "sales" in a narrow sense as "the processes of direct communication between the seller and the buyer, that is, the sale" (Kovalchuk, 2016; Sadovska et al., 2024). In our opinion, this definition is somewhat limited, as it does not cover all components and processes of sales activities and does not contribute to their effective implementation.

Some authors define sales activities as "the process of promoting products to the market with the aim of generating business profit" (Kozhukhar, 2023; Verzilova, 2020). Although this general definition is correct, it does not specify the components of the process and does not emphasize the market orientation of the activity as a key condition for the enterprise's success.

A more comprehensive understanding of the nature of sales is provided by the broad interpretations of previous authors, as well as by Lukan, O.M. approach, which views sales activities as a set of procedures for promoting finished products to the market and organizing payment for them (Lukan, 2017). He characterizes sales not only in terms of distribution, goods movement, and sales, but also from the perspective of marketing and financial aspects.

The starting point for the effective implementation of sales and the management of its costs can be considered the approach of Zasadnyj, B.A., Bashkin, I.E., which

demonstrates a strategic vision and the content of activities in the implementation of the enterprise's tactical tasks (Zasadnyj and Bashkin, 2019). The costs incurred in the sales process determine the amount of profit, the efficiency of all operations, the enterprise's competitiveness, and its market status; therefore, they require special attention from managers.

The first approach to interpreting selling expenses views them as analogous to a company's general expenses. This approach is prevalent among foreign experts (Plaksiienko and Romanchenko, 2019), who emphasize their monetary form and intended purpose, and sometimes equate them with the cost of goods sold. Some foreign authors, defining selling expenses as a company's general expenses, note that the period in which they are incurred and the period of their recovery may not coincide, which is important for determining the amount of profit. Others introduce the concept of "opportunity" costs, considering not only accounting but also economic costs.

The second approach is represented by domestic researchers who define the concept of selling expenses more specifically, linking them directly to sales activities. For example, some authors define them as the use of funds for product sales, without distinguishing between production and selling expenses. Others focus on the expenditure of labor, material, financial, and other resources specifically for the purpose of sales, which somewhat narrows the essence of these costs to the sales stage and overlooks other operations of sales activities. At the same time, a number of scholars note the formation of costs at all stages of sales activities, rightly emphasizing their productive nature and interconnection with the final stage of the product life cycle.

Scholars propose various approaches to grouping costs depending on the focus of the analysis. For example, there is a well-known classification of sales costs by categories corresponding to the business processes of sales activities and their management: product warehousing and inventory storage, packaging, transportation costs, and sales management costs (Akimova et al., 2018). The first three groups reflect specific sales activities, whereas administrative expenses do not allow for a separate distinction between sales and direct management components. In addition, the author proposes dividing sales expenses into additional and net expenses, which makes it possible to classify them by the nature of the activities – production-related and non-production-related.

By classifying costs by the nature of operations (production/non-production, administrative, marketing), the author distinguishes between primary and additional sales costs, as well as marketing costs, giving priority to the latter, since, in her opinion, the results of sales activities depend to a large extent on the effectiveness of marketing measures. The idea of classifying marketing expenses as a separate category is also supported by other scholars, who view compliance with regulatory requirements as an advantage of such a grouping. The marketing aspect also dominates in Sadovska I., Nahirska K., Kulaj O. classification (Sadovska et al., 2024).

At the same time, we consider I. R. Polishchuk's proposal to separately classify "expenses for the development of marketing, product, and pricing policies regarding the renewal of the product range" to be controversial and inappropriate. In our opinion, these

costs are an integral part of overall marketing expenses, can be controlled within the framework of the enterprise's management accounting, and the timely renewal of the product range is a natural tool of marketing activity for achieving its goals.

The modern economic environment requires agricultural enterprises to actively use market-based management methods, which requires new approaches to the management system of the process of marketing agricultural products. The formation of such a system should ensure the adaptation of enterprises to changes in the external environment in order to increase sales efficiency.

An important condition for the successful operation of enterprises is to achieve the optimal level of production costs, which will increase the competitiveness of products and become a real achievement of long-term economic growth of enterprise productivity. The costs of the enterprise were always and are still remaining a significant economic category that characterizes the results of the enterprise and its profitability.

According to UAS 16 "Expenses", expenses are defined as a decrease in economic benefits due to the disposal of assets or an increase in liabilities that result in a decrease in equity (excluding a decrease in equity due to owners 'contributions). By type of activity, costs and revenues are divided into costs and revenues from ordinary and extraordinary activities. In turn, ordinary activities are divided into operating, financial, and investment. Accordingly, operating expenses are grouped by function - production costs (sales), management costs, sales and other operating costs.

In other words, direct labor costs include: basic salaries of production staff of the enterprise, accrued to workers and employees at tariff rates, piece rates, salaries, including wage indexation, as well as labor costs of freelancers who perform work, related to production; the cost of products issued in kind to workers employed in crop production; allowances and surcharges to tariff rates and salaries, including salaries for night work, for combining professions, expanding service areas; the cost of food, products that, in accordance with the law, are provided free of charge to employees at enterprises in certain industries; payment of annual leave and other additional payment; one-time annual award; remuneration of freelance workers for the work performed in accordance with civil law contracts, including the contract, provided that the settlements with the workers for the work performed are carried out directly by the enterprise.

Other direct costs include all other production costs that can be directly attributed to a specific cost item, including social security contributions, rent, depreciation, etc. When grouping costs, the object of cost accounting should be understood as the product that needs to determine the costs associated with its production.

Indirect costs are costs that cannot be allocated directly to a particular cost item in an economically feasible way, and therefore require apportionment. To be included in the cost, these costs must be distributed among the objects of accounting. Therefore, in practice, they are often called those that are distributed, and according to the UAS "Costs" - total production costs. Current costs include costs associated with the production and sale of products for this period. This is usually the bulk of production costs.

To determine the cost of production (exhausted costs) we should emphasize the

difference between costs of production and costs of the period. Product costs are the costs associated with producing or purchasing products for sale. In the manufacturing sector, such costs include all costs associated with the production consumption of production factors. Period costs are costs that are not included in the cost of inventories and are treated as costs of the period, when they are incurred (administrative, marketing costs, other operating and extraordinary costs).

When making a management decision on any business transaction, a distinction should be made between relevant and irrelevant costs. Relevant costs are costs that can be changed as a result of making a management decision, and irrelevant - do not depend on such a decision. According to the degree of dependence on the volume of activities, costs are divided into fixed and variable costs.

Variable costs are costs that value changes in proportion to changes in production (output). Hence, the amount of these costs per unit of output remains constant.

Fixed costs include costs, the value of which does not change or almost does not change (relatively fixed costs) when changing the volume of production.

Any costs are variable costs if their value depends on the volume of production. This means that increasing the number of manufactured products by 10 times will increase the total amount of variable costs tenfold. One of the interesting aspects of variable cost behavior is that variable costs remain constant per unit of output. However, there are some peculiarities due to the fact that when buying, for example, materials in large quantities, you can get a discount (this option is always considered and analyzed by managers).

As a result, the monetary cost of the material per unit of output decreases with the growth of production and the growth of wholesale purchases. It is clear that such a change occurs only when crossing a certain "limit" of production growth. However, more often the behavior of variable costs is described in the above classic example. Note, that even after crossing this "limit" the behavior of variable costs does not change - we just have a different value per unit of output. Practice shows that not all variable costs change in direct proportion to the change in activity.

Semi-variable costs are costs that change, but are not directly proportional to the change in activity. Examples of such costs are the cost of purchasing materials subject to a discount in the case of purchasing a large batch, and the cost of time per unit of output, which gradually decreases with increasing skills (so-called experience curve).

A significant part of semi-variable costs is mixed costs, that contain an element of both variable and fixed costs. A typical example of variable costs is the telephone fee, which includes fixed costs in the form of a subscription fee and variable costs - a fee for the duration of calls.

Fixed (conditionally fixed) costs are costs, the total amount of which remains unchanged when the volume of activity changes. These include rent payments, depreciation, etc. Regarding the behavior of fixed costs, it should be said that fixed costs per unit of output change inversely proportional to the change in activity.

A certain part of fixed costs behaves as fixed costs within certain limits of production, but at the intersection of certain points of its growth also changes in the direction of

increase. Examples are the cost of maintaining administrative staff and the cost of maintaining and operating equipment.

Fixed costs are fixed only within the relevant range of activities and at a certain time. Relevant range is the range of activities within which the interconnection between the amount of costs and their factor remains steady. For example, rental costs will increase if the increase in production requires additional space. Conversely, rental costs may decrease if the decline in production encourages the company to use less space.

In many cases, when you reach a certain level of activity, costs change dramatically, by leaps and bounds. Such costs are called semi-permanent or incremental.

Semi-fixed costs are costs that change incrementally as the volume of activity changes. An example of such costs is the salary of repair workers, provided that for the maintenance of each 1000 machine-hours of equipment requires 1 worker.

Thus, in a short period of time, costs can be variable (semi-variable) and fixed (semi-permanent). But over a long period of time, all costs tend to change, i.e. fixed costs become semi-permanent and change gradually.

The most cost-effective approach to building a cost accounting system is to identify typical groups of solutions (such as controlling labor costs or the use of materials) and selecting appropriate cost accounting items (such as products or departments). Legislative separation of accounting into financial and managerial has led to a debate in the scientific community, and currently there is no single approach to disclosing the essence of management accounting. Thus, some scholars believe that managerial accounting is a part of accounting, the main task of which is to account for production costs and product costing, others present management accounting as an integrated information system that combines planning, rationing, production organization and more.

Thus, O. Machulka notes that costs are defined as an element of activity, if incurred, then documented. I.B. Sadovska notes that the expenses of a certain period are determined simultaneously with the recognition of income for which they were made. If the expenses cannot be directly related to the income of a certain period, they are reflected in the expenses of the reporting period in which they were incurred. In addition, he puts forward the concept of costs to determine the financial result. Inexhaustible costs are reflected in the assets of the balance sheet, and exhaustible costs - in the statement of financial performance.

The idea of implementing a system of management documentation of production costs deserves attention (Tubolets, 2012). This will reduce the amount of primary documentation (due to the abolition of internal invoices), excessive costs and production costs, quickly determining the stage of the technological process at which losses occur, which significantly increases the responsibility for spending resources.

In the course of research of theoretical bases of the account and control of sales activity, it was established that the important organization of efficiency of economic activity is the accurate organization of sales policy. In this context, the proposal to develop a model of sales policy of an agricultural enterprise deserves attention.

Thus, it can be argued that the efficiency of the enterprise largely depends on timely

and complete information on operating costs, which can provide only an accounting system based on the existing legal framework.

Accounting for sales activities at enterprises has always been and still remains a topical issue, because the transformation of commodity assets of the enterprise into cash plays an important role in the production process. It is carried out on the basis of the product sales process. At the stage of marketing products, companies reimburse their costs, sell the value of the additional product and receive a corresponding profit. Sales of products - is to determine the feasibility of economic activity of enterprises and quantitative and qualitative assessment of their labor.

Clarification of the essence of sales activities by stages and functional elements and expanding its boundaries requires changes in the organizational system and management of the economic process. This requires the creation of an appropriate sales information system - the collection, processing and synthesis of primary data for internal and external users, providing feedback between the elements of the economic mechanism.

Traditional methods of accounting and control of sales operations are not able to meet the needs of management in relevant information (regarding the choice of optimal and effective methods and techniques of sales promotion, identifying products that require additional efforts to promote them on the market). In such circumstances, operational control and sales management becomes more complicated.

Analysis of costs by elements allows one to study their composition, to determine the specific weight of each element, the share of living and tangible labor in total production costs. In the general management model of sales policy at the enterprise, the leading place is occupied by the account and control of sales activity that will provide reception of positive financial results. An in-depth analysis of the classification of costs gives grounds to determine that the costs of sales relate to the operating costs of the reporting period on a company's expenses in financial accounting and their presentation in financial statements are established by Accounting Standard 16 "Expenses." According to this standard, selling expenses include costs associated with the sale of products, goods, work, and services, and define their composition.

The Methodological Recommendations on the Formation of Expenses and the Procedure for Their Planning in Commercial Activities, approved by Order of the Ministry of Economy of Ukraine No. 226 dated March 2, 2010, detail the structure of selling expenses and provide explanations for each item. A comparative analysis of the list of selling expenses under PAS 16 and the aforementioned Methodological Recommendations reveals certain differences between them.

To organize the accounting for selling expenses, it is recommended to apply the Methodological Guidelines to the extent that they do not conflict with PAS 16. At the same time, to enhance the informative value of accounting data, it is advisable to classify selling expenses. In this regard, it is advisable to introduce clear classification groups for selling expenses at the legislative level, which will enhance the effectiveness of synthetic and analytical accounting.

Academic studies propose dividing selling expenses into two main categories –

“selling expenses” and “marketing expenses” – by opening separate subaccounts under account 93 “Selling Expenses.” However, this approach is feasible only if there is a detailed analysis of how expenses are allocated to marketing activities or directly to sales. For example, the salaries of sales and marketing department employees must be recorded separately in the corresponding subaccounts, which requires a clear distinction between expenses.

In the author’s view, business entities have the right to independently determine the classification of selling expenses, taking into account the specifics of their operations, industry characteristics, regulatory requirements, and other factors. The academic literature also proposes various approaches to grouping such expenses, including:

- primary, secondary, and other;
- selling and marketing expenses;
- primary and auxiliary, travel expenses, etc.;
- expenses for warehousing, storage, product packaging, transportation, and sales management.

Grouping expenses into relevant categories helps simplify the organization of synthetic and analytical accounting, strengthens cost control, and enables their timely analysis during the reporting period, rather than only after the preparation of financial statements. The classification of selling expenses is consistent with the requirements of Accounting Standard 16 “Expenses,” which means it complies with current regulatory provisions. At the same time, the company has the right, if necessary, to expand the list of selling expense items, taking into account the specifics of its operations and business conditions.

The main advantages of the proposed approach include:

- the formation of five groups of selling expenses based on specific criteria, which simplifies the organization of accounting;
- the separation of marketing expenses into a separate group;
- the availability of separate accounting objects for each group;
- improved control over selling expenses through group accounting;
- a more structured presentation of information on selling expenses, enabling their analysis both within individual groups and as a whole;
- improvement of the organization of synthetic and analytical accounting, making it more rational and effective.

It is advisable to plan selling expenses based on data from previous periods, with subsequent adjustments to reflect changes in market conditions. As an example, we will examine the first proposed group of selling expenses, breaking them down into individual items. The practical value of the proposed statement lies in the fact that it contains the necessary information for managing selling expenses and also enables their control and analysis in both the current and reporting periods. Expenses for which no budgeted figures have been established should be analyzed by comparing them with similar expenses from several previous periods.

The proposed statement provides a clear overview of selling expenses for any period,

which facilitates management decision-making and analysis. In practical use, it does not require additional data processing by management personnel. The control function is implemented through the figure in the third column of the statement: its total must match the data in the General Ledger, Journal 5, the Income Statement, and the Notes to the Financial Statements.

To strengthen control over selling expenses, it is also advisable to organize their accounting by responsibility centers. This necessitates the development of additional accounting registers to summarize expenses by responsible departments and determine the actual amount of selling expenses as of the date of preparation of the financial statements for the enterprise as a whole.

The sales process is influenced by uncertain risks due to market conditions, prices and other factors that are beyond the reach of enterprise management. It is established that risk is one of the main factors influencing the formation of profits. This makes it necessary to predict the level of risk of entrepreneurial activity of agricultural enterprises.

According to the considered provisions, accounting and audit of expenses of sales activity should provide:

- correct definition and reliable classification of operating costs;
- correct delineation of costs by type of activity;
- correct and complete documentation and timely reflection in the registers of sales costs;
- complete, reliable and unbiased information on marketing costs for management purposes;
- observance of legislative acts in the formation of information on costs incurred;
- completeness and reality of the reflection of sales costs in the reporting of the enterprise;
- correct determination of costs in accordance with the accounting policy of the enterprise;
- correct allocation of costs to the relevant reporting periods;
- completeness: whether all actually incurred expenses are reflected in the reporting;
- assessment: the correctness of determining costs in accordance with the adopted accounting policy;
- correctness of reflection: verification of costs in relation to their reality and accuracy of reflection and belonging to the current reporting period;
- affiliation: whether all reflected costs belong to the enterprise;
- legality: compliance with laws, instructions, regulations and other regulations
- to determine and reflect costs;
- reliability: compliance of cost indicators with primary documents;
- consistency: consistency of cost determination methods during the reporting period;
- compliance: attribution of costs to the relevant reporting period in which they were incurred.

An important role in conducting clear financial and economic activities is the establishment and compliance with the company's accounting policies. Accounting policy is a

set of methods and procedures used by the company to prepare and submit financial statements, i.e. the company's choice of certain and specific methods, forms and techniques of accounting based on current business rules and characteristics of the enterprise.

Constant (from year to year) application of the chosen accounting policy, in other words - consistency - one of the basic principles of accounting, established by Art. 4 of the Law of Ukraine "On Accounting and Financial Reporting in Ukraine" (1999). However, this does not mean that by determining the approaches to accounting for assets or liabilities, the company will no longer have the right to change them. This possibility is provided in paragraph 9 of UAS 6 "Correction of errors and changes in financial statements". It is allowed to transform the accounting policy in situations when:

- the statutory requirements of the enterprise change;
- the requirements of the body that approves the accounting regulations (i.e. the Ministry of Finance) change;
- the changes will provide a reliable reflection of events or transactions in the financial statements of the enterprise.

The first two cases are almost rare.

Changes in accounting policies that accurately reflect the events or transactions in the entity's financial statements are made if, in the accountant's opinion, the use of new accounting policies will more accurately disclose the entity's financial statements.

The standards do not specify the specific cases when it is necessary to change the accounting policy. Therefore, if the regulations that introduce changes in accounting policies prescribe the date of their start, it is from them that they will have to start. However, it is necessary to remember one of the basic principles of accounting, given in Art. 4 of the Law of Ukraine "On Accounting and Financial Reporting in Ukraine" are sequences. That is, the constant annual application of the company's chosen accounting policy, which can be changed only in exceptional cases.

Note: for each single year, you can not re-sign the order of accounting policies, but make changes to the current (basic) policy. The Ministry of Finance recommends in this regard: "The administrative document on accounting policy can be adopted as a base for the time of the enterprise, which, if necessary, changes from a certain time" (see the above-mentioned letter to the Ministry of Finance № 31-34000-10-5 / 27793). If the changes cover most of the text or significantly affect its content, the accounting policy should be set out in full in a new version.

The consequences of the change in accounting policy are due to p. 11 - 13 UAS 6. Accounting policies should be applied to events and transactions from the moment they occur, except when this is not possible (paragraphs 11 and 13 of UAS 6). That is, we will have to review the operations for which new approaches have been chosen, for the entire time of their implementation and re-perform all the calculations as if they were used in the enterprise from the beginning.

When changing the accounting policy, it is necessary to determine its impact on the events and operations of previous periods. This is done by adjusting the balance of retained earnings at the beginning of the reporting year and re-providing comparative

information on previous reporting periods (paragraph 12 of UAS 6). If the amount of retained earnings at the beginning of the reporting year cannot be determined reliably, the accounting policy applies only to events and transactions that occurred after the date of the change in accounting policy.

It should be noted that not every change in the accounting policy order falls under the definition of changes in accounting policies. A striking example is the change in the depreciation method. Although it is prescribed in the order of accounting policy, it is nothing more than a change in accounting estimates. This position was confirmed by the Ministry of Finance in a letter dated November 2, 2009 № 31-34000-20-23-5535 / 5708. Therefore, changes in accounting policies should be clearly distinguished from changes in accounting estimates. If it is impossible to distinguish, it should be considered as a change in accounting estimates, accounting for which is only promising (paragraph 14 of UAS 6).

At the researched enterprise, the Order on accounting policy is approved annually. Let's analyze which provisions on cost accounting should be reflected in the Order on Accounting Policy, taking into account the legislative changes in 2012:

1. List and composition of articles for calculating the production cost of products (works, services).

In accordance with paragraph 11 of UAS 16 "Costs" companies must set them independently. This paragraph specifies that the production cost includes:

- direct material costs;
- direct labor costs;
- other direct costs;
- variable overhead and fixed allocated overhead costs.

Despite a number of legislative inconsistencies in the accounting of general production costs in 2011, these rules will remain unchanged. They are included in the production cost in both accounting and tax accounting (paragraph 138.8 of the TCU).

2. List and composition of variable and fixed overhead costs (basic and additional salaries of general production staff and contributions to social activities; costs of water supply for the technological process; energy costs of the technological process, etc.). On the basis of item 16 of UAS 16 "Costs" the enterprises should establish them independently.

3. Base for the distribution of variable and fixed overhead costs.

According to paragraph 16 of the UAS, variable overhead costs are allocated to each cost object (account 23) using the distribution base (hours of work, wages, volume of activity, direct costs, etc.), based on the actual capacity of the reporting period. Fixed are established for each cost object using the distribution base (hours of work, wages, direct costs, etc.) at normal capacity. Unallocated fixed overhead costs are included in the cost of goods sold, works, services (account 90) in the period of their occurrence.

Since for the purposes of determining the tax cost of overhead costs are also subject to distribution between production cost and cost of sales, determining an adequate distribution base is a question relevant to tax accounting.

4. Normal production capacity of structural units (units of output, volume of work performed and services provided, etc.) is the basis for the distribution of fixed overhead costs, which will be used for both accounting and tax purposes.

5. Defect cost rates.

It is better to state this information in the separate order on the enterprise. After all, according to paragraph 138.7 of the TCU, enterprises have the right to independently determine the allowable norms of technically inevitable marriage in the order of the enterprise, provided that its size is justified (to be taken into account when determining the object of taxation). Such norms, independently established by taxpayers, are in force until the adoption of the relevant norms of the Cabinet of Ministers. At the present moment, such norms have not yet been established.

6. The period of creation of qualifying assets.

UAS 31 "Financial costs" refers to qualifying assets that require significant time to create. However, it does not specify this segment. Hence, the conclusion that companies can determine it themselves.

The Ministry of Finance recommends considering a qualifying asset, the creation of which takes more than three months (letter of the Ministry of Finance dated 01.06.06 № 31-34000-10-5 / 11601).

This will also affect the accounting of financial expenses in tax accounting (paragraph 138.10.5, paragraph 146.5 of the TCU). This is where it is necessary to follow the recommendations of the Ministry of Finance, as self-employment leads to tax risks.

Documentation is the first stage of accounting, that includes: registration and recording of information regarding facts, transactions, processes, its processing and generalization. Relevant primary documents are provided for documenting business transactions. According to the Regulation on Documentary Support of Accounting Records, approved by the order of the Ministry of Finance of Ukraine dated 24.05.1995 № 88 primary documents are drawn up on standard forms approved by the Ministry of Statistics of Ukraine, as well as on specialized forms approved by ministries and departments of Ukraine.

Primary documents must be drawn up at the time of the transaction, and if this is not possible, it must be immediately after its completion. They must be timely received by the accounting department and contain complete and accurate information on each transaction. The structure of the document flow should be such as to ensure the timely receipt of the necessary information for both accounting and control and operational management of product movement.

Depending on the needs of informational support of the managerial system, the stages of organization of primary accounting of sales activities, requirements for the initial registration of sales operations, as well as the features of documenting sales transactions through different channels are revealed (Fig. 1.5.1).

Sales cost data can be obtained by checking primary documents and accounting records.

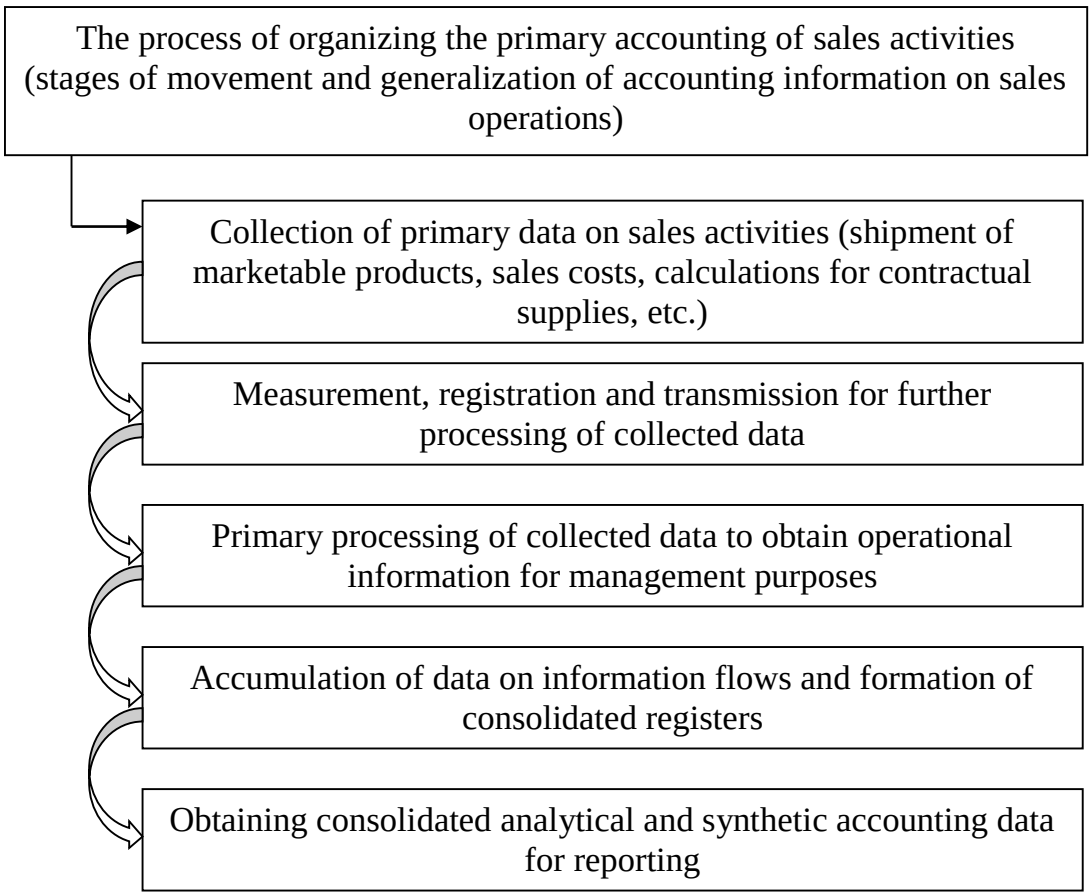


Fig. 1.5.1. Stages of organization of primary sales accounting in operating activities

In accounting, the sales process is divided into parts with a separate reflection of income, cost of goods sold and financial results of sales. The study found that marketing costs are aimed at market research, market conditions, study changes in demand for products, and sales costs are limited and are aimed primarily at meeting the needs of consumers in the sale of products. Their volume and structure are determined by market conditions, the specifics of marketable products, consumer demand, strategic goals of the enterprise.

Remuneration of employees is calculated based on the amount of revenue from the sale of goods or time worked at the enterprise in accordance with the timesheet, contracts with sellers and documents on the proceeds.

On the basis of primary documents on labor remuneration, a consolidated statement of accrual and distribution of labor remuneration and deductions from it by objects of accounting is compiled on a monthly basis.

Disinfectants, low-value and perishable items and other materials are released to the wholesale warehouse or shop on the limit-withdrawal cards for receipts and invoices, and written off by relevant acts.

If employees engaged in the sale of goods, receive funds for business trips or in the report, then in a timely manner, they must submit to the company's accounting a certain

list of documents.

The initial stage of the organization of the primary accounting of settlements with accountable persons is registration of the order of the head of the enterprise.

The order is the main document for sending an employee on a business trip. Without it, as we have already found out, the trip will not be considered a business trip. According to item 1.1 p.1 Instructions on business trip in the order reflect:

- destination;
- the name of the enterprise where the employee is sent;
- term of business trip;
- its purpose.

In addition, it indicates the names and positions of seconded employees. The general provisions of the Instruction on business trip give the head of the enterprise the right within the limits of norms at own discretion to limit the sums and the purposes of use of the means given out on business trip. At the same time, the manager may decide to reimburse the costs, that according to regulations is not necessary to reimburse, or increase the amount of daily allowances. This is reflected in the order.

In addition to the order, an estimate of business trip expenses is added. The General Provisions of the Instruction on Business Trips state that the company is obliged to provide the business trip in advance in the amounts established by regulations. Its amount is determined by cost estimates.

There are five categories of travel expenses:

1) daily (expenses for food and personal needs of the employee);
2) for the travel to the place, back and at the place of business trip;
3) for accommodation, taking into account the services provided in the hotel;
4) to pay telephone bills;
5) for the issuance of passports, visas, compulsory insurance, transfers, payment of taxes and fees and other costs associated with the rules of entry and stay at the place of business.

The money under the report is issued for travel expenses, purchase of various materials, small household, postage and other expenses. At the same time, it is necessary to adhere to the current rules for regulating cash circulation. An advance is issued to the accountable person in the amount necessary for the implementation of the planned measures, and only if the accountable person has no arrears on previously issued amounts. An advance is issued on the basis of a cash disbursement order or payment statement if the money is issued to several persons at the same time. Therefore, when issuing an advance on a payroll, the cash disbursement order should be issued not for each employee, but for the total amount of cash issued from the cash register. The accountable person has the right to spend the advance only for the purposes for which it was issued. In case of transfer of funds from the current (currency) account, the money under the report is issued on the basis of a payment order of the established form.

Justifying documents for the expenditure of cash for household needs can be:

- regarding the acquisition of material values: cash receipt of the purchase registrar

and delivery note to the warehouse; invoice, tax invoice, consignment note and documents for delivery of purchased property to the warehouse of the enterprise;

- regarding the work performed and services performed by the contractor: receipt of acceptance of money; the root of the profitable cash order and the act of acceptance-transfer of the performed works (services), etc.;
- regarding the costs of payment of wages for one-time work: employment agreement concluded with employees and executed in the prescribed manner, the statement of accrual of wages and deductions from employees;
- other documents - depending on the purpose of business expenses and related business transactions.

Electricity, heat, water supply and sewerage are supplied to the company in accordance with the concluded agreements.

In accordance with the concluded contracts, suppliers issue invoices for these services (heat, electricity, water supply). As they pay, they issue tax invoices and deeds.

After receiving documents from utility providers, the company's accounting department calculates utilities, according to which part of the utilities refers to a specific object of accounting (administrative costs, sales costs, other costs).

For the protection of the premises of the enterprise enters into contracts for the protection of each object (warehouse, shop, office).

Contracts are also concluded for advertising goods in the media. According to the acts of work performed, the corresponding amounts are related to selling expenses. Similar documents are drawn up and performed in work on the current repair of warehouses and shops, freight forwarding services, if they are performed by contractors. Packaging materials, materials spent on the repair of containers, are written off by relevant acts.

In some cases, when organizing sales activities, "Nika LLC" insures its goods. Insurance contracts are concluded about this and insurance policies are received from the insured, the amounts paid for them are also included in sales costs.

During the sale of goods there are costs directly related to the sale: wages of sellers, loaders, transport work, depreciation of fixed assets (trade equipment, retail space, cash registers), heating, lighting, etc. All of them refer to sales expenses, which are recorded in the active account 93 "Sales expenses". The debit of the account reflects the amount of recognized costs of sales (costs of packaging materials, transportation of products, goods under the terms of the contract, costs of marketing and advertising, wages and commissions to sellers, sales agents, sales staff, depreciation, repair and maintenance of fixed assets, etc. tangible non-current assets used to ensure the sale of products, goods, works and services) on the loan it is used a write-off to account 79 "Financial results".

Account 93 "Sales Costs" records and accumulates sales costs.

Analytical accounting of sales costs of the enterprise is conducted in the information in terms of cost items and economic elements. When organizing the accounting by cost centers, the relevant registers are kept in the context of warehouses and services related to the sale of finished products.

The general method of accounting for sales costs by elements is similar to the method of accounting for production costs. That is, at the first stage the elements of costs are formed, at the second stage they are written off to the financial results.

In the internal accounting, it is determining the possibility of direct or indirect allocation of costs to the relevant type of product. Indirect costs are shared between individual products.

Data from the registers of analytical accounting are transferred to the journals-orders, where, at the end of the month, the final data are transferred to the general ledger, which calculates the turnover on debit and credit of each account.

The general ledger is used to summarize the data of journals-orders, mutual verification of records made on individual accounts and compiling the balance sheet. Due to the fact that the cost of sales affects the financial result, it is advisable to distribute these costs between individual types of products sold outside financial accounting. In this case, the costs can be distributed monthly as follows:

а) general expenses - between types of sold products in proportion to its production cost;

б) transport costs (if the share is significant) - by type of products sold, they are simply written off at the end of the month.

As a result of the research, it is established that the current accounting model reduces the analytical value of the cost indicator, complicates the pricing process. It is necessary to provide for the possibility of separate accounting of direct and indirect costs of marketing and sales activities in order to adjust the cost of sales in the amount of direct sales costs.

The reflection on account 90 shows only the production cost of the product and automatically suspends the monitoring of the economic process at the stage of production and does not allow to fully reflect the sales activities that involve additional measures to promote the product on the market and, consequently, mandatory additional costs.

Based on this, the approach to changing the name and purpose of account 90 from "Cost of sales" to "Commercial cost" is noteworthy. This will make it possible to improve the method of accounting for the costs of sales activities, which are reflected in accounts 90 "Cost of sales" and 93 "Costs of sales" (Zasadnyj and Bashkin, 2019, p. 216).

The results of the study indicate the need to deepen the analytical accounting of sales to improve the management and control of sales activities. Analytical accounting should provide the opportunity to analyze the proceeds from the sale and choose the best of the available and possible areas of sale. In this case, the quantity, quality and effectiveness of analytical information will depend on the reality of the presentation of economic processes, during the implementation of which provides income and determine financial results.

When studying the peculiarities of the organization of analytical accounting, it was found that sales activities, providing the opportunity to obtain financial results, are on the border of external and internal environment of the enterprise. Other economic processes (supply, production) significantly depend on sales policy (markets).

The place of sales activity in the environment of economic formations through the

system of analytical accounting requires the separation of accounting data for internal and external users (primarily for reporting) and strengthening the internal control of the sales process. To do this, it is proposed to organize analytical accounting of income and expenses separately by areas, regions of sale, market segments.

According to the results of the study in analytical accounting, it is advisable to identify significant aspects of the sales process. They should be considered as separate economic categories: the number of marketable and sold products, cost of sales, the amount of revenue and income, marketing costs, profit and loss. Other concepts and categories can be attributed to the objects of accounting, provided that they are potentially useful to consumers of accounting information.

Criteria for analytical detailing of accounting data to determine the financial results of sales in the operating activities of agricultural enterprises may be: the direction of information flows (external, internal); objects of analytics (enterprise as a whole, departments (shops, teams), types of marketable products); time periodization (for a certain period, on the current date); cost categories. This practice will allow organizing an effective system of management accounting and internal reporting at the enterprise, significantly increase the quality of internal control.

For the purpose of formation of operative analytical data on a course and results of sales activity, it is expedient to use the Information of the account of expenses of sales activity and the Statement of the account of sales on channels. Their management will provide an opportunity to control sales costs at the main stages of the sales process (from forecast market research to control sales activities), assess the feasibility of their implementation. The information can be used as a form of internal reporting on sales transactions.

The accounting system, which is based on the use of highly efficient computer technology, is a special form of accounting that meets modern management requirements. A wide range of software products for automation of accounting for different types of enterprises poses a difficult task for potential consumers: to choose the best solution from many unfamiliar, unusual options and their combinations. The basic capabilities of the program must meet the needs of the enterprise. Therefore, before choosing a future system, it is important to determine what activities the company is engaged in and in what areas it operates.

The researched enterprise does not use software in the organization of accounting processes. In order to test the automation of the studied area of accounting, we will take as a basis the configuration "Accounting of an agricultural enterprise for Ukraine". Operation of such a module is possible only with the platform "Enterprise".

The main functionalities of the program:

1. Accounting and tax accounting in accordance with national standards of Ukraine.

2. Ensuring the solution of all tasks facing the accounting department of the enterprise: from the processing of primary documents to the formation of regulated reporting.

3. Tax accounting in the context of several types of VAT (optional): separate books of sales, purchases, VAT returns are formed.

4. Analysis of other sales, gross income and expenses.

The following areas of accounting are automated in the configuration:

1. Accounting in crop production. As part of the improvement of the accounting system, the concept of a "technological operation" is being introduced. Source documents reflecting the performance of work are generated based on standardized technological operations, ensuring their uniformity and ease of processing. The software environment defines the structure of cultivated areas with the ability to visually display them as a graphical map of fields. Expenses related to the preparatory stages of production are tracked with detailed breakdowns by specific fields, crop types, and expense categories. Additionally, mechanisms for the proportional allocation of costs based on area have been implemented, as well as tools for analyzing them and determining actual cost levels, which enhances the soundness of management decisions.

2. Accounting for mutual settlements on land lease (accounting for shareholders). Implemented automatic calculation of charges and deductions. Payment is made via all possible ways: non-cash, cash, finished products, goods. Implemented automatic calculation of charges and deductions.

3. Livestock accounting. Animals are taken into account in the summary account, in heads, in live weight. The accountant has the ability to display in the system all business transactions for the registration of animals from offspring to slaughter.

4. Accounting for transport and agricultural machinery. The program records waybills and registration sheets, keeps track of fuel, speedometer readings and balances in tanks, calculates fuel consumption according to standards, calculates piecework salary. In addition, it is possible to analyze the cost of maintaining the machine-tractor fleet of drivers, mechanics and their assistants.

5. Accounting for processing and ancillary production is implemented with the ability to calculate the actual cost and analyze the cost structure of finished products.

6. Accounting for other expenses. It is conducted in the context of divisions, objects (nomenclature groups) and cost items. The mechanism of distribution and analysis of costs, calculation of the actual cost of finished products is implemented.

7. Extended opportunities for salary calculation. Personnel accounting; system of flexible adjustment of types and groups of calculations; calculation of sick leave. Formation of standard and regulated reports. Payment of the calculated salary can be made both through the company's cash desk, through the bank card, and services, goods and finished products.

Automation of cost accounting is carried out in the following stages:

1) setting up an account plan;
2) setting up directories;
3) establishment of analytical accounting;
4) input of primary information;
5) receiving reports.

Directories are special tools that keep lists of the same type of accounting objects and store the parameters that characterize these objects. All directory objects have their own unique code, that allows the program to identify them, regardless of the values of other parameters, including the name. As a rule, each type of subaccount corresponds to a separate directory.

For example, the list of employees of the enterprise is stored in the directory "Employees", and to enter fixed assets is used directory "Non-current assets", to save information about the costs of the company use the directory "Types of costs". Each field in the "Document" or "Operation" dialog has a certain type of value. If this type is a number, string, or date, you can fill in this field directly from the keyboard. And if this type is a directory item, then when you access this field, a list of items in the directory will automatically appear, from which the accountant must select the desired value. In addition, the elements of most directories are characterized not only by the name but also by a set of other parameters. For example, for fixed assets it is - inventory number, initial cost, accounting account, depreciation account and depreciation item, commissioning date, etc. These parameters can be automatically used by the program when generating postings and printed forms of documents.

The list of directory items in the program can be multileveled. In this case, all directory lines will be divided into two types: directory items and directory groups. Groups allow you moving to the lower levels of the multilevel directory. The use of multi-level directories allows you to detail the degree of input and storage of information. Items and groups of items in a multilevel directory can be transferred from one group to another. The program allows you to create multi-level directories with nesting up to 10 levels.

Within a single directory, different items can be grouped together, so it's a good idea to group them before you start filling in the directories. The main criteria for grouping should be certain criteria that is used to analyze the accounting information (receive reports). Groups of elements, in turn, can be divided into subgroups (which is very convenient for setting up standard accounting reports) so that they reflect the state of economic assets by individual groups.

You can perform various actions on items and groups of items in the directory:

- to change the name;
- to change the values of details (parameters);
- to move from one group to another;
- to destroy (mark for destruction);
- to perform a search by name and other details;
- to sort, copy, etc.

This configuration makes it possible to track all income and expenses of the organization in terms of several types of activities carried out by the organization, carried out in the directory "Activities".

In this work, we use the directories "Activities" and "Types of costs". In most cases, the type of activity is indicated directly in the forms of those documents that form the postings of income or expenses. Accordingly, at the end of the month, financial results

will be obtained independently of each activity.

In some cases, the type of activity is strictly defined for directory items. For example, for each employee (in the directory "Employees") must be specified the type of activity to which will be the cost of calculating the employee's salary.

If we do not need to keep records of individual activities, we will leave one element of "Main activity" in this guide. Let's fill the constant "From default activity" with this element of the directory. After that, today's type of activity will be substituted in one requisite on all requisites and directories.

The "Types of costs" directory contains a list of types of costs. The directory is used both when editing documents and for analytical accounting of accounts (in our example, accounts 91 and 92).

The directory has a three-tier structure. For each element of the directory you should enter the name and specify the account to which at the end of the month will be written off the amount of expenses under this article. This information will be used when conducting the document "Financial results" in the mode "Closing cost elements".

The checkbox "Applies to overhead costs" is an indication that the current expense item is the analytics of account 91 "Overhead costs". Each transaction contains one or more postings that reflect the business transaction in accounting in kind and in monetary terms. Each posting, in turn, may consist of one or more correspondences. Postings that contain multiple conversations are called complex. In complex postings, the debit of one account corresponds to the debit of several accounts, and vice versa.

A typical operation template is used to perform standard operations. Creating a template of a typical operation is in the mode «Accounting», which allows the accountant to debug the program according to their needs. The program provides the most effective means of entering postings on the facts of economic activity - the compilation of correspondence accounts for documents.

Two documents are provided to automate the accounting of inventories or services related to the company's sales costs. The first of them is "Income invoice", the entered income invoices are stored in the journal of the same name. The second is "Incoming invoice" is entered upon receipt of an invoice from the supplier, in case of prepayment, this document can play the role of an order.

If there is no prepayment, i.e. stocks received from the supplier and only then will be paid, then the entry of the document "Incoming invoice" is optional. In this case, the role of the order during payment is played by the "Agreement" or the same "Income invoice", which is accounted for stocks at the company. If the supplier issued an invoice and this invoice was paid before receiving the goods (prepayment), you must use the document "Incoming invoice". Then, in the case of obtaining inventories, you should enter "Income invoice" on the basis of the document "Incoming invoice". To automate the write-off of inventories for marketing costs, the company is assigned the document "Write-off of goods and materials".

Completing the form of this document should begin with the selection of the warehouse from which to write off inventories (for example, fuel warehouse №2), the

expense account to which will be written off the book value of objects (account 93), the relevant articles of the analyst of this account. You should also indicate the reason for the write-off, which will be required for the formation of the printed form of the act of write-off. To automate the receipt of initial and reporting information related to the calculation of the amount of deductions and deductions, in the typical configuration of the program "Accounting", provides the appropriate document: "Payroll".

Using the document "Payroll" it is possible to perform several operations:

- payroll to employees of the enterprise;
- formation of advance accrual information;
- entering the information base, the balances of settlements with The document "Account Card" is regulated and intended for the following operations: closing the accounts of overhead costs and determining the final financial result of the enterprise, i.e. closing all accounts of income and expenses (accounts class 7.9) to the relevant subaccounts 79 account.

Each of these transactions corresponds to a certain stage of determining the financial results of the enterprise (the mode of operation of the document) and is set directly in the details "Determination of financial results" of its dialog form. At the stage of "Determination of financial results" is the write-off of the balance of accounts of income and expenses of the enterprise to the relevant subaccounts of account 79 "Financial results".

Analytical accounting is conducted to obtain more detailed information on the availability and movement of funds of the enterprise. The very opportunity of analytical accounting and the number of its possible sections on one account is determined in the process of configuring the program. Maintenance of analytical accounting for a specific account is determined by the establishment of subaccounts, which is set in the Chart of Accounts. If for the account of analytical accounting is set using a set of types of subaccounts, then such analytical accounting is called multilevel. On the other hand, analytical accounting can be multi-level, if one of the subaccounts of the account is a multi-level directory.

In the program " Accounting" there is an opportunity within one synthetic account to receive several systems of analytical accounts, which, in turn, comprehensively reflect the primary information. In each system of analytical accounts, information is grouped and summarized for management purposes according to a certain principle determined by the types of subaccounts. Analytical accounting can be maintained for any account for the subaccount and include from 3 to 5 different sections of analytics, while organizing the conduct of analytical accounting in the required sections. On account 93 "Sales costs" analytical accounting is conducted in terms of activities and types of costs.

The program implements the ability to work with both regulated and standard reports. A set of standard reports is included in the default configuration. Standard reports are a holistic system that allows you to generate some reports based on others, detailing the report data. They are designed to obtain data on the results of accounting entries in different sections. Such reports may be prepared using the Chart of Accounts used in the program, regardless of the content and purpose of specific accounts. Standard reports can be used to obtain both generalized and detailed information on any areas of accounting.

CHAPTER 2. MODERN FINANCIAL TECHNOLOGIES AND DIGITAL FINANCE: PRACTICAL AND THEORETICAL ASPECTS

2.1. IMPACT-ORIENTED BUDGETING IN THE AGRICULTURAL SECTOR: FROM EXPENDITURE FINANCING TO SUSTAINABLE DEVELOPMENT OUTCOMES

Svitlana Kachula,
Doctor of Economic Sciences, Professor, Professor of the Department of Finance, Banking and Insurance,
Dnipro State Agrarian and Economic University, Dnipro, Ukraine

The conditions of martial law and the urgent need to restore the productive capacity of Ukraine's agricultural sector create a demand for fundamentally new financial instruments. Traditional public support mechanisms, which were largely oriented toward increasing output volumes, are increasingly misaligned with current economic realities and the strategic course toward European integration. At this stage of financial system transformation, a revision of the basic principles underlying the allocation of limited budgetary resources is unavoidable. A gradual shift toward a new paradigm is evident: approaches focused on maintaining existing systems are giving way to models based on transformative investment. While conventional budgeting emphasized the quantitative distribution of funds to sustain institutional functioning, the impact-oriented approach reorients attention toward achieving measurable and long-term societal outcomes. Consequently, the analytical focus extends beyond the mechanics of financing to the promotion of structural changes capable of generating tangible economic, environmental, and social effects.

Reconsidering fiscal policy in the agricultural sector also requires a re-evaluation of how financial inputs are linked to actual outcomes. Traditionally, effectiveness has been assessed through indicators such as fund absorption rates or overall production growth. However, these metrics provide only a partial understanding of real results. They tend to overlook delayed and indirect consequences, including environmental degradation, transformations in rural social structures, and long-term productivity trends. Therefore, reliance on narrowly defined quantitative indicators leads to a fragmented and often insufficient assessment of public policy effectiveness.

Contemporary challenges, such as climate change, soil depletion, global market instability, and demographic decline in rural areas, necessitate more advanced approaches to evaluating budgetary policy. Mechanisms focused solely on supporting production are no longer adequate for achieving strategic development objectives, particularly those related to resilience and sustainability. Moving toward a results-oriented model of financing requires consideration not only of immediate economic returns but also of broader systemic changes affecting environmental and social dimensions.

A key feature of the agricultural sector lies in the close interconnection between economic outcomes, ecological conditions, and the quality of human capital. Increasing

production intensity without maintaining ecological balance may generate short-term benefits, but it simultaneously creates long-term risks associated with land degradation and depletion of natural resources. In a similar way, insufficient attention to social development in rural areas weakens labor reproduction processes and limits the sector's innovative potential. For these reasons, budget policy must be approached from a multidimensional perspective.

Ensuring that financial decisions are aligned with sustainable development goals requires the incorporation of multidimensional evaluation criteria into the budgeting process. The integration of such approaches improves both the efficiency of public expenditure and its ability to drive systemic change. In this context, the study of impact-oriented budgeting gains particular importance, as it provides a conceptual and methodological basis for linking fiscal instruments with long-term development priorities.

The evolution of budgeting approaches entails a reconsideration of the very economic nature of public finance. In the traditional paradigm, budgetary resources have largely been perceived as instruments for financing current expenditures and ensuring operational continuity. This logic is typically based on the assumption that increasing funding will directly stimulate output growth, often without sufficient attention to qualitative outcomes. However, the orientation toward sustainable development requires a different interpretation, where public finance is viewed as an investment tool capable of generating integrated value across economic, environmental, and social domains.

Advancing toward sustainability-oriented outcomes presupposes a fundamental transformation in the logic of public finance management. The conventional cost-focused model is gradually being replaced by an investment-based approach, within which budgetary resources serve as drivers of systemic change. Under such conditions, financial allocations are no longer limited to maintaining existing processes but are increasingly directed toward achieving clearly defined transformations in key development dimensions. This shift prioritizes the creation of added value while simultaneously safeguarding natural capital and strengthening the social resilience of rural areas.

In this context, particular importance is attached to the multiplier capacity of budgetary instruments. Public expenditures begin to generate not only immediate sectoral outputs but also indirect effects that extend to related industries and systems. Investments in resource-efficient technologies provide a clear example, as they simultaneously enhance productivity, improve soil conditions, and reduce energy consumption. Such combined effects lead to long-term environmental and economic benefits. Accordingly, methodological approaches to evaluating public expenditure effectiveness are evolving, with analytical emphasis moving away from the volume of financed activities toward their contribution to strategic sustainable development goals.

The introduction of results-oriented financing is also associated with the development of feedback mechanisms that connect future budget decisions with previously achieved outcomes. This creates the foundation for an adaptive budgeting system capable of responding to changing conditions in the agricultural sector while supporting its long-term resilience and stability.

At the same time, growing external volatility, the intensification of climate-related challenges, continued depletion of natural resources, and rising societal demands for transparency in public finance management all necessitate more sophisticated analytical instruments for assessing budgetary policy. Financial tools traditionally aimed at maintaining production and ensuring short-term stability are becoming less effective in an environment where the success of government interventions is determined primarily by the quality of outcomes rather than the scale of expenditures. In parallel, integration into the European economic space introduces additional requirements, compelling national budgetary policy to align with the principles of sustainability, efficiency, and institutional accountability.

The agricultural sector should be viewed as a complex system that integrates economic activity with ecological conditions and the social structure of rural territories. Productivity within this system is inherently dependent on the interaction of these components. Such interdependence limits the applicability of simplified financial regulation models and reduces their practical effectiveness. When systemic approaches to assessing the consequences of budgetary decisions are underutilized, this leads to the gradual accumulation of structural imbalances, weakening long-term competitiveness and increasing environmental risks. Under these conditions, the analysis of impact-oriented budgeting becomes particularly relevant, as it allows a shift from fragmented assessments toward a comprehensive evaluation of the outcomes generated through public support.

The growing emphasis on results-based public financial management, combined with the need to justify the effectiveness of budget expenditures and intensified competition for limited financial resources, creates a solid basis for further development of the theoretical and methodological foundations of the impact-oriented approach. Its application in agriculture is driven by the need to develop instruments capable of linking short-term managerial decisions with long-term strategic objectives. These objectives include strengthening the resilience of production systems, preserving natural capital, and improving the quality of life in rural areas.

At the conceptual level, the impact-oriented approach reflects a gradual departure from a linear model of resource allocation. It is being replaced by a more complex governance system that focuses on achieved results. Traditionally, the budget has been interpreted mainly as a mechanism for financing sectoral needs. Within the impact framework, however, it is redefined as a strategic investment instrument. This shift is accompanied by changes in evaluation logic, where attention moves from the volume of resources used to the nature and scale of the outcomes achieved. Such an approach aligns with the concept of a value creation chain, in which final economic, environmental, and social effects, as well as their consistency with sustainable development goals, become central to analysis.

A clear distinction between the concepts of performance and impact is essential for a coherent analytical framework in agricultural policy. In practice, these categories are often treated as interchangeable, despite their fundamental differences.

Performance is typically assessed over a shorter time horizon and reflects the extent to which planned indicators (usually quantitative) are achieved, such as the number of beneficiaries or total area covered. Impact captures broader and longer-term transformations, including structural changes like land-use diversification and the transition toward production models aligned with climate neutrality.

The current provisions of the program-target method, as stipulated in Article 20 of the Budget Code of Ukraine (Budget Code of Ukraine, 2026), already include certain elements of performance evaluation. However, in comparison with the broader analytical potential of impact-oriented budgeting, the scope of this method remains relatively constrained. The focus of analysis gradually shifts from formal compliance with planned measures to the actual consequences they generate, particularly in terms of improvements in living standards and environmental quality. At the same time, the specific features of agricultural production complicate the direct measurement of such outcomes. Seasonality and the extended duration of investment cycles are especially relevant in this regard. For instance, the effects of investments in soil fertility restoration often become visible only over long time horizons, which necessitates more flexible and adaptive budgeting approaches.

The strong dependence of agriculture on natural and climatic conditions further increases uncertainty and highlights the need to incorporate adaptive mechanisms into budget programs. In this context, the concept of impact should be interpreted more broadly, encompassing not only observable positive outcomes but also the prevention of potential losses and the preservation of existing production capacity. This expanded interpretation is supported by analytical evidence presented in studies conducted by NISS (NISS, 2026).

At the same time, the social dimension of agricultural policy remains critically important. Public expenditures serve as instruments for promoting inclusive development, supporting demographic stability and strengthening social cohesion. Budgetary resources can also function as catalysts for mobilizing private investment in environmentally and socially responsible initiatives (EY Global, 2026). Although the existing regulatory framework, including Order No. 836 of the Ministry of Finance and Resolution No. 918 of the Cabinet of Ministers, provides a basis for evaluating budget programs, it remains largely focused on quantitative indicators. This limits its ability to capture broader and more complex impacts. In this regard, digital platforms, particularly the State Agrarian Register (State Agrarian Register, 2026), play a key role in enhancing impact monitoring. The integration of geospatial data and satellite technologies enables real-time tracking of actual changes, thereby improving both transparency and the targeting of public support.

Particular attention should be paid to the development of digital infrastructure, especially the State Agrarian Register, which serves as a critical technological foundation for assessing the real effects of public financing. Its application significantly increases transparency and accuracy in the allocation of state support, creating the conditions necessary to identify actual outcomes at the level of individual agricultural producers. The expansion of digital tools facilitates a transition away from purely formal statistical

reporting toward the analysis of observable changes as they occur, based on satellite data and geospatial analytical systems. In this context, impact-oriented budgeting acquires an additional functional dimension, acting as a mechanism for generating long-term value and ensuring consistency between short-term financial decisions and broader strategic objectives related to the recovery and sustainable development of the agricultural ecosystem.

Determining an effective budgeting model for the agricultural sector requires a comparative analysis of alternative conceptual approaches, particularly impact-oriented and gender-responsive frameworks. In Ukraine, gender-responsive budgeting has already been formally institutionalized and integrated into the regulatory system. At the same time, practical implementation indicates that the existing methodological tools are not always sufficient to address complex and multidimensional challenges, especially those associated with ecosystem-level transformations in the agro-industrial sector.

The development of gender-responsive budgeting is closely linked to the need to incorporate the principles of equality and non-discrimination into the processes of public resource allocation. It is grounded in the understanding of the budget as a policy instrument that reflects the socio-economic priorities of the state and generates differentiated outcomes for women and men. Within this perspective, budgetary decisions are assessed in terms of their effects on various social groups, which requires a systematic analysis of resource distribution, access to public services, and opportunities for participation in economic and social life (Karpych, 2021). Particular attention is given to identifying structural imbalances shaped by institutional, economic, and cultural factors, as well as evaluating whether fiscal policy mitigates or reinforces these disparities.

The methodological framework of gender-responsive budgeting integrates both qualitative and quantitative approaches, including the development of indicator systems to measure the gender sensitivity of budget programs. Embedding these tools across all stages of the budget cycle, from planning to evaluation, allows for a more nuanced consideration of the needs of different population groups. This contributes to more informed decision-making and a more balanced allocation of financial resources. However, the predominant focus on social aspects constrains the analytical scope of this approach in areas where economic, environmental, and institutional interactions are critically important, as is particularly evident in the agricultural sector.

Applying gender-responsive budgeting in agriculture requires attention to sector-specific factors, such as employment structures, access to land, availability of financial instruments, and the state of production infrastructure among different groups within rural communities. Women in rural areas often face barriers to participation in management processes, as well as limited access to credit, modern technologies, and state support programs. These constraints affect not only individual opportunities but also the overall performance of the agro-industrial sector. Integrating a gender perspective into agricultural budget programs promotes a more equitable distribution of resources, supports employment, and contributes to the development of human capital in rural areas. At the same time, a focus limited primarily to social considerations does not fully capture

the complexity of interactions among economic, environmental, and technological factors that shape current sectoral dynamics.

The impact-oriented approach, by contrast, is centered on evaluating achieved results and the long-term effects of public policy, bringing together multiple dimensions of development within a single analytical framework. Its application focuses on identifying causal relationships between budgetary decisions and their influence on socio-economic and environmental processes, as well as assessing progress toward strategic development goals. This approach enables a more comprehensive evaluation of resource efficiency, taking into account not only equity in access but also the overall contribution of financial instruments to structural transformation within the sector. Emphasis on multidimensional outcomes, systematic evaluation, and long-term effects allows for a clearer understanding of the limitations of gender-responsive budgeting and highlights the need to consider broader analytical models. An important advantage of the impact-oriented framework in contemporary conditions is its ability to provide an integrated perspective on agricultural development by combining economic, environmental, and social components within a unified analytical structure. Focusing on final outcomes and their long-term implications supports more effective prioritization of budgetary policy, improves the assessment of resource use, and helps mitigate risks associated with environmental degradation and production instability. While gender-responsive budgeting remains a valuable tool for promoting social equity, its use as the primary framework for the agricultural sector does not offer sufficient analytical depth or a strong strategic orientation toward sustainable development.

Gender-responsive approaches are primarily focused on promoting inclusiveness and ensuring equal access to resources for both women and men, which represents a fundamental objective of public policy. In contrast, impact-oriented budgeting offers a more comprehensive analytical framework by integrating economic outcomes, environmental sustainability, and long-term development effects. Consequently, while gender-responsive budgeting plays a significant role in enhancing transparency and fairness in resource allocation, its application as a standalone analytical model is limited under current conditions. An exclusive focus on gender dimensions constrains the ability to fully assess the effectiveness of budgetary policy, particularly in terms of its contribution to economic resilience and environmental security. The transition requires a comparative analysis of alternative frameworks, such as gender-responsive and impact-oriented budgeting (Table 2.1.1).

A key methodological advantage of the impact-oriented approach lies in its capacity to assess not only how public support is distributed among beneficiaries but also how such support transforms the system in which it is applied. The analytical perspective shifts from identifying recipients to examining the influence of allocated resources on the structural development of the sector as a whole. Within the framework of the agricultural sector Development Strategy (Ministry of Economy of Ukraine, 2026), this orientation appears well substantiated. It enables the identification of multiplier effects, including contributions to environmental security and energy independence, which are often not

visible within short-term analytical horizons. Moving beyond a purely quantitative perspective broadens the scope of budget evaluation and supports alignment with the strategic objectives of European integration.

Table 2.1.1

Comparative characteristics of budgeting approaches

Comparison criterion	Gender-responsive budgeting (GRB)	Impact-based budgeting (IBB)
Object of attention	Ensuring equal rights and opportunities for women and men	Systemic changes in the agricultural sector and related ecosystems
Key indicator	Number of recipients by gender; gender pay gap levels	Added value, soil condition, energy efficiency levels
Sphere of influence	Mainly social: inclusion and fair distribution of resources	Economic, environmental, and food sustainability
Role in the agricultural sector	Analysis of access of different groups (including women farmers) to resources	Assessing the industry's ability to recover, adapt, and develop itself
Evaluation horizon	Short and medium term	Mostly long-term, with delayed effects

In practical terms, implementation of this approach is closely linked to ongoing digital transformation processes. The use of the State Agrarian Register facilitates a transition from formal reporting to more meaningful monitoring practices, including the assessment of soil quality and crop yield dynamics. Such indicators provide a more reliable representation of the actual outcomes of public policy. International experience further confirms the relevance of adopting an impact-oriented model. ESG standards (Green Transformation Office, 2026) are increasingly shaping the conditions under which investment decisions related to Ukraine’s recovery are made. A focus on long-term outcomes allows for a more comprehensive evaluation of the agricultural sector’s contribution to food and environmental security, as also highlighted in analytical studies by NISS (NISS, 2026).

The need to reform the system of state support is largely driven by accumulated contradictions within existing subsidy mechanisms. Although these mechanisms previously proved effective, their limitations have become more apparent over time. The traditional model, primarily based on quantitative indicators such as per-hectare or per-livestock payments under CMU Resolution No. 918, once played a significant role in stimulating production growth. However, it is no longer capable of ensuring progress toward sustainable development goals. A narrow focus on quantitative criteria may even produce negative effects, including the expansion of extensive farming practices, insufficient attention to soil restoration, and the persistence of outdated technologies.

Accordingly, revising budgetary policy approaches becomes necessary, with a gradual shift from monitoring resource utilization to evaluating the outcomes and structural changes generated by those resources. Contemporary academic research

suggests that direct financial support without a clear link to qualitative results may foster dependency among agricultural producers (Huang, 2025), thereby reducing incentives for innovation and the adoption of environmentally sustainable technologies. Experts from the National Institute for Strategic Studies emphasize that in the context of postwar recovery, state support should evolve into a system of targeted investments, where each unit of public funding is directed toward achieving a clearly defined socially significant outcome (NISS, 2026).

Establishing a coherent system of impact indicators is therefore a critical step in modernizing the budgeting process within the agricultural sector. The proposed methodological framework is based on a logical value chain that connects initial resource allocation with the generation of final impact outcomes (Fig. 2.1.1).

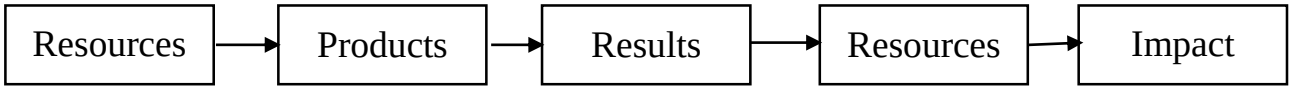


Fig. 2.1.1. Logic model for transforming budget resources into strategic impact of sustainable development

Application of such a logical framework makes it possible to trace how public investments contribute to the achievement of strategic state objectives across several interrelated dimensions. From an economic perspective, this involves increasing the added value of agricultural output and strengthening export potential, thereby enhancing the financial autonomy of producers.

The environmental dimension encompasses measures aimed at restoring soil fertility, reducing emissions, and expanding organic production in line with the objectives of the green transition.

At the same time, the social dimension is reflected in the creation of stable employment and support for family farming as a foundation of rural development.

Digital technologies provide the methodological basis for real-time measurement of these indicators.

The introduction of impact-oriented budgeting not only improves transparency in the use of public funds but also facilitates alignment with international ESG standards and expands access to global capital markets. Embedding this approach within the program-target framework, as defined by Ministry of Finance Order No. 836, creates the institutional preconditions for a substantive transition toward sustainable agricultural development.

Historically, state agricultural programs have operated within a linear financing paradigm, where effectiveness was assessed primarily through the rate of budget execution. However, contemporary sustainability priorities necessitate a conceptual shift toward an impact-driven policy model focused on measurable outcomes. Under such an approach, the budgeting process should be oriented not around available financial

resources, but around clearly defined social or environmental objectives, such as improving soil quality or strengthening community resilience.

Modernization of the monitoring system is equally essential. Traditional program documentation, which is largely limited to recording financial outputs such as issued loans, should be replaced by impact mapping instruments. These tools enable a structured differentiation of results across three analytical levels: immediate outputs, including the scale of financial support and number of beneficiaries; medium-term outcomes, such as technological changes in production and growth in added value; and long-term impacts, including ecosystem stabilization, improved food security, and progress toward climate neutrality. The transition to medium-term budgeting cycles of three to five years, as provided for by Article 33 of the Budget Code of Ukraine, is critically important in this context, given that many sustainability-related effects, such as biodiversity restoration or structural export changes, manifest over extended time horizons. Accordingly, impact-oriented programs require stable and predictable financing throughout their full implementation period.

The digital transformation of the agricultural sector, particularly through the State Agrarian Register (SAR), has evolved beyond its initial function as an application platform to serve as a central instrument of financial transparency. Within an impact-oriented framework, the register enables detailed tracking of public expenditures at the level of individual land plots and specific production activities.

Achieving full traceability of targeted outcomes necessitates the integration of the SAR with complementary digital systems. These include geographic information systems, which allow real-time verification of land conditions using satellite data; agricultural monitoring platforms adapted from European practice for assessing farm income and environmental performance; and electronic land cadaster systems, which ensure automatic validation of ownership and land-use rights, thereby preventing the allocation of funds to informal or unregistered activities.

The transparency ensured by integrated digital platforms significantly reduces information asymmetry between public authorities and agricultural producers. The creation of individual digital impact profiles for each recipient enables a more automated and data-driven allocation of resources. In this context, budgeting mechanisms become increasingly oriented toward efficiency, directing financial support to those farms that demonstrate measurable progress in environmental performance and social outcomes.

In addition, the accumulation of verified digital data on the use of public funds creates a foundation for the development of green credit ratings for agricultural producers. Such ratings can facilitate access to international financial resources under more favorable conditions, thereby strengthening the investment capacity of the sector.

The introduction of green budgeting within agriculture requires a clearly defined methodology for classifying programs according to their contribution to sustainable development objectives. This involves adapting established international practices of environmental auditing to the national context. Expenditure classification should differentiate between initiatives that generate positive environmental effects, those with

neutral impact, and those that may contribute to resource depletion. Such categorization should be integrated at the stage of budget planning, where program administrators are required to substantiate the environmental justification of proposed expenditures. Adherence to the "do no significant harm" principle should function as a mandatory criterion in the selection of programs, effectively transforming the budget into an instrument of strategic environmental governance.

The application of green budgeting provides policymakers with a more accurate understanding of the environmental implications of public spending. For instance, a predominance of expenditures classified as neutral or environmentally detrimental would indicate structural imbalances in agricultural policy and signal the need for its revision. Under these conditions, the budget process evolves from a purely distributive mechanism into a strategic planning tool, where the state assumes a proactive role in shaping the long-term trajectory of the agricultural sector, aligning financial incentives with ecosystem conservation goals.

A structured framework for classifying agricultural expenditures can be developed in accordance with the typology outlined in Table 2.1.2, which systematizes budget programs based on their sustainability impact.

Table 2.1.2

Hierarchy for labeling agricultural budget expenditures

Expense category	Description of the impact on sustainable development	Example of a budget program
Favorable	Direct support for environmental practices and regeneration	Organic farming, forest belt development, biogas plants
Conditionally positive	Technological modernization that reduces the burden on the environment	Loans for energy-efficient equipment, precision farming
Conditionally positive	Technological modernization that reduces the burden on the environment	Loans for energy-efficient equipment, precision farming
Neutral	Administration and basic education costs that have no direct impact	Staff training, record keeping, statistical observations
Unfavorable	Subsidizing practices that lead to resource depletion	Benefits for pesticide use, support for monoculture production

The transition to such a model necessitates deep institutional transformation and a reconfiguration of interactions among key stakeholders. Instead of fragmented or conflicting approaches between financial and sectoral authorities, the impact-oriented paradigm fosters coordination around shared development objectives. Within this framework, the Ministry of Finance increasingly operates as a strategic investor, assessing expenditures in terms of their long-term value creation. At the same time, the sectoral ministry is required to enhance its analytical capabilities and justify funding requests through robust projections of environmental and social outcomes. This transformation

also imposes new competency requirements on public officials, including proficiency in spatial data analysis, the ability to evaluate external effects, and the capacity to communicate policy outcomes transparently and effectively.

Institutional configurations within the public finance system are undergoing a profound shift. Functions historically centered on control and compliance are progressively being replaced by a more strategic model of resource governance. In this context, the Ministry of Finance increasingly assumes the role of a capital allocator, evaluating expenditures through the prism of their long-term impact rather than limiting its mandate to procedural oversight. Concurrently, the Ministry of Agricultural Policy is expected to enhance its analytical capacity by preparing funding proposals that integrate not only production metrics but also projected environmental and social effects.

These transformations inevitably redefine the competency profile of professionals engaged in the budget process. There is a growing demand for specialists capable of transcending traditional financial analysis and combining it with comprehensive evaluation of policy outcomes. Core skills now include the assessment of externalities, particularly the ability to anticipate medium- and long-term impacts of budget interventions across related sectors. Proficiency in digital technologies is equally critical, including the use of geospatial data and the State Agrarian Register for remote verification. In addition, communication capabilities are becoming increasingly important, as experts must clearly articulate the societal value of public expenditures and justify decisions on the basis of transparent, evidence-based reasoning.

Impact-oriented budgeting should therefore not be interpreted as a purely technical adjustment to existing financing mechanisms. Rather, it represents a systemic transformation that reshapes decision-making processes at all levels, from institutional design to the operational behavior of individual stakeholders.

For Ukraine, in the context of its European Union accession trajectory, the strategic task extends beyond the formal incorporation of selected provisions of the Common Agricultural Policy for the 2023-2027 period. Greater importance lies in internalizing its core logic, which prioritizes the financing of ecosystem services over traditional income support. The experience of European countries demonstrates that meaningful reform in agricultural budgeting is achievable through the combination of coherent institutional arrangements and adaptable financial instruments. In practice, this is reflected in mechanisms such as green payments, which link financial support to compliance with environmental standards. Their effective adaptation to national conditions requires the development of a robust digital ecosystem capable of ensuring transparency and enabling funding decisions based on verified outcomes.

The effectiveness of these transformations can be evaluated using a budget conversion coefficient that reflects the capacity of each unit of public expenditure to generate additional economic value alongside measurable social and environmental outcomes. Empirical evidence from countries such as Poland and Romania supports the practical applicability of this approach. In both cases, budgetary systems were

progressively reoriented away from financing current expenditures toward instruments that promote investment-driven growth and support long-term development objectives.

The Polish case demonstrates the benefits of early and coordinated institutional consolidation. The creation of the Agency for Restructuring and Modernization of Agriculture made it possible to move beyond direct income transfers toward financing structural transformation and expanding processing capacities.

By contrast, the Romanian approach placed stronger and more consistent emphasis on social inclusion, particularly among small-scale farmers. This contributed to preserving stability in rural areas, although it also constrained the pace of growth in value-added production. In both countries, instruments such as the Single Area Payment Scheme (SAPS) and environmentally oriented direct payments operated as impact-based tools, linking financial support to the provision of ecosystem services. A comparative overview of these models, including their applicability within an impact management framework, is presented in Table 2.1.3.

Overall, the experiences of Poland and Romania highlight the practical relevance of impact-oriented approaches and offer useful guidance for the development of Ukraine's policy model.

Table 2.1.3

Institutional parameters of agricultural subsidies transformation: experience of Poland, Romania and guidelines for Ukraine

Comparison parameters	Poland (investment and technology)	Romania (Socio-Environmental)	Ukraine (impact-oriented)
Baseline institution	ARiMR (centralized agency)	APIA (Paying Agency)	Digital ecosystem (DAR + block chain)
Budgeting vector	Vertical integration and export	Horizontal Community Resilience	Post-war regeneration and ESG compliance
Control toolkit	IACS system and GIS monitoring	Administrative Audit and Photographic Recording	Smart contracts and satellite monitoring
Key result	Increasing the share of added value	Biodiversity Conservation	Soil restoration and energy autonomy

At the same time, the reliability of such assessments depends critically on the availability of high-quality data covering economic, social, and environmental outcomes:

$$C_{bc} = \frac{\Delta V_{add} + \sum E_{ext}}{B_{\exp}}$$

in this context

ΔV_{add} - reflects the increase in gross value added within the agricultural sector;

$\sum E_{ext}$ - represents the aggregated environmental and social effects;

B_{exp} - denotes the total volume of public support, including both direct and indirect expenditures.

This indicator combines economic and non-economic dimensions, thereby enabling a more comprehensive evaluation of budget efficiency.

Empirical findings from Poland suggest that the highest values of the budget conversion coefficient are typically associated with projects characterized by short supply chains and a high level of technological intensity. In Romania, a stronger analytical focus on environmental and social outcomes facilitated the reallocation of financial resources toward environmental protection measures, which proved particularly important for sustaining economically vulnerable and geographically disadvantaged regions. For Ukraine, the incorporation of these approaches into the National Strategic Plan should be guided by the principle of accelerated technological upgrading, with a strong emphasis on digital tools to ensure transparency, efficiency, and clear orientation toward measurable results.

Comparative analysis of Polish and Romanian practices also indicates that the successful implementation of impact-oriented subsidy mechanisms depends not only on institutional capacity and digitalization but also on the availability of flexible financial instruments capable of generating tangible effects at both farm and community levels (European Union, 2026). This logic is reflected in recent reforms of the Common Agricultural Policy for the 2023-2027 period, particularly through the introduction of eco-schemes. These instruments are based on voluntary participation, whereby farmers receive financial support in exchange for commitments that exceed minimum environmental standards. European experience highlights several defining features of such mechanisms. First, financial support is increasingly contingent upon verified outcomes rather than mere participation. In several countries, including Austria and France, payments are disbursed only after confirmation of measurable improvements, such as enhanced biodiversity or better water quality. Second, flexibility is a key characteristic, allowing these instruments to be adapted to regional specificities and to support a wide range of agricultural practices, from high-precision technologies to traditional extensive systems.

The principle of conditionality plays a pivotal role in shaping modern agricultural support systems. Access to core forms of public funding is increasingly contingent upon compliance with established environmental standards, including those related to good agricultural and environmental condition. The adoption of similar mechanisms in Ukraine would facilitate the progressive alignment of national budgetary policy with European regulatory frameworks. At the same time, such instruments create incentives for agricultural producers to adapt to evolving requirements, improve production practices, and ultimately gain access to a wider range of European support mechanisms.

Considerable opportunities for applying impact-oriented budgeting also emerge within the context of decentralization, particularly at the level of rural communities. Local populations directly experience both the economic benefits and environmental

consequences of agricultural activity. At the same time, large agricultural enterprises often intensively utilize local resources, such as land and infrastructure, while contributing relatively little to local development and, in some cases, generating significant ecological pressure. An impact-oriented framework offers an alternative by enabling local authorities to deploy more flexible fiscal tools, including differentiated land taxation based on sustainability criteria or employment generation. Greater participation of community members in setting budget priorities further enhances this approach. Such measures support a gradual shift away from raw-material export models toward the development of local processing and higher value-added activities. The introduction of community-level impact profiles represents an important step in this direction, broadening evaluation beyond production metrics to include indicators of human capital development and the condition of natural resources, thereby enabling a more comprehensive assessment of long-term territorial outcomes.

At the same time, the implementation of systemic reforms in public finance is inevitably associated with a range of risks. One of the most significant concerns is the potential distortion of data or the superficial classification of expenditures as impact-oriented without the generation of real outcomes. Addressing these risks requires strict adherence to evidence-based principles, ensuring that program classification is supported by independent evaluation and transparent data sources. The involvement of academic institutions and civil society in public monitoring processes enhances the credibility of assessments and contributes to a more objective evaluation of budget effectiveness. Alignment with internationally recognized reporting standards further strengthens confidence in impact-oriented policies and improves transparency for external stakeholders.

Risks of distortion may arise at multiple stages of implementation. Common challenges include inaccuracies in reporting, whether intentional or unintentional, such as misrepresentation of soil conditions or improper reporting of plant protection practices. Additional vulnerabilities stem from the absence of unified and scientifically grounded evaluation criteria, which opens the door to subjective interpretation when classifying programs as environmentally beneficial. Another important issue is the displacement effect, whereby public funding substitutes for private investment without generating additional economic or social value.

Mitigating these risks requires a consistent and system-oriented approach to the organization of impact-based budgeting. A central element is the application of the evidence principle, ensuring that expenditure classification is based on independent assessments conducted by qualified environmental and social auditors. Transparency can be significantly enhanced through the establishment of open monitoring systems, including the publication of relevant data from the State Agrarian Register in accessible formats, while respecting necessary security constraints. Such measures expand

opportunities for independent analysis and enable alternative evaluations of program effectiveness by researchers and civil society organizations.

A comprehensive assessment of information technologies in agriculture requires moving beyond a narrow, instrumental view. Digital tools should be regarded not merely as supportive mechanisms but as fundamental elements of economic sovereignty. In this context, digital sovereignty refers to the ability of both the state and agricultural producers to manage data flows, control processing methods, and independently verify results. Such capacity is essential for building trust between public institutions responsible for allocating financial resources and the beneficiaries of those resources. The use of distributed ledger technologies creates an environment in which transactions are permanently recorded and resistant to unauthorized alteration. Automated disbursement of funds based on verified impact indicators enhances both transparency and operational efficiency. Moreover, directing public investment toward areas with high regenerative potential ensures that financial resources generate maximum environmental and social returns, thereby supporting the transition to more sustainable and technologically advanced agricultural systems.

At the same time, centralized data management models exhibit a number of inherent limitations. These include dependence on administrative oversight, vulnerability to technical failures, and insufficient transparency in value creation processes. In this regard, the increasing attention to distributed ledger technologies is well justified. Blockchain should be understood not only as a technological innovation but also as a governance instrument that enhances the credibility of publicly financed outcomes. Through decentralized data validation, it ensures that each record is verified by multiple participants and cannot be altered retroactively, thereby strengthening trust and minimizing the risks of fraud or data manipulation.

The practical relevance of blockchain is particularly evident in its capacity to provide end-to-end traceability across production chains. Each stage of the process, from land preparation to final product distribution, can be documented through secure digital records, forming a comprehensive and verifiable dataset. Such traceability enables the integration of economic, environmental, and social indicators within a single analytical framework. Enhanced transparency, in turn, expands the possibilities for impact-oriented budgeting by allowing precise monitoring of fund allocation, evaluation of achieved outcomes, and timely identification of areas requiring adjustment. Furthermore, automated verification procedures reduce administrative burdens and improve accountability for all stakeholders, including public authorities, producers, and society at large.

The integration of blockchain with complementary digital technologies, such as resource monitoring systems, sensor networks, and analytical platforms for assessing socio-environmental performance, substantially broadens its functional scope. Within these interconnected digital ecosystems, real-time data on production activities, financial

flows, and program outcomes becomes available, enabling more informed and responsive decision-making.

Overall, the application of blockchain technologies supports a shift away from traditional control-based oversight toward governance models grounded in transparency, reliability, and efficient resource allocation. These characteristics are critical for the successful implementation of sustainable development strategies and impact-oriented budgeting. Smart contracts further reinforce this transformation by automating key financial procedures. Budgetary transfers can be executed automatically once predefined conditions, such as verified improvements in soil quality or reductions in emissions, are met through digital monitoring or satellite verification. This reduces dependence on subjective judgment and establishes a more objective, data-driven framework for evaluating policy outcomes.

Additional prospects arise from the application of tokenization mechanisms, through which verified environmental and social outcomes can be converted into digital assets. This approach broadens access to investment capital, including financing from international funds oriented toward environmental, social, and governance criteria. In this way, the agricultural sector can gradually shift from a passive recipient of subsidies to an active source of measurable sustainability outcomes. At the same time, preserving national control over data management and its practical use remains a critical condition for maintaining economic security.

The deployment of such a model requires not only technological advancement but also deep institutional transformation. Establishing unified standards and ensuring interoperability between domestic digital systems and international platforms are key prerequisites. In particular, linking the State Agrarian Register with global traceability infrastructures can substantially strengthen the competitive position of Ukrainian agricultural products in markets where transparency and quality assurance are decisive factors.

The integration of digital technologies with impact-oriented budgeting forms a fundamentally new operational logic within the agricultural sector. Under this approach, priority is no longer limited to production volumes but extends to verifiable societal outcomes. Assessing the effectiveness of public support in the context of global instability and external pressures necessitates moving beyond conventional accounting practices toward a more comprehensive evaluation of actual policy effects. Within this framework, impact-oriented budgeting translates environmental and social results into quantifiable economic indicators. The use of net impact valuation methods, which incorporate discounted flows of public goods generated by specific programs, provides a more robust analytical basis. Unlike traditional cost-benefit approaches, this methodology explicitly incorporates factors such as natural capital restoration, soil regeneration, and the preservation of agrobiodiversity, thereby aligning policy evaluation with the objectives of the 2030 Sustainable Development Agenda.

Modeling the outcomes of agricultural programs requires the application of regional resilience coefficients, which enable the assessment of funding efficiency in relation to local conditions and varying degrees of anthropogenic pressure. Each unit of public expenditure is evaluated in terms of its capacity to generate multiplier effects across related sectors and to facilitate a transition from raw material exports to higher value-added production systems. Validation of results is ensured through independent sustainability audits, reducing subjectivity in funding decisions and supporting compliance with international standards of transparency and reporting.

The expansion of positive effects within the agricultural sector is closely linked to the development of public-private partnerships, where public funding serves as a catalyst for mobilizing private investment in sustainable initiatives. Blended finance models enable risk-sharing between the state and private actors while channeling resources into strategically important areas, including technological modernization, irrigation infrastructure, and the rehabilitation of critical assets. An impact-oriented framework also encourages the adoption of climate-neutral production practices, which are essential for deeper integration into European markets. At the same time, it is necessary to ensure that public support mechanisms do not crowd out private investment, thereby preserving the principle of additionality for each unit of budgetary expenditure.

The introduction of this budgeting model is accompanied by a range of nontrivial risks. Among the most persistent are institutional inertia and the tendency to generate formally compliant sustainability reports that are not substantiated by real changes in production practices. Expanding digital oversight tools, together with the deployment of algorithm-based allocation mechanisms, can mitigate these vulnerabilities to a considerable extent. Data derived from the State Agrarian Register, when integrated with satellite monitoring systems, enables continuous verification of impact indicators and significantly constrains opportunities for manipulation. At the same time, adherence to the "do no significant harm" principle ensures that agricultural subsidies simultaneously support economic efficiency, environmental integrity, and rural development. The establishment of a comprehensive impact management framework thus enhances transparency and improves the overall effectiveness of public expenditures in fostering sustainable growth within the agro-industrial sector.

Advancing the integration of Ukraine's agricultural sector into the European Union's economic space requires a substantive revision of the legal architecture governing budgetary support. Particular importance is attached to the implementation of Regulation (EU) 2021/2115, which establishes the principles for national strategic planning under the Common Agricultural Policy for 2023-2027. A key challenge lies in replacing a compliance-oriented model, focused primarily on adherence to spending rules, with a system that evaluates both performance and long-term outcomes. In the Ukrainian context, this implies further development of the regulatory framework, including the formal

incorporation of impact indicators as obligatory criteria in the allocation of public subsidies.

Legislative harmonization also entails the introduction of enhanced conditionality mechanisms, whereby eligibility for basic payments is contingent upon compliance with standards of good agricultural and environmental condition. In practical terms, this requires the Cabinet of Ministers to design and approve a clearly structured set of eco-schemes aimed at incentivizing climate-neutral production practices. Institutionalizing such instruments reduces the likelihood of disputes in resource allocation and strengthens transparency for international stakeholders. The application of green tagging methodologies further reinforces this system by classifying public expenditures according to their contribution to the objectives of the European Green Deal.

The digital dimension of impact monitoring is being advanced through the modernization of the State Agrarian Register and its integration with the European Union's Integrated Administration and Control System. Recognition of the register as a unified and reliable data source enables automated verification procedures and lowers corruption-related risks. Satellite imagery and geospatial information systems provide objective evidence of compliance with impact-related commitments. This configuration not only simplifies administrative processes but also establishes a robust foundation for audits conducted by European institutions, which is essential for accessing structural funding instruments.

The evolution of financial instruments includes the growing use of blended finance models, in which public funds operate as leverage mechanisms to attract private investment into environmentally sustainable projects. Within this arrangement, the state extends its role beyond direct financing and acts as an institutional partner ensuring regulatory stability and predictability. Impact-oriented management of budget resources thereby becomes a catalyst for market transformation, facilitating the emergence of a technologically advanced agricultural sector. This transition requires a decisive shift from short-term stabilization measures toward long-term strategic planning and enhanced adaptive capacity. The updated model of financial support promotes innovation and strengthens the integration of agricultural producers into global value chains.

A critical element of this transformation is the establishment of an impact audit system focused on verifying actual socio-economic and environmental changes rather than formal procedural compliance. Analytical emphasis is placed on the dynamics of integrated indicators reflecting both community development and ecosystem conditions, necessitating coordinated interaction among all participants in the budget process. The application of evidence-based policy approaches enables timely adjustment of programs and more efficient targeting of resources toward initiatives with the highest transformative potential. In the context of food sovereignty, impact-oriented budgeting contributes to the expansion of domestic processing capacity and enhances the resilience of the national economy to external shocks.

Ensuring coherence within the legislative framework elevates impact-oriented budgeting from a pilot-level initiative to a fully institutionalized mechanism capable of supporting food security and strengthening long-term competitiveness in international markets.

The alignment of domestic policy with globally recognized sustainability standards enhances the external positioning of the agricultural sector. When instruments of public support are systematically connected with impact monitoring mechanisms, producers are better equipped to verify compliance with international requirements, thereby expanding their access to investment resources. In this context, budgetary policy evolves into an active tool for promoting national economic interests beyond domestic boundaries. Given the constraints on available financial resources, the productivity of each unit of public expenditure becomes critically important, and the impact-oriented approach offers a structured basis for prioritizing allocations according to demonstrated results.

Embedding these principles within governance systems ensures coherence of objectives both vertically and horizontally, extending from individual agricultural enterprises to the national economy as a whole. Territorial development initiatives based on impact indicators generate cumulative effects and support the formation of resilient agroecosystems.

At the same time, public disclosure of impact audit results, combined with regular reporting on expenditure effectiveness, strengthens institutional accountability and enhances public trust. As a result, transparency and evidence-based decision-making become defining features of a modern public finance system capable of supporting sustainable agricultural development.

The transition to impact-oriented budgeting should be understood as a complex and long-term transformation requiring coordinated engagement among public authorities, private sector actors, and the research community. This approach establishes the foundation for a qualitatively new governance model in which financial instruments are aligned simultaneously with societal priorities and environmental constraints.

Within such a framework, the agricultural sector assumes the role of a central driver of sustainable national development. Continued refinement of methodologies for assessing multidimensional impacts, alongside the introduction of sector-specific reporting standards, will enable the completion of the shift from expenditure-based financing toward a results-oriented system, ensuring macroeconomic stability and reinforcing the country’s competitive position in the global economy.

In a broader perspective, impact-oriented budgeting can be interpreted as a strategic instrument for restructuring the agricultural sector into a source of sustained value creation. The conceptual model outlined in this study supports a transition away from raw material export dependence toward innovation-led development, thereby enhancing international competitiveness and contributing to long-term economic resilience.

2.2. CONCEPTUAL FRAMEWORK AND EVOLUTION OF THE EUROPEAN UNION'S BUDGETARY POLICY AMID GLOBAL TURBULENCE

Larysa Brovko,
Ph.D. in Economics, Associate Professor, Associate Professor
of the Department of Finance, Banking and Insurance,
Dnipro State Agrarian and Economic University, Dnipro, Ukraine

At the current stage of integration, the European Union is one of the most powerful economic and political organizations in the world. A significant part of stability, competitiveness and sustainable development depends on effective budgetary policy within its framework. The EU's budgetary policy is not only a financial instrument or mechanism through which strategic priorities are implemented, including economic growth, social cohesion, environmental transformation, but also the basis on which financing is provided for common projects, regional support programmes for agriculture, scientific research, innovation, security and foreign policy. Due to the challenges of recent years - the COVID-19 pandemic, the war in Ukraine and the energy crisis, as well as increased migration processes - the common budgetary policy has played an important role. It was perceived as a key instrument for financial stability, as well as in establishing solidarity between Member States. With increasing global instability, the European Union needs a balanced and flexible budgetary policy. A policy that can respond to new socio-economic changes and challenges. The efficient allocation of financial resources between Member States and sectors of the economy is essential for increasing the transparency of the budgetary process, as well as for strengthening control over the use of funds. An analysis of the EU budgetary policy will help to assess the effectiveness of the mechanism, identify strengths and weaknesses, as well as areas for improvement based on current trends in the European financial area.

The budgetary policy of the European Union covers the legal, organizational and financial provisions for establishing, distributing and using funds from the common EU budget, as well as for spending funds effectively to achieve objectives. It does not simply define the financial framework within which policies can be developed at different levels between Member States; with further economic growth or integration; it is an instrument for exercising sovereignty over political matters between Member States (individually and collectively through their Common Parliaments) with further solidarity and economic growth or integration. This concept assigns the EU budget not only the role of a provider of resources, but also the role of a mechanism for creating "added value" at the European level, i.e. it finances those programmes and measures that would be less effective or would not be implemented at the national/regional levels. For example, the long-term EU budget is structured within the Multiannual Financial Framework (MFF) – a seven-year spending plan that promotes predictability and stability of financial flows. The resource component, the revenue side of EU budgetary policy, should be covered together with aspects related to the priority areas of integration, cohesion, supporting competitiveness and the green and digital transitions (Testpolitics, 2024).

The overall objective of EU budgetary policy is to provide the means to implement its common priorities – increasing economic growth, raising living standards, reducing regional inequalities, while maintaining global competitiveness and ensuring strategic autonomy through the efficient and transparent use of public funds (Council of the European Union, 2020).

The EU budget performs the function of solidarity between Member States, in addition to the economic direction, it contains a socio-political justification - assistance to less developed regions, support for agriculture, investment in infrastructure, which promotes cohesion. The EU's budgetary policy is also aimed at ensuring macroeconomic stability, as it takes place in conditions of deeper financial integration and economic intermediation by Member States (European Commission, 2023). Therefore, another goal that this same budget should pursue is to act within the framework of the rules of financial discipline, so as not to jeopardize the financial stability of the Union.

The principles of the EU's budgetary policy can be defined by certain basic rules reflecting the legal, economic and political aspects of its functioning. The principle of unity – a single budget for the whole Union, covering all revenue and expenditure. The principle of budgetary precision – clearly defined specific appropriations, supported by justifications. The principle of annuality – the budget period is one calendar year; although the budget operates within a long-term framework, budgetary decisions are taken annually. The principle of balance – the budget does not provide for a deficit (unlike many national budgets), i.e. "expenditure = revenue" within a set limit. The principle of universality, according to which the budget includes all revenue and expenditure without special accounting of specific revenues for specific expenses; outside the budgetary process, individual items of revenue cannot be automatically linked to specific expenses. The principle of certainty or specification, according to which each budget appropriation has a clearly defined purpose and a specific type of activity. The principle of sound financial management – the budget should ensure economy, efficiency and effectiveness of expenditure, as well as accountability. The principle of transparency – information about the budget should be available to the public, and control and audit mechanisms should be in place (Astrid, 2024; European Commission, 2023).

The above principles form the legal and organizational basis for the implementation of the EU budgetary policy. They ensure legitimacy in the implementation of the EU budgetary policy, effective management and orientation towards common European priorities.

There is an institutional system consisting of clearly defined roles through which the EU budgetary policy is implemented. The key institutions among them are: the European Commission is the executive body of the Union, which prepares the draft budget and manages its implementation; the Council of the European Union, together with the European Parliament, approves the annual budget; the European Parliament participates in the budgetary process, gives its consent and exercises control over the implementation of the budget; the European Court of Auditors controls the efficiency and targeted use of

the Union's budgetary funds; the national authorities of the Member States act as joint managing authorities of the EU funds (Council of the European Union, 2020).

This structure ensures the division of powers. The European Commission is closely involved in the preparation and implementation of the EU budget, and the mobile administrative executive, the Cabinet of Ministers, has to set the structure and parameters to which the budget corresponds. The draft budget is prepared by the European Commission, which, where necessary, provides indicative allocations for the different "headings", i.e. individual policy areas (including cohesion and regional development). Once the draft is prepared, the Commission monitors its implementation, controls spending and ensures compliance with the established rules. The powers and responsibilities of the European Commission are therefore crucial for maintaining the efficiency and integrity of the EU financial management system.

The process of approving the EU budget is a joint effort of the European Parliament and the Council of the European Union, which act as the key decision-making institutions. The Parliament scrutinises the draft budget proposed by the Commission, debating and voting on a chapter-by-chapter basis to arrive at the final version. In the meantime, the Council of the Member States examines these proposals and agrees a position that reflects national priorities and interests. This bicameral procedure guarantees democratic oversight, with Parliament providing the political lens through which the EU's financial powers are scrutinised and approved, ensuring that the Commission's technocratic nature does not deprive the budget of its political substance.

Accountability and compliance with budgetary discipline are the responsibility of the European Court of Auditors (Court) and other supervisory bodies. The Court regularly audits the EU's finances and assesses whether the money is spent legally, economically, efficiently and effectively, and in accordance with the rules. Its report on apparent irregularities and inefficiencies provides the Union with information that, in capable hands, helps it to protect its financial interests. Other institutions and committees also play a role in monitoring and enforcing compliance. Together, they constitute a comprehensive system of checks and balances that safeguards the integrity of the Union's budgetary policy and promotes sound financial management.

It is a coherent and complex system that ensures the implementation of the Union's budgetary policy. The main components of the budgetary process are the European Commission, the European Parliament, the Council of the EU and the EU audit institutions. Transparency, accountability and respect for the values and objectives set out in the EU budget are supported by this system, which allows the EU to manage its finances effectively and contribute to the stability and development of all Member States.

The EU budgetary process has two time levels: one is the long-term or multi-annual budgetary cycle, and the other is the annual budgetary process.

1. The long-term budget is the Multiannual Financial Framework. The Multiannual Financial Framework sets out the expenditure structure of different policy areas for a specific period, usually five to seven years. For example, the current MFF covers the years 2021-2027 and provides for ceilings for EU budget expenditure. It ensures financial

predictability, eliminates the possibility of deficit financing and provides the basis for an annual procedure.

2. The annual budget is based on the Multiannual Financial Framework. It sets out in detail the Union's revenue and expenditure for the financial year in question. By 1 September each year, the Commission examines the guidelines provided by the Multiannual Financial Framework when preparing the draft budget (Council of the European Union, 2020). This draft budget is then discussed and adopted by the Council and Parliament, normally by 31 December of the same year. The budget is implemented by the Commission, the Member States and other bodies under different management models (Köhler and Larch, 2023). The main steps in the process are: the Commission aligns the draft budget with the political priorities, analyses and assesses the available appropriations under the Multiannual Financial Framework; the Council and Parliament examine, amend and adopt the budget; the Member States implement expenditure under EU programmes (e.g. agriculture, regional policy) – "shared management"; the Commission or its agencies manage certain programmes directly – "direct management"; at the end of the year, the Commission reports and the European Court of Auditors monitors the audit (PricewaterhouseCoopers, 2025).

The EU budget is balanced, revenue fully covers expenditure – deficits are prohibited. A significant part of expenditure (by some estimates, more than half) is under shared management, which creates difficulties in coordination at national and European levels. The participants in the budgetary process have to balance the desire for centralized efficient management with subsidiarity – delegating powers to the national level where justified. The budgetary conciliation procedure is a lengthy agreement between the 27 Member States, the Commission, the Parliament and the Council, which affects flexibility and a rapid response to new challenges. The mechanism of the multiannual financial framework and the annual budget allows for planning, but through the conciliation procedure and expenditure restrictions, it hinders a rapid response to unforeseen crisis situations.

The institutional set-up of the European Union in the budgetary process is the result of a long evolution aimed at balancing supranational and national interests in the Member States. The EU budget itself is a multi-level process, involving aspects of both intergovernmental and supranational governance. In general, institutional partnership mechanisms, accompanied by concerted action between the institutions, will create the conditions for democratic scrutiny, through which funds can be allocated in a reasonably balanced manner between competing options where they are most needed to maintain financial stability and contribute to the achievement of similar objectives - even in such conditions, in line with the objectives set by the events of integration; economic convergence; social cohesion; sustainable development.

The EU budget is financed by so-called "own resources", which are intended to ensure the financial autonomy of the Union within the limits laid down in the Treaties. The main categories of revenue are classified as follows: Customs duties – mainly duties levied by Member States on imports from third countries within the customs union. This

resource reflects the EU's common trade policy, for example in the distribution of customs duties between the budget and the part that remains in the Member States. VAT-based contribution – part of the Member States" VAT tax base that is transferred to the EU budget. This resource is intended to ensure that the budget is partly dependent on economic activity in the Member States, but at the same time its size is limited and adjusted according to rules. GNI-based contribution – the largest component of EU budget revenue, based on the gross national income of the Member States. This resource performs the function of "balancing" the budget: it is automatically adjusted so that revenue covers all approved expenditure and the budget remains balanced. New own resources – a new resource based on the amount of non-recycled plastic packaging waste has been established since 2021. In the future, there will be a resource linked to the Emissions Trading System and a resource from the Carbon Border Adjustment Mechanism, as well as possibly a resource based on the excess profits of large multinationals (Ianchovichina and Martin, 2024). Other resources – include revenue from fines, contributions from third countries, interest and surpluses carried over from previous years.

The system of revenue sources is established on a contractual bsis, the decision on own resources is taken by the Council of the European Union with the consent of the European Parliament and ratified by the Member States. The main condition is a balanced budget, i.e. revenues covering the agreed financial obligations. In 2025, the final agreement on the EU budget for 2026 and the revised Multiannual Financial Framework, almost blocked by a divergence in priorities between the European Parliament, the Council of the EU and the Commission, was formally resumed and approved after lengthy negotiations. The Parliament insisted on the allocation of additional funds for crisis response (in particular, to support refugees and health programmes). The payment schedule for Ukraine for 2026 was confirmed, which guaranteed the stability of the Ukrainian budget. Due to high interest rates on global markets, the EU's own debt service costs have increased. The agreement of 10 December determined from which sources (new taxes or contributions) these costs should be covered, so as not to cut funding for science (Horizon) and students (Erasmus+). Thus, when forming the EU budget revenues, financial receipts arise that have both very obvious features of national contributions (through GNI, VAT) and more common features (customs duties, new resources) - this forms the basis for the development and implementation of a common budgetary policy.

The EU budget is spent within the framework of the Multiannual Financial Framework and the annual budget. The main areas of expenditure can be grouped as follows: Single market, innovation and digital transformation - supporting the EU's competitiveness, research and development, and the digital economy. Focus on sustainability and values - covering regional policy, social cohesion, crisis response mechanisms and the protection of EU values. Natural resources and environment - covering agricultural policy, fisheries policy, rural development programmes and environmental protection measures. Migration and border management - spending on immigration, integration and border management. Security and defense is a separate area that is becoming increasingly important in the context of crisis-related challenges.

Neighborhood and the world – assistance to allied countries, international cooperation, humanitarian aid. European public administration – administrative expenditure of the EU institutions (Zuleeg, 2023).

For example, for 2025, the total budget commitments are planned at around €199,438.4 million across different areas. In summary, for the period 2021-2027, the largest part of the budget is allocated to resources related to cohesion and environmental protection.

The facts follow from a simple distribution of revenue and expenditure in the EU budget. Revenue: high share of GNI contributions; i.e. the financing potential depends on the economic strength or weakness of the Member States. This dependency has also been called "national contributions that are then returned", which is a criticism of this dependency (Testpolitics, 2024). The new resources will enrich the real own financial base at Union level, easing the burden on Member States. The spending clearly shows the priorities: moving to the other side of the fiscal framework, namely green policies, digital transformation, strategic autonomy – all of this is reflected in the structure. This also means that the EU budget acts not only as an allocator of funds, but as a strategic policy instrument. The EU budget is usually around 1% of EU GNI. The budget is quite small compared to the combined national budgets. Its role is more about efficiency and focus than about volume (Heinemann, 2023). Spending on crisis instruments, such as special instruments to respond to a pandemic or other emergency, adds additional flexibility.

At the same time, there are problematic areas that are important in the context of improving the EU's budgetary policy. The system of revenue sources remains largely conservative, with traditional own resources forming the main share, while new resources have only just begun to be introduced. The structure of expenditure is growing with the need to respond quickly to exogenous shocks (economic crises, migration, climate events), which requires flexibility that is not always provided by the Multiannual Financial Framework. The growth of expenditure in strategic areas (security, digitalization) requires appropriate resources, which motivates the search for new own resources. There is a need to clearly show and explain the results that could only be achieved through joint action at EU level within the framework of policies supported by the EU budget. In other words, there is a need to show and explain not only what has been achieved, but also the additionality of these results (products) (European Commission, 2023). In summary, the system of revenue and expenditure of the European Union budget is a compromise between the principle of financial autonomy of the Union and the preservation of the budgetary sovereignty of the Member States. The structure contains components that include traditional own resources - customs duties, VAT-based contributions, gross national income (GNI), modern environmental and tax instruments that ensure both the stability of financing through the budget and allow the EU to respond to new challenges, in particular, the "green transition", digital and climate policy.

The structure of expenditure is dominated by areas related to economic growth, regional cohesion and the development of innovation, as well as strengthening competitiveness at the global level. A special role belongs to expenditure in support of the

common agricultural policy, cohesion policy, security and external relations. At the same time, new trends indicate the growing importance of some new items - scientific research, energy security, defense and migration policy. Thus, the EU budgetary system is not only an instrument for financial support for institutional needs, but also an important mechanism for implementing strategic goals. Consolidates the efforts of the Member States to achieve economic, social and environmental balance, to ensure unity and stability of the European integration area.

The budgetary policy of the European Union has changed significantly since the creation of the European Communities to the Multiannual Financial Framework. This evolution has been influenced by the deepening of integration, which has allowed the Union's competences to be expanded, the number of Member States to increase and new challenges to emerge - economic, social and geopolitical. Building on this foundation, the EU's budgetary policy is increasingly moving from a simple financial management tool to a strategic instrument aimed at promoting cohesion, innovation and sustainable growth in all Member States. This transition has culminated in a strategy called the "Multiannual Financial Framework". Comprehensive in its scope, the MFF outlines expenditure priorities and revenue ceilings for several years. This creates stability and predictability for projects lasting more than one year. The BFR framework shows how the EU has addressed challenges in new areas such as economic crises, migration and climate change, with sufficient budgets for research and innovation, digital and environmental "greening", demonstrating their new importance for innovation, competitiveness and the EU's strategic autonomy. Furthermore, the EU has had to adjust its budgetary policy to respond to crises such as the COVID-19 pandemic, leading to the creation of recovery instruments such as NextGenerationEU, which have mobilized unprecedented levels of spending in its history to help Member States recover. Furthermore, the enlargement of the EU to include new Member States has also required a review of budgetary allocations to ensure fair development and cohesion across the different economies.

The main key stages in the evolution of budgetary policy:

I. Early phase: 1950s-1960s. In the early phase of integration (through the European Coal and Steel Community in 1951, the European Economic Community in 1957), budgetary mechanisms were quite limited. Common budgets financed mainly administrative activities, and the key common policy was the agricultural policy, which dominated the Community budget. There was no clear multiannual plan at this stage; financing was carried out mainly on an annual basis with limited planning mechanisms (Heinemann, 2023).

II. Introduction of the "financial perspective" and multiannual planning (1988-1992). In 1988, at the initiative of the President of the Commission, a five-year financial perspective was adopted, which marked the transition to better planning and stability in the budgetary process within the framework of expenditure. Known as the "Deloras I package", covering the years 1988-1992, it was then that the initial systemic framework of joint expenditure commitments for several years was established, together with the introduction of a resource based on the gross national income (GNI) of the Member States

as a stabilizing revenue item. This ensured predictability in the financing of common policies, thereby introducing supranational budgetary discipline (Fabbrini, 2022).

III. The period of enlargement and reform (1993-2006). Between 1993 and 1999 (in the so-called "Deloras II package"), budgetary policy was adjusted to take account of the new EU policies, in particular economic and social cohesion, external relations, and trans-European networks. In 2000-2006, against the background of the first major EU enlargement (10 Member States joined in 2004) and the CAP reform (as part of the Agenda 2000), budgetary policy faced challenges: growing needs in regional policy, the need to modernize agricultural support, and adjusting approaches to financing (Council of the European Union, 2020).

IV. Transition to the current system of the Multiannual Financial Framework (2007-2020). Since 2007, a different format of the Multiannual Financial Framework has been introduced - a seven-year cycle: 2007-2013, 2014-2020. This time, the share of agricultural policy in the expenditure structure has decreased, while innovation policy, the internal market, and digitalization have become more prominent. Thus, the share of agricultural policy spending decreased from around 58% in 1988-1992 to 38% by 2014-2020 (Fabbrini, 2022; Council of the European Union, 2020). Budgetary policy has also become more flexible, with reserves, special crisis response instruments (e.g. the 1998 financial crisis) and a growing demand for the budget as a strategic policy instrument (green and digital transitions).

V. Current phase: 2021-2027 and beyond. In December 2020, the EU budget for the period 2021-2027 was adopted, combining a long-term framework with a historic post-pandemic recovery instrument – Next Generation EU (Heinemann, 2023). This is largely characterized (Fabbrini, 2022) by a stronger focus of the budget on strategic priorities – green transformation, digitalization; a more flexible system has been developed, a rapid crisis response mechanism (for example, mobilizing innovative resources to assist Ukraine); a transition from purely budgetary allocation to more strategic planning, which involves co-financing, coordination with national plans, and a "national partners" approach (Köhler and Larch, 2023; European Commission, 2023).

The EU budget is thus no longer just an administrative financing instrument, but is becoming an important aspect of integration and competitiveness policies. The evolution of EU budgetary policy reflects changes within the Union itself – from narrowly targeted financing to a broad, long-term mechanism that ensures the implementation of strategic priorities. The content of the EU budget has been transformed – from local administrative expenditure and support for agriculture to a modern innovation-oriented, digitalized, resilient and responsive budget; but in particular, the new phase contains a higher degree of (greater) predictability, (greater) flexibility – and even strategicity – than the previous ones.

The overall EU budget for 2025 was approved with appropriations of around €199.4 billion in commitments and €155.2 billion in payments (European Commission, 2023). This is in line with the programming priorities set by the Multiannual Financial

Framework (MFF 2021-2027) and the specific instruments (mainly due to the impact of Next Generation EU and other specific instruments).

The EU budget revenue is traditionally generated by "own resources". The current system of own resources includes:

1. GNI-based contributions (contributions calculated in proportion to the gross national income of each Member State) – currently the largest component of revenue; according to analytical reviews, its share in the structure of own resources is approximately over 60%.

2. VAT-based resource – defined as part of the VAT base in the Member States; has a limiting conversion mechanism.

3. Traditional own resources – customs duties and related revenues collected within the framework of the customs union; their share is significant but gradually decreasing in absolute terms compared to GNI contributions.

4. New own resources – gradual implementation (from 2021, the first example is plastic; in the plans – resources similar to CBAM/ETS, tobacco excise duty, etc.). Their aim is to increase the "autonomy" of the EU budget and reduce the pressure on national contributions (GNI). However, so far the new resources generate relatively small amounts compared to GNI contributions (for example, the resource based on non-recycled plastic packaging in 2023 gave a total of about 7.2 billion euros in the first year – an indicator that does not yet solve the problem of long-term farming from the Next Generation EU debt) (Zuleeg, 2023; Council of the European Union, 2020).

Since the main revenue is the GNI-based contribution, in favorable macroeconomic times in the EU budget revenues increase. This makes the budget very vulnerable to recessions and GNP reductions in large donor countries. The real financial returns from CBAM, ETS and other resources are still quite limited, while the dependence on GNI remains high, as the political will to implement them has only recently started to grow (the amounts planned for CBAM/other resources are relatively modest compared to the total expenditure). The own resources system can only be changed procedurally (Council consent, Parliament consent and ratification in the Member States at the same time), which delays rapid budgetary reforms (Ianchovichina and Martin, 2024).

The EU budget expenditure is formally grouped under a few broad headings, which are relevant in the Multiannual Financial Framework 2021-2027 and the annual budgets.

These headings include areas such as Cohesion and Values, Natural Resources and Agriculture, Security and Citizenship, Single Market, Innovation and Digital, and External Action. Each category covers specific programmes and initiatives aimed at promoting sustainable growth, social inclusion, environmental protection, technological innovation and geopolitical stability within and outside the European Union. For example, the Cohesion and Values heading covers funding aimed at correcting regional imbalances, infrastructure and social investment (with significant amounts foreseen under cohesion programmes for the period 2021-2027, making this area one of the largest expenditure items). Natural Resources and Agriculture mainly finances the Common Agricultural Policy, which aims to ensure food security, sustainable land use and rural development.

This has always been the most important share, until recently its relative weight started to decrease significantly. The allocation for security and citizenship focuses on strengthening internal security, border management and policies related to migration and asylum. The categories “Single Market”, “Innovation” and “Digital” direct resources to modernizing infrastructure, promoting research and innovation, and supporting the digital transformation in Member States to increase economic competitiveness. This area is becoming important due to competitive and technological challenges, which leads to increased funding for research and development, digital programmes and industrial policy. External action includes funding for development aid, diplomatic initiatives and efforts to address global challenges such as climate change and conflicts, as well as funding for external cooperation, humanitarian aid, support for neighboring regions (including essential needs related to the war in Ukraine). These broad headings contribute to the distribution of EU funds in a structured manner, allowing the Union to pursue its strategic objectives (Council of the European Union, 2020; Köhler and Larch, 2023).

For example, in the annual breakdown for 2024, the amounts indicated for the headings of the Multiannual Financial Framework were: cohesion ≈ €74–77 billion, natural resources ≈ €54–57 billion, single market ≈ €21 billion, etc. – these figures illustrate the priority areas (the detailed breakdown varies between the Commission draft, the Council positions and the final decision of the Parliament) (European Commission, 2023).

Next Generation EU, as a temporary instrument, provided significant financial assistance (the volume of the package together with the MFF is estimated at ≈ €2 trillion in current prices for the period 2021–2027). NGEU allowed the mobilization of borrowing on European markets for grants and loans aimed at the post-pandemic recovery and structural investments. First of all, the NGEU has provided additional temporary resources for investments in the green and digital transitions; it has created debt servicing and repayment obligations that will affect future fiscal balances (Ianchovichina and Martin, 2024).

The ongoing enlargement of the European Union fundamentally shapes both the priorities and the operational arrangements of the EU budget, requiring a comprehensive realignment of policy objectives and funding strategies in interconnected areas. With the accession of new Member States, the budget needs to be recalibrated to address new challenges, in particular the decarburization of the EU energy system, which is a central priority against the backdrop of the evolving dynamics of enlargement. This transition is not minimal and has far-reaching implications for funding, namely that the allocation of funding should complement climate and energy-related objectives while supporting broader economic competitiveness and cohesion. Such reallocation requires not only more funds to address the problems, but also prioritizing the funds so that they encourage private investment and strengthen long-term competitiveness, which in turn will allow for the effective implementation of a more diverse policy mix. Reconciling these multiple objectives soon becomes even more difficult due to the requirement to rethink budgetary instruments (National Reform Programmes, European Competitiveness Fund), which

should be important tools for improving the planning of public spending and reforms. Ultimately, these trends point to a continued need for adaptive policy measures and flexible and dynamic fiscal frameworks that can support expansion, promote sustainable growth and proactively respond to spillovers (Ianchovichina and Martin, 2024).

The main trends in the EU budget are aimed at increasing the share of spending on security, defense, digitalization and climate (green policy); in parallel, the gradual reduction of the share of direct agricultural payments continues; the search for new own resources - a political initiative to introduce CBAM, tobacco products or any other resource to cover both current needs and NGEU debt service. It contains both a political and technical aspect; broader flexibility and response mechanisms - the development of budgetary instruments that can more quickly reorient resources to crisis needs (financing support to Ukraine, energy and humanitarian aid, mechanisms for mobilizing reserves) (Zuleeg, 2023).

But there are also risks: in the event of an economic downturn, GNI contributions decrease, which may limit the budget's capabilities at a time when the EU's efforts are most needed; the obligation to service the repayment of loans under the NGEU program burdens future budgets and requires a clear strategy for generating new resources or reducing costs; politically incompatible interests of Member States – complicated by consensus in the Council and the need for Parliament's consent, open up new possibilities for significant reallocation of funds between chapters or changes by adding new sources of revenue; the question of "added value" remains open in a situation where investments at national level are more than fully compensated by EU funds. There are concerns about the effectiveness of individual programmes, which requires strengthened monitoring and auditing (Council of the European Union, 2020).

The EU control system is the result of systematic efforts to ensure transparency, accountability and independent control over the use of EU funds, both through external and internal measures. At the central level is the Court of Auditors, the EU's "financial conscience", which monitors the proper use of EU resources. Established in 1977 and strengthened by the provisions of the Maastricht and Amsterdam Treaties, the Court of Auditors has gradually gained independence and expanded audit powers to achieve its current position as a fully-fledged EU institution with a legal status comparable to that of the other main institutions.

The Court of Auditors plays an important role in ensuring their accountability by providing reliable, objective information essential for their accountability; it carries out a range of audits, including financial, compliance and performance audits, and examines the management of the EU institutions. Complementing this external oversight, the European Commission's internal audit function assists ongoing internal control by assessing management performance and further reviewing its procedures, working to bring them into line with internal standards such as COSO and other international standards relevant to EU institutions and/or internal auditors. Despite its maturity, questions still remain about the relevance of the Commission's "audit work" and the usefulness of its oversight, suggesting that improvements could be useful to strengthen

the EU's overall accountability system and strengthen the protection of EU resources. But the continuous development and improvement of these audit functions also demonstrate the EU's commitment to good controls that are fit for purpose and contribute to integrity and public trust. While the Commission's audit reports and conclusions provide an overview of a generally well-functioning control system, they highlight issues with verification procedures, verification of expenditure under shared management, the effectiveness of anti-fraud measures and the quality of reporting. Several European Research Bodies (ERBs) have indicated that further improvements are needed to improve the effectiveness of the new own resources and to monitor their implementation (European Commission, 2023).

The EU budget is currently focused on the EU's strategic priorities while ensuring macroeconomic stability, as its own resources consist mainly of contributions from Member States based on gross national income, VAT resources, traditional customs duties and gradually introduced new sources. This makes revenues relatively predictable, but highlights both the sensitivity of revenues to the economic situation in Member States and the strong dependence on diversified budget financing (Astrid, 2024). The main share is clearly divided between different key components: a contribution based on gross national income; a contribution based on value added tax; customs duties (including agricultural duties).

Budgetary expenditure is aimed at implementing the main EU policies: cohesion policy, common agricultural policy, innovation, digitalization, external cooperation, security and defense. The multiannual financial framework, together with temporary instruments, increases the flexibility of the budget, allowing for a rapid response to crisis challenges and coordinating the mobilization of resources to achieve strategic objectives. The modern EU budget is seen not only as a financial instrument for administrative purposes, but also as an engine of integration policy, providing for the economic sustainability and competitiveness of the Union worldwide. Its effectiveness and sustainability are explained by a balanced revenue structure, rational expenditure, accompanied by either flexibility or the ability to address new economic, social and geopolitical challenges (Köhler and Larch, 2023).

Thus, the modern EU budget is not just a financial instrument to meet administrative needs, but also a mechanism for implementing integration policy, economic sustainability and competitiveness of the Union at the global level. Efficiency and sustainability depend on a balanced revenue base, a rational allocation of expenditure and flexibility or the ability to respond to new economic, social and geopolitical challenges.

Several approaches are used to assess this effectiveness, ranging from simple comparisons between the size of budget expenditure or revenue and their elasticity to macroeconomic aggregates of the Member States (GDP growth, employment, regional convergence) to analyses based on econometric modelling, involving simulations with different assumptions about the mix of policies at national and EU level. Aggregated analysis is quite common, either on total expenditure or on revenue: general economic equilibrium models or simple expenditure multipliers (e.g. assessing the impact of

cohesion policy on GDP) – for example, the Joint Research Centre estimates that each euro of investment in cohesion policy can generate around €1.3 of additional GDP by 2030 and up to €3 by 2043 within the EU; impact analysis of research and innovation programmes such as Horizon Europe, which examines the relationship between investment expenditure and the economic value added generated; analysis of integrated financial policy and fiscal governance: how budgetary policy is adjusted in response to economic and financial challenges, whether it contributes to stability and growth (Testpolitics, 2024).

Effectiveness is assessed taking into account the time gap between investment and the achievement of sustainable results, as well as the characteristic multi-level governance (European level, national level, regional level) with the corresponding obstacles (administrative, legal, financial). Cohesion policy is one of the main channels through which the EU budget influences the development of Member States. According to JRC estimates, investments under the 2014-2027 programme will provide a double result of reducing regional inequalities and increasing GDP - each euro of investment can bring 1.3 euros by 2030, and by 2043 this figure will increase to 3 euros. This demonstrates not only the high multiplier effect of investments, but also their strong time impact (10-20 years). For the countries that won these programs (in particular, the countries of Eastern and Central Europe), such funds played an important role in modernizing infrastructure, transforming the production base, increasing employment levels, and aligning income levels with the average European level (European Commission, 2023).

Another channel is innovation programmes such as Horizon Europe. This is the European Union's main and largest research and innovation funding programme for the period 2021–2027, with a total budget of around €95.5 billion, from which the EU provides grants to scientists, universities, start-ups and large companies to solve global challenges. Every euro invested in this programme could generate up to €11 by 2045, according to estimates of its long-term impact on GDP. EU budget spending also largely supports national budgets, stimulating private investment and technological innovation, which improve productivity by increasing competitiveness on the global market, ultimately leading to economic growth in Member States (PricewaterhouseCoopers, 2025).

Despite the positive results, there are significant limitations that either reduce the effect of budgetary policy or make it more difficult to apply. Investment policies only produce results after a few years, making it difficult to assess effectiveness in the short term. Effectiveness varies considerably depending on management capacity, institutional capacity, corruption environment and previous development. For example, studies show that the effectiveness of agricultural policy subsidies varies across EU countries. Complex procedures, different governance models, co-financing and control requirements create obstacles to maximum effectiveness. The strategically oriented EU budget is small in size (around 1% of EU GDP) and depends on Member States' revenues. It is not clear what share or proportion of growth and productivity gains are the result of EU budgetary policies and what is due to national or global factors (Heinemann, 2023). There is good

evidence that EU budgetary policies have a clear positive impact on the economic development of Member States through cohesion policy, innovation programmes and crisis support mechanisms. Investment in infrastructure, research and development to modernize the economy multiplies the benefits by reducing regional inequalities.

The budgetary policy of the European Union is being formed in an environment where economic, political and social issues are closely intertwined with the phenomena of the global crisis. The energy crisis after the COVID-19 pandemic, caused by Russian aggression against Ukraine, as well as the deepening of climate threats and structural changes in the world economy, have posed unprecedented challenges to the EU budget. The modern budgetary policy of the EU must continue to finance its traditional programs - agricultural, regional or even scientific and research - but also perform a stabilization function, an anti-crisis transformational role, responding to both short-term and long-term factors, requiring flexibility and rapid response, financial autonomy, while facing institutional political and legal constraints. The EU budget also remains relatively small - about 1% of the Union's GNI, which significantly limits its capabilities to implement any large-scale economic programs. Compared to the structures of the US federal budget (over 20% of GDP), the financial resources within the EU do not allow it to fully perform its stabilization functions in times of crisis (Zuleeg, 2023). This requires the search for new own resources, for example, a tax on financial transactions, a carbon adjustment mechanism for imports, partial revenues from digital taxation, etc. Budget revenues mainly consist of contributions from member states based on gross national income - about 70% in 2024. Such a structure creates a risk of instability and recessions in the economies of member states, and also leads to the erosion of the autonomy of EU institutions. The distribution of the financial burden between member states will always be a hot political potato, which will delay any timely decision-making on budgetary issues. Although the impact of budgetary policy on regional development can generally be assessed positively, there is an asymmetry in the benefits obtained. Central and Eastern European countries are significant beneficiaries of funding, and "net donors" (Germany, the Netherlands, Sweden) are increasingly voicing their financial burden, which allows initiating political debates on the advisability of maintaining the existing redistribution mechanism, thus creating unbalanced risks of fiscal solidarity. The high level of bureaucratic implementation, accompanied by complex approval, control and reporting procedures, delays the distribution of funds, and also makes their use less effective. The European Court of Auditors reported an average delay of more than two years in the "implementation" of cohesion policy programs. In reality, part of the funds remains unused within the budget cycle (European Commission, 2023). The structure of the EU budget has not been able to meet all the requirements for rapid response, particularly since 2020, when the COVID pandemic, the war in Ukraine and the energy and food crises were highlighted by temporary financing instruments, the integration of which into the overall financial system is still problematic.

The war in Ukraine and the war in potential conflict zones around the world have led to increased spending on security, defense and foreign policy. For the first time, the budget

systematically includes military aid, refugee support and humanitarian programmes, which is a conceptual transformation of the traditional budget from an economic development-oriented to a sustainability-oriented approach. According to the European Green Deal, significant financial needs are increasing for the transition to a low-carbon economy. At the same time, the risks associated with climate change are placing a significant burden on the budget, especially through increased costs for disaster recovery and adaptation measures, as well as for compensation mechanisms for carbon-intensive regions (Ianchovichina and Martin, 2024).

The need to reorient the economy towards digital technologies requires investment in research and innovation, cybersecurity and digital infrastructure, and is reinforced by the very different levels of readiness of EU countries for the digital transition process, which can exacerbate regional disparities through fiscal policies that must ensure development, as well as the inclusiveness of the digital transition. The new priorities it gives to social policies are due to population aging, migration processes and social inequalities, to overcome which it is necessary to redistribute budgetary resources, which significantly limits the financing of innovative or environmental programs, unless balanced mechanisms for financial redistribution are developed (Astrid, 2024).

The challenges to the EU's budgetary policy include the financial and institutional levels, the geopolitical aspect along with the structural dimensions. Among these key challenges are the limited resources, as well as the extreme dependence on Member States' contributions, as well as the inefficient distribution of benefits, accompanied by complex governance procedures. Other external global threats include wars, climate change, digital transformation, and demographic processes. To ensure the future sustainability of the European Union's budgetary policy, it is necessary to strengthen its fiscal autonomy, flexibility and transparency, create permanent crisis response mechanisms, while optimizing institutional governance procedures. It is thanks to a reformist approach to financial control and strategic planning that the EU budget will be able to play its legitimate role in stimulating economic development, ensuring social cohesion and at the same time increasing the Union's competitiveness at the global level.

The European Union's financing system is constantly transforming due to the dynamics of economic development, political priorities and global challenges. The real reason for reforming the EU's financial instruments and budget allocation mechanisms is the increased demand for more efficient use of resources, ensuring financial sustainability within the Union itself, and adapting to new strategic directions highlighted by the European Green Deal, the digital transformation and cohesion policy. One of the new trends is the use of the multiannual financial framework as a strategic planning tool. According to the current financial perspective for 2021-2027, it includes new areas that are particularly relevant for financing climate-neutral innovation, digital infrastructure and security. However, the challenges arising today from the war, the energy crisis in Ukraine and global economic imbalances have highlighted the need for flexible budgetary mechanisms that can respond immediately to emergencies without the delays inherent in traditional procedural budgets (Council of the European Union, 2020).

Another important direction of reform is the reorientation of the own resources system towards the EU, which is its main source of budget revenue. The traditional structure, which includes contributions from Member States based on GNI, customs duties and VAT shares, is gradually being complemented by new sources. These should not only provide additional financial revenues, but also help achieve the climate goals set for the EU, while increasing tax fairness for global corporations. It is also urgent to develop and expand new financial instruments, including guarantees, loans, investment platforms and risk-sharing funds. In this context, a significant part belongs to the NextGenerationEU recovery plan. This is the EU's temporary instrument to stimulate economic recovery, created in response to the crisis caused by the COVID-19 pandemic. It is the largest stimulus package ever financed in Europe, amounting to €806.9 billion, and it is additional to the EU's core budget. The main innovation of the NGEU is that for the first time in history, the European Commission began to borrow money on the financial markets on behalf of the entire European Union (by issuing common EU bonds), rather than simply collecting contributions from member states. This mechanism set a precedent for future practice in the EU and illustrated both the actual and potential aspects of common borrowing in transforming into an instrument available for macroeconomic stabilization (Fabbrini, 2022). The next evolutionary step in such a process of the fund could be its creation on a permanent basis as an EU Stability Fund to ensure more effective implementation of anti-crisis measures.

Future reforms will also aim to optimize the mechanisms for distributing funds between member states, in particular within the framework of cohesion policy. The current system is very often accused of excessive bureaucracy with delays in project financing and uneven access to resources. The new method is likely to be based on the results achieved in achieving strategic objectives, rather than solely on formal criteria of economic development. The European Commission has introduced a scheme of transition regions, which makes the adaptation of funding to different levels more flexible both within a country and within a region. One important aspect of the digitalization of the budget process itself is the use of digital tools for monitoring, control, evaluation, efficiency, transparency, accountability, financial policy. That is why it is important to develop an integrated EU financial management platform with open access to data on the implementation of programs and the use of resources (PricewaterhouseCoopers, 2025).

Thus, a more flexible, innovative and result-oriented budgetary system is seen as a promising way to reform the EU's financial instruments and distribution mechanisms. A system that could adapt to a rapidly changing global environment. This type of reform would increase the Union's financial autonomy, making the country politically and economically strong. The Multiannual Financial Framework for 2021-2027 has become one of the key elements of the European Union's new socio-economic development strategy, driven by the post-pandemic recovery, energy instability and geopolitical tensions. More than €1.21 trillion (in current prices) has been approved as financial resources (Council of the European Union, 2020), together with a recovery plan worth another €750 billion under NextGenerationEU - an unprecedented budgetary support for

economic recovery and environmental transformation in Europe, as well as strengthening social cohesion through digitalization (Fabbrini, 2022). The main objective of this new financial thinking should be to relaunch the EU's budgetary policy based on the strategic priorities of sustainable development – the green transition; digital transformation; inclusive growth and increased competitiveness (European Commission, 2023). Thus, there have been significant shifts in the reallocation/inflow of funds in the main programmes between these areas. Around 30 percent of the total expenditure is focused on achieving the objectives of the European Green Deal, according to which Europe will become the first climate-neutral continent by 2050. The Horizon Europe programme (€95.5 billion), Invest EU (€26.2 billion) and the Connecting Europe Facility (€33.7 billion) are programmes supporting policies to accelerate innovation, modernize infrastructure and upgrade technology (PricewaterhouseCoopers, 2025).

The 2021-2027 financial perspective also sees a new focus on social policy by increasing the allocations from what was previously known only as the European Social Fund, which now includes it together with another fund called the Just Transition Fund and another fund called the Recovery and Resilience Facility. Financing for employment support initiatives aimed at preparing workers for emergencies, overcoming inequalities that may result from the economic consequences of COVID-19 or migration caused by the war in Ukraine is provided through these instruments. The main socio-economic contribution of this new financing instrument is evident in the strengthening of cohesion policy, which remains one of the key components of the EU's common budget. Regional development and investment programmes aimed at reducing inequalities between regions, stimulating the development of peripheral areas, increasing the competitiveness of small and medium-sized enterprises and promoting employment at local level amount to approximately €392 billion (European Commission, 2023).

A key aspect of this financial perspective is the introduction of the principle of conditionality. The EU financial architecture has expanded the mechanisms of fiscal solidarity. The mechanism of joint borrowing on the financial markets to finance the NextGenerationEU programme has been approved for the first time in the history of the EU. In addition to the possibility of mobilizing resources for the economic recovery, this is another important step towards deeper fiscal integration with far-reaching consequences for future stages of improving the architecture of the European Economic and Monetary Union. The socio-economic consequences resulting from the actualization/introduction of new aspects within the framework of the related perspectives are manifested in several main dimensions: economic - encouraging investment in sustainable development, job creation, supporting innovation and the digital economy; social - reducing social unemployment, especially among young people, strengthening social protection and supporting equal opportunities; environmental - supporting the transition to a low-carbon economy, reducing energy dependence and developing green infrastructure; institutional - improving the efficiency of governance, increasing the transparency of budgetary processes and the financial responsibility of Member States (Köhler and Larch, 2023).

Thus, the EU's budgetary policy is based, above all, on a principled approach that includes solidarity, efficiency, transparency and accountability. It also focuses on maintaining financial stability within the Union, while supporting economic competitiveness, with the ultimate aim of reducing socio-economic disparities between regions, as well as on the joint co-financing of European projects. The examination of the institutional structure together with the budget formation mechanism demonstrates that the main institutions interact at different levels, such as the European Commission, the Council of the EU, the European Parliament, to achieve a balance between the national interests of the Member States and the wider interests of the Union. The analysis of the sources of revenue showed that the main budgetary resources are the budget's own resources: the EU's own resources (GNI contributions, customs duties, VAT share); and new instruments, revenues from the emissions trading system, carbon adjustment of imports and digital taxation.

The development of the EU's budgetary policy has shown a constant tendency to improve, adapting to changes in the international economic environment. From the initial focus on financing the common agricultural policy, there has been a gradual transition to a multi-vector model that integrates economic, social and environmental innovation components. This has become especially evident after the introduction of the multiannual financial framework, with the help of which it was possible to ensure long-term stability of financing (Heinemann, 2023).

In modern realities, the EU budget is perceived not simply as a financial management tool, but also as a tool for implementing an active policy of socio-economic development and political unification within the union. In this regard, further reforms in the development of the budgetary system include flexibility, transparency or clear frameworks for the allocation of resources, accompanied by increased efficiency, expressed through cost-saving measures (Astrid, 2024). If these aspects are implemented, the European Union will become more economically sustainable, while developing the ability to solve global problems as a single integrated leading center worldwide.

The EU budgetary system is based on strict principles, among which the key one is the principle of balance, namely the prohibition of deficits. This fundamentally distinguishes the EU financial model from national budgets and ensures a high level of financial discipline, while requiring complex coordination mechanisms between the European Commission, the Parliament and the Council of the EU (Council of the European Union, 2020). The launch of the NextGenerationEU plan in December 2020 was another landmark event, allowing the EU to access capital markets as a single borrower for the first time. The combined effect of the BFR and NGEU was to accumulate a reserve of over €2 trillion, which allowed not only to overcome the consequences of the pandemic, but also to lay the foundation for the Union's strategic autonomy (Fabbrini, 2022). The future of EU budgetary policy therefore lies in further EU enlargement and the decarburization of the economy. Both of these aspects will require a review of cohesion mechanisms and the creation of new flexibility instruments that will allow combining long-term investments with the ability to respond to sudden unforeseen exogenous shocks.

2.3. THE INVESTMENT STRATEGY OF INSURANCE COMPANIES AS A TOOL FOR ENHANCING THE EFFICIENCY OF THEIR OPERATIONS

Oksana Vodolazska,
Ph.D. in Economics, Associate Professor,
Associate Professor of the Department of Finance, Banking and Insurance,
Dnipro State Agrarian and Economic University, Dnipro, Ukraine

The modern insurance market of Ukraine functions in conditions of increased turbulence caused by both global financial fluctuations and internal factors – armed conflict, changes in regulatory requirements, digitalization of financial processes, and growing risks of counterparty insolvency. Under such conditions, strategic management of the placement of insurance reserves becomes crucial for ensuring liquidity, financial stability and competitiveness of insurance companies.

Investment activity of insurance companies is an integral part of their financial and economic activity and an important source of profit generation. Its specificity is due to the peculiarities of the insurance business, in particular, the accumulation of significant amounts of monetary resources in the form of insurance premiums and the need to ensure the fulfillment of obligations to policyholders in the future.

The economic essence of the investment activities of insurers consists in purposeful placement of temporarily free funds in various financial instruments with the aim of obtaining income and ensuring liquidity, solvency and financial stability. Unlike other economic entities, insurance companies carry out investment activities not only for the purpose of maximizing profits, but also to guarantee the fulfillment of their long-term obligations.

Formation of investment resources of insurers takes place at the expense of two main sources: own capital and borrowed funds represented by insurance reserves. The peculiarity of the latter is their intended purpose – covering future insurance payments, which imposes significant restrictions on the choice of investment objects.

Therefore, the essence of investment activity of insurers is revealed through its functions. First of all, it is an income function, which provides investment income as an important source of the insurance company's profit. Secondly, the stabilization function, which consists in ensuring financial stability and solvency. Third, a backup function that ensures timely fulfillment of insurance obligations. Fourth, the regulatory function manifested in the impact of investment activities on the general state of the financial market.

In the current economic conditions, the investment activity of insurance companies is undergoing significant transformations under the influence of globalization, digitalization and the development of financial technologies (Ihoshyn, 2025). Therefore, there is a need to improve approaches to the management of investment resources, the introduction of innovative financial instruments and the use of modern methods of data analysis and forecasting.

In the conditions of market instability for insurance companies, financial stability remains a key condition for their effective functioning and trust from policyholders. In this context, investment activity plays a decisive role, as it ensures not only the growth of income, but also the maintenance of the necessary level of liquidity and solvency.

Financial investments allow insurers to compensate for the unevenness of cash flows, which arises as a result of the difference between the moment of receipt of insurance premiums and the realization of insurance payments. Thanks to the effective placement of funds, insurance companies are able to receive additional income, which can be directed to covering losses, forming reserves and business development.

One of the determining directions of the impact of investment activity on the financial stability of an insurance company is maintaining its solvency at an appropriate level. The insurer, unlike many other financial institutions, operates with a significant volume of obligations that are probabilistic in nature and can be realized at any moment in time. That is why the ability to timely and fully make insurance payments is a basic criterion of its reliability on the market. In this context, the investment portfolio performs not only the function of generating income, but also acts as a tool for ensuring liquidity and financial flexibility. Its structure should be formed in such a way that in the event of an insurance event or a significant volume of claims, the company could quickly convert part of the assets into cash without significant loss of value. This implies the presence of a sufficient share of highly liquid instruments in the portfolio, such as bank deposits, short-term government securities or other assets with a low level of market risk.

At the same time, focusing exclusively on liquid assets limits the yield potential, which can negatively affect the overall profitability of the insurer's activity. Therefore, the key task of the investment policy is to achieve the optimal ratio between profitability and liquidity. On the one hand, the company seeks to maximize income from the placement of insurance reserves, on the other hand, it must guarantee a sufficient level of availability of resources to fulfill current and future obligations.

Thus, the effective management of the investment portfolio involves the diversification of assets according to the degree of risk and liquidity, which simultaneously ensures the financial stability of the insurance company and maintains its competitiveness in the market of insurance services.

The investment activity of an insurance company plays an important role in the formation of its general income base, as it ensures the diversification of sources of income. Traditionally, the main source of income for an insurer is insurance premiums received from concluded insurance contracts. However, in today's conditions, this is no longer enough for the stable operation and long-term development of the company, since the volume of insurance premiums can fluctuate under the influence of market conditions, the level of competition and changes in the demand for insurance services.

In this context, investment income is an important stabilizing element of the insurer's financial model. By placing temporarily free funds, primarily insurance reserves, in various financial instruments, the company forms an additional source of income. It can be income from interest on deposits, coupon payments on bonds, dividends from shares

or income from other investment operations. Thus, the investment component allows you to partially compensate for possible fluctuations in insurance payments and reduces the dependence of the financial result on purely insurance activity.

Diversification of income is of strategic importance, as it increases the financial stability of the insurance company and its ability to withstand external shocks. During periods of economic instability, inflationary pressure or a decrease in business activity, income from insurance premiums may decrease, while a competently formed investment portfolio is able to generate a relatively stable income. Therefore, a more predictable cash flow is ensured, which contributes to maintaining the company's solvency.

In addition, in the conditions of increased competition in the insurance market, investment activity becomes an additional tool for increasing competitiveness. Insurers who effectively manage their investment resources can offer clients more flexible tariff conditions, form reserves for expanding the product line, and increase the level of reliability in the eyes of policyholders.

Therefore, investment activity not only performs an auxiliary function in relation to the main insurance business, but also becomes a key factor in the financial stability and strategic development of an insurance company in the conditions of a dynamic and unstable economic environment.

At the same time, one of the key elements of the effective investment activity of an insurance company is the management of investment risks (Lobova, 2025). For insurers, this issue is of particular importance, since investment resources are formed mainly at the expense of insurance reserves and equity, which are directly related to ensuring future payments to policyholders. Accordingly, any significant losses from bad investment decisions can negatively affect not only the company's profitability, but also its ability to fulfill its obligations.

An inefficient structure of an investment portfolio can be manifested in an excessive concentration of assets in one sector of the economy, an excess of the share of risky instruments, an insufficient level of liquidity or a weak diversification of investments. In such conditions, even minor market fluctuations can cause a significant decrease in the value of assets, a shortage of cash, or a violation of solvency standards. Especially dangerous are situations when investment assets do not meet the terms and structure of insurance obligations, which can cause an imbalance of cash flows. In order to minimize these threats, insurance companies implement modern risk management systems, which provide for constant monitoring of the investment environment, identification of potential risks and development of response measures. Considerable attention is paid to the identification of the main types of investment risks, including market risk, credit risk, interest rate risk, currency risk, liquidity risk, operational risk. Each of them requires separate methods of assessment and control.

One of the most common tools is scenario analysis, which makes it possible to model various options for the development of the economic situation and assess their impact on the investment portfolio. For example, scenarios of rising inflation, devaluation of the national currency, rising interest rates or falling stock market can be considered. This

allows you to determine potential losses in advance and prepare management decisions on portfolio adaptation.

An important place is also occupied by stress testing, which involves checking the insurance company's resistance to extreme but probable negative events. In contrast to standard analysis, stress tests are focused on crisis situations, such as a sharp drop in the market value of assets or a simultaneous increase in insurance payments. The results of such tests make it possible to assess the margin of financial strength of the insurer and to take preventive measures in a timely manner.

Economic and mathematical modeling is also widely used, which makes it possible to quantitatively assess the ratio of risk and return, to forecast the behavior of assets and to form an optimal portfolio structure. For this, the methods of portfolio theory, correlation analysis, probabilistic models, optimization models and other analytical tools are used. Thanks to this, the insurer can make more informed decisions about the distribution of capital between different types of assets.

In addition, modern insurance companies are increasingly using automated analytics systems, digital risk monitoring platforms, and big data processing technologies. Therefore, the speed of response to market changes and the accuracy of forecasting possible threats increases.

Therefore, effective management of investment risks is a necessary condition for ensuring the financial stability of the insurer. The use of modern methods of risk assessment and control allows not only to reduce the probability of losses, but also to improve the quality of investment decisions, support the solvency of the company and ensure the stability of its activities in the long term. The importance of investments in ensuring financial stability is also reinforced by regulatory requirements. State bodies set restrictions on the structure of insurers' assets, requirements for liquidity and diversification of investments, aimed at protecting the interests of policyholders and ensuring the stability of the financial system.

When carrying out investment activities, in particular when placing insurance reserve funds, insurers are obliged to take into account the requirements of current legislation, observing the established directions, standards and investment principles. The main ones include:

– the principle of safety, which provides for the placement of assets in such instruments that guarantee their complete preservation, i.e. orientation to the most reliable areas of investment;

– the principle of profitability, according to which investment activity should not only ensure the preservation of invested funds, but also generate income;

– the principle of liquidity, which means the need to form such a structure of assets that allows you to quickly transform them into cash without significant costs;

– the principle of diversification, which consists in the distribution of investments between different types of assets in order to minimize risks and increase the stability of the insurer's investment portfolio.

In addition, the legal acts of the NBU determine the maximum amount of placement of insurance reserves depending on the specialization of the insurer, which is fixed in the relevant provision on establishing requirements for ensuring the solvency and investment activities of the insurer (NBU, 2023) (Table 2.3.1).

The investment activity of insurance companies is closely related to the state and level of development of the national insurance market. Insurance payments (premiums) received in the process of carrying out their main activity are the source of formation of investment resources of insurers. In this regard, it is advisable to single out and analyze the key characteristics of the modern insurance market that shape the investment potential of insurers.

Table 2.3.1

Normative restrictions on the riskiness of investing reserves of insurance companies in Ukraine

Asset groups	Non-life	Life
Bank deposits, including deposits in foreign currency	≤90%	
Bank metals	≤15%	
Real estate objects	≤20% (at the same time, ≤10% for one separate real estate object)	
Securities, in particular:	total ≤40%	
– shares of domestic issuers	≤3%	
– corporate bonds of Ukrainian companies	≤30%	≤40%
– shares and bonds of foreign issuers, as well as debt instruments of foreign countries	≤10%	≤20%
– municipal bonds	≤10%	
– bonds of international financial institutions	≤40%	
Government bonds of Ukraine	≤80%	≤90%
Requirements for reinsurers	≤50%	
Cash in the cash register	≤3%	
Loans to policyholders-individuals	–	≤20%

First of all, we will consider the peculiarities of the insurance market of Ukraine, which affect the investment opportunities of domestic insurance companies. First, it is important to compare the level of insurance penetration in Ukraine (NBU, 2025) and the countries of the European Union (Global Insurance Report, 2025) (Fig. 2.3.1). This indicator reflects the degree of influence of the insurance sector on the socio-economic development of the state and determines its potential, calculated as the ratio of gross insurance premiums to gross domestic product.

Therefore, the level of insurance penetration in European countries and Ukraine shown in Fig. 2.3.1 shows significant differences that are directly reflected in the investment potential of insurance companies. Developed countries such as France and Denmark have the highest life insurance penetration (6,0% and 6,1% respectively),

indicating the significant role of long-term savings products in the financial system. Life insurance itself forms a stable base of long-term insurance reserves, which insurers can invest in government bonds, corporate securities and other low-risk financial instruments. Consequently, this ensures a high investment potential of insurance companies in these countries and their active participation in financing the economy.

Countries with developed but more balanced insurance markets, such as Germany, Italy and Spain, have a slightly lower but still significant level of insurance penetration, with the non-life segment dominating in Germany and Spain. And this means that the structure of the insurance market is more focused on short-term risks, which limits the amount of long-term investment resources compared to countries where life insurance dominates, but the overall investment potential remains high due to the scale of the market.

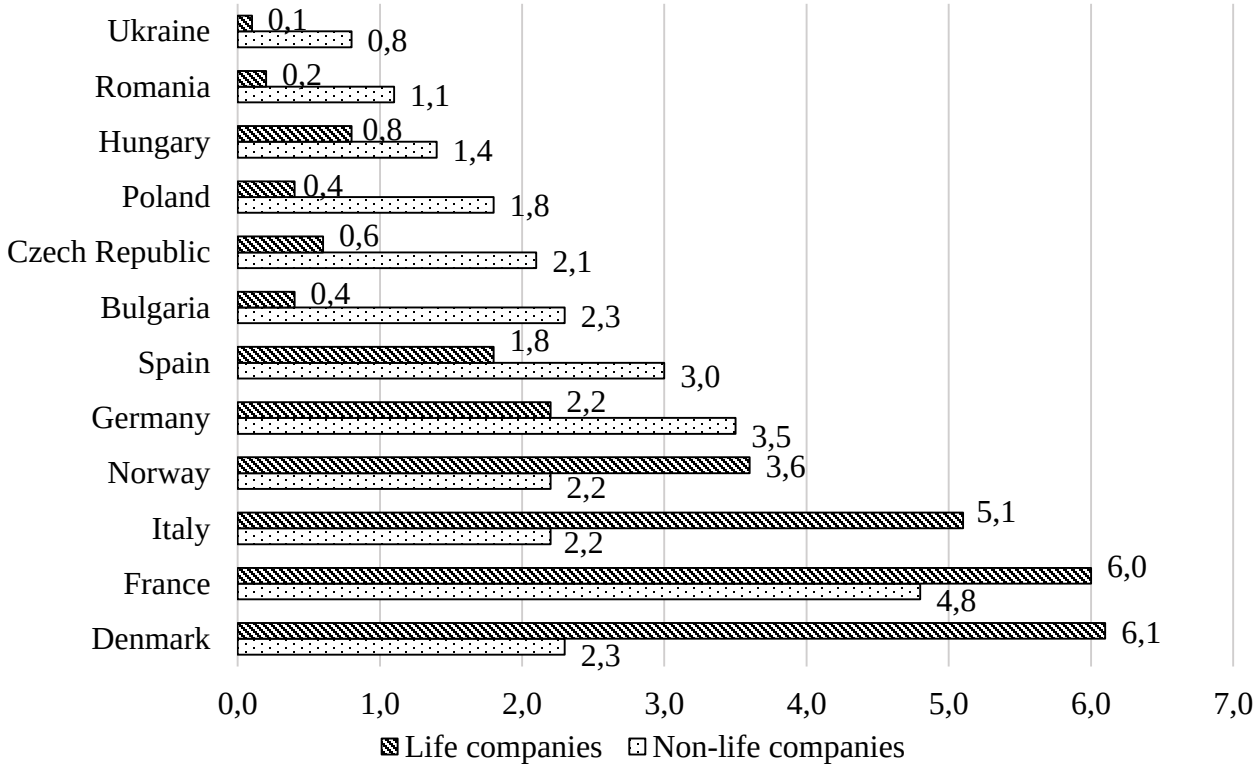


Fig. 2.3.1. The level of insurance penetration in European countries and Ukraine, 2025

In the countries of Central and Eastern Europe, in particular in Poland, the Czech Republic, Hungary, Romania and Bulgaria, the level of insurance penetration is significantly lower, especially in the life insurance segment, where the indicators vary between 0,2-0,8%. This somewhat limits the ability of insurance companies to accumulate long-term financial resources, which, in turn, narrows their investment potential and reduces their role in the formation of investment capital of the economy.

The situation in Ukraine is the most critical, where the penetration level of non-life insurance is 0,8%, and life insurance is only 0,1%. The indicators testify to the extremely

low development of the insurance market and the practical absence of a significant institutional investor in the form of insurers. Due to the minimal amount of insurance premiums and the weak accumulation of long-term reserves, the investment potential of insurance companies in Ukraine remains limited, which does not allow them to play a significant role in the financial market and in investment provision of economic development.

Thus, the analysis confirms that the level of insurance penetration, especially in the life insurance segment, is a key indicator of the investment capacity of insurance companies. The higher this indicator, the greater the amount of long-term resources accumulated by insurers, which directly strengthens their role as institutional investors and contributes to the overall development of the country's financial system.

Secondly, a significant feature of the Ukrainian insurance market is insufficient development of accumulative types of insurance, primarily life insurance. The diagram in Fig. 2.3.2 shows that the structure of insurance premiums is dominated by income from risky types of insurance, the share of which is about 90% (NBU, 2025).

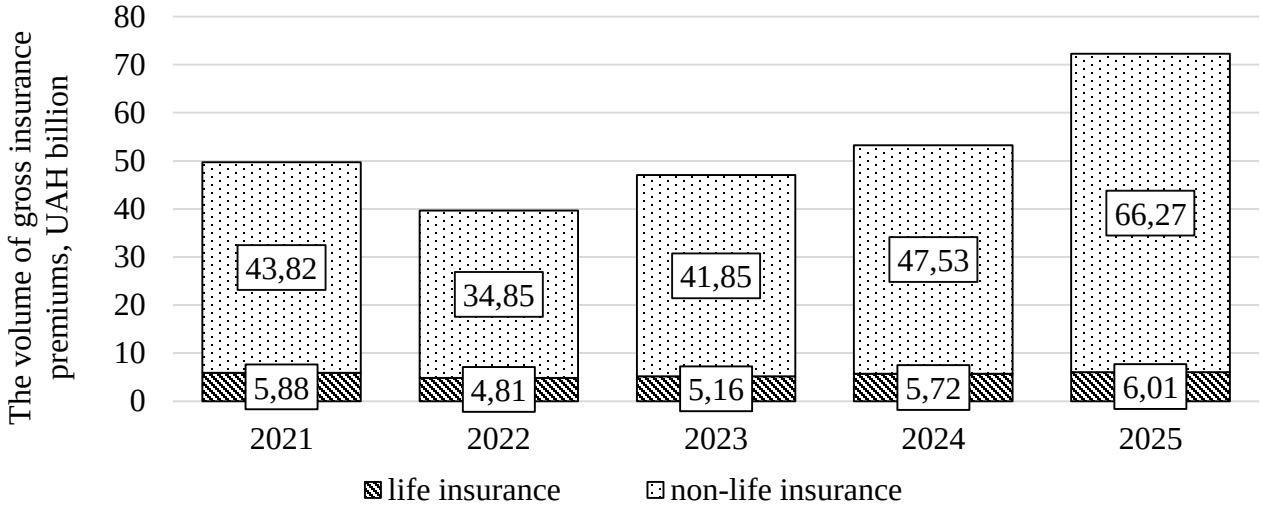


Fig. 2.3.2. Volumes of gross insurance premiums in the non-life insurance and life insurance segments

In the non-life insurance segment, the dynamics is more volatile, but reflects a more significant growth in 2024-2025 (from UAH 41,85 billion in 2023 to up to UAH 66,27 billion in 2025). The drop in 2022 reflects the shock effects of a full-scale invasion, reduced economic activity and reduced insurance premiums. However, further sharp growth indicates the adaptation of business, the recovery of economic activity and the increase in demand for risky types of insurance (property, transport, cargo, military risks). For the investment potential, this means an increase in the volume of short-term insurance reserves, which, although less “long” than in the life segment, provide a significant revolving investment resource.

In the life insurance segment, relatively moderate but stable dynamics are observed: after a decrease in 2022 (4,81 billion hryvnias), the indicator gradually recovers and reaches 6,01 billion hryvnias in 2025. Therefore, there is a gradual restoration of public confidence in long-term savings products, even in conditions of war risks and macroeconomic instability. From the point of view of investment potential, this is a positive signal, since life insurance itself forms “long money” of insurers, which can be directed to long-term investment instruments (government bonds, infrastructure projects, corporate securities). At the same time, the slow recovery of the segment indicates that this source of investment capital is limited in the short term.

In general, the overall dynamics show that the insurance market of Ukraine is gradually recovering its ability to accumulate financial resources necessary for investment activities. However, the structure of this potential remains shifted towards non-life insurance, which means that short- and medium-term investment opportunities prevail over long-term ones. Therefore, the depth of the investment role of insurance companies in the economy is limited, but at the same time their liquidity and flexibility in conditions of increased risks are ensured.

So, it can be concluded that the investment potential of insurance companies of Ukraine in 2021-2025 has a restorative nature with gradual growth, but its qualitative structure remains unstable and dependent on macroeconomic and security factors. At the same time, the investment activity of insurance companies largely depends on their specialization: life insurers are the key institutional investors, as they are able to make long-term investments due to the duration of their obligations. Instead, the activities of risk insurers are limited by liquidity requirements. Consequently, insufficient development of life insurance negatively affects the investment potential of the Ukrainian market.

For comparison, in the countries of the European Union, the share of life insurance in the total volume of insurance premiums is much higher, which contributes to the formation of a stronger investment base (Global Insurance Report, 2025).

Thirdly, a characteristic feature is a significant share of insurance premiums received under types of insurance, the obligation of which is determined by legislation. On the one hand, this ensures the stability of insurers' income, but on the other hand, it may indicate an insufficient level of formed market demand from individuals and legal entities.

Therefore, according to Fig. 2.3.3, in 2025, the structure of earned insurance premiums indicates a significant predominance of the profitability of insurance companies from mandatory insurance products (NBU, 2025). The largest volume of premiums was provided by OSCPV – UAH 16,22 billion, which is the highest figure among all types of insurance. This confirms the stability of revenues from the mandatory civil liability insurance of vehicle owners.

An important place is also occupied by the Green card – UAH 5,43 billion, which is a mandatory type of insurance for transport abroad. Together, OSCPV and the Green Card form more than UAH 21 billion premiums, which indicates a significant dependence of insurers' income on state-regulated insurance services.

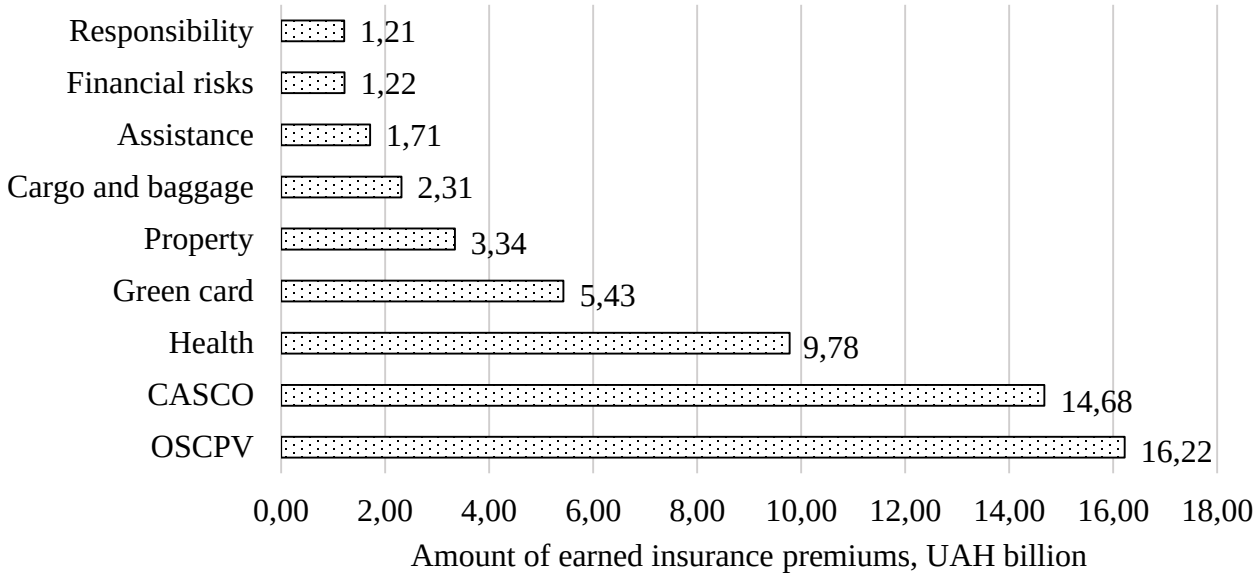


Fig. 2.3.3. Earned insurance premiums by types of contracts, 2025

Voluntary types of insurance, in particular CASCO (14,68 billion hryvnias) and health insurance (9,78 billion hryvnias), also have significant positions, but it is mandatory products that provide insurance companies with the most stable and predictable financial flow. In general, this indicates that the profitability of the insurance market of Ukraine is largely based on the compulsory insurance segment.

In addition, it is important to note that a significant part of insurance payments is formed at the expense of contributions of individuals (Fig. 2.3.4). In particular, their share in premiums under risk insurance contracts exceeds half (NBU, 2025). And this means that the insurance market of Ukraine is sensitive to changes in the level of income of the population. In the conditions of martial law, the reduction of citizens' incomes can negatively affect the formation of investment resources of insurance companies.

Therefore, the data in Fig. 2.3.4 show that during 2021-2025, the main source of insurance premiums remained the insured individuals, whose share consistently exceeded the income from legal entities and FOP. In 2021, UAH 27,91 billion was received from the population, while UAH 19,90 billion was received from legal entities and entrepreneurs. and this indicates the important role of the retail segment in the formation of insurance market revenues.

In 2022, a decrease in the amount of premiums was observed in both categories: from individuals – to UAH 24,55 billion, from legal entities and FOP – to UAH 13,98 billion. Such dynamics are associated with the negative impact of military and economic factors on the solvency of customers and the business activity of businesses.

Starting from 2023, the market showed a gradual recovery. In 2024, the volume of premiums from individuals increased to UAH 32,88 billion, and from legal entities and FOP – to UAH 20,07 billion. The highest figures were recorded in 2025: UAH 46,22 billion and UAH 25,79 billion in accordance.

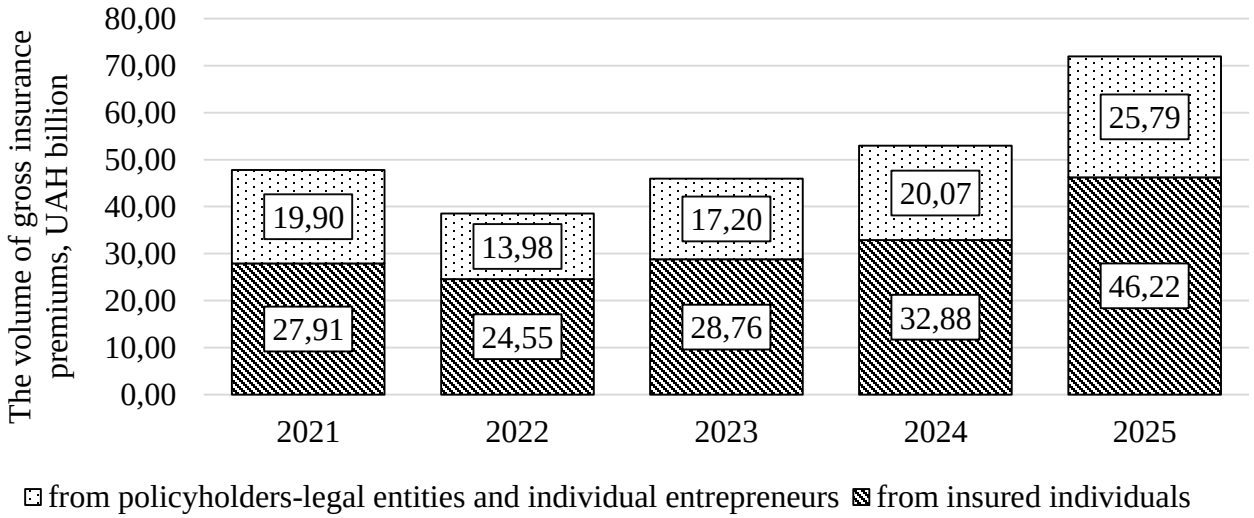


Fig. 2.3.4. Volumes of gross insurance premiums from insured individuals and from insured legal entities and individual entrepreneurs

In general, during the studied period, insurance companies received significantly more income from the population than from the corporate sector. This indicates the dominance of individual insurance and the high dependence of the insurance market on demand from individuals.

Therefore, the totality of outlined features of the insurance market of Ukraine mainly has a restraining effect on the development of investment activities of domestic insurers.

At the same time, it should be emphasized that the formation of an investment portfolio by insurers depends not only on the state of the insurance market, but also on a complex of internal and external factors. Various approaches to the identification of such determinants of insurers' investment activity are presented in scientific studies.

In particular, Hundzynska L.Yu. and Hrypa V.A. emphasize that when developing an investment strategy, insurance companies should take into account market and credit risks, as well as liquidity, concentration and diversification risks in order to form an optimal portfolio according to a given level of risk (Hundzynska, 2024).

In turn, Popova L.V. among the key factors determining the development of long-term investment strategies of insurers, the availability of appropriate financial instruments, accumulated investment experience in certain asset classes, as well as access to a high-quality information base stand out (Popova, 2025).

In the scientific and practical plane, there is a widespread position according to which the use of more aggressive investment strategies by insurance companies is justified only in the presence of a developed financial market and a stable macroeconomic environment. This is due to the fact that riskier investment instruments, as a rule, are characterized by increased yield volatility and sensitivity to changes in the economic situation, which can create additional threats for insurers to fulfill their obligations to clients.

Insurance companies operate in specific conditions, as they manage significant amounts of insurance reserves, which must ensure future payments for insurance cases. In this regard, the priority of the investment policy is not only profitability, but also preservation of capital and maintaining a sufficient level of liquidity. Accordingly, the use of aggressive investment strategies – with a high proportion of shares, derivatives or other high-risk assets – requires the presence of a mature institutional infrastructure, an effective regulatory environment and developed risk management mechanisms.

Macroeconomic stability is a key prerequisite for expanding the investment activity of insurers in riskier market segments. Under the conditions of low inflation, a stable exchange rate and a predictable economic policy, systemic risks are reduced, which allows companies to form more diversified and profitable investment portfolios. Instead, in conditions of instability or crisis phenomena, preference is given to conservative strategies focused on capital preservation and asset liquidity.

An important factor that determines the nature of the investment behavior of insurers is also the level of development of the country's stock market. A developed stock market requires the availability of a wide range of financial instruments, sufficient liquidity, transparency of operations and an effective information disclosure system. In such conditions, insurance companies get the opportunity to form balanced investment portfolios with an optimal ratio of risk and profitability.

On the other hand, in markets with a low level of fund infrastructure development, insurers' investment opportunities are significantly limited. Therefore, there is a concentration of assets in a narrow range of instruments, mainly bank deposits or government bonds, which reduces the yield potential and limits the effectiveness of insurance reserve management.

Therefore, the choice of an insurance company's investment strategy is directly dependent on the level of development of the financial and stock markets, as well as on the general macroeconomic environment. Together, these factors determine the acceptable level of risk, the structure of the investment portfolio and the possibility of increasing investment income without threatening the insurer's financial stability.

In modern conditions, the Ukrainian stock market remains at the stage of structural formation and has not reached the full maturity characteristic of developed financial systems. One of its key problems is the low level of liquidity, which is manifested in relatively small volumes of exchange operations, a limited number of active market participants and insufficient depth of trading (Frolov, 2025). Therefore, it is difficult to convert financial instruments into cash quickly and without losses, which reduces the attractiveness of the stock market as a platform for long-term investment, in particular by institutional investors such as insurance companies.

Another significant limitation is the insufficient level of development of the market infrastructure, both functional and technical. This is about the imperfection of the organizational system of securities trading, limited integration of depository and clearing mechanisms, as well as insufficient automation of accounting and settlement processes. Such institutional deficiencies increase transaction costs, reduce the efficiency of market

operations and create additional operational risks for investors. An important problem is also the insufficient level of protection of investors' rights, which manifests itself in the difficulties of ensuring proper transparency of issuers' activities, limited effectiveness of corporate governance mechanisms, and insufficiently effective legal protection tools for minority shareholders. In such conditions, the level of investment risks increases, which restrains the inflow of long-term capital to the stock market and reduces its investment attractiveness.

In addition, it should be noted the limited range of financial instruments and investment mechanisms. The market is characterized by a relatively narrow structure of available assets, which complicates the formation of diversified investment portfolios. Government debt instruments and individual corporate securities predominate, while complex financial products, derivatives and innovative investment mechanisms remain underdeveloped or inaccessible to a wide range of investors.

Particular attention needs to be paid to the insufficient development of joint investment institutions, which in developed economies perform an important function of accumulating small and medium-sized capital and transforming it into long-term investment resources. In Ukraine, such institutions do not yet play a system-forming role, which limits the possibilities of effective redistribution of financial resources in the economy and reduces the overall level of investment activity.

Taken together, these factors create an environment of increased investment risks and limited opportunities for the effective functioning of the stock market. This situation directly affects the investment behavior of institutional investors, in particular insurance companies, forcing them to prefer more conservative instruments with fixed income and a high level of liquidity.

In the future, it is advisable to consider the experience of the European Union regarding the implementation of regulatory mechanisms aimed at stimulating the investment activities of insurance companies, in particular, their participation in financing the real sector of the economy. At the same time, before that, it is necessary to analyze the current trends in investment policy formation by insurers in Ukraine compared to EU countries.

In Ukraine, the investment policy of insurers in general has a pronounced conservative character (see Table 2.3.2). According to the NBU, the structure of debt instruments included in the investment portfolios of domestic insurers is dominated by domestic state loan bonds (OVDP). In addition, a significant share is occupied by bank deposits, which remain one of the key forms of asset placement (NBU, 2025). At the same time, there are actually no significant differences between the structure of investment portfolios of risk insurers and life insurance companies.

Thus, in 2025, the total investment portfolio of insurers increased from UAH 55,28 billion up to UAH 70,89 billion (+28,2%), which indicates the expansion of investment activities. The largest share is stably formed by bank deposits, which increased from 42,9% to 48,0%. This confirms the increased focus on highly liquid and low-risk instruments. The second position is occupied by bonds of state loans of Ukraine: their

volume increased, but the share decreased from 39,9% to 37,1%, which indicates a slower growth compared to deposits. Other assets (cash, real estate, corporate and international bonds, shares) show minor fluctuations and generally decrease in specific weight, remaining secondary elements of the portfolio. Consequently, the portfolio of insurers remains conservative: deposits and government bonds dominate, while the share of risk instruments is minimal.

Table 2.3.2

Distribution of assets in the investment portfolio of insurers of Ukraine

Investment asset	2024		2025	
	ths. UAH	%	ths. UAH	%
Bank deposits	23723394	42.9	34004780	48.0
Bonds of state loans of Ukraine	22047600	39.9	26282185	37.1
Current accounts and cash	5114308	9.3	5873479	8.3
Real estate	2783278	5.0	2881291	4.1
Corporate bonds	978333	1.8	1162091	1.6
Bonds of international financial organizations	449561	0.8	481162	0.7
Actions	184726	0.3	201486	0.3
Total	55281201	100.0	70886474	100.0

Research shows that European insurers have a strong preference for fixed income instruments – both government and corporate bonds – with relatively balanced holdings. Substantial amounts of funds are also channeled into collective investment funds, while investments in stocks remain relatively small. It is worth noting that the structure of investment portfolios of EU insurers has not changed significantly since 2016; some growth is observed only for investments made through joint investment institutions (Liutyi, 2025). Therefore, both in Ukraine and in Europe, insurance companies mainly follow conservative approaches to investing, despite the significantly larger amount of resources of European insurers. At the same time, in the EU, the share of investments in corporate bonds and joint investment institutions is more significant.

As already mentioned, regulatory requirements play an important role in shaping the investment policy of insurers. Traditionally, European capital standards have been quite restrained in relation to investments in the real sector of the economy. In order to stimulate more active investment, the European Commission introduced changes to the approaches to calculating solvency requirements aimed at encouraging long-term investments and the use of more risk-oriented strategies.

Insurance reserves are the financial foundation of the insurer's activity, because they are used to make insurance payments, guarantee the fulfillment of obligations to policyholders, build trust in the company. Effective management of reserves in conditions of high uncertainty should involve a comprehensive approach – combining traditional financial methods with the latest risk management technologies, big data analytics, digital forecasting models and diversification of investment portfolios.

Management of insurance reserves is a system of measures for the formation, placement and control of the use of funds intended to ensure future insurance payments. Its strategic level consists in choosing long-term guidelines for managing liquidity, profitability and riskiness of reserves, taking into account market fluctuations and potential crisis scenarios.

The main strategic tasks of managing insurance reserves form the basis of the insurance company's financial stability and determine its ability to timely fulfill its obligations to policyholders. Effective management of reserves covers the processes of formation, placement, control and adaptation of reserve funds to changes in the external environment. In modern conditions, the key areas of such management are the following tasks.

1. Maintaining the optimal structure of reserves by type of insurance. Insurance reserves must be formed taking into account the specifics of certain types of insurance, the terms of validity of contracts and the nature of risks. For example, in life insurance, reserves are of a long-term nature, while in risk types of insurance, higher operational liquidity is required. Therefore, the structure of reserves should correspond to the company's insurance portfolio and ensure a sufficient level of financial coverage of future payments.

2. Ensuring diversified placement of reserves. An important task is the effective placement of reserves in various financial instruments in order to reduce the concentration of risks. Diversification involves the allocation of funds between government securities, bank deposits, corporate bonds, real estate and other permitted assets. This contributes to increasing the stability of investment income and reducing possible financial losses.

3. Balancing risk and return on assets. Management of reserves should ensure a combination of reliability of investments with a sufficient level of profitability. An excessive focus on only safe assets can reduce returns, while excessive risk can result in capital loss. Therefore, the insurer must form a portfolio of assets with an optimal ratio of risk, liquidity and profitability, especially in conditions of inflation and market instability.

4. Introduction of digital monitoring and forecasting tools. Modern reserve management is impossible without the use of digital technologies. Automated systems of data analysis, payment forecasting, liquidity control, and risk assessment allow prompt response to market changes. The use of analytical platforms, artificial intelligence and business intelligence systems increases the accuracy of management decisions and reduces operational risks.

5. Increasing the transparency and adaptability of the insurer's financial policy. The company's financial policy should be clear, open and flexible. Transparency involves high-quality disclosure of information regarding the formation and use of reserves, compliance with regulatory requirements and principles of corporate governance. Adaptability means the ability to quickly adjust financial decisions depending on changes in legislation, the economic situation or the structure of the insurance portfolio.

Therefore, the strategic management of insurance reserves is a complex process that combines financial security, investment efficiency, technological modernization and

management flexibility. Implementation of the specified tasks contributes to strengthening the insurer's solvency and increasing its competitiveness on the market of insurance services.

The high uncertainty of the external environment requires that insurance companies implement not only current, but also anti-crisis strategic management, which takes into account the possibility of macro-financial shocks, temporary losses of liquidity, inflationary pressure and changes in policyholder behavior.

The main challenges of the modern market affecting the effectiveness of insurance reserve management are presented in Table 2.3.3.

Table 2.3.3

The main challenges affecting the effectiveness of insurance reserve management

The main challenges	Manifestation in the activities of insurers
Military and political instability	Risk of loss of assets, reduction of the client base, shift in the structure of demand for insurance products
Inflationary fluctuations	Depreciation of reserves in the national currency, the need to hedge currency risks
High volatility of financial markets	Instability of yield of investment instruments, growing risk of issuer defaults
Regulatory changes	Transition to the new requirements of the National Bank regarding solvency, reporting and the structure of reserves
Technological transformation	The need to implement FinTech solutions, automated risk assessment and asset monitoring systems

In such conditions, traditional approaches to reserve management (focusing on low-risk deposits or government bonds) lose their effectiveness, because they do not provide a sufficient level of profitability and flexibility. Therefore, there is a need to develop innovative management strategies.

Increasing the efficiency of insurance reserve management requires systematic modernization of the insurer's investment strategy. Among the key areas, the following can be distinguished (Fig. 2.3.5):

1) diversification of the asset structure – placing funds in different types of financial instruments in order to minimize the risk of concentration;

2) application of the principles of risk-based management (Risk-Based Approach), which is based on the assessment and control of the risks of each investment decision;

3) stress testing of reserves – simulation of crisis event scenarios to assess the impact on the liquidity and solvency of the company;

4) integration of ESG-approaches (environmental, social, management criteria) into the process of allocating reserves, which increases the stability and confidence of investors;

5) digitization of management processes – implementation of automated asset management systems (Asset Management Systems), use of artificial intelligence to predict the unprofitability of the portfolio.

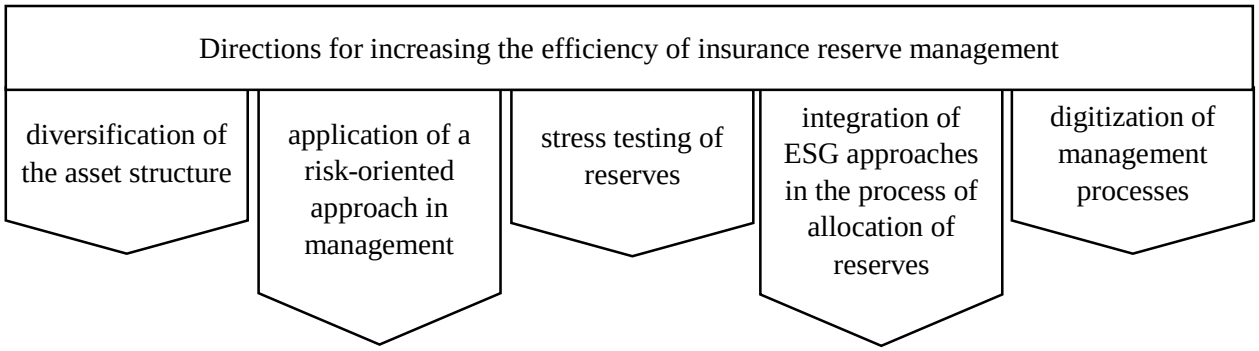


Fig. 2.3.5. Directions for increasing the efficiency of insurance reserve management in the context of systemic modernization of the insurer's investment strategy

The investment strategy of companies is a key element of their general financial strategy, which determines the long-term directions and principles of allocating financial resources in order to achieve strategic goals. It is formed taking into account the specifics of the insurance business, in particular the need to ensure the fulfillment of insurance obligations, maintain solvency and obtain stable investment income.

In the scientific literature, the insurer's investment strategy is interpreted as a complex system of management decisions that determines the long-term logic of the company's financial resources placement, taking into account its obligations, risks and target development guidelines. It covers not individual investment operations, but a holistic architecture of approaches to the formation, distribution and use of investment capital, which in the case of insurers is largely formed at the expense of insurance reserves and temporarily free funds. The key element of the investment strategy is the determination of priority investment objects, that is, the selection of specific classes of assets (government and corporate securities, bank deposits, real estate, other financial instruments) to which it is appropriate to direct resources, taking into account their risk profile and expected profitability. At the same time, special attention is paid to the compliance of the investment structure with the nature of insurance obligations, their repayment terms and requirements for asset liquidity.

An important component is the formation of the optimal structure of the investment portfolio, which involves balancing between different categories of assets in order to achieve an acceptable “risk-return” ratio. In this context, the strategy determines not only the list of instruments, but also their share in the overall portfolio, the level of diversification, as well as the permissible limits of risk concentration. This approach makes it possible to reduce the impact of individual market fluctuations on the financial result of the insurer and ensure the stability of its investment income.

A separate block of the investment strategy is the determination of the acceptable level of risk and expected return. Insurance companies operate in a regulated environment, where the priority is to maintain solvency, therefore the level of risk of investment activity is strictly limited by regulatory requirements and internal risk management policies. At

the same time, the strategy should provide a sufficient level of profitability, which allows to compensate inflationary losses, cover costs and generate profit.

An equally important element is the management of investment flows in the long term, which involves planning the receipts and withdrawals of funds, matching the investment policy with the dynamics of insurance obligations, as well as adapting the portfolio to changes in the macroeconomic environment and financial markets. In this context, the investment strategy functions as a mechanism for flexible response to external and internal changes, ensuring financial adaptability of the insurer.

Thus, the investment strategy of an insurance company can be considered as a kind of “road map” of its investment activities, which determines the general direction of movement, decision-making principles and a system of priorities in the field of asset management. It ensures alignment between the company's financial capabilities, the structure of its obligations and long-term strategic goals, such as financial stability, profitability and competitiveness in the insurance market.

The importance of the investment strategy lies primarily in ensuring the effective use of the insurer's financial resources. In conditions of high competition in the insurance market, it is investment income that often becomes an important source of profit formation. In addition, a well-formed investment strategy contributes to strengthening the financial stability of the company, increasing its investment attractiveness and trust from customers.

A peculiarity of the investment strategy of insurance companies is its close connection with the nature of insurance obligations. For example, life insurance companies focus on long-term investments, while risk insurers prefer more liquid assets. Thus, the investment strategy should take into account the time structure of obligations, the level of risk and the need for liquidity.

An important component of the investment strategy is also its adaptability to changes in the external environment. Modern financial markets are characterized by high dynamism, which requires insurance companies to be flexible in making investment decisions. Therefore, regular review of the portfolio structure, risk assessment and adjustment of strategic guidelines should be provided for.

Therefore, the investment strategy of insurance companies acts as a system-forming element of their activity, which ensures effective management of financial resources and contributes to the achievement of long-term stability and competitiveness.

The formation of the investment strategy of insurance companies requires a clear definition of its goals, objectives and functions, which reflect the main directions and mechanisms of implementation of investment activities.

The main goal of the investment strategy is to ensure the effective placement of the insurer's financial resources, taking into account the requirements of profitability, liquidity, reliability and diversification. Achieving this goal allows not only to receive a stable income, but also to guarantee the fulfillment of insurance obligations to clients.

The main goals of the investment strategy include:

– ensuring the financial stability and solvency of the insurance company;

– maximization of investment income at an acceptable level of risk;
– preservation and increase of capital;
– optimizing the structure of assets in accordance with liabilities;
– increasing competitiveness in the insurance market.

The implementation of the specified goals requires solving a number of tasks. The key tasks of the investment strategy include:

– determination of priority areas of investment;
– formation and optimization of the investment portfolio;
– assessment and management of investment risks;
– ensuring the liquidity of assets;
– monitoring of the efficiency of investment activities;
– adaptation of investment policy to changes in the market environment.

The functions of the investment strategy reflect its role in the management system of the insurance company. The main functions include (Fig. 2.3.6):

1) distributive function, which consists in determining the directions of use of financial resources and their distribution among various investment instruments;

2) the regulatory function, which involves influencing the structure of the insurer's assets in order to achieve the optimal ratio between risk and income;

3) stabilization function, which provides support for the company's financial stability and solvency;

4) the control function, which involves evaluating the results of investment activities and adjusting the strategy if necessary;

5) predictive function, which consists in predicting future trends in financial markets and taking them into account in the formation of investment policy.

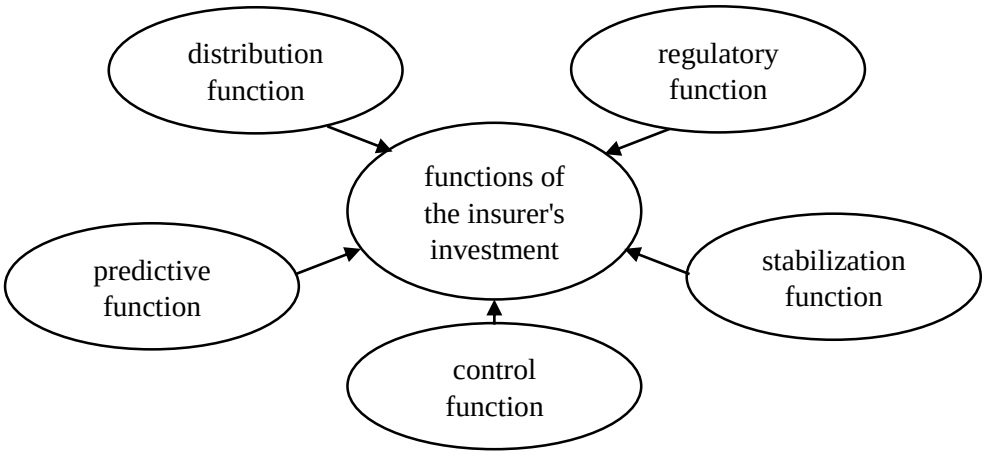


Fig. 2.3.6. The main functions of the insurance company's investment strategy

Thus, the investment strategy performs a complex role in the activities of insurance companies, ensuring effective management of financial resources and contributing to the achievement of strategic goals.

In the practice of insurance companies, various types of investment strategies are used, the choice of which depends on the financial condition of the insurer, the structure of its obligations, the level of risk and external conditions of operation.

One of the most common is a conservative strategy, which involves investing funds in reliable and low-risk assets, such as government bonds, bank deposits and other fixed income instruments. The main goal of this strategy is to preserve capital and provide a stable, albeit low, income. It is typical for companies with significant liabilities and seeking to minimize risks.

Moderate (balanced) strategy combines elements of conservative and aggressive approaches. It involves the diversification of the investment portfolio between different asset classes, including both reliable and riskier instruments. This approach makes it possible to achieve an optimal ratio between profitability and risk.

An aggressive strategy is focused on obtaining high investment income by investing in risky assets such as stocks, high-yield corporate bonds, investments in startups, etc. It is associated with a high level of risk and requires an effective risk management system. Such a strategy is typical for companies with a high level of capitalization and readiness for risk.

A separate asset-liability matching strategy (ALM) can be distinguished, which involves matching the terms and volumes of investments with the characteristics of insurance liabilities. This approach allows you to minimize the risk of liquidity and ensure the fulfillment of obligations in the established terms.

A dynamic strategy involves active management of an investment portfolio depending on changes in market conditions. It is based on constant monitoring of the market and quick response to its changes.

In modern conditions, innovative investment strategies involving the use of financial technologies, algorithmic trading, artificial intelligence and big data analytics are also becoming widespread. InsurTech allows you to increase the efficiency of portfolio management and reduce costs.

Therefore, the choice of the type of investment strategy is an important management decision that determines the efficiency of the insurance company and its ability to adapt to changes in the external environment.

The formation of the investment strategy of insurance companies is carried out under the influence of a wide range of factors, which can be conventionally divided into external and internal. External factors include macroeconomic conditions, the state of the financial market, the level of inflation, interest rates, currency fluctuations, as well as political and economic stability. For example, during periods of economic instability, insurance companies tend to prefer more conservative investment strategies.

State regulation also plays an important role. Legislative restrictions on asset structure, diversification and liquidity requirements significantly affect insurers' investment decisions. The regulatory policy is aimed at ensuring the protection of policyholders' interests and the stability of the financial system.

Among the internal factors, the financial condition of the insurance company, the volume and structure of insurance reserves, the level of capitalization, risk appetite and strategic development goals should be highlighted. For example, companies with high levels of capital can afford riskier investments.

The structure of the insurance portfolio is also an important factor. Companies specializing in long-term types of insurance have the opportunity to invest in less liquid, but more profitable assets. Instead, insurers working with short-term risks must ensure a high level of liquidity (Vodolazska, 2015).

The level of development of financial technologies also affects the formation of an investment strategy. The use of modern analytical tools makes it possible to more accurately assess risks and forecast market trends.

The quality of management and the professional level of personnel who make investment decisions also play a significant role. Effective management of investment activities requires a high level of competence in the field of finance, risk management and analytics.

Thus, the investment strategy of insurance companies is formed under the influence of a complex of interrelated factors that determine its effectiveness and ability to ensure the achievement of the insurer's strategic goals in a dynamic economic environment.

In international and Ukrainian practice, several strategic models of reserve management are distinguished (Table 2.3.4). Comparison of conservative, moderate, aggressive and digital analytical model according to their essence, advantages and disadvantages allows to assess the balance between risk, profitability and technological possibilities for effective management of reserves.

Table 2.3.4

Strategic models of insurance reserve management

Model	The essence	Advantages	Disadvantages
Conservative	Focus on the most reliable, liquid assets (deposits, OVDP)	Low risk, stability	Low yield, limited investment opportunities
Moderate	A combination of low-risk and medium-risk instruments (corporate bonds, funds)	Balance between profitability and risk	Requires analytical monitoring
Aggressive	High level of diversification and focus on profitable markets (shares, alternative investments)	High potential profitability	Significant risk of losses during crisis fluctuations
Digital and analytical	Using Big Data, AI and Blockchain for Reserve Management	Efficiency, accuracy, transparency	The need for high investments in IT infrastructure

For Ukrainian insurance companies, a moderately conservative approach is optimal, which ensures liquidity in a crisis period and gradual digitization of asset management.

In conditions of high uncertainty, the use of digital financial technologies becomes especially relevant. The most promising areas include:

1) Big Data analytics – makes it possible to predict the dynamics of insurance payments and optimize the structure of reserves;

2) blockchain – increases transparency and control over transactions, prevents fraud;

3) algorithmic asset management (Robo-advisory) – automates investment decision-making based on market analysis;

4) cloud platforms for risk management – allow real-time monitoring of liquidity, solvency and changes in the value of assets;

5) FinTech solutions for compliance (RegTech) – simplify compliance with regulatory requirements and increase reporting accuracy.

The high efficiency of reserve management is achieved due to the optimal ratio between liquid, income and stable assets. The rational structure of reserves must be constantly revised taking into account macroeconomic changes, the level of inflation and interest rates, as well as the results of internal stress testing.

Risk management is a key component of reserve policy effectiveness. The main tools include:

– hedging currency risks using currency derivatives or balancing currency positions;

– risk-oriented pricing that takes into account actuarial indicators of unprofitability;

– internal policies of limits regarding placement of funds in specific issuers or sectors;

– monitoring of solvency indicators (Solvency II) – control of the level of capital sufficient to cover risks.

In modern conditions, it is important to implement dynamic risk management, i.e. prompt adjustment of the reserve strategy in response to changes in market parameters.

The National Bank of Ukraine is gradually implementing European standards of insurers' solvency, which brings the reserve management system closer to Solvency II requirements. This involves:

– transition from formal reservation to a risk-oriented model;

– introduction of quantitative and qualitative risk assessment (ORSA);

– increasing requirements for transparency and disclosure of information about assets;

– use of international financial reporting standards (IFRS 17).

Such approaches stimulate insurers to strategically review reserving policies, increase the level of analytics and institutional responsibility.

Taking into account the specifics of the Ukrainian market and military risks, it is advisable to apply the following practical strategies:

– adaptive reserve strategy – regular review of the volume and structure of reserves in accordance with current macroeconomic indicators:

– investment strategy of “short liquidity” – focus on instruments with a high turnover rate (deposits, bonds with a short maturity);

– partnership strategies with banks and investment funds – joint management of assets to improve efficiency;

– a strategy for the digital transformation of reserve management – the use of analytical platforms and cloud storage for forecasting, monitoring and reporting;

– anti-crisis strategy – creation of internal liquidity insurance funds to cover short-term losses.

To assess the effectiveness of insurance reserve management, it is advisable to use a system of key performance indicators (KPI), in particular:

– solvency ratio (Solvency Ratio);

– liquidity level of reserves;

– weighted average return on assets;

– indicator of investment portfolio diversification;

– risk load index (Risk Exposure Index);

– the dynamics of the volume of insurance premiums and payments.

An analytical comparison of these indicators allows you to determine how much the chosen strategy contributes to increasing the company's sustainability.

Strategies for increasing the efficiency of insurance reserve management in conditions of high uncertainty should be flexible, digital-oriented and risk-adaptive. Their implementation ensures not only the stability of the insurance company, but also strengthens the trust of clients, promotes integration into the European financial space and increases the competitiveness of the domestic insurance sector.

The key success factors are: a combination of conservative and modern financial approaches; implementation of FinTech solutions and data analytics; systematic diversification of assets; effective risk and liquidity management; compliance with Solvency II and IFRS 17 European standards.

In the future, it is the comprehensive strategy of managing insurance reserves that will become the basis of the financial stability of insurers and an important element of Ukraine's economic security.

Therefore, one of the key problems of the development of the economy of Ukraine is the lack of investment resources, and the insurance market can play an important role in its solution, accumulating significant long-term financial flows.

In general, the investment activity of insurers both in Ukraine and in the European Union is characterized by conservatism, while the regulatory environment is one of the determining factors in the formation of investment strategies. In the EU, through the adaptation of regulatory requirements, the participation of insurers in financing the real sector of the economy is stimulated.

This approach is also relevant for Ukraine, especially considering that from January 1, 2027, insurance companies that meet the defined criteria of the Law of Ukraine “On Insurance” will be required to calculate solvency capital in accordance with Solvency II principles. Activation of the investment activities of insurance companies will contribute to the mobilization of financial resources necessary for the recovery and further development of the economy of Ukraine.

2.4. SYNERGIC TOOLS AND FINANCIAL TECHNOLOGIES OF INSURANCE COMPANIES IN THE DIGITAL ECONOMY: LEGAL ASPECTS, GLOBAL EXPERIENCE AND STRATEGIC DEVELOPMENT

Oksana Pavlenko,
Ph.D. in Economics, Associate Professor,
Associate Professor of the Department
of Finance, Banking and Insurance,
Dnipro State Agrarian and Economic University, Dnipro, Ukraine

In modern conditions of globalization, digitalization of the economy and rapid development of financial technologies, the insurance industry is undergoing significant transformations. Insurance traditionally performs an important socio-economic function, providing financial protection for business entities and the population from risks, forming long-term investment resources and contributing to the stability of the state's financial system. At the same time, the development of the insurance market largely depends on the efficiency of financial mechanisms used by insurance companies, as well as on the level of implementation of innovative digital technologies in insurance processes.

Digitalization of the economy and the development of financial technologies are becoming determining factors in the transformation of the modern insurance market. On a global scale, there is an active implementation of digital platforms, analytical tools and FinTech solutions that change the traditional business models of insurance companies. On the one hand, this opens up new opportunities for increasing the efficiency of activity, process automation and optimizing risk management, on the other hand, it poses a number of challenges for insurance companies: legal regulation, cybersecurity, adaptation to new customer service models.

The relevance of the topic is due to the fact that digital technologies are becoming the basis of the insurer's competitive advantage. In modern conditions, the success of insurance companies is determined not only by financial indicators, but also by the ability to integrate technological innovations into their operational, analytical and customer-oriented activities. Synergic tools allow you to combine the resources of various subsystems of the insurance company and market partners, which ensures greater efficiency and flexibility in making management decisions.

The purpose of the study is to determine the theoretical foundations, practical mechanisms and strategic approaches to the implementation of synergic tools and financial technologies in the activities of insurance companies, assess world experience and analyze legal aspects in the context of the digital economy, also is to determine the role of financial mechanisms and digital technologies in the insurance market development and to substantiate directions of their improvement in the conditions of digital transformation of the economy.

To achieve the goal, it is necessary to solve the following tasks:

- reveal the economic essence of financial mechanisms in the insurance system;
- investigate the role of digital technologies in the insurance business

development;

– analyze the impact of InsurTech on the functioning of the insurance market;
– identify the main directions of digital transformation of insurance companies;
– substantiate the prospects for the insurance market development in the conditions of digitalization.

The methodological basis of the study is presented by general scientific and special methods of scientific knowledge. The following methods were used in the research process:

– method of scientific abstraction - to determine the essence of financial mechanisms of insurance;
– system approach - to analyze the relationship between financial and technological factors of the insurance market development;
– economic and statistical method - to assess the trends in the insurance market development;
– comparative analysis - to study the world experience of insurance digitalization;
– generalization method - to form conclusions and recommendations.

The information base of the study were the scientific works of domestic and foreign scientists, materials from international financial organizations, statistical data on the insurance market and analytical reports on the development of InsurTech.

In modern conditions of the global economy development, digitalization is a key factor in the transformation of the financial sector, in particular the insurance market. Integration of financial technologies and innovative tools into the activities of insurance companies forms a new paradigm of their functioning, based on the principles of efficiency, adaptability and customer-orientation. In this context, synergic tools that ensure the interaction of various elements of the financial system, technological platforms and management approaches are of particular importance, contributing to the achievement of higher results compared to traditional insurance business models.

Digital economy creates fundamentally new conditions for the development of insurance companies, which are forced to adapt their business models to the rapid changes in the external environment. The growth of data volumes, development of artificial intelligence, spread of mobile technologies and cloud services change the nature of interaction between insurers and clients. In such conditions, synergic approach allows you to combine financial resources, information technologies and management tools to achieve the strategic development goals of insurance companies (Sharenko, 2024).

Synergic tools in the insurance can be considered as a system of interconnected methods and mechanisms that ensure integration of various areas of insurance company activity. These include digital platforms, analytical systems for processing big data, automated risk management systems, as well as innovative financial products based on the use of modern technologies. An important component of the synergic effect is the ability of these tools to ensure interaction between insurance companies, banks, FinTech companies and other financial market participants.

One of the key areas of the insurance sector development is the implementation of financial technologies, which have received the generalized name InsurTech. This area includes the use of digital technologies to optimize insurance processes, increase the efficiency of risk management and improve the quality of customer service. The use of artificial intelligence technologies allows you to automate underwriting processes, predict insurance risks and create personalized insurance products. The use of big data provides the ability to analyze customer behavior, which helps to increase the accuracy of risk assessment and reduce the level of insurance fraud.

Blockchain technology opens up new opportunities for ensuring transparency and reliability of insurance transactions. The use of smart contracts allows you to automate the execution of insurance contract terms, which reduces administration costs and increases customer trust in insurance companies. In addition, blockchain helps to increase the level of cybersecurity, which is especially important in the context of growing cyber threats (Global Financial Stability Report, 2019).

An important aspect of financial technologies development in insurance is legal regulation. In modern conditions, the legislation of many countries does not keep up with the pace of technological development, which creates certain risks for insurance companies functioning. The need to adapt the legal and regulatory framework to the new realities of the digital economy is one of the key challenges for regulators. At the same time, effective legal regulation can contribute to the development of innovations, ensuring a balance between protecting consumer rights and stimulating technological progress.

World experience shows active introduction of financial technologies into insurance activities. In developed countries, special regulatory "sandboxes" are being created that allow testing innovative products in conditions of limited regulation. This contributes to the development of startups in the field of InsurTech and stimulates competition in the insurance market. In addition, digital platforms are being introduced in many countries that unite various participants in the financial market, ensuring effective interaction between them.

Particular attention should be paid to the strategic development of insurance companies in the digital economy. The success of their activities largely depends on the ability to adapt to changes and implement innovative technologies. Strategic development should be based on integrating financial and technological resources, developing digital competencies of personnel and forming an effective risk management system.

An important direction of strategic development is forming ecosystems of insurance services that combine various financial and non-financial services. This approach allows you to create complex products that meet the needs of customers and increase their loyalty. In addition, the development of partnerships with FinTech companies contributes to innovation and increasing the competitiveness of insurance companies (Kryvoshlyk and Loginova, 2025).

In the context of Ukraine, development of financial technologies in insurance has significant potential. At the same time, there are certain problems associated with insufficient level of digitalization of the insurance market, limited access to the investment

resources and imperfect legal and regulatory framework. To overcome these problems, it is necessary to develop a comprehensive strategy for the insurance market development, which would include active implementation of digital technologies, development of infrastructure and improvement of legislation.

One of the key tasks is to increase the level of digital literacy of the population, which will contribute to the growth of demand for insurance services. In addition, it is important to ensure the development of cybersecurity, since the growth of digital transactions increases the risks of cyberattacks. In this context, it is necessary to introduce modern information protection technologies and improve mechanisms for responding to cyber threats.

Thus, synergic tools and financial technologies play an important role in the development of insurance companies in the digital economy. Their effective use allows you to increase the competitiveness of insurance business, ensure sustainable development and adaptation to changes in the external environment. At the same time, it is important to ensure proper legal regulation and take into account world experience, which will create favorable conditions for the development of innovations in insurance.

In the future, insurance market development will be determined by the level of integration of financial technologies and the ability of insurance companies to use synergic effects to achieve strategic goals. This opens up new opportunities for increasing the insurance business efficiency and forming a modern model of its functioning in the digital economy.

Synergic tools in insurance are a set of interconnected mechanisms that ensure integration of financial, technological and managerial resources. They allow creating an interaction effect when the result of the system's activities exceeds the sum of its individual elements, which in practice manifests itself in the following way (Fig. 2.4.1, based on Kryvoshlyk and Loginova (2025), Kuzheliev and Nechyporenko (2025), Tytarenko and Kostenko (2024), Tovkun (2024), Folvarsky (2020)):

- integration of insurance platforms with banking and FinTech solutions;
- use of big data analytical systems to predict insurance events;
- automation of underwriting and policies management;
- creation of customer-oriented products based on personalized data.

The essence of synergic tools in insurance is manifested not only in combining individual technologies or financial solutions, but also in forming a holistic integrated system for managing the activities of an insurance company, which operates on the principles of interaction, adaptability and self-development. In modern conditions of digital economy, such tools are an important factor in increasing the insurance business efficiency, as they allow optimizing business processes, minimizing costs and ensuring a high level of customer service.

The synergic approach in insurance involves the interaction of various elements of the system, in particular financial resources, information flows, human capital and technological platforms. Such interaction ensures forming a new quality of management,

based on the integrated use of innovative solutions.

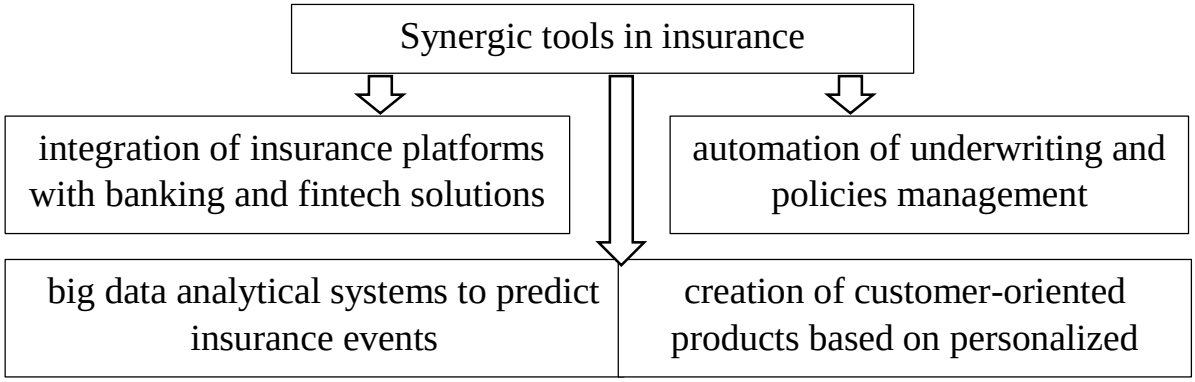


Fig. 2.4.1. Synergic tools in insurance

An important feature of synergic tools is their ability to adapt to changes in the external environment, which is especially relevant under conditions of high uncertainty and increased risks.

In modern insurance practice, synergic tools are implemented through integration of various information systems that provide processing of large volumes of data and making management decisions in real time. The use of such systems allows insurance companies not only to increase the accuracy of risk assessment, but also to ensure more effective management of insurance portfolios. In particular, the use of big data technologies makes it possible to analyze customer behavior, determine their needs and form individualized insurance products (Sharenko, 2024).

One of the key areas of synergic tools development is automation of underwriting processes. Traditional approaches to risk assessment involve significant participation of the human factor, which can lead to errors and subjective decisions. In contrast, the use of machine learning algorithms allows you to significantly increase the accuracy of forecasting insured events, reduce the level of uncertainty and ensure more justified formation of insurance tariffs. In addition, underwriting automation helps reduce application processing time and increase the speed of customer service.

No less important is the use of synergic tools in the field of insurance policies management. The use of digital platforms allows you to automate the processes of concluding, servicing and prolonging insurance contracts, which significantly increases the efficiency of insurance company's activities. In addition, such platforms ensure transparency of interaction between the insurer and the client, which helps increase the level of trust in insurance institutions.

An important role in forming synergic effect is played by the integration of insurance companies with other financial market participants, in particular banks, investment companies and FinTech startups. Such integration allows you to create complex financial products that combine insurance and banking services, ensuring more complete satisfaction of customer needs. For example, bancassurance is one of the most common

examples of synergic interaction, which allows insurance companies to expand sales channels and increase sales.

In the context of digitalization, the use of blockchain technology is of particular importance, as it ensures a high level of security and transparency of financial transactions. Implementation of blockchain solutions in insurance allows creating decentralized accounting systems that ensure reliable information storage and minimize the risks of fraud. In addition, the use of smart contracts allows you to automate the execution of insurance contract terms, which helps reduce administrative costs and increase the efficiency of insurance process management.

Another important area of synergic tools development is the use of the Internet of Things (IoT), which allows you to collect data on insurance objects in real time. For example, in the field of auto insurance, the use of telematics devices allows you to assess the driving style of customers and form individual insurance tariffs. In the field of health insurance, the use of wearable devices makes it possible to monitor the health of the insured and respond to possible risks timely (Kovalenko, 2023).

Synergic tools also contribute to increasing the level of customer orientation of insurance companies. By using digital communication channels, insurers can ensure constant contact with customers, provide them with up-to-date information and respond promptly to their requests. This allows them to increase customer satisfaction and build long-term relationships with them.

At the same time, implementation of synergic tools requires significant investments and changes in the internal organizational structure of insurance companies. It is necessary to ensure development of digital competencies of personnel, introduction of new management methods and adaptation of business processes to the conditions of digital economy. In addition, it is important to ensure adequate level of cybersecurity, since the growth of digital transactions increases the risks of unauthorized access to information (Folvarsky, 2020).

Thus, synergic tools are an important element of the modern model of insurance companies' operation. They ensure integration of financial, technological and managerial resources, which contributes to increasing the efficiency of operations, reducing costs and improving the quality of customer service. In the future, their role will grow, which is due to the further development of digital technologies and increased competition in the insurance market.

The use of InsurTech technologies is becoming a determining factor in increasing the efficiency of insurance activities. Artificial intelligence technologies allow processing large data sets, automating risk assessment and decision-making processes. Mobile platforms and cloud services provide access to insurance products 24/7, reducing operating costs and increasing customer satisfaction.

Of particular importance is the use of analytical forecasting and risk management systems, which allows insurance companies to model the probability of an insured event and optimize tariff policy.

The further development of InsurTech technologies causes profound transformation

not only of individual business processes of insurers, but also of the entire logic of the insurance market functioning. An important component of this process is implementation of intelligent analytical systems based on machine learning and forecasting algorithms, which enable multifactor risk analysis taking into account a large number of variables. This, in turn, contributes to transition from traditional statistical models to more flexible and dynamic approaches that take into account the behavioral characteristics of customers, external economic factors and individual characteristics of insurance objects (Tovkun, 2024).

One of the key areas of InsurTech development is personalization of insurance products. Thanks to the use of big data and analytical tools, insurance companies are able to create individual insurance offers which are most corresponding to the needs of a particular client and allow not only to increase the level of customer satisfaction, but also to optimize insurance tariffs, reducing risks for the insurer. For example, in the field of health insurance, analysis of data on the lifestyle of the clients, their physical activity and medical history enables forming more accurate and fair insurance premiums (Folvarsky, 2020).

A significant role in the development of InsurTech is played by the automation of insurance claims settlement processes. The use of digital platforms, mobile applications and image processing algorithms allows you to significantly reduce the time required to review client claims and make decisions on payments. For example, in car insurance, a client can file a claim for an accident via a mobile application, upload photos of the damage, after which the system automatically assesses the damage and forms a decision on payment. This significantly reduces the insurer's administrative costs and increases the speed of customer service.

An important element of InsurTech is also development of digital channels for the sale of insurance products. Online platforms, insurance marketplaces and mobile applications allow customers to independently choose and issue insurance policies without the need to contact intermediaries. This contributes to increasing transparency of the insurance market, reducing distribution costs and expanding access to insurance services for a wide range of people.

Particular attention should be paid to the use of blockchain technology in insurance, which provides a high level of security and reliability of data storage. Blockchain allows you to create decentralized registers that make it impossible to forge information and ensure transparency of financial transactions. The use of smart contracts helps automate implementation of insurance contract terms, which reduces administration costs and minimizes the risks of fraud (Tytarenko and Kostenko, 2024).

No less important is implementation of Internet of Things (IoT) technologies, which allow collecting data on insurance objects in real time. This opens up new opportunities for the development of insurance focused on customer behavior. For example, in auto insurance, the use of telematics devices allows you to assess driving style, which allows you to form individual insurance tariffs on the principle of “pay as you drive”. In property insurance, the use of sensors allows you to identify risks at an early stage, which helps

prevent insured events.

In addition, InsurTech contributes to the development of new business models in insurance. In particular, models such as peer-to-peer insurance, on-demand insurance and microinsurance are becoming more widespread. These approaches make insurance services more accessible, flexible and adapted to the needs of modern consumers. They are based on the use of digital platforms that provide quick access to insurance products and minimize the costs of their administration (Kuzheliev and Nechyporenko, 2025).

An important component of InsurTech development is also increasing the level of cybersecurity. The growth of digital transactions and the use of big data increases the risks of cyberattacks and information leaks. In this regard, insurance companies are forced to implement modern data protection systems, including multi-level authentication, information encryption and cyber threat monitoring systems. This allows ensuring the security of client data and increasing trust in insurance companies.

Another important area is integration of insurance companies with other financial market participants, in particular banks, FinTech companies and technology startups. Such integration allows creating complex financial products and provides a synergic effect from the use of different technologies and resources. For example, combining insurance and banking services within a single digital platform allows customers to receive a full range of financial services in one place.

Thus, the use of InsurTech technologies creates the prerequisites for forming new insurance business model based on digitalization, automation and integration of various technological solutions. This helps to increase the efficiency of insurance companies, reduce costs, improve the quality of customer service and ensure sustainable development of the insurance market in digital economy. In the future, the role of InsurTech will only grow, since it is these technologies that determine the directions of innovative development of the insurance sector and form its competitive advantages.

The synergic effect is achieved by combining mechanisms, technologies and financial products. For example, integration of a blockchain platform for issuing policies with artificial intelligence systems for risk assessment creates a more transparent and effective chain of interaction between the insurer and the client, which in turn helps to increase trust in the insurance company and reduce the costs of administering insurance contracts (Tovkun, 2024).

The synergic effect in the activities of insurance companies is formed as a result of a targeted combination of innovative technologies, financial instruments and management approaches, which provides a qualitatively new level of functioning of insurance business. Its achievement is based on the integration of various subsystems of the insurer - operational, financial, information and client, which allows creating a single digital management circuit for all processes.

One of the key mechanisms for creating a synergic effect is integration of digital platforms that provide a combination of different channels of interaction with consumers of insurance services. Thanks to the implementation of omnichannel solutions, insurance companies can simultaneously use mobile applications, web platforms, chatbots and

contact centers, which creates a continuous communication space. This approach allows you to significantly improve the quality of customer service, reduce the time for processing requests and ensure the personalization of insurance products.

An important mechanism of the synergic effect is combination of big data (Big Data), which allows insurance companies to move from a reactive management model to a proactive one. Analysis of large volumes of information makes it possible not only to assess current risks, but also to predict future events, which significantly increases the efficiency of underwriting. As a result, insurance companies are able to more accurately determine insurance rates, minimize losses and form a more balanced insurance portfolio.

Another important area is the synergy between insurance and banking sectors, which is implemented through bancassurance models. Within the framework of this interaction, banks act as sales channels for insurance products, and insurance companies gain access to a wide client base. This allows you to reduce marketing costs, increase sales efficiency and create complex financial products that combine credit, investment and insurance services.

An important mechanism of the synergic effect is also the use of cloud technologies, which provide flexibility and scalability of insurance companies. The transition to cloud infrastructure allows you to reduce IT maintenance costs, increase data processing speed and provide access to information from anywhere in the world. This is especially important in the context of globalization and development of remote customer service channels.

In addition, an important role is played by automation of insurance claim settlement processes, which is one of the most resource-intensive stages of insurer's activity. The use of digital solutions, such as mobile applications for submitting insurance claims, photo and video recording of losses, as well as algorithms for automatic damage assessment, allows you to significantly reduce payment time and increase the transparency of the process. This, in turn, contributes to increasing customer trust and improving the reputation of the insurance company.

Another important aspect is integration of the Internet of Things (IoT) into insurance activities, which creates new opportunities for collecting and analyzing data in real time. For example, the use of telematics devices in car insurance allows you to evaluate driver behavior and form individual insurance tariffs on the "pay-how-you-drive" principle. In the field of property insurance, sensor devices can detect risks (fires, floods, etc.) at an early stage, which allows preventing significant losses.

No less important is the mechanism of ecosystem approach, which involves creation of digital platforms that unite various market participants - insurance companies, banks, medical institutions, service companies and customers. Within such ecosystems, the client receives access to complex services in a single environment, which significantly increases convenience of use and stimulates demand for insurance products. For insurers, this means expanding monetization opportunities and increasing competitiveness (Ogdanska and Mykhailenko, 2025).

The synergic effect is also achieved through implementation of innovative business

models, such as peer-to-peer insurance or on-demand insurance. These models are based on the use of digital platforms and allow to significantly reduce administrative costs, increase transparency of financial flows and provide more flexible insurance conditions.

At the same time, implementation of synergic mechanisms requires an appropriate level of organizational transformation of insurance companies. This includes changing corporate culture, implementing agile management methods (agile, scrum), developing digital competencies of staff and creating an innovative environment. Without such changes, even the most advanced technologies will not be able to provide the expected effect.

It should also be noted that an important element of the synergic effect is ensuring cybersecurity and data protection. In the process of digitalization, insurance companies process large amounts of confidential information, which increases the risks of cyberattacks. The use of modern encryption technologies, multi-level authentication systems and monitoring of cyber threats is a necessary condition for ensuring stable functioning of insurance systems.

Thus, the mechanisms of synergic effect in insurance are based on complex combination of technological, financial and organizational tools, which ensures increased efficiency of insurance companies. Their implementation allows you to create a flexible, adaptive and innovative insurance business model that can function effectively in digital economy. In the future, importance of synergic mechanisms will grow, since they provide competitive advantages and sustainable development of insurance companies in the global environment (Kovalenko, 2023).

We propose to analyze the world experience of applying financial technologies in insurance. Thus, in the USA, Great Britain, China and Singapore, insurance companies are actively implementing digital platforms for policies management and risk assessment. For example:

– Lemonade (USA) – using AI for fast application processing and automated reimbursement;

– Ping An (China) – a mobile platform for complex management of life and property insurance;

– Aviva (UK) – a blockchain solution to reduce the time for concluding insurance contracts and verifying customer eligibility.

The world experience of applying financial technologies in insurance demonstrates that digital transformation of insurance industry is a global and irreversible process that covers both developed countries and emerging markets. A key trend is formation of full digital insurance ecosystems, within which insurance companies, financial institutions, technology providers and customers are integrated. This approach allows ensuring continuity of interaction between all market participants, increasing transparency of operations and significant reducing transaction costs.

In the United States of America, development of the InsurTech sector is the most dynamic due to the high level of digitalization of financial services and active involvement

of venture capital. In addition to Lemonade, which is one of the most famous examples of a fully digital insurance platform, other market players that use artificial intelligence to automate underwriting and claim settlement have also made significant progress. In the USA, behavioral insurance models are actively used, when insurance rates are formed on the base of analysis of customer behavior in real time, in particular through mobile applications and telematics devices.

An important feature of the American market is the widespread use of big data and predictive analytics. Insurance companies integrate data from various sources, including social networks, credit histories, medical records and behavioral patterns, which allows them to form the most accurate risk profiles of customers. This not only increases profitability of insurance companies, but also reduces the level of fraud in the insurance sector.

In the UK, development of FinTech in insurance is largely supported by regulatory policy that promotes innovation while ensuring protection of financial services consumers. Aviva is one of the leaders in digital transformation of the insurance market, actively implementing blockchain solutions and automated insurance contract processing systems. In addition, digital insurance platforms are actively developing in the UK, allowing customers to compare insurance products, apply for policies online and receive advice in real time.

Another feature of the British market is the active use of regulatory sandboxes, which allow FinTech companies to test innovative insurance products in a controlled environment. This helps to accelerate implementation of new technologies and reduce regulatory barriers to innovation.

In China, development of the InsurTech sector is taking place with participation of large technology corporations that integrate insurance services into their digital ecosystems. Ping An is one of the largest financial technology conglomerates in the world, combining insurance, banking services and healthcare services in a single digital platform. The use of artificial intelligence, image recognition technologies and big data allows Ping An to automate most processes, including underwriting, claims settlement and customer service.

The Chinese market is characterized by a high level of mobile integration of insurance services. Most insurance transactions are carried out through mobile applications, which ensures accessibility of insurance to wide segments of the population, including rural regions. In addition, microinsurance is actively developing, which allows providing insurance protection to the population with low incomes.

In Singapore, development of InsurTech is taking place with the support of the state, which actively stimulates innovation in the financial sector. Singapore is one of the leading financial hubs in Asia, where favorable conditions have been created for the development of digital insurance solutions. The country is actively using blockchain technology to ensure transparency in insurance transactions, as well as artificial intelligence for risk analysis and process automation.

Singapore is also a center for the development of international InsurTech startups

that are testing new insurance models, including parametric insurance, which involves automatic payments when certain conditions occur without the need for traditional claims settlement. This significantly increases the speed of receiving insurance payments and reduces administrative costs.

A common trend for all the countries considered is the gradual transition to fully digital insurance models, where artificial intelligence, big data, blockchain and mobile technologies play a key role. This enables creation of more efficient, transparent and customer-oriented insurance systems that meet the requirements of modern digital economy (Kuzheliev and Nechyporenko, 2025).

Thus, global experience shows that the introduction of financial technologies into insurance is one of the main drivers of industry transformation. Countries that actively invest in the development of InsurTech gain significant competitive advantages, in particular in the form of increased efficiency of insurance companies, reduced costs and improved quality of customer service. In the future, further expansion of the use of digital technologies in insurance and formation of a global digital insurance market are expected.

Technological models for implementing FinTech in insurance are a key element of digital transformation of the industry, since they determine data processing architecture, level of security, speed of operations and degree of automation of business processes. In the modern practice of insurance companies, two basic approaches to building digital systems have been formed: centralized registries and decentralized blockchain solutions. Each of these models has its own advantages, limitations and areas of effective application, and their choice depends on strategic goals of the insurer, level of regulatory requirements and degree of digital maturity of the market. Development of technological models in insurance indicates that digitalization of the financial sector has become not just a fashionable trend, but a necessary condition for increasing efficiency of insurance companies. In the practice of using FinTech in insurance, two basic models are distinguished - centralized registries and decentralized blockchain solutions, each of which has its own characteristics, advantages and challenges. Therefore, two main models of implementing FinTech in insurance are used:

Centralized registries - classic insurance platforms with centralized data control.

Decentralized blockchain solutions - provide transparency and immutability of records, automation of fulfillment of the terms of insurance contracts.

Centralized registries have traditionally been the basis of functioning of most insurance companies. They involve storing all information in a single database controlled by the insurer or an authorized technology operator. This model provides a high level of data manageability, enables rapid implementation of changes in business processes and centralized control over operations. In addition, centralized systems are more understandable for regulators and are easier to integrate into the existing financial infrastructure (Global Financial Stability Report, 2019).

An important advantage of centralized registries is their ability to provide high performance of data processing in real time. Insurance companies can quickly update information about policies, customers and insured events, which contributes to effective

risk management. In addition, centralized systems allow implementation of complex analytical models that are used to assess risks, form tariffs and predict the unprofitability of insurance products.

However, the centralized model also has certain disadvantages. The most significant of these is a high level of data concentration, which creates risks of cyber threats and unauthorized access to information. In addition, centralized systems are less transparent for customers, since all the processes are controlled directly by the insurance company, which can reduce the level of trust in it. This model also limits the possibilities of automating individual processes, in particular, execution of contract terms in real time.

In contrast to centralized registries, decentralized blockchain solutions offer a fundamentally different approach to organizing insurance processes. They are based on a distributed network of nodes, where each transaction is recorded in the form of a block and confirmed by network participants. This approach provides a high level of transparency, since all the records are immutable and available for verification.

One of the key advantages of blockchain technologies in insurance is the possibility of using smart contracts. These are programmable algorithms that automatically execute the terms of insurance contracts when certain events occur. For example, in the case of parametric insurance, payment can be made automatically when a certain weather phenomenon or other event is recorded, without the need for additional applications by the client. This significantly reduces the time for settling insurance claims and administrative costs.

Decentralized systems also contribute to reducing the level of insurance fraud. Since all transactions are recorded in an immutable register, the possibility of data falsification or manipulation of information is significantly limited. This is especially important in the field of property and health insurance, where the risks of fraud are traditionally high.

Another advantage of blockchain solutions is increasing the level of trust between insurance market participants. Due to the decentralized nature of the system, clients gain access to more transparent information about insurance conditions, transaction history and payment mechanisms. This contributes to forming more open and competitive insurance services market.

At the same time, blockchain models have certain limitations. In particular, they require significant computing resources, which can affect the speed of transaction processing. In addition, integration of decentralized systems into the traditional financial infrastructure is a complex process that requires adaptation of regulatory approaches and creation of new security standards.

In modern practice, a hybrid model is increasingly used, which combines elements of centralized registries and blockchain solutions. In such a system, critical data can be stored in a centralized database, while operations that require a high level of transparency and automation are performed via blockchain. This allows you to combine the advantages of both approaches and minimize their disadvantages.

Hybrid technology models are particularly effective in large insurance companies with complex business process structures and large amounts of data. They enable

management flexibility, high system performance and at the same time increase customer trust. In addition, such models contribute to the gradual transition from traditional systems to fully decentralized solutions in the future.

It is important to note that development of technology models in insurance is closely related to the general trends in the financial sector digitalization. The growing role of artificial intelligence, big data and the Internet of Things creates the prerequisites for the further evolution of both centralized and decentralized systems. In the future, we can expect formation of fully integrated digital ecosystems in which insurance companies, banks and technology providers will work in a single information environment (Ogdanska and Mykhailenko, 2025).

Therefore, technology models for implementing FinTech in insurance are the fundamental basis for the digital transformation of the industry. Centralized registries provide stability and manageability of processes, while decentralized blockchain solutions open up new opportunities for transparency, automation and increased trust. Their combination within hybrid systems allows you to form the most effective model of functioning of the modern insurance market, focused on innovation and customer orientation.

Impact on efficiency. Financial technologies allow you to reduce operating costs by 20–30%, increase the accuracy of risk assessment and improve interaction with customers, which has a positive impact on the profitability and sustainability of insurance companies in a competitive environment.

Additionally, it should be emphasized that the impact of financial technologies on the efficiency of insurance activities is not limited only to reducing operating costs, but covers a much wider range of changes in the structure and quality of business processes. First of all, implementation of digital solutions provides a significant increase in the speed of information processing, which allows insurance companies to quickly respond to changes in market conditions and customer behavior. As a result, the time lag between submitting an application and making a decision on insurance coverage or payment of compensation is reduced.

Another important aspect is the increase in the underwriting accuracy through the use of artificial intelligence algorithms and big data. This enables more detailed assessment of individual client risks, taking into account not only traditional statistical indicators, but also behavioral, social and digital factors. This approach contributes to formation of fairer and more adaptive insurance tariffs, which reduces the level of loss-making of insurance portfolios and increases the financial stability of companies (Folvarsky, 2020).

In addition, financial technologies significantly improve the customer experience, which is one of the key factors of competitiveness in the modern insurance market. The use of mobile applications, online platforms and chatbots provides customers with continuous access to insurance services 24/7, which increases their satisfaction and loyalty. The convenience of digital services contributes to the growth of insurance product sales and the expansion of the customer base.

No less important is the impact of financial technologies on reducing the level of fraud in the insurance sector. The use of analytics, machine learning and blockchain solutions allows you to detect suspicious transactions, verify reliability of data and ensure transparency at all stages of the insurance process. This significantly reduces financial losses for insurance companies and increases overall trust in the insurance market.

Thus, financial technologies form a complex effect of increasing efficiency, which covers both economic and organizational aspects of insurance companies' activities. In the long term, their use becomes a key factor in ensuring competitiveness, innovative development and stability of the insurance sector in the context of digital transformation of the economy.

Legal aspects and regulation of digital insurance technologies play a paramount role in the development of financial technologies in the financial markets of countries. In many countries, legislation does not keep up with the development of technologies. To reduce legal risks, regulators create special "sandboxes" (regulatory sandboxes), where companies test new products in a limited environment. In Ukraine, the issue of regulating InsurTech is just beginning to develop, in particular in the field of personal data protection, licensing and cybersecurity.

Legal regulation of digital insurance technologies is one of the key factors in the stable development of the InsurTech market, since it is the legal and regulatory framework that determines permissible limits of the use of innovations, the level of consumer protection and requirements for the insurance companies activities. In today's rapidly digitalizing financial sector, legislation often fails to adapt to new technological realities, which creates a regulatory gap between the development of innovations and the possibilities of their legal regulation.

In this regard, the concept of regulatory sandboxes is being actively implemented in many countries around the world, which allows financial and insurance companies to test innovative products and technologies in a controlled environment under the supervision of the regulator. This approach provides a balance between stimulating innovation and minimizing risks for the consumers of financial services. Within the sandboxes, companies can test the effectiveness of new insurance models, digital platforms, artificial intelligence algorithms and blockchain solutions without the need to fully comply with all regulatory requirements at the testing stage.

In Ukraine, development of legal regulation of InsurTech is at an early stage, but certain positive developments related to the adaptation of legislation to European standards are already being observed. Particular attention is paid to protection of personal data, as digital insurance technologies involve processing of significant amounts of confidential information about customers. In this context, it is important to implement requirements for consent to data processing, storage and transfer, as well as ensuring the right of users to control their own information.

Another important area of regulation is the licensing of insurance companies that use digital technologies. Regulators must take into account the specifics of InsurTech models, which often involve process automation, the use of artificial intelligence and the absence

of traditional physical infrastructure. This requires updating licensing conditions and developing new criteria for assessing the financial stability and reliability of digital insurance companies (Ogdanska and Mykhailenko, 2025).

A special role is played by regulation in the field of cybersecurity, as digital insurance platforms are potential targets of cyberattacks. Legislation should establish minimum standards for the protection of information systems, requirements for data encryption, access management and response to security incidents. This allows to reduce the risks of data leakage and increase the level of trust in digital insurance services.

Thus, the legal aspects and regulation of digital insurance technologies are critically important for ensuring their sustainable development. They form a safe environment for implementation of innovations, protect the interests of consumers and contribute to integration of national insurance markets into the global digital economy.

Implementation of innovative financial technologies and digital tools is accompanied by many risks (Fig. 2.4.2):

- cyberattacks and data leaks;
- legal uncertainty in the case of the use of smart contracts;
- risks of non-compliance with financial control standards.

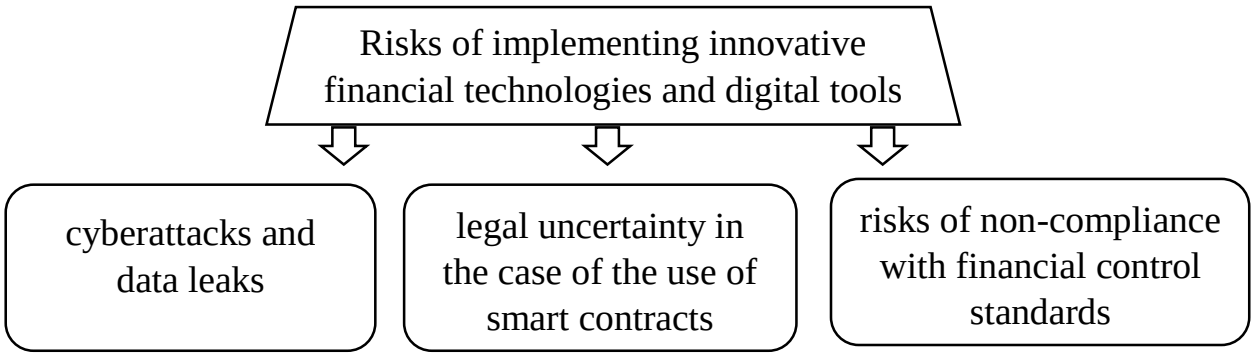


Fig. 2.4.2. Risks of implementing innovative financial technologies and digital tools

To minimize these risks, modern approaches to cybersecurity, liability insurance and adaptation of regulatory and legal acts are needed.

Introduction of digital technologies in insurance, despite significant advantages, is accompanied by a set of risks that are both technical and legal in nature. One of the most critical is the risk of cyberattacks and leakage of personal and financial data of clients. Since insurance companies process large amounts of confidential information, they become an attractive target for cybercriminals. In the event of a successful attack, not only financial losses are possible, but also significant deterioration in the company's reputation, which can lead to the loss of clients and decrease in trust in the insurer as a whole.

The risk associated with the use of smart contracts in blockchain systems requires special attention. Although these technologies provide automation of insurance

obligations, they also create legal uncertainty in cases of technical errors, incorrect programming or unforeseen situations that were not taken into account in the contract code. In such cases, the question arises: who is responsible for the failure - the software developer, the insurance company or another side of the agreement. The lack of clear legal regulation of smart contracts in many jurisdictions makes it difficult to resolve such disputes (Tytarenko and Kostenko, 2024).

Another significant risk is non-compliance with financial control standards and regulatory requirements. The use of innovative technologies sometimes outpaces the update of the regulatory framework, which can lead to situations where individual digital solutions operate in the “gray zone” of regulation. This creates potential threats to the financial stability of companies and complicates control by government authorities. In addition, an insufficient level of standardization of digital processes can lead to errors in reporting and difficulties in auditing the insurer's activities.

To minimize these risks, it is necessary to implement complex cybersecurity systems that include multi-level authentication, data encryption, constant monitoring of suspicious activity and regular penetration testing. Personnel training is also an important element, since the human factor often remains one of the main causes of cyber incidents.

A special role is played by cyber risk and professional liability insurance, which allows companies to compensate for possible losses in case of negative scenarios. This approach helps to increase financial stability of insurance companies and reduce the impact of unforeseen events on their activities.

In addition, it is important to improve the legal and regulatory framework, which should take into account the specifics of digital technologies in insurance. This includes developing clear rules for the use of smart contracts, determining responsibility of participants in digital transactions and establishing data protection standards. Only a complex approach to risk management will ensure safe development of InsurTech and increase the efficiency of the insurance market under conditions of digital transformation of the economy.

Strategic development of insurance companies in the digital economy involves the use and implementation of digital strategies and innovations into the financial system at the following levels:

- implementation of digital platforms and analytical systems;
- development of partner ecosystems;
- creation of personalized products based on big data;
- formation of digital competencies of personnel.

World practice demonstrates that digitalization of insurance business and development of innovative financial technologies form a new model of the insurance market functioning. Emergence of the InsurTech direction, which combines insurance and digital technologies, contributes to modernization of traditional insurance processes, increases efficiency of risk management, reduces transaction costs and expands availability of insurance services for the population. The use of technologies such as

artificial intelligence, blockchain, big data, cloud services, and the Internet of Things (IoT) allows insurance companies to optimize underwriting processes, automate claims settlement and increase accuracy of risk assessment (Kuzheliev and Nechyporenko, 2025).

Researches show that digital technologies significantly increase innovative potential of insurance companies, contribute to optimization of business processes and ensure growth of the insurance sector efficiency. In addition, development of InsurTech helps to reduce information asymmetry between the insurer and the insured, which increases trust in insurance institutions.

For Ukraine, this problem is particularly relevant, since the insurance market is at the stage of structural transformation, caused by both internal economic challenges and the influence of global digital trends. State of war conditions, increasing risks level, the need to develop financial stability and integration into the global financial space require modernization of the insurance market mechanisms and active introduction of digital technologies into insurance activities.

In this regard, researching the role of financial mechanisms and digital technologies in the insurance market development is an important segment of the state's financial system, which ensures redistribution of financial resources and formation of the investment potential of the economy. However, traditional mechanisms for the functioning of insurance business do not always meet the modern requirements of digital economy and the growing needs of customers.

Among the main problems of the insurance market development there are:

– insufficient level of digitalization of insurance companies;
– low financial accessibility of insurance services for the population;
– imperfection of financial mechanisms for managing insurance risks;
– limited use of innovative technologies in the processes of underwriting and settlement of insurance cases;
– low level of public trust in insurance institutions.

One of the key areas for solving these problems is introduction of digital technologies into insurance activities and improvement of financial mechanisms for the functioning of insurance companies. Digital platforms, automation of business processes, use of machine learning algorithms and analysis of big data create new opportunities for increasing efficiency of insurance business.

Thus, there is a need for complex research on the role of financial mechanisms and digital technologies in forming a modern model of insurance market development.

Financial mechanisms of the insurance market are an important tool for ensuring stability of insurance companies functioning and effective risk management. They include a system of financial methods, levers and tools used to form insurance funds, manage insurance reserves and make insurance payments.

The main elements of the financial mechanism of insurance include:

– forming insurance premiums;

– managing insurance reserves;
– reinsurance;
– investment activities of insurers;
– financial control and regulation.

Formation of insurance premiums is a key element of the financial mechanism of insurance, since it is insurance contributions that form the financial basis of the insurance company's activities. The amount of insurance premiums depends on the level of insurance risks, characteristics of the insured object and probability of an insured event.

Table 2.4.1

Analysis of the insurers rating in terms of gross insurance premiums for 2022-2025

№	Insurer	2022, thousand UAH	2023, thousand UAH	2024, thousand UAH	2025, thousand UAH	Growth rates, %	Deviation, +/-
1	ARX	2763 900	3691 795	4280 208	4 409 580	159.54	1 645 680
2	TAS IG	2432 614	3539 924	4881 262	5 716 609	235.00	3 283 995
3	UNIQA	2547 433	3213 478	3786 491	3 572 245	140.23	1 024 812
4	USG	3167 510	2936 373	3009 586	3 458 434	109.18	290 924
5	VUSO	1769 461	2677 387	3461 821	3 727 946	210.68	1 958 485

Analysis of the insurance companies rating by gross insurance premiums for 2022–2025 indicates a general trend of growth in the insurance market and increased competition between leading insurers. The data presented in the Table 2.4.1 reflect dynamics of activities of the five leading insurance companies of Ukraine: ARX, TAS IG, UNIQA, USG and VUSO. The indicators characterize the volumes of gross insurance premiums for the period 2022–2024 and as of September 30, 2025.

In general, analysis of dynamics of gross insurance premiums indicates a significant increase in the volumes of insurance business in most companies. The highest growth rate for the studied period was demonstrated by the insurance company TAS IG. In 2022, the company's gross insurance premiums amounted to 2,432,614 thousand UAH, while as of September 30, 2025, they increased to 5,716,609 thousand UAH. Thus, the growth rate was 235%, and the absolute deviation was 3,283,995 thousand UAH. This indicates significant expansion of the company's insurance portfolio, active marketing policy and increase in demand for its insurance products.

The second place in the volume of insurance premiums in the studied period is occupied by the ARX company. In 2022, gross insurance premiums amounted to 2,763,900 thousand UAH, and as of September 30, 2025, they increased to 4,409,580 thousand UAH. The overall growth rate was 159.54%, and the absolute deviation was 1,645,680 thousand UAH. Dynamics of the indicators show stable growth of the company

and strengthening of its positions in the insurance market of Ukraine.

Insurance company VUSO also demonstrates high growth rates. In 2022, the volume of gross insurance premiums amounted to 1,769,461 thousand UAH, in 2023 – 2,677,387 thousand UAH, in 2024 – 3,461,821 thousand UAH, and as of September 30, 2025 – 3,727,946 thousand UAH. The growth rate was 210.68%, and the absolute deviation was 1,958,485 thousand UAH. Such dynamics shows the active development of the company, expansion of the client base and increase in competitiveness.

The UNIQA insurance company also demonstrates positive dynamics in the growth of insurance premiums. In 2022, the figure was 2,547,433 thousand UAH, in 2023 – 3,213,478 thousand UAH, in 2024 – 3,786,491 thousand UAH. However, as of September 30, 2025, there is a slight decrease in the volume of premiums to 3,572,245 thousand UAH. Despite this, the overall growth rate for the period is 140.23%, and the absolute deviation is 1,024,812 thousand UAH, which shows the stability of the insurer's activities.

The slowest growth rate among the studied companies is demonstrated by USG. In 2022, the volume of gross insurance premiums amounted to 3,167,510 thousand UAH, which was the highest indicator among the presented insurers. However, in 2023, there was a decrease to 2,936,373 thousand UAH. Further, there was a gradual increase: in 2024, the indicator amounted to 3,009,586 thousand UAH, and as of September 30, 2025, it was 3,458,434 thousand UAH. The growth rate is only 109.18%, and the absolute deviation is 290,924 thousand UAH, which clearly demonstrates a more restrained pace of development compared to other insurers.

Thus, analysis results show positive development dynamics of the insurance market of Ukraine in 2022–2025. Most leading insurance companies demonstrate significant increase in gross insurance premiums, which is the result of insurance services expansion, increased demand for insurance and insurers activity. The most dynamic development is observed in TAS IG and VUSO companies, which demonstrate the highest growth rates of insurance premiums. At the same time, ARX and UNIQA maintain stable positions in the market, while USG is characterized by more moderate growth rates. In general, this shows gradual strengthening of the insurance market of Ukraine and increasing role of insurance in the financial system of the state.

In modern conditions, financial mechanisms of insurance are increasingly integrated with digital technologies, which allows to increase accuracy of insurance tariff calculations and optimize risk management processes.

Digital technologies in insurance activities play a primary role in the development of both the financial market as a whole and the insurance market in particular. Digitalization of insurance business has become one of the important factors in the transformation of the insurance market. The introduction of digital technologies allows insurance companies to significantly increase the efficiency of their operations and improve the quality of customer service.

Analysis of Ukrainian insurance companies rating by financial results in 2024–2025 shows significant changes in the structure of market profitability, increased competition between leading insurers and redistribution of leading positions (Table 2.4.2).

In 2025, the leader in financial results was TAS IG, which received 429,220 thousand UAH and rose to the first place, while in 2024 it occupied only the seventh position. Such dynamics indicate significant improvement in the company's efficiency, expansion of the client base and, probably, optimization of the insurance portfolio. This may also be a consequence of active digitalization of business processes and aggressive market strategy. The second position in 2025 was taken by ARX with a result of 295,861 thousand UAH, which in 2024 was the market leader (452,835 thousand UAH). Despite maintaining high positions, there is a significant decrease in financial results, which may indicate increased competition, changing tariff policy or increasing insurance payments.

On the third position in 2025 is "ARSENAL INSURANCE" (294,340 thousand UAH), which significantly improved its positions compared to 2024, when the company took the eighth place. This shows significant increase in the effectiveness of risk management and expansion of its presence in the market.

In 2025, PZU Ukraine rose to the fourth position with a result of 255,041 thousand UAH, demonstrating stable development and strengthening of its positions among the market leaders. A similar trend is observed in INGO, which moved from the third place in 2024 to the fifth in 2025, with a slight decrease in financial results.

UNIVERSALNA shows relatively stable results, but also loses ground, dropping from the fourth place in 2024 to the eighth in 2025. This may indicate increased competitive pressure and the need to update the business model.

Table 2.4.2

Analysis of financial results in the insurers rating for 2024-2025

№	Insurers	Financial result in 2025, thousand UAH	№	Insurers	Financial result in 2024, thousand UAH.
1	TAS IG	429 220	1	ARX	452 835
2	ARX	295 861	2	UNIQA	433 614
3	ARSENAL INSURANCE	294 340	3	INGO	262 606
4	PZU UKRAINE	255 041	4	UNIVERSALNA	233 858
5	INGO	245 904	5	COLONNADE UKRAINE	157 521
6	KNIAZHA	241 557	6	ORANTA	157 423
7	UNIQA	234 443	7	TAS IG	157 084
8	UNIVERSALNA	228 781	8	ARSENAL INSURANCE	119 603
9	ORANTA	220 468	9	VUSO	118 824
10	VUSO	201 047	10	ViDi-INSURANCE	77 901

Significant fluctuations are observed in UNIQA, which in 2024 was in the second place (433,614 thousand UAH), but in 2025 dropped to the seventh place (234,443 thousand UAH). Such a sharp change may be due to decreasing premiums or increasing insurance payments, which negatively affected the financial result.

ORANTA and VUSO companies demonstrate relatively stable but average positions, remaining in the second half of the rating, which shows limited competitiveness compared to the market leaders. At the same time, KNIAZHA rose to the sixth place in 2025, which shows positive development dynamics.

In general, the analysis shows that the insurance market of Ukraine in 2024–2025 is characterized by high volatility of financial results and redistribution of market positions. Leadership is becoming less stable, and the success of companies largely depends on adaptability to digital technologies, effectiveness of risk management and ability to quickly respond to changes in the market environment.

One of the most promising areas of insurance development is the use of artificial intelligence and machine learning. Such technologies allow analyzing large amounts of data and predicting insurance risks with high accuracy. For example, modern insurance companies use machine learning algorithms to analyze customer data, predict the probability of insured events and determine optimal insurance tariffs.

The use of Big Data technologies allows insurance companies to obtain detailed information about customer behavior, which contributes to creation of personalized insurance products.

Another important direction of insurance digitalization is the use of blockchain technology. Blockchain provides a high level of transparency and security of insurance transactions, allows you to create smart contracts and automate the process of settling insurance cases.

In addition, the development of digital technologies contributes to emergence of new insurance models, in particular:

- peer-to-peer insurance;
- on-demand insurance;
- microinsurance;
- digital insurance platforms.

These models allow expanding the population's access to insurance services and increasing the level of financial inclusion.

InsurTech has a number of positively influencing factors in the insurance market development, as it is one of the most dynamic areas of financial technology development. Its main goal is to modernize traditional insurance processes through the use of innovative digital technologies.

InsurTech companies are actively implementing new insurance business models using digital platforms, mobile applications and online services. This significantly simplifies the process of concluding insurance contracts and reduces the time for settling insurance claims.

Researches show that the development of InsurTech contributes to increasing the level of technological innovation in insurance companies and stimulates their digital transformation. In addition, digital technologies allow insurance companies to use new data sources for risk assessment, which increases accuracy of underwriting and reduces the likelihood of insurance fraud.

Digital transformation of the insurance sector creates new opportunities for the insurance market development. Introduction of digital technologies helps to increase efficiency of insurance companies, reduce customer service costs and improve the quality of insurance services. Among the key trends in the insurance market development under conditions of digitalization, the following development prospects can be distinguished:

- growth of the role of digital insurance platforms;
- development of personalized insurance products;
- automation of insurance claim settlement processes;
- integration of insurance with other financial services;
- increasing the level of financial inclusion.

In the context of digital economy, insurance companies need to actively introduce innovative technologies and modernize their financial mechanisms to ensure competitiveness in the market.

The study found that financial mechanisms and digital technologies play an important role in the development of the modern insurance market.

Firstly, financial mechanisms ensure effective functioning of insurance companies, formation of insurance funds and management of insurance risks. They are the basis of financial stability of the insurance sector.

Secondly, digital technologies are significantly changing the traditional model of insurance business. The use of artificial intelligence, big data, blockchain technologies and digital platforms allows to increase the efficiency of insurance processes, reduce costs and improve the quality of customer service.

Thirdly, the development of InsurTech contributes to modernization of the insurance market, stimulates innovative activities of insurance companies and forms new insurance business models.

For the further development of the insurance market it is necessary to:

- activate the process of digital transformation of insurance companies;
- improve financial mechanisms for managing insurance risks;
- develop innovative insurance products;
- increase the level of digital literacy of the population;
- create a favorable regulatory environment for the development of InsurTech.

Thus, the integration of financial mechanisms and digital technologies is an important factor in increasing efficiency of the insurance sector and ensuring its sustainable development in digital economy and acquires important theoretical and practical significance in the context of digitalization.

2.5. FINANCIAL SUPPORT FOR THE AGRICULTURAL SECTOR THROUGH PROCESS AUTOMATION

Anna Sirko,
Ph.D. in Economics, Associate Professor,
Associate Professor of the Department
of Finance, Banking and Insurance,
Dnipro State Agrarian and Economic University, Dnipro, Ukraine

The full-scale invasion of Ukraine by the Russian Federation, which began in February 2022 and continues into 2026, has caused unprecedented destruction across the national economy, particularly in the agrarian sector. Agriculture traditionally represents one of the key pillars of Ukraine's economic system and plays a significant role in ensuring global food security. However, the consequences of military actions have substantially undermined the production, logistical, and financial capabilities of agricultural enterprises.

According to estimates provided by international organizations such as the Food and Agriculture Organization (FAO), the World Bank, and analytical research centers, the total direct and indirect losses of Ukraine's agricultural sector exceeded USD 80–85 billion by the end of 2024 – beginning of 2025, with further increases expected due to ongoing hostilities and infrastructure damage. A significant portion of arable land in frontline regions remains contaminated with mines and unexploded ordnance, accounting for more than 25% of the total cultivated area in affected territories. In addition, the destruction of irrigation systems, grain storage facilities, agricultural machinery, and energy infrastructure has considerably reduced the productive capacity of farms.

The situation is further complicated by rising prices for key production inputs, including fertilizers, fuels, seeds, and crop protection products. Logistical disruptions, restrictions in export routes, and a critical shortage of qualified labor caused by mobilization and migration have also negatively affected the stability of agricultural production. Despite these significant challenges, Ukrainian agribusiness has demonstrated a high level of resilience and adaptability. In 2024–2025, the sector continued to generate substantial export revenues, reaching approximately USD 24–25 billion, which allowed it to remain one of the largest sources of foreign currency inflows to the national economy. Ukraine maintains leading positions among the world's exporters of agricultural commodities such as corn, wheat, sunflower oil, and rapeseed.

A key factor contributing to this resilience has been the accelerated adoption of digital technologies and automation within agricultural production and management systems. Precision agriculture technologies are increasingly being implemented across Ukrainian farms. These include GPS-based autopilot systems used in agricultural machinery, satellite monitoring of crop conditions, drone technologies for field scouting and targeted spraying, Internet of Things (IoT) sensors for real-time monitoring of soil and plant conditions, as well as artificial intelligence systems for yield forecasting and decision support.

The implementation of such technologies significantly improves production efficiency by reducing input costs by 15–30%, optimizing resource allocation, and minimizing crop losses. Automation also partially compensates for labor shortages by enabling autonomous or semi-autonomous operation of agricultural machinery and improving operational planning.

In the context of post-war economic recovery, which is expected to intensify following the stabilization of the security situation, the role of technological modernization will become even more critical. Ukraine's strategic course toward integration with the European Union, including alignment with the standards of the Common Agricultural Policy (CAP), requires the modernization, digitalization, and sustainability of agricultural production systems.

At the same time, government support programs for agriculture are increasingly focusing on technological transformation. In 2025–2026, the Ukrainian government allocated between UAH 9.5 and 14.1 billion to support agricultural producers, with a growing share of these funds directed toward grants for technological modernization, land demining, restoration of irrigation systems, agricultural insurance programs, and access to preferential financing mechanisms.

Under such conditions, the integration of automation technologies into agricultural production becomes not merely a tool for increasing productivity but a strategic mechanism for strengthening the financial stability of enterprises, improving their creditworthiness, attracting investment, and ensuring long-term economic and food security.

Therefore, the study of financial support mechanisms for the agrarian sector through the implementation of automation technologies is highly relevant in modern economic conditions. Automation is gradually transforming from an optional technological innovation into a fundamental factor in restoring the competitiveness and sustainability of Ukraine's agricultural economy during wartime and the subsequent post-war recovery period. The purpose of this study is to provide a theoretical, methodological, and practical justification of the role of automation in production, management, and logistics processes as an effective mechanism for financial support and sustainable development of Ukraine's agrarian sector under wartime conditions and during the post-war reconstruction period.

To achieve this goal, the following research objectives are defined:

- to examine the evolution of the concept of financial support within agrarian economics and identify its key sources in modern economic conditions;
- to analyze automation technologies in agriculture, including precision farming, drones, IoT systems, artificial intelligence, and robotics, as tools for optimizing costs, reducing risks, and creating additional value;
- to investigate existing and prospective financial mechanisms that link funding to automation projects, including state grants, preferential lending, agricultural insurance, supply-chain finance instruments, and green bonds;
- to assess the current level of automation adoption in Ukraine during 2024–2026 and conduct a comparative analysis with leading agricultural countries;

- to identify key barriers, risks, and institutional limitations that hinder the large-scale implementation of automation-based financing mechanisms;

- to develop an integrated model of financial support based on the interaction of automation, credit, and subsidy mechanisms, and to formulate practical recommendations for public authorities, financial institutions, and agricultural enterprises.

The object of the research is the financial support system of the agrarian sector of Ukraine under wartime conditions and in the period of post-war economic recovery.

The subject of the research is the processes and mechanisms for providing financial resources to agricultural producers through investments in automation technologies and digitalization of production and management processes.

The research is based on an interdisciplinary methodological approach that integrates various analytical and scientific methods. In particular, system analysis is used to examine automation as an integrated element of the financial support system of the agrarian sector. The comparative method allows benchmarking the level of technological development and financial mechanisms in Ukraine with those in leading agricultural economies such as the European Union countries, the United States, Israel, and China.

Economic and mathematical modeling methods are applied to evaluate the effectiveness of automation projects through indicators such as return on investment (ROI), net present value (NPV), payback period, and cost-benefit ratios.

Additionally, statistical analysis and expert evaluation methods are used to process and interpret data obtained from international organizations, the Ministry of Agrarian Policy and Food of Ukraine, the State Statistics Service, and surveys of agricultural enterprises conducted in 2024–2025.

Finally, scenario forecasting methods are applied to model potential development trajectories of the agrarian sector until 2030 under different wartime and post-war recovery scenarios.

The research consists of several logically interconnected parts that consistently reveal the theoretical and practical aspects of financial support for the agrarian sector through process automation.

The structure of the study includes the following main parts:

1. Theoretical foundations of financial support in the agrarian sector.
2. Automation as a tool for improving financial efficiency in agriculture.
3. Mechanisms of financial support for automation in the agrarian sector.
4. Current state of automation in Ukrainian agriculture and international experience.
5. Key problems and risks associated with the implementation of automation technologies.
6. Prospective directions for the development of financial support mechanisms.
7. Practical recommendations for improving the efficiency of financial support systems.
8. General conclusions.

The material presented in the chapter is supplemented by analytical tables, diagrams, mathematical formulas, and case studies illustrating the experience of leading Ukrainian

and international agricultural enterprises. The concept of financial support in agrarian economics has evolved significantly over time, reflecting transformations in economic systems, agricultural policy, and global food markets. Traditionally, financial support for agriculture was interpreted mainly as state assistance aimed at maintaining agricultural production, stabilizing farmers' incomes, and ensuring national food security (Blank, 2019).

During the twentieth century, most countries introduced various mechanisms of agricultural support, including price regulation, subsidies, tax incentives, and preferential lending programs. These measures were primarily designed to reduce production risks and protect domestic agricultural producers from market volatility (Cramer et al., 2011).

In modern economic conditions, the interpretation of financial support has become significantly broader. It is now considered as a complex system of economic relations and financial instruments aimed at mobilizing, distributing, and effectively using financial resources in agricultural production. Such a system includes both public and private financial mechanisms such as government subsidies, bank lending, investment financing, insurance instruments, and international grants (European Commission, 2024).

From a theoretical perspective, financial support in the agrarian sector can be defined as a system of financial relations and mechanisms that ensure the formation, allocation, and effective use of financial resources necessary for the sustainable functioning and development of agricultural enterprises.

In recent decades, the concept of financial support has increasingly incorporated elements related to technological development, digital transformation, and sustainable agriculture. Modern agricultural production requires significant investments in innovative technologies such as precision farming, automated machinery, and digital monitoring systems. Therefore, financial support mechanisms must stimulate innovation and facilitate the modernization of agricultural enterprises (FAO, 2024).

For countries undergoing economic transformation or post-conflict recovery, financial support mechanisms become particularly important, as they contribute not only to the restoration of production capacities but also to long-term structural modernization of the agrarian sector.

The financial support system of the agrarian sector is based on a combination of various sources of financing. The diversification of financial sources allows agricultural enterprises to reduce financial risks and increase their resilience in conditions of economic instability (Lowenberg-DeBoer and Erickson, 2019).

The main sources of financial support include budgetary financing, credit resources, grant funding, investment capital, and own financial resources of enterprises.

Budgetary financing includes direct state subsidies, compensation programs, and targeted support measures provided to agricultural producers. Such support plays an important role in stabilizing agricultural production and supporting small and medium-sized farms (OECD, 2024).

Credit financing is provided by commercial banks and specialized financial institutions. Agricultural enterprises use bank loans to finance working capital needs, purchase machinery, and implement investment projects.

Grant funding is typically provided by international organizations and development programs aimed at supporting agricultural modernization, environmental sustainability, and rural development.

Investment capital includes domestic and foreign investments directed toward the development of agricultural infrastructure, technological modernization, and expansion of production capacities.

Finally, own financial resources represent internal funds generated through enterprise profits, depreciation funds, and accumulated reserves (Table 2.5.1).

Table 2.5.1

Main Sources of Financial Support for Agricultural Enterprises

Source of financing	Characteristics	Advantages	Limitations
Budgetary support	State subsidies and compensation programs	Stability and targeted support	Limited state budget
Bank credit	Loans from commercial banks	Access to large financial resources	Interest rates and collateral requirements
Grants	International financial assistance	Non-repayable financing	Limited availability
Investment capital	Domestic and foreign investments	Technological modernization	Investment risks
Own funds	Enterprise profits and reserves	Financial independence	Limited volume

Expanding on the above discussion, it is important to further examine the strategic role of financial support and automation in shaping the long-term development of the agrarian sector under conditions of globalization and digital transformation.

First, a key aspect is the formation of an effective system of state regulation that combines financial instruments with institutional support. In addition to direct subsidies and preferential lending, co-financing programs for agricultural investment projects play a significant role. These programs facilitate the attraction of private capital for the modernization of production, development of processing infrastructure, and implementation of innovative technologies. Public-private partnerships are particularly important, as they ensure more efficient allocation of resources and a balanced distribution of risks between the state and agribusiness (Sabluk, 2018).

Another important direction is the development of specialized agricultural financial instruments, such as agricultural receipts, forward contracts, and crop insurance schemes. Agricultural receipts allow farmers to obtain financing secured by future harvests, which is especially valuable for small and medium-sized enterprises. Forward contracts help reduce price volatility by locking in future prices for agricultural products. Meanwhile, crop insurance—often supported by government subsidies—enables producers to mitigate

losses caused by adverse weather conditions and other unforeseen risks (Wolfert et al., 2017). In the context of automation, digital transformation is not limited to improving production efficiency; it fundamentally reshapes management models in agricultural enterprises. The implementation of enterprise resource planning (ERP) systems and AgriTech platforms allows for the integration of financial accounting, production planning, logistics, and marketing into a unified digital environment. This enhances transparency, improves cost control, and enables faster and more informed managerial decision-making (World Bank, 2024).

Moreover, automation significantly contributes to resource optimization. Precision agriculture technologies allow farmers to apply inputs such as seeds, fertilizers, water, and pesticides in a highly targeted manner. As a result, enterprises can substantially reduce production costs while simultaneously increasing yields and minimizing environmental impact. This aligns with the growing global emphasis on sustainable and "green" agricultural practices (World Economic Forum, 2023).

An additional benefit of digitalization is its positive impact on financial resilience. The use of big data analytics and predictive modeling enables more accurate forecasting of yields, revenues, and expenses, thereby reducing uncertainty and financial risks. Furthermore, digital transparency enhances access to external financing, as financial institutions and investors gain better insight into farm performance, improving creditworthiness and investment attractiveness (FAO, 2024).

It is also important to consider the socio-economic implications of automation in agriculture. While automation reduces the need for low-skilled labor, it simultaneously increases demand for highly qualified specialists, including agri-engineers, data analysts, and IT professionals. This shift necessitates the modernization of agricultural education systems and the development of new training programs that meet the evolving needs of the labor market (European Commission, 2024).

Finally, automation enhances supply chain efficiency and market integration. Digital platforms enable real-time tracking of products, improve logistics management, and facilitate direct connections between producers and consumers. Technologies such as blockchain further strengthen transparency and trust in supply chains by ensuring product traceability and reducing transaction costs (World Economic Forum, 2023).

In conclusion, the integration of comprehensive financial support mechanisms with advanced automation technologies creates a strong foundation for the sustainable development of the agrarian sector. It not only improves productivity and profitability but also enhances resilience, environmental sustainability, and global competitiveness in an increasingly complex and dynamic economic environment (World Bank, 2024).

The gradual transition from basic mechanization to fully digital agricultural systems represents a fundamental transformation of agricultural production systems and contributes to improving financial performance and operational sustainability of agricultural enterprises (Table 2.5.2). This transition reflects not only technological progress but also a shift toward data-driven decision-making, integrated management systems, and more efficient allocation of resources within the agricultural sector. As a

result, agricultural enterprises are increasingly able to enhance productivity, minimize risks, and adapt to changing environmental and market conditions (Wolfert et al., 2017).

Table 2.5.2

Levels of Automation in the Agrarian Sector

Level of automation	Characteristics	Technologies used
Basic automation	Mechanization with partial digital control	GPS navigation, sensors
Intermediate automation	Data-driven farm management	IoT systems, farm management software
Advanced automation	Integration of AI and robotics	Autonomous machinery, drones
Fully digital agriculture	Fully integrated digital ecosystem	AI platforms, blockchain systems

Automation technologies can be classified according to the stages of the agricultural production cycle in which they are applied (Table 2.5.3). Each stage of agricultural production involves specific processes that can be optimized through the use of modern digital technologies (Wolfert et al., 2017). The agricultural production cycle typically consists of the following stages: cultivation, harvesting, storage, processing, and marketing. Automation technologies can be implemented at each stage to improve productivity, reduce costs, and ensure better resource management.

At the cultivation stage, automation is primarily associated with precision agriculture technologies. These include GPS-guided machinery, soil sensors, satellite monitoring, and decision-support systems. Such technologies enable farmers to monitor soil conditions, moisture levels, and crop health in real time, allowing for precise application of fertilizers, irrigation, and plant protection products. This targeted approach reduces input costs, minimizes environmental impact, and increases crop yields. Moreover, automated irrigation systems help optimize water usage, which is particularly important in regions facing water scarcity (World Economic Forum, 2023).

During the harvesting stage, automation is achieved through the use of advanced machinery such as autonomous harvesters and smart combines equipped with yield monitoring systems. These machines can operate with minimal human intervention, improving harvesting speed and reducing labor costs. In addition, real-time data collected during harvesting allows farmers to assess productivity across different fields and make informed decisions for future planting seasons. This contributes to improved planning and resource allocation (World Bank, 2024).

At the storage stage, digital technologies play a crucial role in maintaining product quality and reducing post-harvest losses. Automated storage systems are equipped with sensors that monitor temperature, humidity, and ventilation conditions. These systems can automatically adjust environmental parameters to ensure optimal storage conditions, thereby preventing spoilage and preserving product quality. As a result, agricultural enterprises can reduce losses and increase profitability (Wolfert et al., 2017).

The processing stage also benefits significantly from automation. Modern processing facilities utilize robotics, automated sorting systems, and quality control technologies to

enhance efficiency and ensure product standardization. Automation reduces human error, increases processing speed, and improves product consistency. Furthermore, digital tracking systems enable full traceability of products throughout the processing chain, which is essential for meeting international quality and safety standards (World Economic Forum, 2023).

Finally, at the marketing stage, digital platforms and information technologies facilitate better integration into domestic and global markets. E-commerce platforms, digital marketplaces, and supply chain management systems allow agricultural producers to connect directly with buyers, reducing the number of intermediaries and increasing profit margins. Additionally, data analytics tools enable producers to monitor market trends, forecast demand, and optimize pricing strategies. Blockchain technology further enhances transparency and trust in transactions by ensuring traceability and authenticity of agricultural products (World Bank, 2024).

Table 2.5.3

Classification of Automated Processes by Stages of the Agricultural Production Cycle

Stage of production	Automated technologies	Key functions
Cultivation	IoT sensors, satellite monitoring, precision farming	Soil monitoring, irrigation management
Harvesting	Autonomous tractors, robotic harvesters	Automated crop harvesting
Storage	Smart storage systems	Temperature and humidity monitoring
Processing	Automated sorting and packaging systems	Increasing efficiency of processing
Marketing	Blockchain platforms, digital marketplaces	Product traceability and transparency

Overall, the integration of automation technologies across all stages of the agricultural production cycle significantly enhances the efficiency, sustainability, and competitiveness of agricultural enterprises. It enables better utilization of resources, reduces production risks, and supports long-term financial stability. Therefore, the adoption of comprehensive automation solutions is becoming a key factor in the successful development of modern agriculture in the context of global economic and technological changes (Sabluk, 2018).

The integration of automation technologies across all stages of agricultural production enables the creation of a digital agricultural ecosystem that significantly improves coordination between production processes. Such an ecosystem ensures seamless data exchange between different operational units, including cultivation, harvesting, storage, processing, and distribution. As a result, agricultural enterprises can achieve higher levels of efficiency, transparency, and responsiveness to both internal and external changes (Sabluk, 2018).

The introduction of automation technologies generates significant economic and financial benefits for agricultural enterprises. One of the most important advantages is the

reduction of production costs through more efficient use of resources such as fertilizers, water, and energy (World Economic Forum, 2023). By applying inputs precisely where and when they are needed, farms can avoid overuse, thereby minimizing waste and lowering operational expenses. This is particularly important in the context of rising input prices and increasing environmental regulations. Studies show that precision farming technologies can reduce input costs by approximately 15–30% while maintaining or increasing crop yields. Automated machinery also allows farms to perform operations faster and with greater accuracy, leading to higher productivity and improved operational efficiency (European Commission, 2024). In addition, labor costs can be significantly reduced, as automation replaces manual and repetitive tasks. This is especially relevant in regions experiencing labor shortages or increasing labor costs.

Automation also contributes to reducing post-harvest losses. Smart storage systems equipped with sensors can maintain optimal temperature and humidity conditions, thereby preserving product quality and reducing waste. This not only increases the volume of marketable products but also improves the overall profitability of agricultural enterprises. Furthermore, better storage conditions allow producers to sell their products at more favorable market prices by avoiding forced sales immediately after harvest (Wolfert et al., 2017). Furthermore, automation improves management decisions through real-time data analysis. Farm managers can monitor production processes, forecast yields, and identify potential risks in advance. Advanced analytics and decision-support systems enable more accurate planning of production activities, resource allocation, and financial flows. This reduces uncertainty and enhances the overall effectiveness of enterprise management (World Bank, 2024).

From a financial perspective, these improvements increase profitability, improve financial stability, and enhance the investment attractiveness of agricultural enterprises. Automated farms tend to demonstrate more predictable financial results, which is a key factor for attracting external financing. Investors and financial institutions are more willing to support enterprises that utilize modern technologies, as they are perceived to be less risky and more capable of generating stable returns (FAO, 2024). Investments in automation technologies require detailed financial analysis. Several financial indicators are commonly used to evaluate the effectiveness of automation projects, including Return on Investment (ROI), Payback Period (PP), Net Present Value (NPV), and Internal Rate of Return (IRR) (European Commission, 2024). These indicators allow managers to assess not only the expected profitability of investments but also the time required to recover initial costs and the overall economic feasibility of the project.

In addition, it is important to consider the long-term strategic benefits of automation investments. While initial costs may be high, the long-term gains in efficiency, cost reduction, and risk mitigation often outweigh these expenses. Moreover, automation enhances the adaptability of agricultural enterprises to external shocks, such as climate change, market volatility, and supply chain disruptions (World Economic Forum, 2023).

Another critical aspect is the scalability of automation technologies. Once implemented, digital systems can be expanded and integrated with new technologies, allowing enterprises to continuously improve their operations. This flexibility is essential in a rapidly evolving technological environment, where innovation plays a key role in maintaining competitiveness. Finally, the successful implementation of automation requires not only financial resources but also organizational readiness and human capital development. Enterprises must invest in staff training, digital skills, and change management processes to fully realize the benefits of automation. Without proper integration into business processes, even the most advanced technologies may fail to deliver the expected results (World Bank, 2024).

In conclusion, automation technologies provide substantial economic and financial advantages for agricultural enterprises, contributing to cost reduction, productivity growth, and improved financial performance. At the same time, careful financial evaluation and strategic planning are essential to ensure the effectiveness and sustainability of such investments in the long term (European Commission, 2024). The Return on Investment (ROI) indicator measures the profitability of an investment relative to its cost:

$$ROI = \frac{Net\ Profit}{Investment\ Cost} \times 100\%$$

Where:

Net Profit – additional profit generated due to automation;

Investment Cost – total investment in automation technologies.

The Payback Period (PP) shows the time required to recover the initial investment:

$$Payback\ Period = \frac{Initial\ Investment}{Annual\ Cash\ Flow}$$

The Net Present Value (NPV) evaluates the profitability of a project by considering the time value of money:

$$NPV = \sum \frac{CF_t}{(1+r)^t} - I_0$$

Where:

CF_t – cash flow in year t;

r – discount rate;

I_0 – initial investment.

The Internal Rate of Return (IRR) represents the discount rate at which the NPV of the project equals zero. The use of financial evaluation tools such as Return on Investment (ROI), Payback Period (PP), Net Present Value (NPV), and Internal Rate of Return (IRR) allows agricultural enterprises to determine the economic feasibility of automation projects and justify investment decisions (Table 2.5.4). These indicators provide a holistic

assessment of both short-term and long-term financial outcomes, enabling managers to select the most efficient technological solutions (European Commission, 2024).

Table 2.5.4

Example of Financial Evaluation of Automation Investment

Indicator	Value
Initial investment	120,000 USD
Annual savings from automation	40,000 USD
Additional revenue	20,000 USD
Net annual benefit	60,000 USD
Payback period	2 years
ROI	50%

Thus, automation technologies represent a powerful instrument for strengthening financial sustainability, enhancing operational efficiency, and ensuring the long-term competitiveness of the agrarian sector. Their implementation not only improves production processes but also creates a foundation for more stable financial performance.

A crucial driver of technological modernization in agriculture is the role of the state, which provides institutional and financial support for innovation. Government programs ensure access to financial resources necessary for the adoption of digital technologies and the modernization of production systems. In many countries, including Ukraine, agricultural policy increasingly focuses on supporting digital transformation and improving sector efficiency (OECD, 2024).

In Ukraine, one of the key support instruments is the national program “єРобота” (eRobota), which provides grants for business development, including agricultural enterprises implementing automation and digital solutions. This program enables producers to invest in modern machinery, digital management systems, and precision farming technologies. Complementing this initiative, grant programs supported by international organizations finance projects aimed at implementing smart farming solutions and developing digital agricultural infrastructure (Wolfert et al., 2017).

Another important financial mechanism is the preferential lending program “5–7–9%”, which provides affordable credit to small and medium-sized enterprises. This program facilitates investment in automated equipment and modern technologies, reducing financial constraints and accelerating technological adoption in the agricultural sector. In addition to public support, private investment instruments play an increasingly significant role in financing agricultural automation. Venture capital serves as a major source of funding for AgTech startups developing advanced solutions such as artificial intelligence systems, autonomous machinery, and digital platforms. These investments contribute to the rapid scaling and commercialization of innovative technologies (World Economic Forum, 2023).

Crowdfunding has also emerged as an alternative financing mechanism, enabling agricultural enterprises and technology developers to attract funds directly from individual

investors. At the same time, green bonds provide targeted financing for environmentally sustainable projects, including precision irrigation systems, renewable energy solutions, and digital monitoring technologies aimed at improving resource efficiency (Blank, 2019). The expansion of these financial instruments significantly broadens access to capital and stimulates the adoption of automation technologies across the agricultural sector. At the same time, the implementation of digital systems enhances the creditworthiness of agricultural enterprises. The use of precision farming technologies and digital management platforms provides reliable and transparent data on production performance, reducing information asymmetry between borrowers and financial institutions (European Commission, 2024).

As a result, financial institutions are able to assess risks more accurately, which improves access to credit and may reduce borrowing costs for technologically advanced farms. In this context, automation technologies function not only as a production tool but also as a factor that strengthens financial reliability.

Additional financial support mechanisms include agricultural insurance and leasing. Insurance programs protect producers against risks such as adverse weather conditions, crop diseases, and market volatility. The integration of digital monitoring systems and satellite data improves risk assessment and allows insurers to develop more efficient and tailored products (Wolfert et al., 2017).

Leasing, in turn, enables agricultural enterprises to access modern machinery and digital technologies without significant upfront investments. This instrument has evolved to include not only equipment but also software solutions, IoT systems, and precision farming technologies, thereby reducing financial barriers to technological modernization.

Automation also contributes to the development of modern agricultural value chains. Digital technologies improve coordination between producers, processors, distributors, and financial institutions, enhancing overall efficiency. In this context, supply chain finance (SCF) plays an important role by optimizing cash flows and facilitating access to financing for participants within the supply chain (OECD, 2024).

Digital platforms and blockchain technologies provide real-time monitoring and verification of transactions, enabling financial institutions to base lending decisions on reliable data. This reduces financial risks and improves liquidity within agricultural value chains. The effectiveness of these mechanisms largely depends on institutional capacity and policy consistency. Stable and predictable government policies create favorable conditions for investment, while well-developed digital infrastructure ensures the practical implementation of automation technologies. Access to high-speed internet and digital platforms is essential for the functioning of modern agricultural systems (World Economic Forum, 2023).

Equally important is the regulatory environment governing digital technologies. Clear legal frameworks for data protection, digital transactions, and the use of advanced technologies such as artificial intelligence and blockchain enhance trust and facilitate their adoption in agricultural and financial systems (FAO, 2024).

International cooperation further supports the development of agricultural automation by providing funding, expertise, and access to best practices. At the same time, innovation ecosystems – including research institutions, technology hubs, and business incubators – play a key role in promoting the development and implementation of advanced agricultural technologies (European Commission, 2024).

Despite significant benefits, the implementation of automation technologies involves certain risks, including high initial investment costs, technological obsolescence, and cybersecurity threats. Effective risk management strategies, including diversification, insurance, and flexible financing mechanisms, are necessary to mitigate these challenges (Blank, 2019).

Cybersecurity, in particular, has become a critical issue in digital agriculture. The protection of data and digital systems is essential for ensuring operational continuity and safeguarding sensitive information. Therefore, investments in secure digital infrastructure and staff training are integral to successful automation strategies (FAO, 2024).

At the same time, automation contributes to environmental sustainability by enabling more efficient use of resources and reducing negative environmental impacts. Precision technologies support water conservation, optimize fertilizer application, and minimize waste, aligning agricultural practices with global sustainability objectives (World Economic Forum, 2023). Furthermore, digitalization facilitates the integration of agricultural enterprises into global markets by ensuring compliance with international standards and improving product traceability. This enhances export potential and strengthens the competitiveness of the agrarian sector in the global economy (Lowenberg-DeBoer and Erickson, 2019). In conclusion, the combination of financial instruments, institutional support, and automation technologies creates a comprehensive framework for the sustainable development of agriculture (Table 2.5.5). These factors collectively improve efficiency, financial stability, and resilience, while also promoting innovation, environmental sustainability, and long-term competitiveness of the agrarian sector (OECD, 2024).

Table 2.5.5

Main Financial Mechanisms Supporting Agricultural Automation

Financial mechanism	Description	Impact on automation
State grants	Government support programs for technology adoption	Reduce investment barriers
Preferential loans	Reduced interest rate credit programs	Facilitate acquisition of technology
Venture capital	Investments in AgTech startups	Development of innovative solutions
Leasing	Financing of machinery and digital equipment	Access to modern technologies
Supply chain finance	Financing based on supply chain transactions	Improved liquidity and transparency

Thus, the integration of automation technologies into financial mechanisms and supply chains creates new opportunities for improving the efficiency, transparency, and sustainability of agricultural production systems.

In modern conditions of global competition and technological transformation, the automation of agricultural production is becoming an important factor in ensuring financial sustainability and long-term development of agricultural enterprises. Governments of many countries actively stimulate the digitalization of agriculture through various financial support mechanisms such as grants, subsidies, preferential loans, and investment programs.

In Ukraine, one of the most important initiatives aimed at supporting technological modernization of enterprises is the state program "eRobota", which provides grants for starting or expanding businesses, including projects related to digital transformation and automation. The program allows agricultural enterprises to receive financial resources for the purchase of innovative equipment, the implementation of digital platforms, and the modernization of production processes (OECD, 2024).

Another important mechanism is the state program of preferential lending "5–7–9%", which provides affordable financing for small and medium-sized enterprises, including agricultural producers. The program allows farmers to attract credit resources at significantly reduced interest rates, which creates favorable conditions for investments in automation technologies, such as precision agriculture systems, agricultural drones, and automated machinery.

In addition to national programs, Ukrainian agricultural producers have access to international financial support instruments provided by organizations such as the World Bank, FAO, and the European Union. These programs often include grants for digitalization projects, modernization of agricultural infrastructure, and development of AgTech innovations (FAO, 2024; Lowenberg-DeBoer and Erickson, 2019).

International experience shows that state support programs significantly accelerate the adoption of agricultural technologies. According to international studies, government incentives and public investment in innovation infrastructure play a crucial role in the development of smart farming technologies and digital agriculture (World Bank, 2024).

In addition to government programs, private investment mechanisms play an increasingly important role in financing agricultural automation. Among the most important instruments are venture capital investments in AgTech startups, crowdfunding platforms, and green bonds.

Venture capital has become one of the most dynamic sources of financing technological innovation in agriculture. Venture investors actively support companies developing solutions in the fields of artificial intelligence, agricultural robotics, and digital farm management systems. Such investments are aimed at scaling innovative technologies and accelerating their implementation in agricultural production.

Crowdfunding platforms also allow agricultural enterprises and technology developers to attract financial resources from a wide range of investors. Through

specialized platforms, farmers can raise funds for the implementation of precision agriculture systems, drone monitoring technologies, and automated irrigation systems.

Another promising financial instrument is green bonds, which are used to finance environmentally sustainable agricultural technologies. Green bonds support investments in resource-efficient production systems, renewable energy in agriculture, and environmentally friendly farming technologies.

These investment instruments contribute to the diversification of financial resources and reduce the dependence of agricultural enterprises on traditional bank lending. They also stimulate the development of innovative ecosystems in the agricultural sector.

Automation technologies can also enhance the financial stability and creditworthiness of agricultural enterprises. The introduction of digital monitoring systems, automated accounting systems, and precision agriculture technologies increases transparency in financial and production processes.

Financial institutions increasingly consider technological modernization as a factor that reduces operational risks and improves the predictability of agricultural production. Automated monitoring systems allow banks to obtain real-time information about crop conditions, production volumes, and resource usage.

As a result, automated farms often have better access to credit resources and more favorable financing conditions. According to international research, digitalization and automation increase the efficiency of agricultural operations and improve the financial stability of enterprises by reducing production risks and increasing productivity (World Economic Forum, 2023). In this context, automation technologies can serve not only as production tools but also as a form of technological collateral, strengthening the financial reliability of agricultural businesses.

Insurance instruments and leasing mechanisms also play an important role in financing agricultural automation. Agricultural insurance programs help reduce risks associated with crop losses, climate change, and market volatility.

Insurance companies increasingly use digital technologies, satellite monitoring, and automated risk assessment systems. These technologies improve the accuracy of insurance models and reduce transaction costs.

Leasing is another effective financial instrument that allows agricultural enterprises to obtain modern equipment without large initial investments. Leasing companies provide farmers with access to automated machinery, drones, sensors, and farm management software.

The main advantage of leasing is the possibility of gradual payment for equipment through operating income. This reduces the financial burden on agricultural enterprises and accelerates the adoption of technological innovations.

One of the most promising directions in the development of financial mechanisms for agricultural automation is the integration of digital technologies into agricultural value chains.

Modern agricultural supply chains increasingly rely on digital platforms that allow real-time monitoring of production processes, logistics operations, and product quality.

Blockchain technologies and digital tracking systems improve transparency and traceability of agricultural products.

Supply chain finance mechanisms enable farmers to obtain financing based on future sales contracts or supply agreements with processing companies and retailers. Automated production systems increase reliability and predictability of supply, which strengthens trust between participants in the value chain. According to international research, automation and digital technologies significantly increase efficiency and productivity in agriculture by optimizing resource use, improving monitoring of production processes, and reducing labor costs (World Economic Forum, 2023). Thus, the integration of automation technologies into agricultural supply chains not only increases production efficiency but also expands access to financial resources (Table 2.5.6 based on FAO (2024); Lowenberg-DeBoer and Erickson (2019; World Bank (2024); World Economic Forum (2023)).

Table 2.5.6

Main financial mechanisms supporting agricultural automation

Mechanism	Financial instrument	Purpose
Government programs	Grants, subsidies, preferential loans	Support for digitalization and technological modernization
Venture capital	Investment funds	Financing AgTech startups and innovative technologies
Crowdfunding	Online investment platforms	Collective financing of agricultural innovations
Green bonds	Environmental investment instruments	Financing sustainable agricultural technologies
Leasing	Equipment leasing	Access to modern automated machinery
Supply chain finance	Contract-based financing	Improving liquidity and financial stability

The introduction of automation technologies in the agricultural sector significantly improves productivity, reduces labor costs, and increases the efficiency of resource use. However, despite these advantages, the implementation of automation systems is associated with a number of financial, technological, institutional, and social risks. Understanding these risks is essential for the development of effective strategies for the sustainable digital transformation of agriculture.

One of the main obstacles to the implementation of automation technologies in agriculture is the high cost of equipment and digital infrastructure. Modern automated systems, including agricultural drones, precision farming equipment, sensors, and artificial intelligence software, require significant capital investment.

According to international research, high initial investment costs remain one of the main barriers to the adoption of digital farming technologies. Nearly 60% of farmers identify the high cost of automation technologies as the key obstacle to implementation. Advanced agricultural robotics systems, for example, can cost hundreds of thousands of dollars, making them inaccessible for many small and medium-sized farms (Cramer et al., 2011).

Another important issue is the relatively long payback period of automation investments. Agricultural enterprises often operate in conditions of high market volatility, climate risks, and unstable commodity prices. As a result, the return on investment in automation technologies may take several years, which reduces the willingness of farmers to implement such innovations. The development of automated agriculture requires a reliable technological infrastructure, including stable electricity supply, broadband internet access, and digital communication networks. However, in many rural regions these conditions are not sufficiently developed.

Many smart farming systems rely on Internet of Things (IoT) devices, cloud platforms, and real-time data processing. Limited access to high-speed internet and digital infrastructure in rural areas significantly complicates the deployment of such systems (OECD, 2024). Another important challenge is the shortage of qualified personnel capable of managing and maintaining digital agricultural technologies. The agricultural sector often faces a deficit of IT specialists, data analysts, and engineers who can effectively operate automated systems.

Studies show that approximately 40% of farm operators lack the necessary skills and training to work with advanced automation technologies, which limits the effectiveness of their implementation (Cramer et al., 2011).

The increasing digitalization of agriculture leads to new cybersecurity threats. Automated farming systems are often connected to cloud services, IoT devices, and digital management platforms, which increases their vulnerability to cyberattacks.

Cybercriminals may target automated agricultural systems through ransomware attacks, unauthorized access to farm management platforms, or manipulation of sensor data. Such attacks may disrupt production processes, damage crops, or cause financial losses for agricultural enterprises (European Commission, 2024).

Another important risk is the dependence on imported technologies and foreign digital platforms. Many agricultural automation systems are developed by international technology companies. This dependence can create technological vulnerabilities, including supply chain disruptions, software restrictions, or geopolitical risks.

In addition, the growing role of digital data in agriculture raises concerns regarding data ownership and control. Technology providers may gain access to valuable production data, which can create competitive imbalances in agricultural markets (FAO, 2024).

Tax regulations may also create barriers to investments in automation technologies. In some cases, agricultural enterprises cannot fully benefit from tax incentives for digital investments due to complex regulatory procedures.

Another important issue is the certification and standardization of agricultural technologies. The absence of unified standards for digital agriculture equipment complicates the integration of different systems and increases implementation costs.

Moreover, the rapid development of digital technologies often outpaces the development of regulatory frameworks, which creates legal uncertainty for agricultural enterprises implementing automation systems.

Although automation technologies can increase agricultural efficiency, they may also generate certain environmental and social risks.

The intensive use of automated machinery can contribute to soil compaction and increased pressure on agricultural ecosystems if technologies are not properly managed. Heavy machinery and continuous mechanized operations may negatively affect soil structure and biodiversity (Lowenberg-DeBoer and Erickson, 2019).

Another important issue is the social impact of automation. The introduction of robotics and digital technologies may reduce demand for manual labor in rural areas, potentially increasing unemployment among low-skilled agricultural workers.

Furthermore, the digital transformation of agriculture may increase inequality between large agribusiness corporations and small farms. Large agricultural enterprises usually have better access to financial resources and technological expertise, which allows them to adopt automation technologies more rapidly.

Therefore, the successful implementation of automation technologies requires balanced policies that consider not only economic efficiency but also social sustainability and environmental protection (Table 2.5.7 based on World Bank (2024)).

Table 2.5.7

Key risks of agricultural automation implementation

Risk category	Description	Potential consequences
Financial risks	High investment costs and long payback periods	Limited access to technology for small farms
Infrastructure risks	Poor internet connectivity and unstable electricity supply	Difficulty in implementing IoT and digital systems
Human capital risks	Lack of qualified IT specialists	Inefficient use of digital technologies
Cybersecurity risks	Vulnerability of IoT devices and digital platforms	Data breaches, operational disruptions
Regulatory risks	Lack of clear legal framework and standards	Uncertainty for investors and farmers
Environmental and social risks	Soil degradation and labor displacement	Social inequality and ecological pressure

The development of the agricultural technology (AgTech) sector in Ukraine is expected to undergo a transformative expansion by 2030, fueled by digitalization, automation, and a growing need for high-efficiency agricultural production. The pace of this transformation will be largely determined by the evolution of post-war recovery, the level of investment inflows, and the effectiveness of state policies in promoting technological modernization. Scenario-based analyses suggest that in an optimistic scenario – characterized by rapid reconstruction of infrastructure, stable energy and logistics systems, and robust state support – automation adoption could reach 80–90% among medium and large agricultural enterprises. In this scenario, the establishment of AgTech startups is likely to attract substantial domestic and foreign investment, further reinforcing the technological and financial resilience of the sector (Sabluk, 2018).

Under a baseline scenario, where recovery is gradual and investment is moderate, automation adoption is projected to reach approximately 50–60% of farms by 2030, leading to incremental increases in productivity and export potential. Conversely, a pessimistic scenario—marked by prolonged instability, insufficient investment, and slow infrastructure restoration—would likely limit automation adoption, undermining the competitiveness of Ukraine's agricultural sector relative to global peers. Across all scenarios, precision agriculture systems, IoT-based monitoring platforms, drone-assisted field management, AI-driven predictive analytics, and robotic machinery remain the core drivers of productivity gains, cost efficiency, and financial resilience (Sabluk, 2018).

The proposed **"**Automation – Credit – Subsidy" model integrates technological modernization with financial mechanisms to reduce barriers to adoption and optimize investment returns. In this framework, automation serves as the primary driver of efficiency, encompassing precision agriculture technologies, IoT sensors, drones, robotic systems, and AI-based farm management platforms. Credit instruments, including preferential loans, specialized AgTech credit products, and leasing arrangements, provide accessible financing, while state subsidies – grants, tax incentives, and insurance support—further enhance investment viability. The interaction of these components reduces financial risk, shortens payback periods, and increases the likelihood of widespread adoption across farms of different sizes and capacities (Cramer et al., 2011).

Government involvement remains critical in creating an enabling environment for AgTech development. Expanding grant programs targeting digitalization and automation can ensure that small and medium-sized farms access the necessary resources for technological modernization. Tax incentives, such as accelerated depreciation of digital equipment, VAT exemptions on IoT devices, and targeted income tax reductions, further stimulate investment. Concurrently, the expansion of state-backed credit programs, investment in rural digital infrastructure, and the creation of regulatory frameworks for autonomous machinery, AI applications, and data ownership are essential measures to reduce uncertainty and promote investor confidence (Blank, 2019).

For agricultural enterprises, adopting a phased and strategic approach is essential for minimizing disruption and maximizing the return on automation investments. Initial steps should include comprehensive audits of current production processes to identify areas where automation offers the greatest efficiency gains. Pilot implementations of IoT-enabled irrigation, drone-assisted crop monitoring, and precision machinery allow enterprises to evaluate the financial and operational impact before scaling. Integration of automation into supply chain and logistical operations ensures that digitalization improves the overall value chain rather than functioning as an isolated tool. Training programs for personnel are equally important, ensuring that staff possess the technical skills necessary to operate and manage new systems effectively, thereby maximizing productivity and cost efficiency (Cramer et al., 2011).

Financial institutions play a key role in facilitating the adoption of AgTech by providing tailored financial products. AgTech-focused loans, flexible repayment schedules tied to seasonal production cycles, leasing options for digital machinery and

software, and supply chain finance mechanisms that leverage real-time operational data enhance both access to capital and the security of investment. Insurance products incorporating automated monitoring and risk management systems further reduce operational risks, providing both farmers and lenders with increased confidence in the stability and creditworthiness of agricultural enterprises (European Commission, 2024).

The successful implementation of the "Automation – Credit – Subsidy" model is expected to enhance productivity, reduce operational costs, and increase export potential, thereby improving the overall financial sustainability of Ukrainian agriculture. By harmonizing government policy, enterprise-level investment strategies, and specialized financial instruments, Ukraine has the potential to establish a modern, innovation-driven agricultural sector capable of competing globally while ensuring resilience against economic and climatic shocks (Table 2.5.8).

Table 2.5.8

Scenario-Based Projection of Automation Adoption and Financial Impact in Ukrainian Agriculture (2025–2030)

Year	Optimistic scenario – Automation adoption (%)	Baseline scenario – Automation adoption (%)	Pessimistic scenario – Automation adoption (%)	Projected revenue increase due to automation (%)	Investment in AgTech (USD million)
2025	35	30	25	5	250
2026	45	38	28	8	400
2027	55	45	32	12	550
2028	65	52	36	17	700
2029	75	58	40	22	900
2030	85	60	45	28	1200

Analysis of the scenario-based projection of automation adoption and its financial impact in Ukrainian agriculture indicates a strong interconnection between the degree of technological implementation and economic outcomes. The data demonstrate that, under all scenarios, automation adoption is expected to increase steadily from 2025 to 2030, although the pace and extent differ depending on the assumptions regarding post-war recovery, investment flows, and policy support. In the optimistic scenario, reflecting rapid infrastructure restoration and robust governmental backing, automated processes are projected to rise from 35% in 2025 to 85% in 2030, representing a high potential for productivity gains and financial efficiency. In the baseline scenario, automation adoption progresses more moderately, from 30% to 60%, highlighting the effects of gradual recovery and incremental investment. Conversely, the pessimistic scenario anticipates limited adoption, increasing from 25% to 45%, suggesting that insufficient investment and prolonged instability may constrain the sector's competitiveness on the international market.

The financial implications of automation are directly linked to revenue growth. The optimistic scenario forecasts an increase in revenues of 28% by 2030, reflecting the cumulative effect of cost reduction, minimized losses, and improved resource efficiency

achieved through advanced AgTech solutions. Moderate gains are observed under the baseline scenario, while limited automation in the pessimistic scenario results in the smallest revenue growth. Investment requirements correspond to the projected level of automation, with the optimistic scenario demanding 1.2 billion by 2030 to achieve the maximum financial and operational benefits. These trends underscore the importance of coordinated investment, technological adoption, and supportive policies to optimize returns and enhance the resilience of the agricultural sector.

To illustrate these dynamics more clearly, Fig. 2.5.1 (Sabluk, 2018) presents a scenario-based comparison of automation adoption and its financial impact over the period 2025–2030. The graph visually depicts the projected growth trajectories under the optimistic, baseline, and pessimistic scenarios, allowing for immediate assessment of the relationship between technological implementation, investment levels, and revenue outcomes. By providing a visual representation, the graph complements the quantitative data and highlights the critical role of strategic planning, phased adoption, and financial support mechanisms in shaping the future of Ukrainian agriculture.

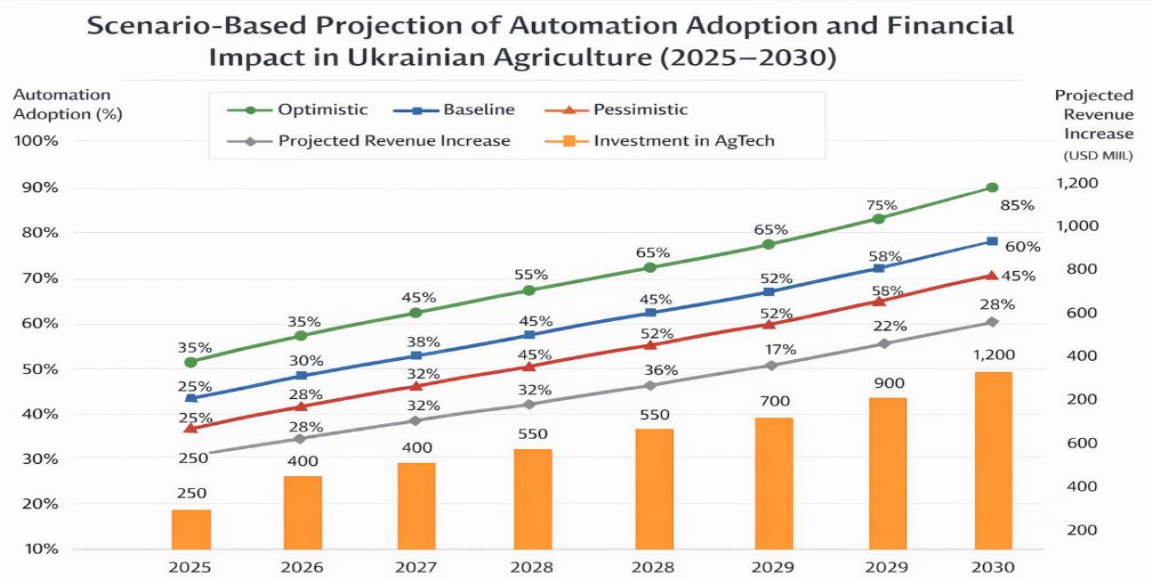


Fig. 2.5.1. Scenario-Based Projection of Automation Adoption and Financial Impact in Ukrainian Agriculture (2025–2030)

The research presented in this chapter underscores the pivotal role of automation in the financial support and sustainable development of Ukraine's agrarian sector, particularly under the extraordinary conditions imposed by wartime disruption and subsequent post-war reconstruction. The analysis demonstrates that automation technologies—including Internet of Things (IoT) devices, artificial intelligence (AI), robotic machinery, drones, precision agriculture techniques, and blockchain-based solutions—have evolved from optional innovations into essential tools for ensuring productivity, operational efficiency, and economic resilience. The study indicates that the adoption of these technologies can significantly reduce input costs, minimize crop losses,

optimize resource allocation, and enhance overall financial stability for agricultural enterprises, even under adverse conditions (European Commission, 2024).

Scenario-based projections suggest a strong correlation between the level of automation adoption and revenue growth. In the optimistic scenario, characterized by rapid reconstruction, robust state support, and active investment inflows, automation adoption is projected to increase from 35% in 2025 to 85% by 2030. Correspondingly, revenue growth due to automation is expected to reach 28%, reflecting the cumulative effect of cost reduction, enhanced efficiency, and improved supply chain management. The baseline scenario assumes gradual recovery and moderate investment, resulting in automation adoption growing from 30% to 60%, with a proportional increase in revenue. The pessimistic scenario, constrained by limited investment and prolonged infrastructural and regulatory challenges, predicts slower automation growth from 25% to 45% and a lower increase in revenue, illustrating the critical importance of coordinated policy and investment support (Cramer et al., 2011).

A key scientific contribution of this study lies in the development of the "Automation – Credit – Subsidy" model, which integrates technological modernization with targeted financial instruments. This framework provides a structured mechanism for linking investments in automation to accessible credit facilities, preferential loans, grants, and state-backed subsidies. By combining automation with financial support, the model allows enterprises to optimize capital expenditures, reduce payback periods, and increase overall profitability. Additionally, the model offers policymakers and financial institutions a tool for strategic resource allocation, prioritizing projects with the highest potential for efficiency gains and long-term sustainability.

The practical significance of the study is multifaceted. For government authorities, it highlights the importance of expanding grant programs, implementing tax incentives for technological adoption, and developing regulatory frameworks that facilitate the safe and effective use of autonomous machinery, AI, and digital platforms. Agricultural enterprises are encouraged to adopt a phased approach to automation, initially focusing on high-impact production and management processes, integrating technologies into supply chains, and providing comprehensive training for personnel. Financial institutions are advised to design specialized AgTech financing products, including flexible credit schemes, leasing options, and risk-sharing instruments supported by real-time operational data. Together, these measures foster an environment in which technological adoption can directly translate into improved financial stability and competitive advantage (European Commission, 2024).

The research also emphasizes that automation adoption is not solely a technological challenge but a multidimensional process that requires addressing financial, infrastructural, human capital, regulatory, and environmental factors. Investment in digital infrastructure, such as energy supply, connectivity, and data management systems, is essential to support the widespread deployment of IoT sensors, drones, and AI platforms. Equally important is the development of human capital, including IT specialists, agronomists trained in precision agriculture, and managers capable of integrating digital

tools into decision-making processes. Regulatory measures, such as certification of autonomous machinery, data privacy legislation, and harmonization with EU agricultural standards, further enhance the feasibility and security of automation projects (World Economic Forum, 2023).

Finally, the study identifies clear prospects for further research. Future investigations should focus on the long-term socioeconomic impact of automation on rural communities, labor markets, and food security; the effectiveness of innovative financial instruments, including green bonds and supply chain finance; and the potential of emerging technologies such as AI-driven predictive analytics and blockchain-based traceability solutions. Comparative studies with advanced agricultural economies can provide additional insights into best practices, scalability, and risk mitigation strategies. These research directions are crucial for ensuring that automation contributes not only to financial efficiency but also to the resilience, sustainability, and global competitiveness of Ukraine's agrarian sector (World Economic Forum, 2023).

To facilitate a clear understanding of the relationships between automation adoption, financial investment, revenue growth, and payback periods, Table 2.5.9 summarizes the scenario-based projections for the period 2025–2030. This table provides a quantitative foundation for developing line and bar graphs, which visually represent trends and highlight the effectiveness of integrated financial and technological strategies in post-war agricultural recovery. Such visualizations serve as essential tools for decision-making by policymakers, managers of agricultural enterprises, and financial institutions.

Table 2.5.9

Summary of Automation Adoption and Financial Impact in Ukrainian Agriculture (2025–2030)

Indicator	Optimistic Scenario	Baseline Scenario	Pessimistic Scenario
Automation adoption (%)	35–85	30–60	25–45
Revenue increase due to automation (%)	5–28	5–20	3–12
Investment in AgTech (USD million)	250–1200	250–1200	250–1200
Payback period (years)	3–6	4–7	5–9

The scenario-based projections presented in Table 2.5.9 provide a comprehensive view of the expected dynamics of automation adoption, financial investment, revenue growth, and payback periods in the Ukrainian agrarian sector between 2025 and 2030. The data indicate a clear positive correlation between the level of automation adoption and the associated financial outcomes. In the optimistic scenario, where investments are substantial and state support is maximized, automation adoption is projected to increase from 35% to 85%, resulting in a significant revenue increase of up to 28% and a relatively short payback period of three to six years. This demonstrates that timely and well-targeted investments in automation technologies can generate considerable economic benefits and enhance the financial resilience of agricultural enterprises.

The baseline scenario, characterized by moderate recovery and investment, exhibits a slower growth trajectory, with automation adoption rising from 30% to 60% and revenue increases of up to 20%. Payback periods in this scenario are slightly longer, ranging from four to seven years, indicating that while incremental adoption of automation still yields positive results, the pace of financial and operational improvement is limited compared to the optimistic scenario. The pessimistic scenario, constrained by insufficient investment and slow technological integration, shows the smallest gains, with automation adoption increasing from 25% to 45%, revenue growth of only 3–12%, and extended payback periods of five to nine years. This scenario highlights the potential risks of delayed or inadequate automation implementation, emphasizing the critical importance of financial mechanisms, policy support, and strategic planning.

A detailed analysis of the Table 2.5.9 reveals that investment requirements remain substantial across all scenarios, reflecting the capital-intensive nature of automation technologies. However, the economic returns, particularly under the optimistic and baseline scenarios, demonstrate that these investments are justified, as they lead to significant operational efficiencies, reduced input costs, and enhanced competitiveness. The variation in payback periods across scenarios further underscores the influence of both external conditions (infrastructure, policy support) and internal enterprise strategies (phased implementation, prioritization of high-impact processes) on the effectiveness of automation adoption.

Overall, the Table 2.5.9 illustrates that automation functions not only as a technological improvement but also as a critical financial tool that directly influences revenue growth, cost management, and investment efficiency. The scenario analysis emphasizes the need for coordinated efforts between governmental authorities, financial institutions, and agricultural enterprises to ensure that investments in automation translate into measurable economic and strategic benefits. In conclusion, the findings from Table 2.5.9 confirm that higher levels of automation adoption, supported by targeted financial mechanisms and policy interventions, are essential for strengthening the resilience, competitiveness, and long-term sustainability of Ukraine’s agrarian sector in the post-war recovery period.

In summary, the analysis demonstrates that automation is a decisive factor in the financial stabilization and sustainable development of Ukraine’s agrarian sector. Scenario-based projections indicate that higher levels of automation adoption lead to substantial increases in revenue, improved efficiency, and shorter payback periods, while limited technological integration constrains financial and operational outcomes. The findings confirm that coordinated investments, supportive governmental policies, and strategic implementation of automation technologies are essential to maximize economic benefits, enhance competitiveness, and ensure long-term resilience of agricultural enterprises in the post-war recovery period. Consequently, the integration of automation with targeted financial mechanisms represents not only a technological advancement but also a critical instrument for shaping the future stability and growth of Ukrainian agriculture.

2.6. ENSURING DIGITAL OPERATIONAL RESILIENCE OF THE FINANCIAL SECTOR AMIDST GLOBAL CYBER THREATS

Ilona Solodovnykova,
Senior Lecturer of the Department of Finance,
Banking and Insurance,
Dnipro State Agrarian and Economic University, Dnipro, Ukraine

In the context of global instability and the intensive digitalization of economic relations, digital operational resilience is becoming a key factor in ensuring the stability of the financial system. It reflects the ability of financial institutions to maintain the continuous provision of critical services even during the active phase of cyberattacks. This approach marks a shift from the traditional cybersecurity model toward a broader paradigm of operational resilience.

In this context, digital operational resilience acquires not only a functional but also a broader conceptual and evolutionary significance, reflecting a gradual shift from static protection models toward more dynamic risk management systems capable of adapting to an ever-changing cyber threat environment.

Its importance becomes particularly pronounced in conditions of increasing global uncertainty, where the stability of the financial system is ultimately determined by its ability to sustain critical functions even under sustained and intensifying cyber pressure.

The relevance of this issue is confirmed by the findings of the ENISA Threat Landscape 2025 report, according to which the financial sector consistently ranks among the top three most targeted industries worldwide, demonstrating an annual increase in the number of incidents by 18%. At the same time, the average cost of recovering from a successful cyberattack for large financial institutions exceeds USD 6.2 million (European Union Agency for Cybersecurity (ENISA), 2025).

The identified trends reflect a transition of cyber risks from the level of isolated incidents to that of systemic destabilizing factors affecting the resilience of the financial sector as a whole. At the same time, the growing scale of economic losses generates not only direct financial pressure on institutions but also indirectly affects the level of market confidence and the stability of expectations among participants in the financial system.

The rapid transformation of the financial intermediation architecture, driven by the adoption of Big Data technologies, artificial intelligence, and cloud computing, enhances the efficiency of financial processes. However, it also significantly expands the “attack surface” and creates complex chains of systemic dependence on third-party IT providers. This, in turn, increases the vulnerability of the financial sector to large-scale cyber incidents.

The digital transformation of financial intermediation is accompanied not only by an increasing complexity of technological architecture but also by a profound and multidimensional restructuring of the underlying risk model, within which critical functions are progressively externalized and executed through a wide range of third-party

technological platforms, including cloud infrastructures, FinTech solutions, and integrated digital service ecosystems.

As a result, this transformation gives rise to a qualitatively new configuration of interdependencies, characterized by the growing entanglement of internal institutional processes with external digital infrastructures, whereby the overall resilience of financial institutions is no longer determined solely by the robustness of their internal capabilities, but is increasingly contingent upon the reliability, security, and operational continuity of external digital partners and service providers.

The modern cyber threat landscape is characterized by the dominance of ransomware attacks, which account for approximately 34% of all incidents (Financial Stability Board, 2023), as well as a growing intensity of DDoS attacks (approximately a 25% increase over the past year) (European Commission, 2024). Such attacks are increasingly integrated into hybrid warfare strategies and are used to destabilize national payment systems and compromise the integrity of banking records.

Under contemporary conditions, cyber threats are increasingly assuming the characteristics of instruments of systemic influence, integrating economic, political, and strategic objectives within a unified operational framework. This evolution fundamentally alters the nature of cyberspace, transforming it into a multi-layered environment of asymmetric conflict, in which the boundaries between criminal activity and geopolitically driven operations become progressively blurred and, in many cases, indistinguishable.

Particular importance is attached to the development of AI-driven attacks, which in 2025 accounted for approximately 15% of successful breaches. These attacks are implemented through highly sophisticated phishing techniques and deepfake technologies, significantly complicating user identification and verification processes and requiring the adoption of fundamentally new security approaches.

The application of artificial intelligence in cybercrime leads to a qualitative transformation in the nature of threats, as the automation of attacks increases their scalability and efficiency, thereby significantly amplifying their overall impact.

In response to these developments, there arises a need for the implementation of adaptive security systems capable of self-learning and rapid response to emerging and previously unknown types of attacks.

The aim of this study is to provide a comprehensive analysis of the mechanisms for ensuring digital operational resilience in the financial sector and to develop scientifically grounded recommendations for adapting domestic financial institutions to global cyber threats in accordance with international standards, particularly the requirements of the DORA regulation.

Achieving the stated objective requires not only a theoretical understanding of the phenomenon of digital resilience, but also its practical interpretation, taking into account the specific features of the functioning of Ukraine’s financial sector under conditions of elevated risk.

To achieve this aim, the following objectives are set: to examine the evolution of the operational resilience concept; to classify modern digital threats according to the level of

their systemic impact; to conduct a critical analysis of international regulatory frameworks (including NIST and FSB approaches); and to identify priority directions for strengthening the cyber resilience of Ukraine's financial system in the context of wartime and post-war challenges.

The implementation of the stated objectives makes it possible to form a comprehensive understanding of the mechanisms for ensuring digital resilience and to identify the key directions of its institutional and technological development.

The object of the study is the process of ensuring the continuous and secure functioning of the financial sector in an aggressive digital environment. The subject of the study is a set of theoretical and methodological provisions, regulatory instruments, and organizational and technological measures aimed at effectively neutralizing cyber threats and minimizing the consequences of digital incidents in the activities of modern financial institutions.

Such an approach ensures the systematic nature of the research and provides a methodological foundation for further analysis of instruments for enhancing the digital operational resilience of the financial sector.

The theoretical conceptualization of the phenomenon of digital operational resilience in contemporary financial science necessitates a radical departure from a narrow technical understanding of cybersecurity in favor of a comprehensive systemic and managerial approach. At the current stage, the ability of a financial institution to survive is determined not so much by the strength of its external perimeter as by the strategic flexibility of its entire digital ecosystem. The genesis of this concept is directly linked to the critical transformation of financial services into intangible digital assets, where any micro-delay in transaction processing translates into large-scale systemic losses and the erosion of public trust. The essence of digital operational resilience lies in the institution's ability not only to withstand disruptive impacts but also to absorb shocks, adapt to new conditions, and rapidly restore critical functions without compromising data integrity.

Digital operational resilience has a distinctly interdisciplinary nature and is formed at the intersection of financial theory, information technology, risk management, and institutional economics. Such an approach makes it possible to interpret the financial sector as a complex digital ecosystem, within which interactions between entities have a network-based character, and the consequences of cyber incidents may spread according to the principle of a cascading effect. In this context, digital operational resilience acts as a systemic property that determines the stability and continuity of the functioning of the entire financial system.

The concept of digital resilience should be considered through the lens of dynamic capabilities, implying the ability of both individual financial institutions and the financial sector as a whole not only to respond to threats but also to proactively identify them, adapt internal and inter-institutional processes, and transform digital infrastructure in accordance with changes in the external environment. Such an approach shifts the focus from a reactive model of protection toward the strategic management of resilience, where

key factors include the speed of adaptation, architectural flexibility, and the level of integration of information systems.

In contrast to classical cybersecurity, which is traditionally based on the triad of confidentiality–integrity–availability and focuses on preventive barriers, the concept of resilience shifts the emphasis to functioning under incident conditions. This reflects the recognition of the "assume breach" paradigm, where the key performance metric is not the absence of attacks but the speed of returning to normal operations (MTTR - Mean Time to Recover) and the prevention of cascading "domino effects" within financial networks. Such a transition reflects a fundamental shift in the cybersecurity paradigm, within which the assumption of the inevitability of incidents becomes a basic premise for the design of protection systems. Accordingly, the key criterion of effectiveness is not the ability to fully prevent attacks, but the capacity to ensure the continuity of critical functions under conditions of their occurrence. It is also critically important to draw a clear distinction between digital resilience and traditional operational risk. While operational risk management within the framework of Basel III/IV is largely focused on quantitative risk coverage through capital allocation mechanisms (Pillar 1), digital resilience is oriented toward the engineering and technological robustness of system architecture, making it an instrument of active survival rather than passive loss compensation.

Digital operational resilience has an interdisciplinary nature, being formed at the intersection of financial theory, information technology, risk management, and institutional economics. Such a synthetic approach necessitates considering the financial sector and its individual institutions not as isolated entities, but as elements of a complex cyber-physical ecosystem, where interactions between participants are nonlinear and the consequences of incidents are potentially exponential. In this context, the concept of systemic vulnerability becomes particularly relevant, according to which even a localized disruption may trigger large-scale destabilization processes through the effect of network interdependence.

Digital operational resilience should be considered through the lens of dynamic capabilities, implying the ability of both individual financial institutions and the financial sector as a whole not only to respond to threats, but also to proactively anticipate their emergence, adapt internal and inter-institutional processes, and reengineer digital infrastructure, thereby shifting the focus from reactive incident management to the strategic management of adaptation, where key roles are played by such factors as the speed of decision-making, the quality of analytical data, and the level of integration of information systems.

The institutional dimension of digital operational resilience is manifested in the formation of the regulatory and legal environment, as well as in the development of standards and protocols of interaction among participants in the financial market. In this context, digital operational resilience acquires significance not only as a characteristic of individual institutions, but also as a public good that determines the overall level of trust in the financial system. Its provision requires coordinated interaction among regulatory

authorities, financial intermediaries, and providers of technological solutions operating within a unified digital environment.

The behavioral aspect of digital resilience, in turn, is determined by the fact that the human factor remains one of the most vulnerable elements within the cybersecurity system. The increasing complexity of social engineering mechanisms and the use of artificial intelligence technologies to create convincing scenarios of fraud and manipulation highlight the need to transform approaches to staff training and the development of a cybersecurity culture. Under such conditions, digital operational resilience encompasses not only technological solutions, but also cognitive and organizational components that determine the ability of actors to adequately respond to modern cyber threats.

The theoretical model of digital operational resilience acquires the features of a multidimensional construct that integrates technical, economic, institutional, and behavioral parameters, which, in turn, creates the foundation for a further transition to the analysis of specific architectural and technological mechanisms for its implementation in the financial sector.

The architectural foundation of digital resilience is based on several fundamental principles, among which the "Zero Trust Architecture" occupies a central place. This approach postulates that no subject, device, or system process within the network can be considered inherently secure by default. It requires the implementation of dynamic microsegmentation of the network landscape, continuous verification of each session, and the use of advanced multi-factor authentication methods. The implementation of this approach implies a fundamental change in the logic of designing protection systems, moving from a perimeter-based model to a model of continuous verification, where trust is treated as a dynamic variable rather than an initial condition of system functioning, thereby allowing for a significant reduction in the risks of latent intrusion and unauthorized movement within the network infrastructure.

The second layer is represented by the concept of "Security by Design," whereby resilience parameters are embedded at the stage of financial product development rather than added as an external layer. Such an approach ensures the integration of security mechanisms at the level of digital product architecture, which minimizes the costs of subsequent system adaptation and enhances their resilience to new types of threats. Embedded security contributes to the formation of a proactive risk management model focused on prevention rather than solely on response. Of particular importance is ICT third-party risk management. In the context of the proliferation of Open Banking models and cloud-first strategies, a bank's digital resilience becomes a direct derivative of the resilience of its cloud providers and software developers, necessitating a transition to end-to-end auditing of the entire digital service supply chain. Under these conditions, third-party risk management transforms into a critical element of the overall resilience architecture, as disruptions in any segment of the digital service supply chain may have a multiplicative effect on the entire financial system, necessitating the implementation of

comprehensive mechanisms for monitoring, assessing, and controlling dependencies on external IT providers.

The third strategic dimension is the transformation of Business Continuity Planning (BCP) and Disaster Recovery strategies. Within the modern paradigm, these instruments evolve from static documents into dynamic stress-testing scenarios. This involves not only data backup but also the creation of "hot" mirrored sites capable of assuming the full system load within minutes.

The transformation of this approach implies a transition to the modeling of crisis situations in a mode as close as possible to real operating conditions, which makes it possible to assess the effectiveness of recovery mechanisms in a dynamic context. Particular importance is attached to the ability of systems to automatically switch between backup environments without compromising data integrity.

However, technological sophistication alone does not ensure full resilience without the integration of human capital. Since the majority of successful cyber incidents are initiated through social engineering techniques, a culture of "digital hygiene" and staff awareness becomes the first line of active defense, forming the so-called "human firewall."

In this context, the human factor acts not only as a source of risk but also as a key element of the protection system, the effectiveness of which is determined by the level of training, awareness, and the ability to timely recognize threats. The development of a cybersecurity culture becomes an integral component of the strategic management of digital resilience.

A key methodological tool for validating this complex system is threat-led penetration testing (TLPT). Unlike standard audits, TLPT involves the real-world simulation of tactics, techniques, and procedures (TTPs) employed by contemporary cybercriminal groups. The application of such an approach makes it possible to move from formal compliance verification to the assessment of the actual effectiveness of protection systems under conditions as close as possible to real attacks, ensuring a deeper understanding of vulnerabilities and potential scenarios for their exploitation. The implementation of Red Teaming (offensive simulation) and Blue Teaming (defensive response) exercises enables financial institutions to identify latent vulnerabilities and assess the actual coordination between technical units and top management under conditions of critical stress. The integration of such practices contributes to enhancing the coordination of actions across different levels of management and develops the organization's ability to function effectively under conditions of high uncertainty and cyber threats.

The analysis of the presented cycle allows us to conclude that digital resilience constitutes a self-learning system. The Identify stage ensures the mapping of critical business processes; Protect minimizes the attack surface; Detect guarantees situational awareness of anomalies; Respond and Recover neutralize disruptive impacts. The final stage, Learn & Evolve, is the most critical, as it closes the feedback loop by transforming accumulated experience into new levels of protection. This creates an "antifragility"

effect, whereby each successfully managed incident strengthens the architecture of a financial institution. The functioning of such a cycle presupposes continuous adaptation, within which each incident iteration serves as a source of new data for improving the security system. As a result, a dynamic risk management model is formed, combining elements of preventive control and post-incident learning.

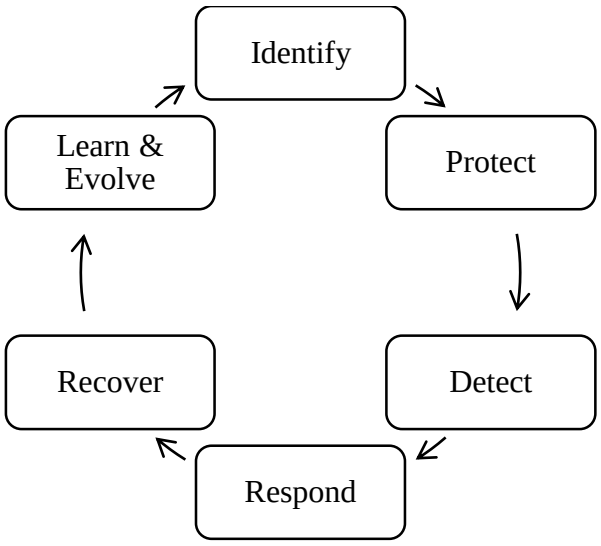


Fig. 2.6.1. The Logical Chain of Digital Operational Resilience Adaptation
(based on the NIST Cybersecurity Framework 2.0)

In conclusion, it should be emphasized that the management of digital operational resilience extends beyond the competence of IT departments and becomes a direct prerogative of the Board of Directors. The governance level must bear strategic responsibility for defining digital risk tolerance and ensuring investments in resilience as a long-term asset. In today's turbulent environment, digital operational resilience is transforming from a budgetary cost item into a key competitive advantage that ensures institutional financial stability and supports the systemic security of the national financial sector as a whole.

The institutionalization of digital resilience management at the level of top corporate governance bodies reflects a shift in the paradigm of cyber risk perception, from a technical issue to a strategic factor of sustainable development. In this context, investments in resilience acquire the characteristics of long-term capital that directly influences the market competitiveness of financial institutions.

The assessment of digital operational resilience requires a transition from a purely descriptive interpretation of resilience toward a formalized analytical framework capable of capturing its multidimensional, dynamic, and systemic nature. In the context of digitalized financial systems, resilience emerges not as an isolated characteristic of technological infrastructure, but as a complex adaptive capacity embedded within the entire institutional ecosystem.

The methodological complexity of assessing digital resilience is driven by the need to account for the interaction of technological, organizational, and ecosystem factors that shape the overall capacity of the financial system to withstand disruptive influences. Accordingly, analytical approaches must go beyond linear risk assessment models.

At the conceptual level, digital operational resilience can be defined as the integrated ability of a financial institution to ensure the continuous delivery of critical functions through the anticipation, absorption, adaptation, and rapid recovery from disruptive digital events, without compromising data integrity, service availability, or stakeholder trust. This definition emphasizes the process-oriented nature of resilience and its direct linkage to both operational continuity and systemic stability.

In this definition, the key emphasis is placed on the process-oriented nature of resilience, which implies a continuous cycle of interaction between threat anticipation, their neutralization, and the restoration of system functionality. Such an approach makes it possible to consider resilience as a dynamic characteristic that continuously evolves.

The proposed conceptual framework is grounded in the assumption that resilience is inherently multidimensional and cannot be adequately assessed through a single metric. Instead, it requires a structured decomposition into interrelated domains that collectively determine the resilience capacity of an institution.

The fragmentation of the concept into separate analytical dimensions makes it possible to more precisely identify sources of vulnerability and determine priority directions for improving the effectiveness of the protection system. The first structural domain -technological resilience -reflects the engineering robustness of digital infrastructure. It includes system redundancy, fault tolerance, cybersecurity architecture, data protection mechanisms, and the ability to maintain high levels of availability under adverse conditions. The level of technological resilience directly determines the limits of functional degradation of the system during cyber incidents and the ability of the infrastructure to maintain critical operational functions. This domain directly corresponds to the technical capability of systems to withstand and operate during disruptions.

The second domain, organizational resilience, encompasses governance structures, internal control systems, and human capital readiness. It reflects the institution’s capacity to coordinate decision-making processes, implement incident response strategies, and maintain operational coherence during crisis situations. Key elements include crisis management frameworks, staff training, communication protocols, and the integration of resilience objectives into strategic planning. The organizational dimension of resilience reflects the ability of an institution to ensure the coherence of managerial decisions under conditions of heightened uncertainty, which is critical for minimizing response time to incidents and reducing systemic losses.

The third domain, third-party (or ecosystem) resilience, captures the increasing dependence of financial institutions on external digital service providers. The expansion of cloud computing, FinTech partnerships, and open banking infrastructures has transformed financial institutions into nodes within interconnected digital ecosystems. The ecosystem dimension of resilience reflects the structural transformation of the

financial sector, within which the boundaries between internal and external components of the system become increasingly blurred, while the level of dependence on external providers becomes critically important for overall stability. Consequently, resilience must be assessed not only at the institutional level but also across the entire value chain, taking into account the reliability, security, and continuity of third-party services.

In addition to these core domains, the framework incorporates a cross-cutting dimension -cyber resilience maturity -which reflects the degree of integration of resilience principles into technological architecture, organizational processes, and corporate culture. This dimension captures the evolution of resilience from a reactive function toward a proactive and adaptive capability, aligned with the "assume breach" paradigm. Cyber resilience maturity serves as an integral indicator of an organization's capacity for systemic learning and adaptation, determining its position along the continuum from reactive to proactive risk management models. A critical feature of the proposed framework is the recognition of non-linear interdependencies between its components. Unlike traditional risk assessment models that assume additive relationships, digital resilience operates within a complex system where vulnerabilities may propagate and amplify across domains. Such a property of the system necessitates considering digital resilience as an emergent phenomenon, in which the overall effect is not a simple sum of its individual components. The interaction between system elements gives rise to new properties that cannot be reduced to the level of individual domains. For instance, a technological failure may escalate due to inadequate organizational response or insufficient oversight of third-party providers. Therefore, the overall resilience capacity is determined by the weakest link within the system, highlighting the necessity of a holistic assessment approach.

In this context, particular importance is attached to the concept of cascading vulnerability, according to which an initial incident may transform into a systemic crisis as a result of insufficient coordination between different levels of management and external participants of the digital ecosystem.

The structure of the presented model reflects the multidimensional nature of digital operational resilience, where each domain performs a specific functional role in ensuring the overall stability of the system. The interconnection between these components forms an integrated resilience architecture that functions as a unified adaptive system.

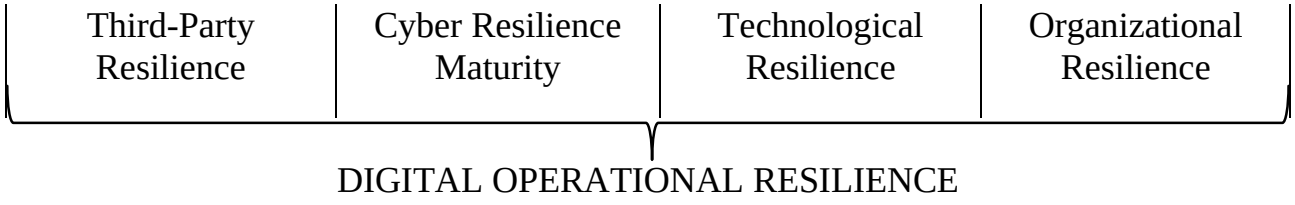


Fig. 2.6.2. Conceptual Model of Digital Operational Resilience in Financial Institutions

From a methodological perspective, this conceptual framework provides the foundation for constructing a composite index of digital operational resilience. Each domain can be operationalized through a system of indicators, which are normalized, weighted, and aggregated into an integrated resilience score. Such an approach enables not only cross-sectional comparison between financial institutions but also longitudinal analysis of resilience dynamics over time. The methodological implementation of such an approach makes it possible to move from a qualitative description of resilience to its quantitative measurement, thereby creating opportunities for formalized benchmarking of financial institutions and the assessment of the effectiveness of implemented risk management strategies. Particular importance is attached to the dynamic nature of indicators, which reflects changes in the level of resilience under the influence of both internal transformations and external shocks.

Furthermore, the framework is aligned with contemporary regulatory approaches to digital resilience, which emphasize end-to-end risk visibility, continuous testing, and governance-level accountability. The integration of technological, organizational, and ecosystem dimensions into a unified analytical model ensures consistency with international best practices and enhances the applicability of the framework in both academic research and practical risk management.

Alignment with contemporary regulatory approaches reflects the gradual institutionalization of the concept of digital resilience as a mandatory element of financial supervision. Within such a framework, particular attention is paid not only to the identification of risks but also to the ability of organizations to ensure the continuity of critical functions in real time.

Table 2.6.1

Conceptual Structure of Digital Operational Resilience Assessment

Dimension	Analytical Components	Measurable Variables (Examples)	Role in Assessment Model
Technological Resilience	Infrastructure robustness, cybersecurity architecture, system redundancy	System availability (%), MTTR, incident frequency	Captures technical stability and recovery capacity
Organizational Resilience	Governance, decision-making processes, human capital readiness	Response time, staff training frequency, incident response effectiveness	Reflects internal adaptive capacity
Third-Party Resilience	ICT dependencies, cloud providers, FinTech ecosystem	Number of critical vendors, vendor failure rate, SLA compliance	Assesses external vulnerability exposure
Cyber Resilience Maturity	Integration of resilience practices, continuous improvement	Frequency of stress testing, TLPT results, audit scores	Measures systemic preparedness and evolution

The contemporary cyber threat landscape is not merely expanding in scale; it is fundamentally transforming in nature, becoming more complex, adaptive, and, in many ways, less predictable. What was once perceived primarily as a technical challenge has

now evolved into a multidimensional risk affecting the stability of entire financial systems. In this context, the financial sector remains particularly exposed, as its high level of digitalization and systemic importance make it an attractive target for both financially motivated attackers and politically driven actors.

The changing nature of cyber threats indicates their transition into the category of systemic risks, which simultaneously encompass economic, technological, and geopolitical dimensions. Such multidimensionality complicates the application of traditional risk assessment models, which are based on the assumption of the relative isolation of incidents.

According to the European Union Agency for Cybersecurity, the ENISA Threat Landscape 2025 reports more than 4,800 significant cybersecurity incidents within a single year. However, beyond the numbers themselves, what is particularly striking is the changing nature of these incidents. Increasingly, cyberattacks are no longer isolated events but part of broader, coordinated campaigns that combine elements of cybercrime, hacktivism, and even state-sponsored operations. This convergence creates a new type of threat environment, where the boundaries between economic and geopolitical objectives become increasingly blurred (European Commission, 2024).

The coordination of different types of cyber activities within unified and orchestrated cyberattack campaigns indicates the formation of a hybrid threat model in which financial, political, and ideological motives are intertwined. Under such conditions, cyberspace functions as an arena of asymmetric influence, where classical deterrence mechanisms lose their effectiveness.

One of the most noticeable features of this environment is the overwhelming prevalence of distributed denial-of-service (DDoS) attacks, which account for approximately 77% of all recorded incidents (Bank for International Settlements, 2021). At first glance, such attacks may seem relatively straightforward compared to more sophisticated forms of cyber intrusion. Yet their real impact lies in their ability to disrupt critical services at scale, often within minutes. For financial institutions, where even short interruptions can undermine customer trust and market confidence, this type of disruption represents a serious operational challenge. The systemic effect of DDoS attacks lies not so much in their technical complexity as in their ability to cause immediate disruptions in the functioning of critical infrastructure. In the financial sector, even short-term service unavailability can lead to disproportionately high reputational and economic losses.

At the same time, it is somewhat paradoxical that, despite rapid technological progress, many successful attacks still rely on relatively simple methods. Phishing, for instance, continues to serve as the primary entry point in around 60% of cases (European Union Agency for Cybersecurity (ENISA), 2025). This suggests that the human factor remains one of the most vulnerable elements in the security architecture of financial institutions. Similarly, the exploitation of known vulnerabilities-responsible for approximately 21,3% of incidents-indicates that even well-documented technical weaknesses are not always addressed in a timely manner. Taken together, these patterns reveal that cyber risk is not solely a technological issue but also an organizational and

behavioral one. The sustained effectiveness of basic attack methods indicates a structural vulnerability that manifests precisely at the intersection of technological, organizational, and behavioral factors. Within such a risk configuration, the key factor is not so much the level of sophistication of defensive technologies as the ability of institutions to respond in a timely manner to known threats and maintain an adequate level of cyber hygiene (Financial Stability Board, 2023).

Insufficient speed in implementing security updates, combined with the asymmetry between technical protection capabilities and user behavioral practices, creates persistent "windows of vulnerability" that can be exploited even by relatively simple attack methods. Taken together, these patterns confirm that cyber risk is shaped not only as a technological phenomenon, but also as a result of organizational and behavioral deficiencies.

Under such conditions, the effectiveness of the protection system is determined not so much by its technical complexity as by the ability of institutions to ensure the timely updating of protective mechanisms and to maintain an appropriate level of cyber hygiene.

Ransomware represents perhaps the most tangible manifestation of cyber risk in economic terms. With more than 7,400 recorded incidents globally in 2025 and over 120 active cybercriminal groups, ransomware has evolved into a highly structured and profitable business model (Bank for International Settlements, 2021). The emergence of "Ransomware-as-a-Service" further accelerates this trend, enabling even less technically skilled actors to conduct large-scale attacks (Financial Stability Board, 2023). For financial institutions, the implications are particularly severe, as such attacks not only disrupt operations but also directly threaten data integrity and institutional credibility. The industrialization of cybercrime through the "as-a-service" model indicates the emergence of a fully developed cyber threat economy, in which attacks become standardized products with a low entry barrier, significantly expanding the pool of potential malicious actors and increasing the frequency of incidents.

Another important and rapidly evolving dimension is the use of artificial intelligence in cyberattacks. Recent evidence suggests that up to 45% of financial institutions have already encountered AI-driven threats (National Institute of Standards and Technology, 2024). These include highly convincing phishing messages, deepfake-based fraud schemes, and adaptive malware capable of modifying its behavior in real time. What makes this trend especially concerning is not only the efficiency of such attacks but also their scalability, which significantly increases the potential impact across the financial system. The application of artificial intelligence in cybercrime is shaping a new class of threats characterized by a high level of autonomy and self-learning capabilities, altering the balance between offensive and defensive systems, as the pace of threat evolution begins to exceed the rate of adaptation of traditional security mechanisms.

At a broader level, the growing interconnectivity of financial systems introduces an additional layer of complexity. Modern financial institutions no longer operate as isolated entities; instead, they are embedded within extensive digital ecosystems involving cloud providers, FinTech partners, and third-party service vendors. While this interconnectedness enhances efficiency and innovation, it also creates new channels

through which cyber risks can propagate. A disruption in one part of the system may quickly cascade across multiple institutions, amplifying its overall impact. The increasing interdependence of participants in financial ecosystems creates conditions for the rapid propagation of risks across market segments. Such a structure increases the systemic sensitivity of financial infrastructure to local disruptions.

In this sense, cyber risk increasingly exhibits a systemic character. Unlike traditional operational risks, which can often be localized and contained, cyber incidents tend to spread through networks, generating chain reactions that are difficult to predict and even harder to control. This raises an important question: to what extent can existing risk management frameworks adequately capture such dynamics?

The problem of adequacy of existing risk management approaches lies in their limited ability to model the nonlinear effects of cyber incident propagation within complex network structures. These observations highlight a fundamental limitation of traditional cybersecurity approaches, which have historically focused on prevention and perimeter defense. While such measures remain important, they are no longer sufficient in an environment where breaches are, to a certain extent, inevitable. This has led to a gradual shift toward the "assume breach" paradigm, where the emphasis is placed not on avoiding incidents altogether, but on ensuring the ability to continue functioning despite them. The transformation of cybersecurity approaches reflects a shift from a prevention-based model to a model of adaptive functioning, in which the key indicator of effectiveness becomes the system's ability to maintain operational continuity under crisis conditions.

Against this background, the concept of digital operational resilience emerges not simply as another analytical construct, but as a necessary response to the realities of the modern digital environment. It reflects a broader understanding of security-one that goes beyond protection and incorporates adaptability, recovery, and long-term sustainability. The empirical trends discussed above provide not only evidence of the growing scale of cyber threats but also a compelling justification for the development of more comprehensive and dynamic approaches to resilience assessment. The generalization of the outlined trends allows digital operational resilience to be considered as an integrative concept that combines protective, adaptive, and recovery components of risk management. Its development reflects the evolution of approaches to ensuring the security of financial systems in conditions of increasing complexity and interdependence of digital infrastructures.

The patterns outlined above not only illustrate the growing scale of cyber threats but also raise an important methodological question: how can the resilience of financial institutions be assessed in a way that adequately reflects this complexity? While descriptive analysis provides valuable insights into the nature of cyber risks, it remains insufficient for capturing their systemic and dynamic character. This is particularly evident given that, according to the European Union Agency for Cybersecurity, more than 4,800 significant cyber incidents were recorded within a single year, many of which had cascading effects across multiple sectors (National Institute of Standards and Technology,

2024). Such dynamics clearly demonstrate that isolated metrics are no longer sufficient for understanding resilience in modern financial systems. At the same time, the increasing interdependence of digital infrastructures leads to a situation in which individual risk indicators increasingly lose their explanatory power, as they fail to capture the effects of threat propagation across interconnected elements of the financial system. As a result, an analytical gap emerges between the actual nature of cyber risk and the tools used to measure it, which remain predominantly linear in nature.

In this regard, the concept of digital operational resilience requires not only theoretical clarification but also quantitative operationalization. In other words, it is necessary to move from understanding resilience as an abstract capability toward measuring it as a multidimensional and comparable indicator. This transition becomes especially relevant in light of the increasing economic impact of cyber incidents, where the average cost of a major cyberattack in the financial sector exceeds several million dollars, emphasizing the need for measurable and actionable assessment tools. The outlined transformation of the analytical approach also implies a change in the very logic of risk assessment, shifting from the reactive identification of consequences to the proactive modeling of potential scenarios of disruption in the functioning of financial systems, taking into account their structural complexity.

At first glance, this task may seem relatively straightforward. However, resilience is not a single-variable phenomenon that can be captured through one metric alone. On the contrary, it emerges at the intersection of multiple domains, each of which contributes differently to the overall stability of the system. Technological robustness, organizational readiness, and the reliability of external partners all play a role, and their interaction often produces non-linear effects. For instance, even highly secure technological infrastructures may fail to prevent incidents if human-factor vulnerabilities-such as phishing, which accounts for approximately 60% of initial breaches-are not adequately addressed. Thus, the analytical complexity of the phenomenon of digital resilience lies not only in the multi-component nature of its structure but also in the presence of synergistic effects between its individual elements, which makes it impossible to apply reductionist approaches to assessing the overall level of protection.

Taking this into account, a composite approach appears to be the most appropriate methodological solution. The proposed model is based on the integration of four key dimensions: technological resilience, organizational resilience, third-party resilience, and cyber resilience maturity. Such an approach enables a transition to the systemic formalization of the concept of resilience, within which each dimension performs not an isolated but a complementary function, forming an integrated assessment architecture in which the overall result is determined not only by the level of individual components but also by the nature of their interaction.

The proposed framework extends existing approaches by explicitly incorporating ecosystem-level dependencies and emphasizing the dynamic interaction between resilience domains, thereby providing a more comprehensive and adaptable basis for resilience assessment in digitalized financial systems. From a methodological perspective,

this implies a transition from static assessment models to dynamic structures, in which resilience parameters are treated as time-varying variables sensitive to internal transformations and external shocks.

Each of these components reflects a distinct aspect of the institution's ability to operate under adverse conditions, while their combination provides a more comprehensive picture of overall resilience. Thus, the complexity and multidimensional nature of cyber risk necessitate the development of a composite and quantifiable resilience metric.

From a formal perspective, this relationship can be expressed through a composite index of digital operational resilience:

$$DOR = w_1 T + w_2 O + w_3 TP + w_4 M,$$

where:

T - represents technological resilience;

O - reflects organizational resilience;

TP - captures third-party (ecosystem) resilience;

M - denotes the level of cyber resilience maturity;

w_i - are weighting coefficients reflecting the relative importance of each component, subject to the condition $\sum w_i = 1$, which ensures the normalization of the composite index and its comparability across different institutional contexts.

From an interpretative perspective, the model assumes that each of the components T, O, TP, and M can itself be represented as an aggregated sub-index constructed on the basis of a set of primary indicators. For example, technological resilience (T) may include indicators such as system availability, mean time to recovery (MTTR), incident frequency, and the level of infrastructure redundancy.

Organizational resilience (O) reflects the effectiveness of incident response procedures, the speed of decision-making, the level of staff preparedness, and the maturity of governance protocols. Ecosystem resilience (TP) is formalized through the degree of dependence on external providers, the level of supplier concentration, and the stability of SLA mechanisms.

The maturity indicator (M) integrates the results of stress testing, TLPT assessments, and the level of implementation of continuous improvement principles.

Importantly, the introduction of weighting coefficients allows the model to remain flexible and adaptable to different institutional contexts. For instance, in highly digitalized banking systems, technological resilience may play a more dominant role, whereas in environments characterized by extensive outsourcing, third-party risk may become the critical factor. This is particularly relevant given the growing dependence of financial institutions on external IT providers, which significantly expands the potential attack surface and increases systemic vulnerability. Thus, the structure of weighting coefficients may be either fixed (regulator-defined) or adaptive, based on empirical calibration or expert assessment.

At the same time, it should be emphasized that the value of such an index lies not only in its numerical output but also in the analytical process behind it. The decomposition

of resilience into measurable components enables the identification of structural weaknesses, making it possible to determine which areas require priority attention. In this sense, the index functions not merely as an evaluation tool but also as a decision-support instrument. It is also important to emphasize that the analytical value of the proposed approach lies in the possibility of constructing a dynamic panel of observations, which allows tracking the trajectory of changes in each component over time and identifying early signals of systemic resilience degradation. This creates a foundation for the transition to proactive cyber risk management, in which the emphasis shifts from reacting to incidents to their prediction and preventive mitigation.

To further operationalize this approach, each component of the model can be represented through a set of measurable indicators. For example, technological resilience may be assessed through system availability, mean time to recovery (MTTR), and incident frequency. Organizational resilience, in turn, can be linked to response time, staff training intensity, and the effectiveness of incident management procedures. Third-party resilience may be evaluated through the level of vendor dependency and service reliability, while maturity reflects the degree of integration of resilience practices, including stress testing and threat-led penetration testing.

The alignment of these indicators within a unified analytical system makes it possible to ensure the comparability of results across different financial institutions, as well as to create a foundation for the standardization of approaches to assessing digital resilience at the international level.

Empirical evidence suggests that differences in such indicators can have a substantial impact on overall resilience outcomes. For example, variations in recovery time-from a few hours to more than a day-can significantly influence the continuity of financial services and the scale of potential losses. Similarly, even small differences in system availability (e.g., 99.9% vs. 99.5%) may translate into disproportionately large operational disruptions in high-frequency transaction environments.

The indicated empirical observations highlight the nonlinear nature of the relationship between the technical parameters of the system and the actual level of operational stability, which is particularly critical for financial markets with a high velocity of capital circulation.

Although the selection of specific indicators may vary depending on data availability, even a simplified model allows for illustrative comparisons between financial institutions. Such comparisons reveal disparities that are often not immediately visible through qualitative analysis alone, thereby providing a more nuanced understanding of resilience capacity. In this context, quantitative formalization serves as a tool for identifying hidden structural imbalances that are not always captured within the framework of traditional risk management.

In this context, the proposed model serves as a bridge between theoretical understanding and empirical assessment. It translates abstract concepts into measurable variables, thereby enabling a more grounded evaluation of resilience in practice. Moreover, by incorporating multiple dimensions, it reflects the inherently systemic nature

of cyber risk, where the overall outcome depends not only on individual components but on their interaction within a complex digital ecosystem.

Thus, the model performs the function of a conceptual intermediary between the normative-theoretical level of analysis and the practical mechanisms for assessing resilience in the financial sector.

These global trends acquire particular significance when applied to high-risk and dynamically evolving environments, such as Ukraine, where cyber threats are not episodic but continuous and strategically coordinated. In view of this, the empirical analysis of the Ukrainian case makes it possible not only to test the applicability of the theoretical model but also to assess its relevance under conditions of extreme cyber dynamics.

The Ukrainian context provides one of the most illustrative and, at the same time, most demanding environments for analyzing digital operational resilience. Unlike relatively stable financial systems, where cyber incidents remain episodic, Ukraine operates under conditions in which cyber threats are continuous, adaptive, and often strategically coordinated. Such environmental specificity creates unique conditions for testing the limits of adaptability of financial institutions and the effectiveness of existing cybersecurity mechanisms.

Over the past two years, the scale of cyber activity targeting Ukraine has increased significantly. In 2024, the total number of recorded cyber incidents exceeded 4,300 cases, representing an increase of approximately 70% compared to the previous year. This growth is not merely quantitative; it reflects a structural intensification of cyber operations, where attacks are becoming more frequent, more targeted, and increasingly aligned with broader strategic objectives. The increasing intensity of attacks indicates the evolution of cyber threats from fragmented incidents to systematically organized operations integrated into broader geopolitical processes.

What is particularly important is the shift in frequency. By 2025, cyber incidents in Ukraine have effectively become a daily operational reality, with an estimated 15-16 incidents occurring per day. This fundamentally changes the nature of resilience. It is no longer sufficient to design systems that can withstand occasional shocks; instead, financial institutions must function under conditions of constant stress, where disruptions are expected rather than exceptional. Under such conditions, the concept of resilience transforms into a characteristic of continuous functioning under conditions of chronic cyber load.

At the same time, the composition of cyber threats reveals a clear strategic pattern. A significant proportion of attacks are directed at critical civilian infrastructure, including energy systems, telecommunications, and financial services. Estimates suggest that over 80% of incidents target civilian sectors, indicating that the primary objective is not simply data theft or financial gain, but systemic disruption. In such an environment, the financial sector becomes both a target and a transmission channel for broader systemic risk. The interconnectedness of civilian infrastructure amplifies the domino effect, whereby disruptions in one sector are rapidly transmitted into the financial domain.

Another important aspect is the increasing complexity of attack vectors. Ukrainian institutions face a combination of DDoS attacks, phishing campaigns, malware intrusions, and attempts to compromise supply chains. These attacks are rarely isolated; instead, they are often synchronized with informational and physical operations, creating a layered threat environment. This convergence significantly complicates detection, response, and recovery processes. The multi-vector nature of attacks creates an environment of cumulative risk, in which the simultaneous impact of different types of threats reduces the effectiveness of traditional response mechanisms.

Despite these pressures, the Ukrainian financial system has demonstrated a relatively high level of operational continuity. Banking services, payment infrastructures, and digital platforms have remained largely functional, even during periods of intensified cyber and physical attacks. This resilience is not accidental; it reflects a combination of prior digital transformation, regulatory intervention, and rapid institutional adaptation. The ability to maintain continuity of operations under conditions of extreme load indicates the formation of a practically oriented model of cyber resilience based on rapid iterative adaptation.

A key role in this process has been played by the National Bank of Ukraine, which has implemented stricter cybersecurity requirements, enhanced incident reporting frameworks, and promoted regular stress testing across the banking sector. In parallel, financial institutions have accelerated investments in redundancy, cloud migration, and incident response capabilities, often under severe time constraints and uncertainty. In this case, regulatory policy serves not only as a mechanism of control but also as an instrument of accelerated institutional transformation of the financial system.

It is also worth noting that Ukraine has become one of the most exposed countries globally in terms of cyber threats. International assessments consistently place Ukraine among the most targeted states, highlighting the intensity and persistence of cyber operations directed at its infrastructure. This level of exposure creates a unique analytical environment in which resilience is continuously tested in real time rather than under simulated conditions.

Thus, the Ukrainian experience forms an empirical basis for the study of digital operational resilience under conditions as close as possible to extreme scenarios of financial system functioning.

What makes this case particularly valuable from a research perspective is the observable shift in how resilience is understood in practice. In relatively stable environments, resilience is often associated with prevention and protection. In Ukraine, however, resilience increasingly takes the form of sustained functionality under pressure. The ability to maintain operations despite ongoing disruptions becomes more important than the ability to prevent incidents altogether. The indicated transformation of the conceptual understanding of resilience reflects a transition from a preventive logic of risk management to an adaptive model, in which the key parameter of effectiveness is the continuity of the performance of critical functions in a dynamically changing environment.

This distinction has important methodological implications. Traditional approaches to resilience assessment, which rely on static indicators or periodic evaluations, are not fully adequate in environments characterized by constant threat exposure. Instead, there is a need for dynamic and multidimensional models that capture not only resistance to shocks but also the capacity for continuous adaptation. The methodological limitation of static models lies in their inability to capture the temporal variability of cyber risks, which makes it necessary to implement approaches focused on the continuous updating of assessment parameters and the consideration of the cumulative effect of incidents.

In this context, the Ukrainian case strongly supports the relevance of composite assessment approaches, such as the Digital Operational Resilience Index proposed in this study. By integrating technological, organizational, and ecosystem-level dimensions, such models are better suited to reflect the complex and evolving nature of cyber risk. More importantly, they allow for the evaluation of resilience not as a fixed state, but as a process that unfolds over time under conditions of sustained pressure. The integrative nature of such models enables the transition from a fragmented analysis of individual components to a systemic assessment of interactions between different levels of digital infrastructure, which is critically important for understanding the real dynamics of cyber resilience.

Ultimately, the experience of Ukraine demonstrates that digital operational resilience is not an abstract theoretical construct, but a practical necessity. It is shaped not only by the presence of threats, but by the ability of institutions to adapt, coordinate, and continue functioning in an environment where disruption is a constant factor. This makes Ukraine not only a high-risk case, but also one of the most informative contexts for understanding the real-world dynamics of resilience in the digital age. The empirical value of the Ukrainian case lies in the possibility of observing the mechanisms of resilience formation under conditions of extreme cyber intensity, which makes it possible to refine both theoretical models and practical approaches to managing digital risks in the financial sector.

The conducted analysis demonstrates that digital operational resilience has evolved from a narrowly defined cybersecurity issue into a systemic property of modern financial infrastructure. Under current conditions, resilience can no longer be reduced to the ability to prevent cyber incidents; rather, it reflects the capacity of financial institutions to ensure the continuity of critical operations, adapt to a rapidly changing threat environment, and restore functionality under conditions of persistent disruption. The empirical and conceptual findings presented in this chapter indicate that cyber risk has acquired a distinctly systemic and nonlinear character. Interdependencies between technological infrastructures, organizational processes, and external digital ecosystems generate cascading effects that cannot be adequately captured within traditional risk assessment models. Accordingly, resilience should be considered an emergent property of interconnected systems rather than an isolated characteristic of an individual institution.

The proposed multidimensional framework, incorporating technological, organizational, ecosystem, and cyber resilience maturity dimensions, provides a more

adequate analytical basis for assessing resilience in digitalized financial systems. Its composite structure allows for the integration of structural decomposition with aggregate assessment, thereby linking theoretical conceptualization with empirical measurement. The Ukrainian case further supports these conclusions, demonstrating that resilience manifests most clearly not under stable conditions, but within an environment of constant stress and high-intensity cyber threats. Under such conditions, resilience takes the form not of preventive protection, but of the ability to maintain operational continuity. This empirically substantiates the need to transition toward dynamic, adaptive, and continuously updated models of resilience assessment that reflect the real intensity of threats. Overall, digital operational resilience emerges as a key condition for the stability of modern financial systems, requiring the coordinated development of technological, organizational, and regulatory dimensions.

This study advances approaches to the analysis of digital operational resilience in the context of contemporary financial systems by refining its interpretation as a multidimensional, systemic, and dynamic characteristic of the functioning of financial institutions. Within the proposed framework, resilience is viewed not as a derivative of operational risk or a separate element of cybersecurity, but as an integrated property formed at the intersection of technological, organizational, and ecosystem factors, complemented by a maturity dimension. The study proposes an approach to the quantitative assessment of digital operational resilience through a composite index (DOR), based on a system of weighted and normalized indicators. Such formalization enables the transition from descriptive analysis to the measurement of resilience as an analytical variable, suitable for cross-institutional comparison and for tracking its dynamics over time.

The proposed framework also accounts for third-party dependencies and the mechanisms of risk propagation within digital ecosystems, which becomes particularly important in the context of the expansion of cloud technologies, FinTech integration, and increasing inter-institutional interconnectedness. This approach allows for a more accurate representation of the modern architecture of financial systems, in which the boundaries between internal and external sources of risk are increasingly blurred. The inclusion of the Ukrainian context makes it possible to examine the functioning of digital resilience under conditions of continuous and intense cyber pressure. In such an environment, resilience manifests primarily as the capacity for continuous functioning and adaptation, which differs from approaches developed in more stable economic systems.

The obtained results are consistent with the broader trend of rethinking cybersecurity, where the emphasis is gradually shifting from the prevention of incidents to ensuring operational continuity and rapid recovery under conditions of their inevitability. Overall, the proposed approach deepens the theoretical and methodological foundations for the analysis of digital operational resilience and can be used for the further development of tools for assessing and managing cyber risks in the financial sector.

2.7. FINANCIAL TECHNOLOGIES IN BANKING: CHARACTERISTICS AND IMPLEMENTATION EXPERIENCE

Olena Lysa,
Ph.D. in Economics, Associate Professor,
Associate Professor of the Department
of Finance, Banking and Insurance,
Dnipro State Agrarian and Economic University, Dnipro, Ukraine

The present phase in the evolution of the banking system is marked by deep digital transformation driven by the rapid adoption of financial technologies (FinTech). These technologies serve as a major catalyst for improving the efficiency of banking operations, broadening access to financial services, and fostering the emergence of new business models. In scholarly discourse, financial technologies are commonly understood as the use of innovative technological solutions to design, deliver, and enhance financial products and services. Their use transforms traditional banking operations, altering both internal processes and interactions with customers.

Financial technologies emerge from the convergence of the financial sector with advanced information and communication technologies, such as artificial intelligence, big data analytics, blockchain, and cloud computing. Their primary purpose is to enhance the speed, accessibility, and security of financial transactions. From an evolutionary standpoint, the progression of financial technologies in banking reflects a shift from automating discrete operations toward the development of comprehensive digital ecosystems. Whereas banks initially relied on technology mainly to optimize internal processes, they now increasingly build integrated digital platforms capable of offering a complete range of financial services to customers.

In modern economic science, the concept of financial technologies (FinTech) is interpreted ambiguously due to its interdisciplinary nature and high dynamics of development. The analysis of foreign academic sources indicates the dominance of a technological-innovation approach to defining FinTech. In particular, international organizations emphasize that "financial technologies are technologically enabled innovations in financial services that result in new business models, products, and processes". This interpretation is the most widespread, as it encompasses both technological and economic aspects of financial sector transformation.

In the work of Anjan V. Thakor (Thakor, 2020), FinTech is considered as the use of technology to create new or improved financial services, with particular attention to reducing the cost of financial intermediation and increasing banking efficiency. The researcher emphasizes that financial technologies are a logical stage in the evolution of financial innovations covering payment systems, lending, investment services, and insurance.

Reports of the Bank for International Settlements (BIS) highlight that FinTech is a form of innovative activity transforming all key banking functions – from payments to risk management. Some BIS studies also detail specific segments, such as FinTech

lending, defined as lending conducted via digital platforms using online customer interaction and large-scale data processing.

From a macroeconomic perspective, studies by the International Monetary Fund (IMF) emphasize that financial technologies are an important tool for increasing financial inclusion and accessibility of banking services, especially in developing countries. FinTech not only complements traditional banking models but also transforms them by creating new channels for accessing financial resources.

Recent academic reviews show a trend toward expanding the content of the FinTech concept. Financial technologies now include key components such as artificial intelligence, big data, blockchain, and digital platforms, which form new financial service ecosystems (Nakonechna and Mykhailyk, 2022; Thakor, 2020; Zhytar, 2024). This indicates a gradual transition from a narrow understanding of FinTech as a technological tool to its interpretation as a comprehensive digital infrastructure of the financial market.

An important aspect of research is the classification of financial technologies. In foreign literature, the most common is the functional approach, according to which FinTech is divided into payment technologies, lending platforms, investment services, insurance technologies, and regulatory technologies (RegTech). This approach allows systematizing innovations depending on their role in the financial system.

Some studies also distinguish a technological approach based on specific technologies such as artificial intelligence, blockchain, and cloud computing. In this context, FinTech is considered as a set of technological solutions ensuring the digitalization of financial processes.

In Ukrainian academic literature, approaches to defining the essence of financial technologies generally correlate with foreign ones, but they have certain specific features. Ukrainian researchers, in particular M. Zhytar (Zhytar, 2024), T. Shevchuk (Shevchuk and Pankovets, 2022), and O. Nakonechna (Nakonechna and Mykhailyk, 2022), consider FinTech as a tool for modernizing the banking system and enhancing its competitiveness. Their works emphasize the role of financial technologies in ensuring the digitalization of banking services, cost optimization, and improving the quality of customer service. Thus, studies by Ukrainian authors highlight that financial technologies are a component of the innovative development of banks and cover such areas as mobile banking, remote customer identification, automated lending, and digital payment systems. At the same time, considerable attention is paid to issues of FinTech market regulation and its integration into the national financial system (Tytarenko and Kostenko, 2024).

A distinctive feature of modern Ukrainian research is the emphasis on adapting global FinTech trends to the conditions of a transforming economy. In particular, recent studies analyze the impact of digitalization on the resilience of the banking system, the development of cashless payments, and the enhancement of financial inclusion.

Despite the significant number of studies in the field of financial technologies, there is no consensus in academic literature regarding their essence and classification. The analysis of foreign and domestic sources makes it possible to identify several conceptual approaches that not only complement but also, in certain aspects, contradict each other.

First of all, it is necessary to note the differences between institutional and technological approaches to defining FinTech. In particular, in the documents of international organizations (IMF, OECD, World Bank) financial technologies are interpreted as innovations in financial services that lead to the emergence of new business models. This approach focuses on the economic outcomes of technological implementation. In contrast, some academic studies primarily consider FinTech as a set of technological solutions (artificial intelligence, blockchain, Big Data) that ensure the digitalization of financial processes. Thus, a methodological contradiction arises: whether financial technologies constitute an independent economic category or merely serve as a tool for transforming financial services.

The relationship between financial technologies and traditional banking is also a subject of debate. In the works of some foreign scholars (in particular, Thakor, 2020), FinTech is viewed as an evolutionary continuation of financial innovations that integrates into the banking system without radically disrupting it. At the same time, other researchers (Shevchuk and Pankovets, 2022), as well as analytical reports of international organizations, emphasize the disruptive nature of financial technologies, which may displace traditional banking institutions from certain market segments. This divergence of approaches indicates the absence of a unified vision of the role of FinTech in the financial system: from a tool of modernization to a factor of structural transformation.

Significant differences are also observed in approaches to the classification of financial technologies. The functional approach, which dominates in foreign literature, involves classifying FinTech according to types of financial services (payments, lending, investments, insurance, RegTech). Its advantage lies in its practical orientation and applicability in the analysis of banking activities. However, this approach is criticized for insufficient depth, as it does not take into account the technological basis of innovations.

An alternative is the technological approach, which classifies financial technologies depending on the technologies used (AI, blockchain, cloud technologies). However, as noted by some researchers (Shevchuk and Pankovets, 2022; Tytarenko and Kostenko, 2024), this approach complicates the analysis of the economic effect of FinTech, since the same technology can be applied across different segments of the financial market.

In Ukrainian academic literature, an integrative approach prevails, combining both functional and technological characteristics of financial technologies. In particular, Ukrainian authors (Nakonechna and Mykhailyk, 2022; Zhytar, 2024) consider FinTech as a tool for the digitalization of banking activities that encompasses both technological and institutional components. However, such breadth of interpretation, on the one hand, allows for a comprehensive understanding of the phenomenon, but on the other hand, reduces the analytical clarity of the category.

Special attention should be paid to the discussion regarding the role of financial technologies in ensuring financial stability. Reports of international organizations (BIS, IMF, World Bank) emphasize the positive impact of FinTech on financial inclusion and market efficiency. At the same time, academic studies highlight potential risks associated with cybersecurity, data concentration, and insufficient regulation. This indicates the

existence of opposing assessments of the impact of financial technologies: from a development tool to a source of systemic risks.

Thus, a critical analysis of academic sources allows us to conclude that modern approaches to defining the essence and classification of financial technologies are characterized by conceptual fragmentation. The most substantiated approach appears to be the integrative one, which takes into account both the technological foundation of FinTech and their functional purpose in banking activities. At the same time, further research should be aimed at developing a unified theoretical framework that would improve the quality of analysis and the effectiveness of the practical application of financial technologies in the banking sector.

Table 2.7.1 presents a comparative characterization of scientific approaches to the interpretation of financial technologies.

The comparative analysis indicates the existence of several approaches to defining financial technologies in academic literature. Foreign researchers primarily focus on the technological or functional components of FinTech, whereas domestic authors tend to adopt an integrative approach that combines technological and economic aspects. At the same time, none of the approaches is universal, as each reflects only certain characteristics of this multidimensional phenomenon. This necessitates further development of the theoretical and methodological framework for studying financial technologies in banking.

Based on a synthesis of existing academic interpretations of financial technologies, it is possible to formulate a comprehensive definition that overcomes their individual limitations and integrates technological, economic, and institutional dimensions: financial technologies (FinTech) represent a complex combination of digital tools, innovative business models, and organizational and economic mechanisms that transform the processes of creating, delivering, and consuming financial services in banking through automation, digitalization, and the "platformization" of operations. This transformation contributes to higher efficiency, broader accessibility, greater personalization, and enhanced security of financial services, while also facilitating the emergence of new segments within the financial market.

The proposed definition relies on the integration of several fundamental perspectives. First, it incorporates the technological dimension by emphasizing the central role of digital innovations in FinTech. Second, it reflects the institutional and economic viewpoint by highlighting the transformation of financial services and business models. Third, the inclusion of concepts such as "platformization" and "ecosystem" enables a more accurate representation of contemporary trends in banking development.

Thus, the generalization of foreign and domestic academic sources allows us to conclude that financial technologies should be considered as a complex phenomenon that combines technological innovations, new business models, and digital financial services. At the same time, FinTech can be classified both by functional areas of banking activities and by the technological basis of their implementation, which reflects the multidimensional nature of this phenomenon.

Table 2.7.1

Comparative Characteristics of Scientific Approaches to Defining the Essence of Financial Technologies (FinTech)

Author / Source	Approach to Defining FinTech	Essence of the Approach	Advantages of the Approach	Disadvantages of the Approach
IMF, World Bank	Institutional-economic	FinTech as innovations in financial services that form new business models	Takes into account the systemic impact on the financial sector; suitable for macro-level analysis	Insufficient attention to the technological component
BIS	System-functional	FinTech as a tool for transforming banking functions (payments, lending, risks)	Enables analysis of the impact on banking processes	Limited disclosure of the technological nature of the phenomenon
Thakor A.	Evolutionary	FinTech as a continuation of financial innovations	Explains the connection with traditional banking	Underestimates the disruptive potential of FinTech
OECD, ECB	Technological-innovation	FinTech as a result of the implementation of digital technologies (AI, blockchain, etc.)	Clearly identifies the technological basis	Insufficient consideration of economic consequences
PwC, Deloitte	Practice-oriented	FinTech as a tool for improving business efficiency of banks	Focus on practical application	Limited theoretical depth
Ukrainian researchers: Zhytar M., Shevchuk T., Pankovets M., Nakonechna O., Mykhailyk O.	Integrative	FinTech as a combination of technologies and financial innovations in banking	Comprehensive approach; considers national specifics	Vagueness of definition; lack of clear boundaries
Ukrainian researchers (legal approach): Tytarenko D., Kostenko V.	Regulatory	FinTech as an object of legal regulation of the financial market	Takes into account the regulatory and legal aspect	Limited coverage of economic essence

In banking activities, financial technologies are represented by a wide range of tools covering payment systems, lending, asset management, risk management, and regulatory processes.

1. Digital payment systems are a fundamental element of banks' FinTech infrastructure and ensure the execution of electronic transactions in real time. Their technological basis includes API interfaces, mobile platforms, tokenization, and contactless technologies (NFC). Banks use these systems both for internal payments and for integration with global payment networks.

Under current conditions, digital payments are characterized by rapid growth in volumes. In particular, the global number of digital wallet users reached 2.6 billion in 2023, with a projected increase to 4.4 billion by 2028. The volume of transactions via mobile wallets exceeds USD 2.25 trillion annually. For example, one of the world's largest banks, JPMorgan Chase & Co., has integrated an instant payment system via Zelle, serving tens of millions of customers; one of Europe's largest banks, HSBC (Hongkong and Shanghai Banking Corporation), is developing global payment platforms using instant settlement technologies. In Ukraine, JSC CB "PrivatBank" has implemented a P2P transfer system via "Privat24," which has become one of the most widespread in Eastern Europe.

Thus, digital payment systems form the foundation of the cashless economy, ensuring high speed and scalability of operations.

Table 2.7.2

Characteristics of the Main Financial Technologies Used in Banking Activities

Type of Financial Technology	Essence	Key Functions	Technological Basis	Effect for Banks
Digital payment systems	Enable electronic transactions	Instant payments, P2P transfers	APIs, mobile applications	Cost reduction, speed
Mobile banking	Remote customer service	Account management, payments	Cloud technologies	Improved customer experience
Online lending	Automated loan provision	Scoring, loan issuance	Big Data, AI	Reduced decision-making time
Blockchain	Distributed ledgers	Secure transactions	DLT technologies	Increased transparency
Robo-advisory	Automated investment consulting	Portfolio management	Algorithms, AI	Reduced advisory costs
RegTech	Regulatory technologies	Risk monitoring	Data analytics	Improved compliance

2. Mobile banking functions as a principal channel of interaction between banks and their clients, involving the use of mobile applications to perform financial transactions. Its functionality includes account management, payments, lending, investments, and personalized analytics. Mobile banking not only optimizes service delivery but also transforms customer behavior by shifting it into the digital environment.

The level of mobile banking adoption has grown exponentially over the past five years. In 2023, more than 4.2 billion people used mobile banking (about 66% of the world's population), while the share of mobile transactions in the United States exceeded 60% of all banking operations. For example, Bank of America has over 40 million active mobile app users, while JPMorgan Chase has around 59 million. Digital banks such as Monzo (over 12 million customers) demonstrate a fully mobile banking model. In Ukraine, Monobank has become one of the most successful examples of a mobile-only bank.

3. Online lending is based on automated systems for assessing customer creditworthiness using Big Data, machine learning, and alternative data sources. Its main advantage is the reduction of decision-making time from several days to minutes.

In recent years, this segment has grown significantly: about 65% of small and medium-sized enterprises worldwide used FinTech lending in 2023 (compared to 42% in 2020). For example, the Dutch banking group ING uses AI-based scoring for instant lending; the American multinational banking group Wells Fargo implements digital lending platforms for small businesses; the Chinese WeBank applies a fully automated lending model without physical branches. In Ukraine, banks actively implement online lending through mobile applications (for example, credit limits in Monobank).

4. Blockchain is a decentralized data storage technology that ensures transparency, immutability, and security of transactions. In banking, it is used for interbank settlements, asset tokenization, and digital asset management. For example, a consortium of banks (including Goldman Sachs, UBS, and Barclays) is developing blockchain-based payment platforms (Fnality); Santander and JPMorgan are testing cross-border payments using blockchain; HSBC estimates that up to 10% of global assets may be tokenized by 2030. The advantage of blockchain lies in enabling 24/7 settlements and reducing transaction costs.

5. Robo-advisory is a technology for automated investment management based on algorithms and artificial intelligence. It allows for the creation of investment portfolios tailored to a client's risk profile.

Global indicators demonstrate rapid growth in this segment: in 2023, assets under management by robo-advisors reached USD 1.8 trillion, and the number of users exceeded 25 million. Examples include Charles Schwab (Intelligent Portfolios), Vanguard (Personal Advisor Services), and Deutsche Bank, which is developing digital investment services. In Ukraine, this segment is still emerging, but banks are beginning to integrate investment services into mobile applications.

6. RegTech encompasses technologies aimed at automating regulatory compliance processes, combating money laundering (AML), and managing risks. They are based on big data analytics, artificial intelligence, and automated transaction monitoring.

Modern banking practice shows that about 76% of banks already use AI solutions, including chatbots and transaction monitoring systems. For example, Citibank uses AI to detect fraud; HSBC applies AML analytics based on machine learning; European banks actively implement RegTech within the framework of PSD2 and AMLD requirements.

RegTech significantly reduces compliance costs and improves the efficiency of financial control.

The analysis of the application of financial technologies shows that all of them demonstrate a steady growth trend both in terms of scale of use and transaction volumes. The most widespread are mobile banking and digital payments, which already cover billions of users, while more specialized technologies (blockchain, robo-advisory, RegTech) are forming a new financial market infrastructure. An important trend is the convergence of these technologies: modern banks do not use them in isolation but integrate them into unified digital ecosystems, maximizing their overall effectiveness.

In global practice, financial technologies have become a cornerstone of banking innovation. Leading financial institutions actively deploy digital platforms, leveraging artificial intelligence for customer data analysis, credit automation, and fraud prevention. European banks widely implement the open banking model, which relies on APIs to integrate banking services with third-party applications, enabling users to manage their finances through unified digital interfaces. In the United States, banks extensively utilize Big Data and machine learning to tailor financial products, while in Asia there is rapid expansion of mobile payment solutions and multifunctional super-apps.

In Ukraine, the development of financial technologies is highly dynamic, largely due to the advanced level of digitalization within the banking sector. Financial institutions introduce mobile banking, contactless payment solutions, remote customer identification, and automated lending platforms. A distinctive feature of the Ukrainian market is the strong collaboration between banks and FinTech companies, which stimulates the creation of innovative products and strengthens the competitiveness of the banking system. At the same time, FinTech contributes to expanding financial inclusion and improving access to banking services for the population.

Software and hardware self-service complexes (SHSCs) are currently highly widespread. These include payment devices located in banking institutions, retail outlets, offices, or public places. They may be branded or universal, differ in functionality, and may belong to banks, commercial agents, or non-bank financial institutions.

According to the Law of Ukraine “On Payment Services,” a payment device is a technical means (ATM, payment terminal, SHSC, software-hardware environment of a mobile phone, or another device) that enables a user to initiate a payment transaction and perform other actions depending on its functional capabilities (Law of Ukraine, 2021).

A financial institution that owns SHSCs must be a participant in a payment system, which includes a payment organization, its participants, and the set of relationships between them in the process of fund transfers. The function of transferring funds is the key one for a payment system, which serves as the fundamental element of SHSC operation.

Any business entity may conclude an agreement with the owner of an SHSC network to accept payments from consumers through such devices. In this case, funds are credited to the entity’s current account in a bank via the payment system.

Management of personal finances is also possible through self-service centers and payment terminals. A self-service center is a mini-branch equipped with banking terminals that allow customers to independently perform operations such as paying for utilities, education, mobile communication, television, Internet, and other services. Compared to traditional in-branch service, this system has several advantages:

1) transactions take only 1÷2 minutes, and funds are credited within a few hours during the business day;

2) payment information is stored for up to five years even in case of receipt loss;

3) in case of an error, funds are automatically returned to the customer's account;

4) the system memorizes payment details, simplifying repeated transactions;

5) 24/7 availability;

6) no need to wait in queues.

The simplest type of such centers is payment terminals, which enable payments both in cash and via cashless instruments. They are located in supermarkets, transport stops, and other high-traffic areas. Such services, like remote ones, are characterized by speed and relatively low service costs, but require significant investments and careful organization by banks.

An automated teller machine (ATM) is a software and hardware device that provides automated cash withdrawal and deposit operations using a payment card within established limits. ATMs are typically located in banks, shopping centers, railway stations, and public places.

The prototype of the ATM was created in 1939 by L.J. Simjian, but the device did not gain widespread use due to the lack of connection to the banking system. Further development of the technology took place in the 1960s: engineer J. Goodfellow developed a prototype and received a patent in 1966, while the first ATM was installed in 1967. At the same time, a similar development was carried out by J. Shepherd-Barron, and the first ATM appeared in London that same year. Early models had limited functionality and could operate only with vouchers. It was only in the 1980s that ATMs began to function online, enabling real-time account balance verification.

Modern ATMs allow not only cash withdrawals but also account top-ups, service payments, transfers, currency exchange operations, account information inquiries, PIN changes, and more. Customer identification is carried out by entering a PIN code, followed by verification through the banking network. To enhance security, banks are also implementing biometric technologies, including voice recognition, fingerprint scanning, and retinal scanning.

One of the key indicators of FinTech development is the level of adoption of cashless payments. In Ukraine, there is a steady upward trend in their share. While in 2019 cashless transactions accounted for about 50% of the total transaction value, in 2024 this figure reached approximately 64.5%, and for the first nine months of 2025 it increased to 65.4%. In terms of the number of transactions, the share of cashless payments exceeded 94% in 2024 and reached 95% in the first nine months of 2025, indicating the actual dominance

of digital channels in everyday financial transactions (National Bank of Ukraine. Cashless Payments, 2019-2025).

These changes reflect a structural transformation of the payment system, in which cash transactions are gradually being replaced by electronic instruments, including card payments, mobile applications, and P2P transfers.

A major trend shaping the modern banking sector is the expansion of remote customer service (RCS), particularly through internet and mobile banking channels. Such services not only intensify banking activity but also significantly decrease the burden on physical branch networks and, in some cases, reduce the necessity of maintaining them, thereby lowering operational costs. These tools are economically beneficial for banks and convenient for customers, gradually replacing traditional branches by implementing the effective marketing concept of a "bank that is always nearby".

Mobile banking is a form of remote banking service that provides access to accounts and enables transactions at any time using a customer's mobile phone registered as a financial number. It is a service for payment card holders that allows them to track the movement of funds via a mobile device. Transactions are carried out using SMS messages, as well as notifications within banking applications and chats. Typically, mobile banking includes the following functions: notifications about crediting, debiting, or blocking of funds; access to account balances and recent transactions; blocking or unblocking a payment card; notifications about card expiration; reminders of mandatory payments (e.g., loan repayments); and information about new banking products and services.

Today, most financial operations involving personal accounts can be performed via a mobile phone (opening deposits, repaying loans, purchasing insurance products, buying tickets, paying utility bills, currency exchange, ordering additional payment cards, etc.). Smartphones as a payment instrument are rapidly replacing plastic cards, and the development of mobile applications has become one of the priority areas of banking activity.

The development of mobile banking in Ukraine demonstrates exponential growth in the number of users: from approximately 5.9 million in 2019 to over 25 million in 2024-2025 (National Bank of Ukraine. Cashless Payments, 2019-2025). Thus, over a five-year period, the audience of digital banking services has increased more than fourfold. Currently, more than 79% of bank customers conduct transactions remotely, and mobile applications have become the primary channel of interaction between customers and banks. This indicates a shift from the traditional branch-based service model to a digital banking model focused on continuous online access.

Among the leading institutions providing internet banking services are PJSC CB "PrivatBank," JSC "Raiffeisen Bank," JSC "PUMB," JSC "Oschadbank," JSC "OTP Bank," and JSC "Alfa-Bank." The undisputed leader in this field in Ukraine, as well as one of the most innovative banks globally, is "PrivatBank" with its "Privat24" system, which accounts for about two-thirds of the market for such services.

The main challenges in the implementation and use of mobile banking in Ukraine include ensuring security, the need to coordinate interaction not only among banks but

also with mobile operators, which necessitates the development of effective integration solutions between banks and telecommunications providers, as well as the psychological unpreparedness of certain customers to use innovative banking services. At the same time, the advantages of mobile banking are evident: these services save customers time and effort, enabling payments and access to information at any time of day. Transactions are carried out online, ensuring data relevance, while the systems themselves are characterized by ease of use.

The functional capabilities of mobile banking have significantly expanded with the spread of smartphones. Mobile devices have effectively replaced plastic cards as a payment instrument. User identification is carried out through special embedded chips, and such transactions are considered more secure compared to card-based operations, as mobile operators are able to track the device.

An important element of FinTech development is the spread of digital payment technologies, including NFC payments, QR codes, mobile wallets (Google Pay, Apple Pay), and instant card-to-card transfers. As of 2024, the share of contactless payments in retail turnover in Ukraine has approached 95%, indicating the near-complete integration of digital technologies into the retail economy. This has also contributed to increased financial inclusion and reduced dependence on cash.

In the small and medium-sized business segment, there is active adoption of digital financial solutions. Approximately 58% of enterprises have begun using digital payment services in recent years, while about 75% report a positive impact of digitalization on revenue levels and operational efficiency. This confirms that FinTech performs not only a service function but also an economic stimulating function by enhancing business competitiveness.

The digitalization of Ukraine’s banking sector is accompanied by significant structural changes. In particular, over the past decade, the number of bank branches has decreased from over 20,000 to approximately 5,000, reflecting the transition to remote customer service. At the same time, banks are increasing investments in digital technologies, cybersecurity, process automation, and data analytics, forming the foundation for the further development of FinTech ecosystems.

In recent years, Ukrainian banks have:

- invested up to 10% of their operating expenses in IT infrastructure;
- significantly increased spending on cybersecurity (by up to +70% in 2024 compared to 2023);
- actively implemented AI, Big Data, and process automation.

The analysis of empirical data makes it possible to identify several key trends in the development of financial technologies in Ukraine’s banking sector:

1) there is a rapid increase in the share of cashless payments, indicating a structural change in consumer payment behavior;

2) mobile banking has become the dominant channel of interaction between customers and banks, displacing traditional offline services;

3) there is active integration of digital technologies into the corporate sector, which enhances the efficiency of business processes;

4) a gradual transformation of banking infrastructure toward digital platforms and ecosystems is taking place.

Table 2.7.3

Generalized Dynamics of FinTech Indicators in Ukraine (2019 – 2025 (9 months))

Indicator	2019	2021	2023	2024	2025 (9 months)
Mobile banking users, persons	5.9 million	10 million	18.3 million	25 million	25+ million
Share of cashless transactions in total transaction volume (by value), %	50	60	64	64	65
Share of cashless transactions in total number of transactions, %	80	90	94	94	95
Remote banking services, %	40	65	75	79	79+

Thus, financial technologies create a more flexible and customer-oriented model of banking services.

Significant changes caused by the implementation of financial technologies are reflected in the differences between traditional and digital models of banking activities (Table 2.7.4).

Table 2.7.4

Comparative Characteristics of Traditional Banking and FinTech-Based Banking

Criterion	Traditional Banking	FinTech in Banks
Transaction speed	Low	High (instant transactions)
Accessibility	Limited to branches	24/7 online access
Cost of services	High	Reduced due to automation
Personalization	Limited	High (data-driven)
Innovativeness	Low	High
Risk management	Traditional methods	AI and data analytics

Below is a conceptual FinTech framework for banking activities (Fig. 2.7.1). It captures the systemic transformation of banking under the influence of financial technologies and illustrates the interconnections among development drivers, technological foundations, applied solutions, domains of application, and resulting outcomes.

At the initial stage, the model identifies the drivers of FinTech development, which create the preconditions for the digital transformation of the banking sector. These include shifts in customer behavior, technological advancement, increased competition from new market entrants, regulatory initiatives, and broader economic factors.

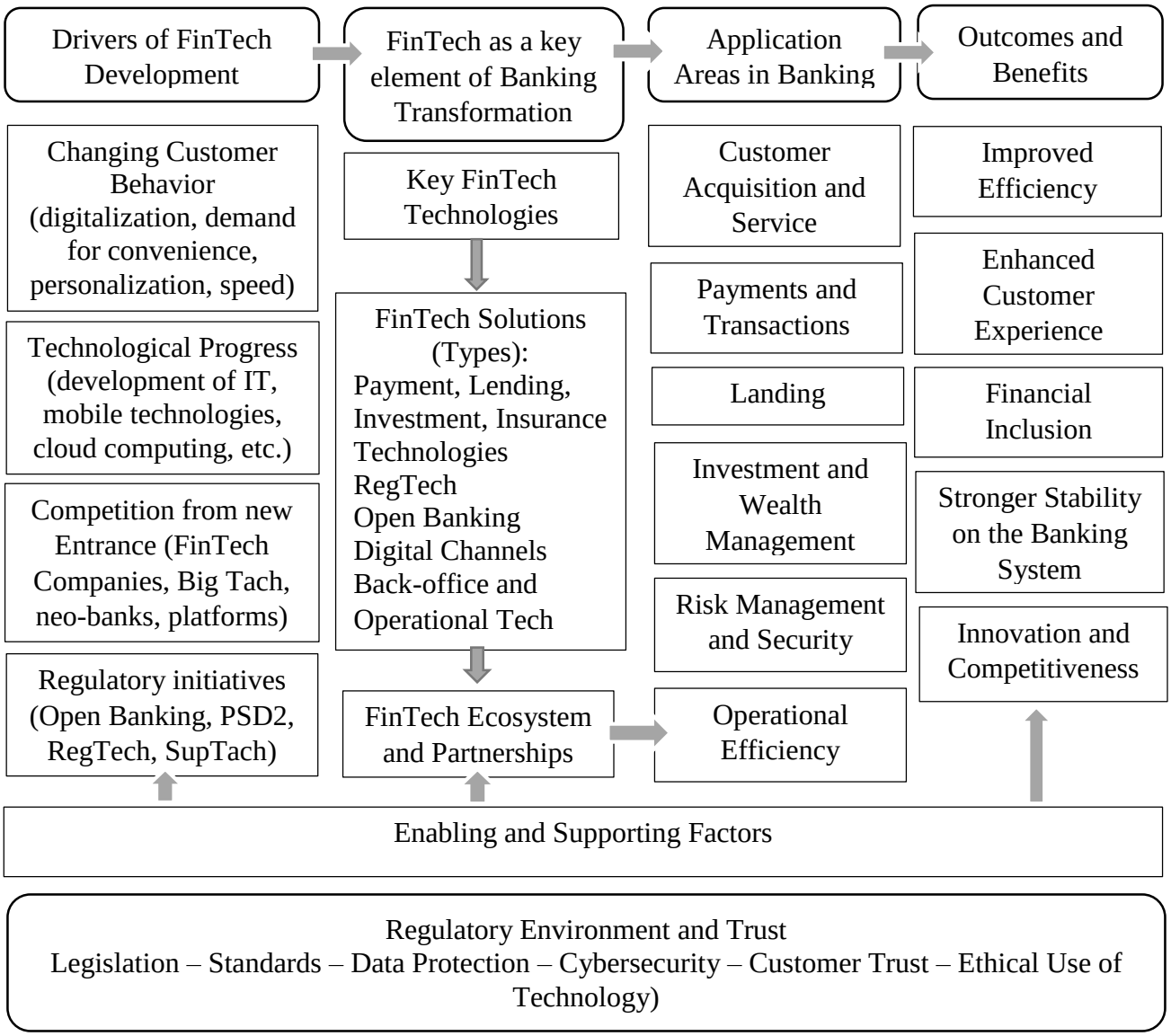


Fig. 2.7.1. Conceptual model of FinTech in Banking Activities

At its core, the model positions financial technologies as the primary engine of banking transformation. Within this structure, they are represented through two interrelated layers: foundational technologies and applied FinTech solutions. Foundational technologies encompass artificial intelligence and machine learning, big data analytics, blockchain and distributed ledger technologies, cloud computing, APIs and platform-based architectures, as well as the Internet of Things and other digital innovations. Together, these elements form the infrastructural backbone of financial innovation. For instance, artificial intelligence supports credit scoring and fraud detection, big data enables advanced customer analytics, blockchain enhances transaction transparency, and APIs facilitate the integration of banking services into broader digital ecosystems.

Building upon these foundational technologies, specific financial solutions are developed and directly implemented in banking practice. These include payment technologies, lending platforms, investment services, insurance technologies, RegTech solutions, open banking, digital service channels, and tools for automating internal processes. This layer reflects the transition from technological capability to real-world application, transforming innovation into concrete banking products and services.

An essential component of the framework is the FinTech ecosystem, which brings together banks, fintech firms, technology companies, startups, regulators, research institutions, and investors. This ecosystem perspective emphasizes that banks no longer operate in isolation but are embedded in a network of partnerships that facilitates access to innovation, advanced technologies, and new customer segments.

The model further demonstrates that financial technologies permeate all key areas of banking activity. In customer service, FinTech enables digital identification, service personalization, and omnichannel experiences. In the payments domain, it drives the expansion of instant, contactless, and cross-border transactions. In lending, automated risk assessment systems and online platforms are widely applied. In investment services, FinTech supports the growth of robo-advisory and digital asset management platforms. In risk management and security, transaction monitoring systems and cybersecurity tools are utilized. In operations, process automation, data management, and cost optimization technologies are increasingly adopted.

The final element of the model concerns the outcomes of FinTech implementation. These include enhanced operational efficiency (achieved through automation and cost reduction), improved customer experience (driven by convenience, speed, and personalization), greater financial inclusion (through expanded access to financial services for diverse population groups), increased resilience of the banking system due to improved risk management, and the advancement of innovation leading to new products and business models.

Additionally, the model incorporates enabling conditions necessary for FinTech development, such as digital infrastructure, data quality, human capital, an innovation-oriented culture, and investment in technology. A distinct role is assigned to the regulatory environment, which encompasses legislation, standards, data protection, cybersecurity, and customer trust. These factors collectively ensure the stability of the FinTech ecosystem and determine the pace of its evolution.

Thus, financial technologies cover virtually all areas of banking activities, including payments, lending, investments, and insurance. Their key feature is a focus on process automation and service personalization.

It is important to note that both the type and scope of financial technologies applied depend on the specific area of banking activity. In lending operations, digitalization enhances service quality and significantly reduces the time required for credit decision-making. Automated scoring systems assess the creditworthiness of individuals, SME-oriented platforms enable real-time transaction flow analysis, and robotic process

automation (RPA) tools monitor compliance with contract terms and generate timely notifications.

In the management of a bank's financial resources, financial technologies contribute to optimizing both the cost of funding and the overall volume of attracted resources. Empirical observations indicate a predominance of funds held in current accounts, which represent a relatively low-cost yet unstable funding source for banks. Ensuring their effective retention and conversion into more stable deposits requires the adoption of advanced technological solutions. One such solution is the development of a machine learning-based Deposit Run-off Model designed to predict potential outflows. In this context, implementing a Machine Learning system to estimate the probability of deposit withdrawals for individual clients is particularly relevant.

The model enables near real-time analysis of more than 150 parameters per client, including:

1. Financial and behavioral indicators: average monthly account balance over the past 6-12 months; balance volatility (standard deviation); transaction frequency and volume (inflows and outflows); number and frequency of customer support interactions; intensity of digital channel usage (mobile app, internet banking); availability and usage of other banking products (credit cards, cash management services, loans); response to previous marketing campaigns (email open rates, link clicks, conversion into target actions).

2. Macroeconomic variables: dynamics of the National Bank of Ukraine's key policy rate; exchange rate of the hryvnia against the US dollar; consumer inflation index; average deposit rates across the banking system (to assess the competitiveness of the bank's offerings).

3. Socio-demographic characteristics: customer age; region of residence; employment status (salaried employee, entrepreneur, retiree).

The model estimates the probability of a substantial outflow of funds (exceeding 50% of the current balance) within the next 30, 60, or 90 days and segments customers according to risk levels:

– Green zone (0÷20%): low-risk, loyal customers – standard service approach;

– Yellow zone (21÷50%): moderate risk – proactive engagement with personalized offers;

– Red zone (51÷100%): high risk – immediate activation of a dedicated retention team with tailored incentives.

The business process for applying the model is structured as follows:

1. On a daily basis, the model evaluates the entire deposit customer base.

2. Clients identified as high-risk are automatically added to a dedicated "Hot Retention" list within the CRM system.

3. Within 24-48 hours, customer relationship managers initiate personalized contact (via phone calls, email, or mobile app notifications) offering:

– increased interest rates (by +0.5–1.0 percentage points);

– deposit renewal under improved terms;

– bonuses for using additional banking products (e.g., free cash management services for six months, reduced loan interest rates);

– consultations with a personal manager on optimizing financial flows.

Based on the experience of banks that have implemented similar systems (such as "PrivatBank", "Monobank", as well as international practices), machine learning models demonstrate high effectiveness, enabling:

– prediction of 70÷80% of deposit outflow cases 30–60 days prior to actual withdrawal;

– retention of 40÷50% of high-risk customers through targeted, personalized offers.

Based on the outputs of the ML model and the bank's current liquidity position, it is possible to design an automated system for calculating personalized deposit interest rates for each customer. Such a system takes into account the following factors:

1. Customer churn risk (ML model forecast): the higher the predicted probability of outflow, the higher the individualized interest rate offered to retain the client.

2. The bank's current liquidity needs:

– if the Liquidity Coverage Ratio (LCR) exceeds 200% (indicating excess liquidity), rates can be maintained at a base level or even reduced;

– if LCR is within the range of 120÷150% (moderate liquidity), rates remain at an average level;

– if LCR falls below 120% (liquidity shortage), higher rates are applied across all customer segments.

3. Customer value (Customer Lifetime Value, CLV): including the size of the deposit, duration of the relationship with the bank, usage of additional products (cross-selling), and the overall profitability of the customer for the bank.

Economic impact:

– optimization of funding costs: the bank avoids across-the-board rate increases and instead applies targeted adjustments only to customers with a high likelihood of churn;

– improved efficiency of the marketing budget: rather than broad campaigns with uniformly elevated rates, the bank relies on precise, personalized offers;

– higher customer retention alongside a reduction in the average cost of funds by approximately 0.2÷0.3 percentage points.

Financial technologies are transforming the architecture of banking services, customer interaction methods, and approaches to risk management. At the same time, alongside the significant advantages of digitalization, a set of challenges emerges that hinder the effective implementation of financial innovations and require systematic solutions (Fig. 2.7.2).

1. Cybersecurity and the increase in fraud cases.

One of the key problems in the application of financial technologies in banking is the increasing level of cyber threats. The digitalization of financial services expands the opportunities for malicious actors, creating new channels for phishing, malware, unauthorized access, and data breaches. Research shows that phishing attacks and

malware remain among the most widespread threats in digital banking, leading to significant financial losses and reduced customer trust in digital service channels.

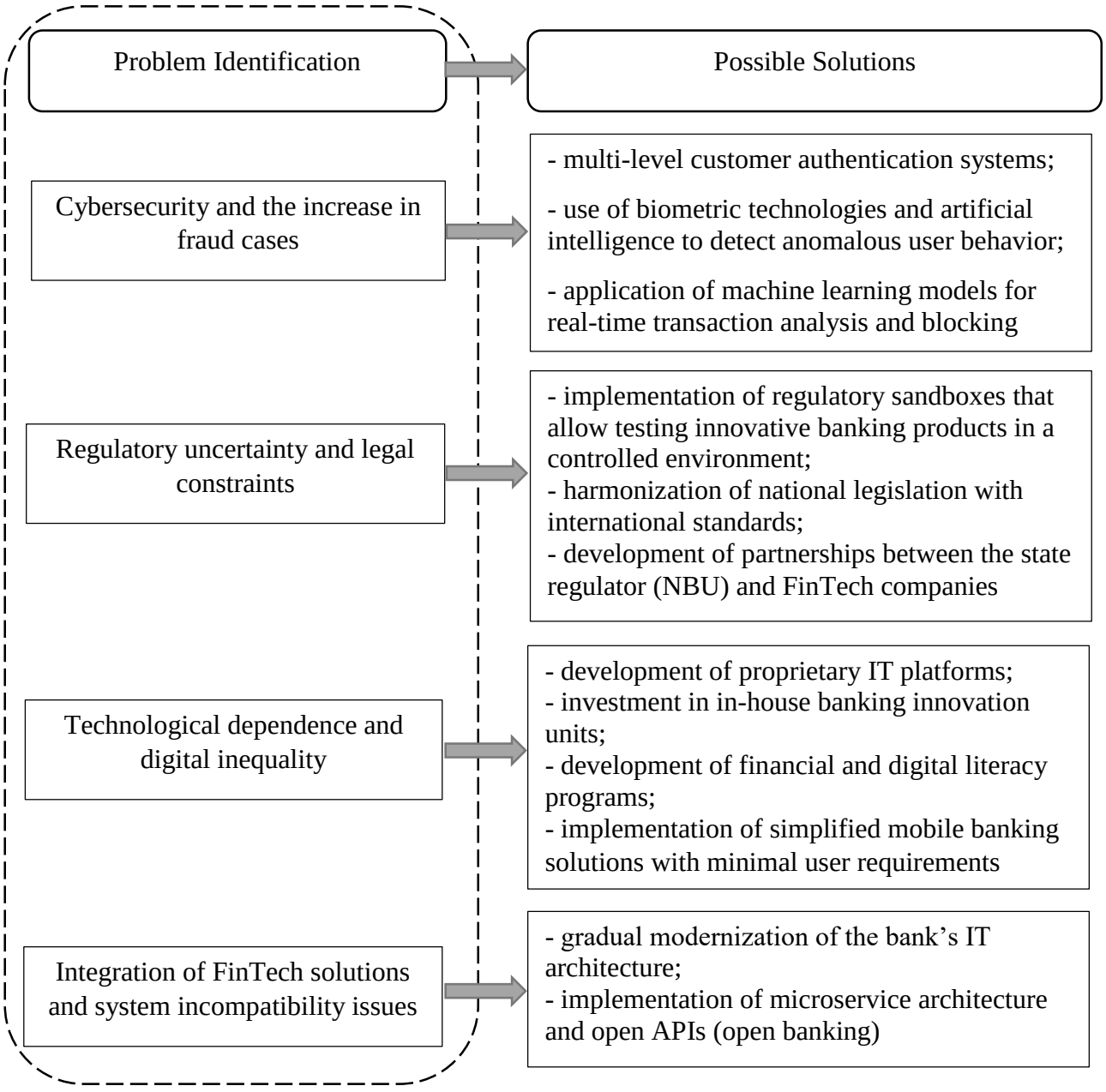


Fig. 2.7.2. Problematic aspects of introducing financial technologies into banking activities and ways to overcome them

In Ukraine, the cybersecurity issue is particularly acute due to the growing share of remote transactions and the use of mobile banking applications. Moreover, the development of open banking and the integration of third-party FinTech solutions further complicate data security control.

Table 2.7.5

Key Cyber Risks in the Application of Financial Technologies in Banking Activities

Cyber Risk	Theoretical Characteristics	Practical Manifestations in Banking Activities	Consequences for the Bank
Phishing attacks	Social engineering methods used to obtain users' confidential data	Fake banking websites, SMS or email messages containing malicious links	Loss of clients' funds, reputational risks
Malware	Software designed to disrupt systems or steal data	Trojans in mobile applications, keyloggers	Account compromise, data breaches
DDoS attacks	Massive requests to servers aimed at overloading systems	Temporary unavailability of online banking services	Operational losses, decreased customer trust
Insider threats	Unauthorized actions by employees or partners	Theft of databases, manipulation of transactions	Financial losses, legal liability
API attacks (open banking)	Exploitation of vulnerabilities in integration interfaces	Unauthorized access via third-party services	Data integrity violations, systemic risks

In 2023, Ukraine recorded a significant increase in incidents related to the use of electronic signatures and digital identification. The banking system generated over 2.95 billion qualified electronic signatures, which on the one hand indicates the scale of digitalization, and on the other hand reflects the expansion of the potential cyber risk zone.

An effective approach to countering cyber fraud involves the implementation of multi-layered customer authentication systems, biometric solutions, and artificial intelligence for identifying abnormal user behavior. The application of machine learning models for real-time transaction monitoring and the blocking of suspicious activities is especially important. The practical adoption of these technologies significantly reduces fraud risks and strengthens trust in digital banking services. According to data from the National Bank of Ukraine and industry research, the banking cybersecurity market in 2024 reached approximately USD 138 million, exceeding the 2023 level by more than 70%. This reflects a substantial increase in investments aimed at protecting digital infrastructure in response to the growing number of cyber threats.

2. Regulatory uncertainty and legal constraints.

Another significant problem is the mismatch between the pace of financial technology development and the speed of regulatory framework updates. Traditional banking regulations often do not account for the specifics of digital platforms, electronic money, crypto assets, and open APIs.

Scientific studies emphasize that rapid digital transformation of the banking sector requires revising regulatory strategies and adapting legislation to new technological

conditions. In Ukraine, this is manifested in the fragmented regulatory environment and insufficient clarity regarding the legal status of certain FinTech solutions.

A promising approach is the introduction of regulatory sandboxes, which allow innovative financial products to be tested in a controlled environment. It is also important to harmonize national legislation with international standards (particularly those of the EU) and to develop partnerships between regulators and FinTech companies. This will help reduce regulatory risks and accelerate the innovative development of the banking sector.

3. Technological dependence and digital inequality.

The active implementation of financial technologies creates the problem of technological dependence of banks on external IT solution providers and cloud services. This increases the risk of losing control over critical infrastructure and complicates data management.

Furthermore, the issue of digital inequality remains significant. Certain segments of the population, particularly in rural and remote areas, face limited access to digital financial services or lack sufficient digital literacy.

Banks can reduce technological dependence by developing their own IT platforms and investing in internal innovation units. To overcome digital inequality, it is advisable to implement financial and digital literacy programs, as well as simplified mobile banking solutions with minimal user requirements. The effect of such measures will be the expansion of financial inclusion and improved accessibility of banking services.

4. Integration of FinTech solutions and system compatibility issues.

Banking institutions often face difficulties in integrating new financial technologies into existing information systems. Legacy banking platforms are not always compatible with modern APIs, blockchain solutions, or artificial intelligence systems. Research shows that the digital transformation of the banking sector is accompanied by the need to restructure traditional operating models and significant costs for IT infrastructure modernization.

An optimal approach is the gradual modernization of the bank’s IT architecture through the implementation of a microservices structure and open APIs (open banking). This ensures system flexibility, rapid integration of new services, and reduced long-term infrastructure maintenance costs. As a result, banks gain the ability to respond more quickly to market changes and introduce innovative products.

The application of financial technologies in banking is a key driver of the development of the modern financial system; however, it is accompanied by a number of significant challenges, including cyber risks, regulatory uncertainty, technological dependence, and difficulties in integrating new solutions into traditional systems. Addressing these issues requires a comprehensive approach combining technological innovation, regulatory framework improvement, and enhanced digital literacy among the population. The implementation of the proposed measures will improve the efficiency of

the banking sector, strengthen its resilience to risks, and ensure the sustainable development of financial innovations.

Despite the growing risks, digitalization has delivered significant positive effects for the banking system of Ukraine, in particular:

1) a sharp increase in banks' operational efficiency. The share of cashless transactions in 2024 exceeded 94% by the number of operations, which reduced the need for cash infrastructure and decreased the operating costs of banking institutions.

2) a substantial increase in investments in IT infrastructure. During 2020–2024, the share of spending on digital technologies averaged 7÷10% of banks' operating costs, becoming a key driver of the development of mobile banking, CRM systems, and Big Data analytics.

3) improved financial inclusion. The expansion of access to mobile services has significantly broadened the coverage of banking services, even during the period of military operations.

Digitalization has led to the transformation of the banking network, in particular:

- the number of branches decreased from over 20,000 in 2012 to approximately 5,000 in 2025;
- online banking has become the dominant channel of customer interaction;
- large banks are developing digital ecosystems (in particular, "PrivatBank", "Monobank", "Oschadbank").

Empirical data allow for an important conclusion: the digitalization of the Ukrainian banking sector has a nonlinear effect. On the one hand, it increases the efficiency, speed, and accessibility of financial services; on the other hand, it generates a new class of systemic risks, primarily cyber risks.

The rise in the share of cashless transactions to 95% and the increase in mobile banking users to over 25 million indicate that Ukraine's banking system has become critically reliant on digital infrastructure. Consequently, even localized cyber incidents can potentially produce systemic effects across the entire financial system.

Thus, cyber risks in financial technologies are systemic in nature and cover both technological and organizational levels of banking operations. At the same time, modern digital solutions – particularly artificial intelligence, multi-factor authentication, and API architectures – not only reduce the level of threats but also generate additional economic and operational benefits. This confirms that the effectiveness of FinTech depends not on risk avoidance, but on the banking system's ability to adapt to them.

The application of financial technologies in modern banking enables an increase in operational efficiency through process automation, reduction of transaction costs, and expansion of digital customer service channels. At the same time, their impact is multidimensional and manifests both in increased profitability and in changes to the cost structure of banks. In this regard, it is advisable to assess the impact of FinTech not directly, but through a system of proxy indicators of digitalization that reflect the level of technological development of banks.

Table 2.7.6

Effectiveness of FinTech Solutions Implementation in the Banking Sector

Implementation Area	Technological Solution	Economic Effect	Organizational Effect
Digital payments	Mobile banking, e-wallets	Reduction of branch maintenance costs	Increased transaction speed
Lending	AI scoring	Reduction of credit risks	Automation of decision-making
Fraud detection	Big Data analytics	Reduction of financial losses	Improved monitoring accuracy
Open banking	Open API	Expansion of customer base	Integration with the FinTech ecosystem
Cybersecurity	SIEM systems	Reduction of losses from cyberattacks	Increased system resilience

To assess the impact of FinTech on banking efficiency, a multifactor regression model is proposed:

$$\mathrm{ROE}_{it} = \beta_0 + \beta_1 * \mathrm{FinTech}_{it} + \beta_2 * \mathrm{Pay}_{it} + \beta_3 * \mathrm{MobileUser}_{it} + \beta_4 * \mathrm{CyberRysk}_{it} + \beta_5 * \mathrm{CostIncome}_{it} + \xi_{it,}$$

where ROE_{it} – return on equity of bank *i* in period *t* (efficiency indicator);

$\mathrm{FinTech}_{it}$ – integral index of financial technology implementation;

PAY_{it} – share of cashless payments in total transactions;

$\mathrm{MobileUser}_{it}$ – number of active mobile banking users;

$\mathrm{CyberRysk}_{it}$ – cyber risk index (number of incidents / losses);

$\mathrm{CostIncome}_{it}$ – cost-to-income ratio;

ξ_{it} – random error term.

ROE (Return on Equity) is used as a key performance indicator of a bank, as it reflects the ability to generate profit on invested capital.

The FinTech index is formed as an integral indicator that includes: the level of payment digitalization; mobile banking penetration; use of AI/Big Data; level of API integrations. In international studies, such indices demonstrate high explanatory power regarding banking efficiency.

The following hypotheses can be formulated for this model:

1. FinTech development positively affects banks' ROE (expected sign "+").

2. Growth in the share of cashless payments increases banking efficiency (expected sign "+").

3. Increase in the number of mobile users positively affects profitability (expected sign "+").

4. Cyber risks negatively affect efficiency (expected sign "–").

5. A high Cost-to-Income ratio reduces bank efficiency (expected sign "–").

Using empirical data for Ukraine, the model can be interpreted as follows:

1) the increase in the share of cashless transactions to over 94% and the growth in mobile banking users to 25 million indicate a strong positive impact of digitalization on bank profitability, $\beta_1 > 0$;

2) banks that actively invested in mobile applications and remote services (e.g., Monobank, Privat24) demonstrated higher ROE compared to traditional institutions, confirming the significance of the MobileUser variable;

3) the increase in cyber incidents during 2022-2025 (phishing, DDoS, API attacks) negatively affects the stability of bank revenues, implying $\beta_4 < 0$, and making cybersecurity a critical factor of efficiency.

The constructed econometric model makes it possible to formalize the impact of financial technologies on the efficiency of Ukraine's banking system. It shows that FinTech (as an integral index of implementation level) is not only a technological factor but also an important determinant of banking profitability. At the same time, cyber risks act as a systemic constraint on digital efficiency.

Considering the above, the results of applying this model confirm the previous conclusion that the development of Ukraine's banking system, particularly in 2020-2025, has a dual nature: increased efficiency driven by digitalization is accompanied by rising cyber risks that require institutional and technological responses.

Thus, the development of FinTech in Ukraine is characterized by high dynamics and a systemic nature of transformations, encompassing both technological and institutional levels of banking activity. The Ukrainian banking sector demonstrates a transition toward a digital banking model in which financial technologies serve as the core infrastructure of the financial market, ensuring increased efficiency, accessibility, and quality of financial services.

Financial technologies have emerged from the convergence of the financial sector with advances in information and communication technologies, including artificial intelligence, big data, blockchain, and cloud computing. Their adoption facilitates the creation of digital ecosystems capable of delivering a full spectrum of financial services to customers within an integrated environment.

The evolution of financial technologies in banking is marked by a shift from the automation of individual operations to the comprehensive digitalization of business processes, as evidenced by studies conducted by international organizations. The future of banking in Ukraine is closely linked to the continued deep digital transformation of all operations and the expansion of remote service channels. It is essential to incorporate alternative data sources – such as public registries and social media data for microbusinesses – into unified analytical systems. Additionally, there is a growing need to develop partnership-based approaches to working with distressed borrowers, focusing on the long-term restoration of their financial viability. Banks should also actively implement ESG-oriented financing principles, aligning their credit portfolios with reconstruction initiatives and sustainable development projects.

CHAPTER 3. FORMATION AND ENHANCEMENT OF INFORMATION AND ANALYTICAL SUPPORT FOR ENTERPRISE MANAGEMENT

3.1. INFORMATION AND ANALYTICAL SUPPORT FOR ENTERPRISE MANAGEMENT: ACCOUNTING AND COST ANALYSIS

Lesia Vasilieva,
Doctor of Sciences of Public Administration, Professor,
Professor of the Department of Accounting, Taxation
and Management of Financial and Economic Security,
Dnipro State Agrarian and Economic University, Dnipro, Ukraine

In the management system, costs are one of the basic economic categories, as they directly reflect the process of using resources in the enterprise. Costs include not only material resources, such as raw materials, energy, components and other components of the production process, but also intangible factors, including labor costs, management costs, technological support and financial resources. Thus, costs are a comprehensive indicator that allows you to assess the efficiency of the use of all types of resources involved in the production or commercial activities of the enterprise.

The importance of costs lies in their direct impact on the competitiveness of the enterprise. High or inefficiently distributed costs can significantly increase the cost of production, which, in turn, negatively affects the pricing policy and the ability of the enterprise to compete on the market. Instead, optimal cost management allows not only to reduce unnecessary costs, but also to increase productivity, improve the quality of products or services, and strengthen financial stability. Thus, costs are not only an economic indicator, but also a strategic management tool that allows the enterprise to adapt to changes in the external environment.

Effective cost management is especially important in conditions of an unstable market and a shortage of resources. The modern economic situation is characterized by frequent fluctuations in the prices of raw materials and materials, changes in demand for products, the appearance of new competitors and technological solutions. In such conditions, each type of expenditure must be carefully monitored and analyzed, because even minor overspending can lead to a significant decrease in profitability and limit the financial capabilities of the enterprise. A rational structure of costs, their planning and analysis allow the enterprise not only to avoid financial risks, but also to determine reserves in time to improve the efficiency of operations.

In addition, expenses directly affect the formation of the cost of production and the profit of the enterprise. They are a key element of financial calculations, since it is on the basis of costs that pricing policy is determined, budgets are developed, and strategic planning is carried out. Rational cost management provides the enterprise with the opportunity to optimize the ratio between costs and income, which is a necessary condition for sustainable development and increasing the efficiency of operations.

Thus, costs in the management system have a multifaceted meaning: they reflect the use of resources, determine the economic efficiency of activities, affect the competitiveness and financial results of the enterprise, and also form the basis for strategic management and development planning. In the conditions of the modern market, cost management becomes not only an accounting task, but also a key tool for ensuring economic stability and development of the enterprise as a whole.

It is worth noting that a single opinion regarding the interpretation of the definition of "expenditure" was not formed in the literature. Scientists from different countries of the world have different opinions regarding the interpretation of this concept. The analysis of scientific sources shows that the concept of "costs" is multifaceted and is interpreted differently depending on the approach. One of the most common is the approach in which costs are considered as a monetary estimate of the resources used in the process of the enterprise. Yes, Golov S.F. notes that expenses are "a set of used economic resources in the process of economic activity, expressed in monetary form".

Atamas P.Y. defines the concept of cost as "monetary expression of the cost of material, labor and financial resources consumed in the production process". The combination of material and non-material factors of production, which also corresponds to the modern characteristics of costs, is defined here. Napadovska L.V. considers expenses from a financial standpoint, emphasizing that the essence of expenses is "a purposeful decrease in assets or an increase in liabilities in the course of the enterprise's activity". Therefore, most scientists consider costs as a valuable form of resource consumption associated with the process of creating products, works or services. At the same time, within the management approach, according to Bilousova I. V., the concept of costs should be interpreted more broadly - as an information category that provides an opportunity to assess the efficiency of the enterprise and serves as a basis for management decisions.

The multifaceted economic essence of costs naturally dictates the need for their clear grouping. It is the classification that makes it possible to transform disparate accounting information into a coherent system suitable for analysis, forecasting and management decision-making. As noted by Len V.S. "classification of costs is a way of organizing data about costs according to certain characteristics, which allows for their accounting, analysis and control". Specialist Parasiy-Vergunenko I.M. adds that a clear grouping of costs is a prerequisite for building an effective management accounting system, as it allows determining the impact of each type of cost on the financial result.

The view on the classification of expenses as a management tool is shared by other scientists, in particular Vasilieva L.M., who emphasizes that "the classification of expenses allows for the systematization of information about their composition and purpose, which creates conditions for forming the cost of products and conducting an in-depth economic analysis". Thus, classification acquires strategic importance in the management accounting system.

Summarizing the approaches of modern Ukrainian scientists to the classification of expenses, it should be noted that this process is not only an accounting procedure, but also

an important tool of enterprise management. Classification of expenses allows to systematize information about the use of resources and provides a basis for making informed management decisions. It should be formed on the basis of key principles that ensure its practical value and effectiveness in strategic and operational management.

The first principle is to focus on the goals of enterprise management. This means that costs are classified in such a way that management can quickly assess their impact on the achievement of strategic and current goals. For example, costs can be grouped according to functional areas - production, sales, management - which allows you to clearly determine which part of resources is directed to specific business processes. This approach contributes to effective control and optimization of costs in various divisions of the enterprise.

The second important principle is the reflection of the industry specifics of production. Costs in different sectors of the economy have their own unique structure, which makes it necessary to adapt the classification to a specific type of activity. For example, in agro-industrial production, a significant share of costs is for materials, seeds and fuel, while in the service sector - for labor and rent. Taking into account industry specifics allows you to get more accurate and relevant information for management decisions.

The third principle is to ensure the analytical suitability of accounting information. The classification of costs should provide the possibility of conducting a detailed analysis and determining patterns in the use of resources. This allows you to identify inefficient costs, calculate the cost of products, evaluate the profitability of individual production processes and make decisions about optimization. Analytical suitability also assumes that costs are divided into direct and indirect, variable and fixed, which is a prerequisite for accurate costing and planning.

The fourth principle is the relationship between costs and performance. The classification should reflect how the costs affect the financial and production results of the enterprise. This makes it possible to analyze the efficiency of the use of resources, evaluate the expediency of individual costs and make management decisions aimed at increasing profitability. This approach allows creating systems of control and motivation of personnel based on specific economic results.

The fifth principle is to ensure comparability of indicators in dynamics. To make strategic decisions, it is necessary to monitor changes in costs over time, compare them with past periods, planned indicators and the results of competitors. Comparability provides the ability to identify trends, forecast financial results, and adjust management strategies. This makes the cost classification system not only an accounting tool, but also an effective mechanism for strategic management of the enterprise.

Thus, compliance with the specified principles allows for the creation of a structured, analytically suitable and practically oriented system of classification of costs, which contributes to increasing the efficiency of resource management and ensures stable financial development of the enterprise.

In our opinion, the given classification allows to comprehensively reflect the structure of enterprise costs, taking into account the peculiarities of their formation and use in the management system. In the conditions of an unstable market environment, the combination of financial and management classifications becomes especially important, which ensures the formation of relevant information for planning, analysis and management decision-making. The proposed additional classification features (strategic development costs and risk-dependent costs) strengthen the company's analytical tools and meet the modern requirements of adaptive cost management.

As scientist Greshchak M.H. rightly points out, understanding the structure of costs and their relationship allows managers to determine not only the economic feasibility of spending, but also potential reserves for reducing the cost price. Expert Dobrovskyi V.M. emphasizes that in practice the choice of classification features must meet the tasks of management analysis, because "there is no universal classification suitable for all enterprises".

A special place in modern researches is the classification of expenses for making management decisions, which is based on the principle "different expenses - for different purposes." As the scientist Butynets F.F. notes, the relevance of costs is determined by their ability to change depending on the decision made. In his opinion, it is appropriate to distinguish between relevant and irrelevant, exhaustive and non-exhaustive, constant and variable costs for managerial needs.

In Ukrainian accounting practice, classifications by economic elements and costing articles are the most common. However, as Volkova I.A. rightly points out, this is not enough for analytical cost management, since this approach does not reveal the target direction of costs and does not allow assessing their impact on the result. Therefore, the combination of accounting and management classifications, which provides a comprehensive approach to cost formation, becomes relevant.

Napadovska L.V. emphasizes that effective classification should be adaptive and provide the possibility of rapid redistribution of information in accordance with changes in economic conditions. In this context, Bilousova I.V. offers an approach in which costs are grouped not only by accounting objects, but also by responsibility centers, which increases the level of control and analytical management reports.

Thus, in modern scientific literature, the concept of costs is interpreted as a complex economic category that characterizes the process of using resources in the enterprise. The classification of costs, in turn, is the basis for building an effective accounting, analysis and control system aimed at increasing the effectiveness of management decisions. Its flexibility and multidimensionality determine the company's ability to adapt to changes in market conditions and ensure economic stability in the long term.

In modern business conditions, the effectiveness of enterprise management largely depends on the quality of information used by management in the process of planning, analysis, control, and management decision-making. One of the most important sources of such information is data on costs generated in the accounting and management accounting system. It is cost accounting that provides the enterprise with reliable, timely

and relevant information about the use of resources, the cost level, the structure of costs and their impact on the performance of activities. In this context, researchers pay special attention to ensuring that accounting information is not only factual, but also analytically oriented, capable of meeting management needs at various levels.

As noted by Golov S.F. the cost accounting system has a dual purpose: on the one hand, it provides the formation of data for financial reporting, on the other hand, it serves as an information base for management and control, as it includes methods of grouping, measuring and displaying costs in the process of activity. According to Atamas P.Y. information about costs is a key element for planning production processes, as it allows determining the economic feasibility of operations, evaluating the efficiency of resource use, and justifying management decisions.

The importance of cost accounting for management is emphasized by scientist Bilousova I. V., who emphasizes that the cost accounting system should be not only a tool for displaying the facts of economic activity, but also a means of forming an information model of the enterprise's activity. This means that accounting should be focused on the formation of information that is needed by different groups of users - both internal and external. Thus, cost accounting serves as the basis for performing cost analysis, determining financial results, monitoring budget implementation, and evaluating the effectiveness of management decisions.

Modern Ukrainian researchers note that the quality of information about costs largely depends on the organization of the production process. Yes, Napadovska L.V. emphasizes that the cost accounting system should reflect the regularity of production cost formation and provide its analytical section, which is critical for effective production management. At the same time Len V.S. believes that cost accounting should provide detailed information by places of cost occurrence, centers of responsibility and types of products, which creates a basis for control and operational management.

An important function of cost accounting is to provide management with information for making management decisions, that is, relevant costs. It is the relevant information that makes it possible to assess the consequences of alternative options for activities, for example, to determine the feasibility of launching a new product, changing the volume of production, a supplier's product, or modernizing a technological process.

According to the approach of Parasiy-Vergunenko I.M., the quality of cost accounting is determined by the ability of the system to provide managers with information about the economic consequences of activities, in particular, deviations from budgets, overspending of resources, changes in the structure of costs, the efficiency of the use of materials and fixed assets. This makes it possible to assess not only the actual state of affairs, but also to forecast future performance results, to form management strategies and tactics.

The integration of cost accounting with management analysis is of particular importance in modern theory and practice. According to Greshchak M.G., it is the combination of accounting data with methods of economic analysis that makes it possible to determine reserves for cost reduction, optimize the cost structure, and control and

improve the efficiency of the enterprise. In his works, the scientist emphasizes that the analytical function of accounting is an integral part of the management decision-making process.

Management cost accounting as noted by Dobrovsky V. M., Hnylytska L. V., Korshikova R. S. characterizes the orientation to the future and provides not only the fixation of costs, but also the modeling of possible scenarios of activity development. He emphasizes that the information about costs generated in the management accounting system should provide for its application for: cost forecasting; justification of plans; evaluation of process efficiency; formation of price policy; budgeting and control.

The scientific literature emphasizes that this orientation to the future is a key feature of modern management accounting, which distinguishes it from financial accounting.

Thus, cost accounting is a key element of the company's information system, as it provides structured, reliable and analytically suitable data necessary for making management decisions. Its organization determines the ability of the enterprise to effectively plan activities, control costs, identify reserves for increased profitability and ensure financial stability. In this context, cost accounting is not only an accounting process, but also an important component of the strategic and operational management system.

The cost accounting organization defines only the initial information base, but this is not enough for real cost management. The effectiveness of management decisions depends on how deeply the enterprise analyzes costs, identifies the factors of their formation, determines the trends of changes and evaluates the possible scenarios of the development of events. That is why methodological approaches to cost analysis are a key element of the enterprise management system, as they provide guidance not only with factual, but also with analytical and predictive information. Modern economic literature emphasizes that cost analysis should be based not only on the evaluation of past data, but also on forecasting and modeling of future performance results.

As Greshchak M.G. emphasizes, the methodology of cost analysis should take into account the relationship between costs, production volume and financial results, which allows to determine reserves for efficiency improvement and cost reduction. In his opinion, the analysis of costs is not just an assessment of their level, but a comprehensive study of the factors that form the cost price, including resources, technology and the organization of production processes.

An important place in the methodology of cost analysis is the classification approach, which makes it possible to systematize costs according to their economic content, places of occurrence, centers of responsibility, and behavior in relation to changes in production volumes. As noted by Len V.S., it is the classification that makes it possible to apply adequate methods of analysis to different groups of expenses, ensuring the accuracy of the assessment and the possibility of managing them.

One of the key methodological tools is factor analysis, which makes it possible to identify the impact of individual factors on the level of costs and cost. According to Parasiy-Vergunenko I.M., factor analysis is the basis for identifying deviations, finding

the causes of cost overruns, and determining cost optimization reserves. The factor approach includes the analysis of labor, material, technological and financial factors that form costs.

Marginal analysis is also widely used in modern practice, which allows you to determine the break-even point, marginal revenue, and limits of relevance. As Butynets F.F. emphasizes, marginal analysis is an indispensable tool for making decisions about pricing, optimizing product assortment, determining critical production volumes, and evaluating project effectiveness. It allows you to assess how a change in production volume affects costs and profits, which is important in unstable economic conditions.

An equally important direction is the analysis of relevant costs, which involves taking into account only those costs that change depending on the management decision. According to Atamas P.Y., a relevant analysis helps to justify the choice between alternatives, in particular in matters of technology selection, production modernization, equipment replacement or outsourcing of certain functions.

CVP analysis (cost-volume-profit analysis), which is based on the "cost-volume-profit" relationship, plays a significant role in the strategic management system. As Golov S.F. notes, this approach makes it possible to assess the long-term consequences of management decisions, forecast financial results, and determine the sensitivity of profit to changes in market and production conditions. CVP analytics is important not only for operational management, but also for strategic planning.

In today's conditions of digitization of the economy, the importance of economic and mathematical modeling in cost analysis is increasing. According to the conclusions of Bilousova I.V., modeling makes it possible to evaluate the effectiveness of alternative activity options under conditions of uncertainty, optimize the cost structure and minimize the risks of management decisions. Mathematical models make it possible to study the dependencies between costs and other indicators, as well as to form predictive scenarios.

The method of cost analysis also includes budgetary control, which ensures comparison of actual indicators with planned ones and detection of deviations. According to Dobrovsky V.M., Hnylytska L.V., Korshikova R.S., budgeting is the basis of management control, as it allows coordinating the activities of units, identifying responsible persons, and ensuring resource savings.

Given the above, it can be argued that methodological approaches to cost analysis cover a wide range of methods and analytical procedures. Their application creates an information base for making management decisions aimed at optimizing costs, increasing the efficiency of operations and ensuring the financial stability of the enterprise. Modern cost analysis should be based on the principles of systematicity, relevance, complexity and efficiency, providing the enterprise with strategic flexibility and competitiveness.

A comparative analysis of the NAC and IFRS approaches to costs confirms the presence of a number of important methodological differences, which are shown in Table 3.1.1. Differences between national accounting regulations, in particular standard 16, and international financial reporting standards are manifested primarily in the level of detail and approaches to the classification and recognition of costs.

Thus, standard 16 contains a clearly structured list of expenses that are not included in the statement of financial results, which allows the accountant to have specific guidelines for keeping records. In the IFRS, the relevant provisions are not concentrated in one standard, but are distributed among several documents, which creates the need to apply a comprehensive approach for the correct display of expenses in financial statements. This division involves a more flexible interpretation, but requires attention and knowledge of several standards from specialists at the same time.

Table 3.1.1

Comparative analysis of NP(S)BO and IFRS approaches to costs

№	Comparison criterion	Domestic approach	International approach
1	Availability of a single standard for costs	There is a special standard 16 "Costs", which comprehensively regulates the composition, classification and methodology of cost formation.	There is no separate "Expenses" standard: the provision is distributed among IAS 1, IAS 2, IAS 16, IAS 23, IAS 38 and others.
2	Classification of costs	Clear demarcation by economic elements and costing articles.	Classification is carried out by nature or by function: costing articles are not regulated.
3	Separation of activity and period costs	Production cost and period costs (administrative, sales costs, etc.) are separated.	In IAS 2, production costs are defined as part of the cost of inventories; other costs are treated as period costs.
4	Recognition of expenses	Expenses are determined when assets are disposed of or liabilities are increased in accordance with the principle of matching income.	Expenses are determined simultaneously with revenues if there is a causal relationship (IFRS 15).
5	General production costs	They are divided into variables and constants with a defined order of their distribution.	Distribution is less regulated; the company itself determines the methods.
6	Non-production costs	They are not included in the production cost of products and are determined by the costs of the period.	Expenses are not capitalized and are determined as period expenses in accordance with IAS 2.
7	Valuation and disclosure	Historical cost predominates; the scope of information disclosure is limited by the standards.	A wider range of valuations (fair, amortized, etc.) and significantly wider disclosure requirements.
8	Flexibility of application	High level of regulation; fewer options for accounting policy.	High flexibility and the possibility of choosing approaches.

Another key difference is the approach to cost classification. In national standards, the main emphasis is placed on the division of costs by types of enterprise activities, economic elements and costing articles, which provides detailed analytical information for management needs. IFRS, on the contrary, focus on grouping costs according to their functional role or nature, which provides greater flexibility in reporting and facilitates comparison of results with international practices. This approach allows companies to choose a cost allocation method that best suits their business process and the information needs of users of financial statements.

An important aspect is also the difference in the recognition of expenses. Standard 16 provides for the reflection of expenses upon disposal of assets or increase of liabilities, i.e. at the time of actual business transactions. IFRS apply the principle of matching costs and revenues, which provides for the simultaneous recognition of costs and revenues, if there is an economic connection between them. This allows you to get a more adequate picture of the financial results of the enterprise in a specific reporting period, ensuring the reflection of costs in the context of the obtained economic effect.

Special attention should be paid to the interpretation of general production costs. The national standards contain detailed provisions regarding their composition and the order of distribution, which ensures clarity in accounting and facilitates control over the efficiency of resource use. In IFRS, these requirements are presented more generally, in particular, the aspects of displaying general production costs are divided between the standards IAS 2 "Inventories" and IAS 1 "Presentation of financial statements". This creates the need for an analytical approach and professional judgment when determining how to allocate such costs in reporting.

Thus, the differences between Standard 16 and IFRS cover classification details, approaches to cost recognition, structure and allocation of general manufacturing costs. They determine the specifics of accounting and financial reporting, as well as affect the analytical capabilities of management when evaluating the effectiveness of the enterprise and making management decisions.

Summarizing the above, it should be emphasized that the legal regulation of cost accounting in Ukraine is multi-level and conceptually compatible with international approaches. At the same time, IFRS offer a more flexible approach, focused on the needs of users and the economic content of business operations. Harmonization of national and international norms is a necessary condition for improving the quality of financial reporting and integration of Ukrainian enterprises into the global economic space.

In the conditions of rising costs, instability of the market environment and increased competition, the improvement of cost accounting becomes especially relevant for making informed management decisions. High-quality accounting and analytical provision of expenses allows timely detection of inefficient items, optimization of the cost structure and increase of the profitability of the enterprise. For a small enterprise, it is an important tool for supporting financial and economic security and ensuring sustainable development in conditions of limited resources.

To improve the analytical and operational efficiency of accounting, as well as to strengthen control over the formation of cost at enterprises, it is advisable to review the methods of organizing analytical accounting and the structure of costing units. In this context, recommendations have been developed regarding the content of costing articles (Table 3.1.2), the use of which allows to significantly improve the information base for making various management decisions.

Table 3.1.2

Proposals regarding the structure of costing articles

Proposals regarding the structure of costing articles	Possibilities of use in management
Possibilities of assessment and rationing	Organization of regulatory accounting and budget planning
Distinguishing direct and indirect costs	Formation of information about the direct cost of the costing object
Separate display of variable and fixed costs	Adoption of operational management decisions based on information about specific costs
Separation of costs under the control of different managers	Organization of accounting by centers of responsibility and budget planning
Allocation of conditionally constant and conditionally variable overhead costs	Identification of cause-and-effect relationships between overhead costs and costing objects, more accurate calculation of full cost

Thus, the implementation of the proposed approaches to the structuring of costing items allows not only to increase the accuracy of the calculation of the cost of production, but also creates an effective basis for management accounting and budget planning. The distinction between direct and indirect costs, variable and fixed, as well as items controlled by different managers makes it possible to receive relevant information in a timely manner for making operational and strategic decisions. The allocation of conditionally constant and conditionally variable overhead costs helps to identify cause-and-effect relationships and more accurately determine the full cost price, which increases the efficiency of enterprise resource management and ensures transparency of financial indicators for all levels of management.

Another area of improvement is the deepening of analytics within individual expenditure items. In particular, it is advisable to detail the article "Other production costs", separating from it those that are significant in terms of volume or significance for the management of the group of costs. Similarly, within personnel costs, it is possible to allocate costs for professional development, training and other elements affecting the development of personnel potential. Such detailing will contribute to increasing the transparency of costs and identifying reserves for their optimization.

One of the promising directions for improving the accounting and analytical support of management decisions at the enterprise is the implementation of a cost accounting

system by responsibility centers (Responsibility Accounting method) and a costing system by types of activities (Activity-Based Costing, ABC). Both approaches are aimed at increasing the accuracy of cost control and optimizing resources, which directly affects the efficiency of business management (Table 3.1.3).

Table 3.1.3

Proposals for implementing a cost accounting system by responsibility centers and a costing system by types of activity

Proposal	The main point	What gives the enterprise	Examples of management decisions
Cost accounting by responsibility centers (Responsibility Accounting)	Division of the enterprise into cost, income and investment centers with the establishment of responsible persons	Identification of sources of excessive costs, increased control, comparison of plan-fact	Optimization of the labor fund, adjustment of material consumption norms
Costing by activity (ABC)	Distribution of costs according to real drivers, not in proportion to volume	Exact cost of products, identification of unprofitable goods, rejection of inefficient operations	Review of assortment, price change, minimization of unnecessary operations

The Responsibility Accounting method is one of the key management accounting tools, which is aimed at increasing the efficiency of control over the company's costs and resources. The main idea of the method is to divide the enterprise into separate cost, income or investment centers, each of which is assigned to a specific responsible person. This approach makes it possible to more clearly track which structural unit or manager is causing cost overruns, and to identify the sources of inefficient use of resources. Each center of responsibility becomes autonomous within the limits of its activity, which enables the management to compare planned and actual cost indicators, evaluate the efficiency of the divisions and make informed management decisions. The implementation of such an approach increases discipline in the use of resources and stimulates managers to economize, as the results of the activities of each division become transparent and subject to evaluation.

In contrast to the traditional distribution of costs according to the volume of production, the ABC (Activity-Based Costing) method involves a more accurate distribution of general production costs based on real cost drivers, such as the labor intensity of operations, machine time, the number of equipment settings, maintenance costs or auxiliary processes. This approach makes it possible to form a more accurate production cost and determine which products or processes are profitable and which

generate losses. Identifying unprofitable elements of production allows the management to make strategic decisions regarding the optimization of the product range, modernization or even abandonment of inefficient operations.

The synergy of the Responsibility Accounting and ABC methods gives the enterprise a powerful analytical tool: the first method provides control over the results of the units' work and the responsibility of managers, the second - an accurate display of costs and justification of management decisions based on cost analysis. Together, they make it possible to increase the transparency of economic activity, reduce waste, optimize costs and increase the overall efficiency of the enterprise, ensuring the stability of financial results and competitiveness in the market. As a result, the use of these methods contributes to a more systematic and accurate cost management, creating a basis for operational and strategic planning, as well as improving the quality of decision-making at all levels of management.

A promising direction for increasing the efficiency of the production and economic activity of an agricultural enterprise, for example, specializing in full-cycle pig farming, is the improvement of the method of distribution of overhead costs. Currently, the company uses a single distribution base, which, although it ensures the simplicity of accounting, does not always reflect the real impact of individual factors on the formation of the cost of production. This is especially critical in segments such as feed, energy, repair work, and animal husbandry, where costs are differentiated and depend on production cycles, technological features, and productivity of individual groups of animals.

The proposed method involves the use of a combined approach to the distribution of overhead costs using technologically justified bases (Table 3.1.4).

Table 3.1.4

The proposed method of distribution of overhead costs of the enterprise

Component of overhead costs	Allocation base	Allocation method
Feed and veterinary costs	Livestock (young pigs, adult pigs, repair stock)	Direct allocation per group of animals
Energy (electricity, heat, water supply)	Actual consumption	Proportional to the consumption of each site
Repair and maintenance	Depreciation of equipment, duration of operation	Proportional to use of equipment
Administrative costs	Number of staff or employment	Proportionate to the number of employees or working hours
Other costs (packaging, logistics, transport)	Processing and delivery volumes	Proportionate to actual logistics costs

For fodder and veterinary costs, it is advisable to apply direct allocation of costs to specific groups of livestock or individual departments of pig breeding complexes, which will allow to more accurately determine the cost of raising young animals and fattening adult pigs. It is advisable to distribute energy, electricity and heat supplies in proportion to the actual volumes of consumption by production sites, which will ensure the correct display of the efficiency of the use of resources and the identification of energy efficiency zones. The repair component and amortization costs for equipment can be distributed according to the duration of use of equipment in individual areas or according to the actual time of operation of production facilities, which will contribute to more accurate accounting of maintenance and modernization costs.

The introduction of a combined cost distribution base will allow the enterprise to receive more detailed and relevant data on the cost structure of products, which, in turn, will increase the informativeness of financial and management reporting. This approach will help to optimize costs, increase the productivity of animals, rational use of feed and material resources, and will also allow reasonable planning of investments in the modernization of the production process.

In addition, the application of the methodology with technologically based bases creates prerequisites for the integration of automated accounting and analytics systems at the enterprise. This will ensure operational control of costs in terms of production sites, accurate calculation of the cost of finished products and the formation of realistic price offers on the market. As a result, the company will be able to compete more effectively on the meat market, increase profitability and production stability.

Thus, the implementation of the combined method of distribution of overhead costs is an expedient and promising step in increasing the economic efficiency and managerial transparency of the enterprise, which will ensure the sustainable functioning of the enterprise and strengthen its position in the meat products market.

It is proposed to implement a step-by-step mechanism with clear roles, a list of documents and the frequency of inspections, which will cover all critical areas: accounting of costs by responsibility centers, movement and storage of stocks, control of technological processes on farms, preparation of primary documents and interaction between supply and production departments. The purpose of the mechanism is to ensure the reliability of accounting data, prompt detection of deviations and minimization of financial risks, in particular, excessive stocks, unsatisfactory credit policy and inefficient use of feed.

Each farm is declared a separate operational center of responsibility with the appointment of a farm manager as the person responsible for production costs, material accounting and the implementation of technological standards. Separate functional centers are distinguished: procurement center (responsible for contracts with suppliers, prices and delivery dates), storage center (responsible for receiving, storing and accounting for feed and medicines), sales center (responsible for invoicing and control of receivables),

accounting (responsible for cost accounting and summary reporting) and the controlling/internal audit department. Functional responsibilities, rights to sign documents, decision-making limits and a list of contact persons are defined for each center. It is important that the roles are formalized in the job descriptions and approved by the order of the head of the enterprise.

All receipts of feed, medicines, spare parts and other materials must be processed in the prescribed form: supplier's invoices, warehouse acceptance certificate, farm outgoing information, feeding logs and veterinary interventions log. Each operation receives a unique identifier for traceability. Acceptance of goods into the warehouse is checked for quantity and quality by the responsible person of the warehouse and signed by the head of the procurement center; movement between warehouses and farms is accompanied by internal invoices indicating the purpose of movement and signatures of both parties. Accounting reconciles inventory data with accounting at least once a quarter and records discrepancies in the protocol.

On each farm, it is necessary to keep daily logs of feeding accounting, recording the distribution of feed by batches, notes of workers who carried out feeding, and weight indicators of control animals. Veterinary records must contain dates and types of procedures, drugs used and signatures of the responsible person. The farm manager daily checks the compliance of actual feed consumption with standard norms and records deviations in the system; in the event of a deviation greater than the set threshold (for example, >5% of the standard), an investigation task is automatically created with the determination of the causes and temporary measures. Every week, the control center receives a report on FCR, mortality and average daily gain, compares it with the plan and prepares a summary report for management with recommendations.

Audits are of two types: planned and selective. Planned inventories of the entire warehouse are conducted at least once a year with the participation of warehouse representatives, an accountant and an independent auditor from the internal audit department. Selective audits of target groups of goods (expensive medicines, feed concentrates, spare parts) - every month. The results of audits are formalized in an act with a list of discrepancies, their quantitative assessment in hryvnias, and recommendations for corrective measures. Identified losses or shortages are subject to investigation with determination of responsible and, if necessary, disciplinary measures. The warehouse maintains a material movement log with digital duplication in the database for ease of reconciliation. The internal audit or controlling department conducts systematic checks of compliance of actual costs with plans and budgets, analyzes large one-time expenditure items, checks compliance with procurement procedures and selection of suppliers. The audit will have an annual plan with a division into quarters, including inspections of specific processes: feed purchases, veterinary orders, accounting for wages in production, work with receivables. Based on the results of each inspection, a report is drawn up with detected violations, an assessment of their impact in hryvnias, and

proposed corrective measures. The management should demand from the responsible persons a plan for the implementation of the recommendations and monitor the terms of its implementation.

In the mechanism, provide for a mandatory assessment of suppliers based on the criteria of price, quality, delivery terms and reliability. Contracts for the supply of feed and critical materials must go through the centralized procurement department with the approval of the CFO. Each contract should contain conditions for quality inspection at acceptance, penalties for lateness, and conditions for return/compensation in case of defective products. Negotiations on long-term prices and delivery schedules are documented, and their implementation is checked monthly.

The sales department should provide weekly reports on the invoices issued and the structure of arrears. Credit limits, advance payment rules for new customers and automatic reminders when payment deadlines are coming are implemented to control the debtor. The internal audit verifies the correctness of the calculation of fines and the application of the terms of contracts, and in case of significant delays, prepares materials for making decisions on restructuring or refusal of cooperation.

Even with a minimal level of automation, it is advisable to implement a single electronic form for accounting for the movement of feed and medicines, reports on feeding and logs of veterinary interventions. If there is an ERP or accounting system, perform daily data synchronization between production, warehouse and accounting. It is also recommended to set up a simple dashboard for management with indicators of critical values (FCR, feed balances, receivables overdue), which will allow you to cut off risks at an early stage.

Optimizing feed costs requires two parallel steps: technical - reducing the FCR (feed conversion ratio) and commercial - reducing the average price of a feed unit. Technical measures include standardization of recipes, regular quality control of components, introduction of control weights for feed release, training of feeding staff and monitoring of FCR by control groups. The goal is to reduce FCR by 5-10% within 12 months. In practice, based on the current example of feed costs in three farms (approximately UAH 3,650,000 per month or UAH 43,800,000 per year), an 8% reduction in the average feed purchase price can result in savings of approximately UAH 3,504,000 per year, and a 5% reduction in FCR will further reduce annual feed consumption by the equivalent of approximately UAH 2,190,000. The implementation of these measures requires the creation of technological feeding maps, regular analysis of the feeding schedule and a monthly report on FCR, according to which a bonus system is established for farm staff when target values are reached.

Inventory and procurement management must become a centralized and analytically supported process. I propose to create a central warehouse for fodder and concentrated materials with transparent procedures for receiving, accounting and moving materials between locations. Use an EOQ approach to order generation and establish safety stocks

for key items taking into account seasonality. If the average inventory balance is currently about UAH 28,292,800, the policy of reducing the average balance by 20% will provide a one-time release of working capital in the amount of approximately UAH 5,658,560, which can be used to pay off short-term liabilities or invest in modernization. In addition, supplier ranking, long-term framework agreements with a fixed price for basic components and automatic quality reconciliation procedures at acceptance should be introduced. Centralization will also allow you to receive volume discounts and minimize logistics costs between locations.

Regarding the management of receivables and payables, I suggest clearly regulating the credit policy: mandatory checking of the solvency of new counterparties, setting individual credit limits, requiring advance payments for new or risky customers, a clear invoicing procedure and automated payment reminders.

Current accounts receivable in the example is UAH 6,730,000; reducing it by 30% will free approximately UAH 2,019,000 of liquidity. The introduction of a regular jingle report, weekly arrears processing, and factoring mechanisms for individual large accounts when necessary, reduce DSO and improve the cash cycle. At the level of payables, negotiations on optimal payment terms should be conducted with the main suppliers and payment deferrals should be used to temporarily optimize liquidity without exceeding acceptable risks. The rationalization of procurement should include standardization of the nomenclature, review of recipes to use cheaper components while maintaining quality, wholesale procurement with price fixation for a period of 6-12 months, and the use of tender procedures for unusual or large purchases. It is advisable to introduce a matrix for assessing suppliers according to the following criteria: price, quality, reliability of supplies and payment terms, as well as conduct a quarterly review of contracts. It is important to combine negotiations with suppliers with internal measures to optimize formulations to avoid repeated reductions due to the deterioration of technological indicators.

Increasing the efficiency of production processes requires a focus on operational discipline and maintenance. I recommend implementing planned and preventive maintenance of equipment, technical inspection schedules, 5S standards at production sites, and monitoring of the implementation of feeding and veterinary care regulations. The implementation of control points with the measurement of average daily growth and tracking of mortality on a weekly basis will allow a quick response to deviations. Investments in automated feeders and dispensers, even partial ones, with batch weighing will reduce losses and increase the accuracy of feed dispensing. Genetic selection in breeding work and systematic assessment of breeding animals should also be considered in order to increase productivity and reduce technological costs in the medium term.

Regarding IT tools, I suggest a phased implementation: at the first stage - a centralized database in the form of a secure table/file storage with unified reporting templates, mobile data collection from farms (daily feeding logs, veterinary records) and automatic generation of weekly and monthly reports. At the second stage, the introduction

of a simple ERP/CMMS-module for accounting of stocks, orders, movement of materials and settlements with counterparties, as well as a BI-dashboard for management with key indicators (FCR, cost price of 1 kg, DSO, average balance of stocks). Such a system will allow you to set up automatic notifications when thresholds are exceeded and reduce the time for preparing reports. Simple entry/exit identification and weighing technologies should be considered for animal tracking and logistics, which will provide more accurate volumes and reduce accounting errors.

An important element of the project is budgeting and budget execution control. I suggest switching to quarterly operational budgeting with a rolling forecast for 12 months, a monthly reconciliation of the fact to the plan and analysis of deviations. Use ABC costing methods to determine the most costly processes and redirect resources to optimize these areas. Implementation of the system of internal control and audit of costs as a regular procedure (monthly control reconciliations of critical items, quarterly audits of the warehouse) will ensure an increase in the accuracy of accounting and a reduction in the risk of losses. To ensure the implementation of the project, I recommend dividing the implementation into three phases: phase 1 (0-3 months) - standardization of accounting, formation of report templates, introduction of weekly ajing and FCR reports; phase 2 (3-9 months) - centralization of the warehouse, negotiations with suppliers and implementation of EOQ policies, beginning of technical measures to reduce FCR; phase 3 (9-18 months) - implementation of IT solutions (ERP/BI modules), automation of feeding and planned preventive maintenance, evaluation of results and setting of the KPI system. Each phase should have a responsible person (operations director - for production processes; financial director - for liquidity and budget; procurement manager - for suppliers; controlling manager - for analytics and KPI).

The assessment of the expected economic effect should be based on realistic scenarios. The conservative scenario provides for a one-time release of working capital due to a 20% reduction in inventories (approximately UAH 5,658,560) and a 30% reduction in receivables (approximately UAH 2,019,000), which together provides free cash resources of approximately UAH 7,677,560 for reinvestment or reduction of short-term liabilities. In addition, annual savings on feed purchases of about UAH 3,504,000 can be expected when applying a negotiation strategy with suppliers, and technical measures to reduce FCR by 5% will provide about UAH 2,190,000 in annual feed cost savings; in total, this can provide more than UAH 5.6 million in annual savings while simultaneously improving operational indicators. Finally, it is critical to anchor the changes through a system of motivation and control: KPI-oriented bonuses for farm managers and supply managers, monthly publication of a dashboard for management, monitoring of the implementation of corrective plans by internal audit and regular audits of procedures. The proposed package of measures combines technological, organizational and commercial tools, which should collectively reduce the cost price, free up working capital and increase the financial stability of the enterprise without significantly increasing

operational risks. Implementation of this plan in defined phases and with clear responsibility will allow the enterprise to achieve significant financial results during the first year and lay the foundation for sustainable growth in the following years.

The use of analytical tools to assess the structure and dynamics of costs in the enterprise should be based on a combination of qualitative observations with clear quantitative calculations.

Index analysis in this context is used as a primary tool for describing changes. Basic and chain indices are calculated for each key element of costs and resources: index of the total volume of assets, index of stocks, indices of individual items of expenditure (feed, veterinary drugs, fuel, wages). The use of indexes allows you to quickly identify which articles change disproportionately to the general indicators. For example, if inventories increased by 253.66%, and total assets - by 325.21%, this means that the growth of inventories lags behind the growth of assets, but the absolute size of inventories and its share in working capital overloads operating liquidity; if the receivables have increased 75 times, then the overdue indexes will allow you to understand what part of this debt is critical. In practice, index analysis is conducted monthly or quarterly to identify trends, and price indices and volume indices are calculated separately to separate the price effect from the volume effect.

The method of elimination in the applied sense is used to build successive scenarios, when the researcher alternately fixes some factors and allows others to change, thereby simplifying the interpretation of the influence of individual components. In the practice of cost control, it works like this: to determine the effect of a change in feed prices on the total cost of production, the volume of feed consumption is fixed at the standard level (q0) and the change in costs is calculated only due to the change in price (p1-p0) at a constant volume. Then, on the contrary, the price (p0) is fixed and the impact of changes in consumption volumes (q1-q0) is calculated. Such sequential eliminative decomposition makes it possible to obtain two components: "price effect" and "volume effect", as well as to estimate the residual mutual effect. Formally, the change in aggregate costs ΔC can be expressed as the sum of $\Delta C_price = \Sigma\, q0 \cdot (p1-p0)$ and $\Delta C_volume = \Sigma\, p0 \cdot (q1-q0)$ plus the cross term. In an enterprise with three locations, this makes it possible to alternately eliminate internal transfers between locations and separate local technological problems from centralized supplies.

Factor analysis is a logical step further. It allows you to quantitatively assess the significance of specific determinants of cost. For the production direction of pig farming, the key factors are traditionally: FCR (feed consumption per unit of growth), average daily gain, mortality rate, feed price, veterinary and medical costs, labor costs per unit of production, energy costs and transport costs. In the applied factor approach, both classical methods of decomposition (linear factor model of the form $Y1-Y0 = \Sigma\, ai \cdot (Xi1-Xi0)$) and regression models are used to identify the share of cost variation that is explained by changes in each factor. For example, if you open a monthly data set for 24 months with a

breakdown by farm, you can build a model of the form: $Cost_kg = \beta0 + \beta1 \cdot FCR + \beta2 \cdot Feed_price + \beta3 \cdot Vet_costs + \beta4 \cdot Labor + \beta5 \cdot DummyFarm + \varepsilon$. The interpretation of β1 shows how many hryvnias the cost of 1 kg changes when the FCR changes by one unit; if β1 turns out to be significant and positive, optimization of feeding, dehydration or stock genetics becomes a priority. The model makes it possible to assess the impact of specific conditions of individual divisions on the cost of production, which cannot be taken into account using classical factor approaches.

In the application of factor and econometric tools, it is also important to pay attention to the quality of the data and the frequency of measurements. To identify operational problems, it is recommended that a monthly frequency is used for key operational metrics, a quarterly frequency for capital expenditures and investments, and analytical models should be updated at least once every six months. If significant factors (for example, feed price and FCR) are identified, they should be included in the KPI system and monitored promptly, with automatic signaling when deviation thresholds are exceeded. This will make analytics effective - from description to control.

Forecasting methodology should combine time series and factor (causal) models. For short-term forecasts (1-12 months), exponential smoothing and ARIMA approaches for sales and production volumes, as well as moving averages for detecting seasonality, are effective. To forecast the cost price, it is advisable to use a combination of time models and regression models, in which the prices of compound feed, FCR, mortality rate, energy prices and wages are the independent variables. Panel models for the three farms will help separate permanent location effects from temporal fluctuations. In the presence of cost history and technological metrics, it is useful to use machine learning methods to detect non-linear dependencies, but only as a supplement to the regression interpreted model. It is important that forecasts are accompanied by confidence intervals and "baseline/pessimistic/optimistic" scenarios, which makes it possible to assess the risk of cost overruns in monetary terms. Scenario modeling is a key element of the system. At least three scenarios should be available to management: a baseline, in which current price and production trends are maintained; negative, which implies an increase in feed prices by 15-25% and an increase in receivables; and positive, in which it is possible to reduce FCR by 5-10% and reduce DSO by 20%. For each scenario, the system should model the impact on the cost of 1 kg of products, gross margin and operating cash flow. It is useful to use simple stochastic simulations (for example, Monte Carlo) to estimate the distribution of possible outcomes with variability of key factors, this allows management to calculate the probability of falling profitability below a critical level.

Technical solutions for building a system can be simple and step-by-step. At the first stage, it is enough to use spreadsheets with report templates and macros for automatic calculations, connecting CSV files from accounting and warehouse. At the second stage, it is advisable to implement a lightweight BI tool that will provide automated reports and interactive panels. Analytical panels should contain key indicators, trends, indicators of

deviations from the plan, inventory maps by location and tables with detailed age of receivables. Visualization should be designed for quick perception: the main thing is dynamic graphs of trends and indicators with color signals when thresholds are exceeded. The panel should allow filtering by period, farms and cost items.

Implementation of the system requires the establishment of data management and quality control procedures. It is necessary to prescribe the rules for entering data, responsible for their verification, the frequency of calculations and the mechanisms for detecting anomalies (for example, significant changes in FCR or a sudden increase in veterinary costs). To avoid forgeries and errors, you should limit editing rights in the data store and implement a change log. In addition, it is necessary to determine the reporting schedule: monthly management reporting by the 7th of the month, quarterly analysis of scenarios and semiannual revision of forecast models.

The personnel aspect in the cost management system is no less important than the organizational and methodical component, because competent employees ensure the effective use of accounting and analytical information. In the structure of the enterprise, it is advisable to provide for the position of the person responsible for management analysis - it can be a financial analyst or a controlling manager. Such a person becomes a central node in the process of data collection, processing and analysis, coordinates the work of all units that form primary information, ensures its reliability and relevance.

The key task of the responsible person is to control the accuracy and timeliness of accounting data, conduct information validation, and prepare predictive models. It analyzes costs according to various criteria, determines deviations from planned indicators and provides management with short and clear reports with conclusions and recommendations. It is important that these reports are structured in such a way that management decisions can be made quickly - for example, to optimize resources, adjust production processes, redistribute budgets or revise spending norms.

The effectiveness of such a system largely depends on the professional level of the staff. Therefore, the company should regularly improve the qualifications of analysts and managers, especially in the use of modern analytical and software tools, such as ERP systems, specialized modules for management accounting, budgeting and forecasting systems. The skills of interpreting the results of the analysis and the ability to formulate practical recommendations for management are no less important than the technical processing of the data.

The training of competent personnel creates a synergy between software solutions and the human factor, which provides a permanent effect in increasing the efficiency of cost management. Analysts not only reflect the actual indicators, but also forecast the development of events, model alternative scenarios and propose measures to optimize the company's activities.

Thus, the personnel aspect is integrated with organizational and methodical approaches, forming a comprehensive cost management system that ensures timeliness, reliability and analytical value of information. Only a combination of modern information systems, clearly defined job duties and a high level of staff competence allows the enterprise to achieve economic efficiency, respond quickly to changes in the market environment and maintain sustainable development in the long term.

The cost management system should include clearly defined feedback mechanisms that allow timely response to deviations from planned indicators. Each deviation from established norms or budget indicators requires not only the recording of the fact, but also a detailed analysis of the reasons for its occurrence. Such an analysis allows you to determine whether the deviation is the result of external factors (for example, fluctuations in resource prices, changes in market demand) or internal processes of the enterprise (flaws in planning, inefficient use of resources, errors in the organization of production). Based on the results of the analysis, a set of corrective measures is developed, in which the persons responsible for the implementation of each measure are clearly indicated and specific terms of implementation are established.

Importantly, the feedback system is not limited to responding to deviations, but serves as a tool for continuous improvement of cost management processes. This allows the enterprise to constantly increase the efficiency of the use of resources, optimize production operations and reduce the risks of overspending. In addition, such mechanisms ensure the transparency of management processes, a clear demarcation of responsibilities between different units, and the formation of a culture of prompt response to financial and production challenges.

The evaluation of the effectiveness of the cost management system is carried out through the achievement of specific financial goals that reflect the practical results of the work of the analytical unit and the activity of the enterprise as a whole. Such goals include, for example, reducing the cost of one kilogram of products to 40 hryvnias within 12 months, reducing the average receivables turnover period (DSO) to 10 days, reducing the average inventory balance by 20%, and increasing operating cash flow by an amount equivalent to 2-3 months of operating expenses.

Achieving these indicators is a concrete indicator of the effectiveness of the analytical cost management system. At the same time, such financial goals help the enterprise to form strategic guidelines aimed at increasing profitability and competitiveness. Thanks to feedback and corrective actions, management gets the opportunity to quickly make changes in resource planning, improve production processes and increase the accuracy of forecasts. Thus, the integration of control, analysis and adjustment mechanisms creates a closed cycle of management, which ensures a sustainable increase in the efficiency of the enterprise and the achievement of the set financial goals.

3.2. IMPROVEMENT OF ACCOUNTING AND ANALYTICAL SUPPORT FOR THE MANAGEMENT OF ACCOUNTS RECEIVABLE IN THE CONTEXT OF ENSURING THE ECONOMIC STABILITY OF AN ENTERPRISE

Tatiana Machak,
Senior Lecturer of the Department of Accounting, Taxation and Management of Financial and Economic Security,
Dnipro State Agrarian and Economic University, Dnipro, Ukraine

In the current conditions of transformation of the economic environment, characterized by increased dynamism, instability of financial markets, and a growing level of uncertainty, the issue of ensuring the economic stability of enterprises is of particular importance. The effective functioning of business entities largely depends on their ability to timely adapt to changes in the external environment, maintain an adequate level of liquidity, and ensure the continuity of cash flows. An important role is played by the working capital management system, among which accounts receivable occupies one of the leading positions.

Accounts receivable, as an important component of the enterprise's financial resources, directly affects its solvency, financial stability, and overall performance. The growth of commercial lending volumes, the widespread practice of payment deferrals, as well as the instability of counterparties' payment discipline, lead to increased risks of non-repayment and the accumulation of overdue receivables. As a result, there arises a need to develop an effective accounts receivable management system that would ensure timely control over settlements and minimization of financial risks.

Accounts receivable is an important category of financial accounting and enterprise management, reflecting the amount of funds unpaid by counterparties for goods delivered, work performed, or services rendered. It serves both as an indicator of current financial interaction with counterparties and as a tool for assessing the financial condition of the enterprise, since its level directly affects liquidity, solvency, and the ability to meet financial obligations in a timely manner. Accounts receivable has a dual nature: on the one hand, it is an asset that can be mobilized in the short term to support working capital; on the other hand, it is a potential source of risks associated with payment delays and failure to fulfill contractual obligations.

In general, the essence of accounts receivable lies in defining the legal relations between the enterprise and its counterparties that arise in the course of business activities and are associated with the provision of trade or financial credit. It records the actual obligations of buyers or customers and reflects the economic relationships that shape the enterprise's cash flows. From a scientific perspective, accounts receivable is a component of current assets and performs the function of an intermediate financial resource which, under effective management, contributes to the stability of cash flows and the maintenance of solvency.

In accounting, the concept of accounts receivable is regulated by National Accounting Standard 10 «Accounts Receivable», which defines it as: «The amount of debt owed to an enterprise by its debtors at a certain date, which is presented in the balance sheet as part of assets». At the same time, according to the provisions of International Financial Reporting Standard (IFRS) 39 «Financial Instruments: Recognition and Measurement», accounts receivable is treated as a financial asset arising from the transfer of goods or services to counterparties with deferred payment terms.

However, these interpretations do not fully disclose the economic essence of this concept; therefore, it is appropriate to consider accounts receivable from the perspective of economic theory. Thus, L.M. Vasylieva and O.V. Traino define it as: «The unpaid amount of funds owed by debtors to an enterprise as a result of their interactions at a certain date» (Vasilieva and Traino, 2017), emphasizing the fact of non-payment, i.e., accounts receivable is interpreted as a current obligation of buyers.

O. Kravchenko and T. Kobets consider accounts receivable as: «The amount of debts owed to an enterprise that arise as a result of business activities and will be settled in the future» (Kravchenko and Kobets, 2021). Here, the emphasis is placed on the time aspect: accounts receivable arises at present but will be repaid later.

Accounts receivable is defined as: «The amount of debt owed to an enterprise by its debtors at a certain date, which is documented, has reached its payment due date, and is reflected in the balance sheet as part of current assets». This definition is based on the accounting approach, where the primary focus is placed on the availability of documentary evidence and proper presentation in financial statements.

Other authors define the concept as: emphasize the legal and analytical nature of this phenomenon, defining accounts receivable as: «The enterprise's right to receive unpaid funds or material resources from counterparties, which serves as a basis for assessing its financial condition through the calculation of performance indicators».

Based on the generalization of these approaches, accounts receivable should be considered as an element of the financial and economic activity of an enterprise that reflects the relationships between business entities in the process of selling goods or services on deferred payment terms, and at the same time serves as an indicator of financial stability and the level of economic security of the enterprise.

Researchers rightly emphasize that accounts receivable is an indicator of the effectiveness of enterprise management, as its growth signals weakened control, increased risks of non-repayment, and a loss of financial flexibility. Accounts receivable management is defined as a process of purposeful and systematic implementation of measures aimed at optimizing its volume and ensuring timely collection through an effective credit policy, monitoring of settlements, and minimization of financial risks of the enterprise.

The significance of accounts receivable in the system of financial and economic security of an enterprise is determined by its ability to influence the formation of liquidity,

the level of asset turnover, and the efficiency of resource utilization. Effective receivables management enables the timely mobilization of funds to finance current needs, minimizes the risks of non-repayment, ensures financial stability, and maintains the enterprise's ability to meet both strategic and current financial obligations. The existence of well-controlled accounts receivable provides the enterprise with timely information on the financial condition of its partners, enables the forecasting of cash inflows, and supports working capital planning, which is an important element of risk management.

In both theoretical and practical terms, accounts receivable is classified according to various criteria, which makes it possible to assess its impact on financial and economic security and to apply appropriate managerial measures. One of the main classifications is based on maturity, distinguishing between short-term (current) and long-term receivables. Short-term accounts receivable is characterized by a repayment period of up to one year and ensures the immediate replenishment of working capital, whereas long-term receivables, with maturities exceeding one year, serve as an instrument for planning financial resources in the medium and long term.

Another important classification criterion is the economic nature of receivables. It may arise from the supply of goods, provision of services, performance of works, issuance of advances, or granting of financial loans. Classification on this basis makes it possible to assess the effectiveness of individual areas of activity and to identify high-risk segments that require particular attention from management.

Depending on the degree of non-payment risk, receivables are divided into performing, doubtful, and overdue. Performing receivables are characterized by timely repayment and a low level of risk, whereas doubtful receivables require additional control and assessment of the probability of collection, and overdue receivables constitute a source of potential financial losses and reduced liquidity. Such classification enables the determination of priorities in dealing with debtors, the establishment of credit limits and deferral periods, and the application of risk management instruments such as factoring, insurance, or debt restructuring.

In addition, accounts receivable is analyzed by aging categories, which allows determining the timing of debt origination and the dynamics of its repayment. Aging analysis helps to identify trends in the accumulation of overdue payments and to respond promptly to problematic areas, which is a necessary condition for maintaining the enterprise's solvency.

Scientific studies emphasize that accounts receivable acts not only as a financial resource but also as an informational management tool. The information base formed on the basis of receivables data enables the analysis of counterparties' payment discipline, forecasting of cash flows, construction of integrated indicators of financial stability, and development of econometric models for assessing bankruptcy risk. This provides a scientifically grounded basis for managerial decision-making and enhances the effectiveness of the internal control system.

At the same time, modern business conditions necessitate the transformation of approaches to accounts receivable management, implying a shift from its purely accounting representation to a comprehensive management system. This approach is based on the integration of analytical, organizational, and control tools that ensure systematic monitoring of settlements with counterparties, assessment of their solvency and reliability, and timely identification of trends indicating deterioration in payment discipline. An important element of this system is the development of an effective credit policy of the enterprise, which includes defining the terms of commercial credit, establishing individual credit limits, applying mechanisms to stimulate timely payments, and imposing sanctions for their violation. In addition, the use of economic analysis and forecasting methods makes it possible to assess the impact of accounts receivable on liquidity and financial stability, as well as to develop cash flow management scenarios taking into account potential non-payment risks. Taken together, this contributes to improving the quality of managerial decision-making, optimizing the volume of accounts receivable, accelerating its turnover, and minimizing financial risks, which are key prerequisites for ensuring the sustainable development of the enterprise.

Accounts receivable management involves a set of measures aimed at ensuring the timely collection of funds from counterparties, minimizing overdue debts, and monitoring the financial condition of customers. One of the key aspects of such management is the classification of accounts receivable, as the proper allocation of receivables according to specific criteria enables the enterprise to more effectively control its financial resources, analyze risks, and make well-founded managerial decisions. Classification makes it possible to systematize information on types of receivables, determine their impact on financial performance, and assess the real likelihood of timely cash inflows.

The classification of accounts receivable in the management process is understood as its distribution according to various criteria that reflect the nature of its origin, maturity, legal status, liquidity level, degree of risk, and other characteristics. The most common is the classification by maturity. Depending on this indicator, current and long-term accounts receivable are distinguished. Current receivables arise within the normal course of business and are expected to be settled within one year. Long-term receivables, in contrast, are characterized by a longer repayment period (more than 12 months) and are usually associated with financial investments or the provision of loans. Such a classification enables the enterprise to assess the liquidity of its assets and determine the actual level of solvency in both the short and long term.

Another important classification is based on the types of debtors, i.e., the entities that owe debts to the enterprise. The main groups of debtors include customers and clients, accountable persons, related parties, and other debtors. This approach is of great practical importance, as it allows identifying which counterparties account for the largest share of receivables and focusing management efforts on the riskiest groups.

In addition, it is advisable to classify accounts receivable according to the nature of their origin. Under this criterion, trade (operating) and non-trade (non-operating) receivables are distinguished. Trade receivables arise from the sale of goods, performance of works, or provision of services and are the most typical for enterprises. Non-trade receivables are associated with other types of settlements, such as advances, penalties, overpayments, or loans granted. This approach makes it possible to determine which portion of the enterprise's assets is directly related to its core activities and which is linked to auxiliary or financial operations.

From a risk management perspective, the classification by the degree of recoverability is of particular importance. In this case, receivables are divided into recoverable (performing), doubtful, and bad (uncollectible). Recoverable receivables are characterized by a high probability of repayment, doubtful receivables involve certain risks of non-recovery, while bad receivables are recognized as uncollectible and are subject to write-off. Such classification serves as the basis for the formation of an allowance for doubtful debts in accordance with the requirements of NAS 10, thereby ensuring the reliability of the enterprise's financial statements.

From a managerial perspective, the classification of accounts receivable by the degree of liquidity, i.e., the speed of its conversion into cash, is also important. Highly liquid receivables are those that can be quickly collected, for example, short-term settlements with regular customers. Medium-liquid receivables are characterized by an average level of reliability, whereas low-liquid receivables typically include overdue or doubtful debts. This approach enables the enterprise to effectively plan cash inflows and reduce the risks of working capital shortages.

In the course of an enterprise's activities, it is essential to timely identify deficiencies in the accounts receivable management system, assess their impact, and take appropriate measures to minimize potential risks. Ineffective management of accounts receivable may lead to significant adverse consequences for the enterprise, affecting its financial condition and level of economic security. One such consequence is the deterioration of liquidity indicators. Funds not collected from debtors in a timely manner reduce the volume of working capital, which may create difficulties in meeting current obligations to suppliers and, consequently, lead to the risk of insolvency. Another serious risk is the increase in the volume of overdue and bad receivables. If the enterprise fails to take timely measures to collect debts, the likelihood increases that part of the receivables will become uncollectible, resulting in financial losses and the need to create provisions that negatively affect profitability.

Insufficient control over debtors and the absence of a clearly defined credit policy in dealing with them may also lead to a loss of trust from partners and create the impression of ineffective enterprise management.

One of the simplest yet effective methods of assessing receivables risk is the analysis of its structure. Such analysis includes classification by maturity: current (up to 30 days),

overdue (30–90 days), and long-term (90 days and more). The greater the proportion of receivables in the overdue category, the higher the risk of non-collection and the negative impact on the enterprise's liquidity.

To assess the risk of non-fulfillment of obligations, an analysis of debtors' solvency is applied, which helps identify weaknesses in the financial stability of partners and facilitates forecasting the probability of receivables occurrence. Key indicators include the receivables turnover ratio, the coverage ratio, and the overdue receivables ratio, as they serve as indicators of the effectiveness of accounts receivable management.

Credit scoring takes into account financial, economic, legal, and political factors and allows for the assessment of default risk. Through econometric modeling, which involves the application of mathematical and statistical methods to analyze relationships between economic indicators, it is possible to evaluate the impact of various factors on the level of receivables and to forecast the risks of non-repayment.

Another effective method is the creation of provisions to cover the risks of bad debts. Such provisions are formed based on an analysis of the recoverability of debts from problematic debtors. The amount of the provision depends on the assessed probability of non-repayment and the level of overdue receivables. The creation of provisions helps reduce the impact of unpaid debts on the financial security of enterprises.

Risks associated with accounts receivable may have different origins and often arise spontaneously, posing a threat to the financial and economic security of an enterprise. An essential tool for preventing such risks is the development of an effective accounts receivable management system, which includes the analysis of customer solvency, the establishment of clear credit policy terms, and continuous monitoring of receivables. The implementation of such a system enables the timely identification of risks, assessment of their potential consequences, and introduction of measures to mitigate them.

The effectiveness of accounts receivable management largely depends on understanding and analyzing the factors that influence its composition, structure, and volume. Internal factors are related to the specifics of the enterprise's own activities. These include credit policy, terms of trade credit, payment terms and procedures, the quality of accounting, the effectiveness of internal control, the organization of claims and litigation work, as well as the level of counterparties' payment discipline. The characteristics of receivables themselves—such as maturity, liquidity, and the ratio between current, overdue, and doubtful receivables—also play a significant role.

External factors are equally important, as they shape the operating environment of the enterprise. These include the overall economic situation in the country, market conditions, the level of inflation, tax burden, changes in legislation, the financial condition of counterparties, the availability of credit resources, as well as force majeure circumstances, including martial law. Under current business conditions, when some counterparties may be located in areas of active hostilities, territorial risk and the potential loss of control over settlements gain additional significance.

The structure of accounts receivable is also determined by the nature of interaction with different groups of customers: large corporate clients, small enterprises, or individuals. In addition, the volume of receivables is influenced by the type of goods or services provided, delivery terms, and the duration of payment deferrals. The analysis of these factors makes it possible to identify potential risks of non-payment, ensure timely cash flow planning, and develop optimal financial decisions.

Effective accounts receivable management is impossible without the enterprise's ability to identify and assess various risks associated with payment delays, as well as to analyze all factors influencing its volume and structure. It is precisely on this basis that managerial decisions are made regarding the extension of credit, control over overdue receivables, and optimization of cash turnover.

At the same time, a key prerequisite for effective accounts receivable management is high-quality information and analytical support, which implies the availability of reliable, complete, and up-to-date information on the state of settlements with counterparties, payment terms, the amount of receivables, the structure of debtors, and the risk level of each of them. Owing to such support, enterprise management is able to promptly assess the condition of accounts receivable, respond in a timely manner to potential risks of its growth, and develop a well-founded credit policy. Researchers emphasize that the information and analytical support of accounts receivable management must meet certain requirements that ensure its effectiveness for managerial purposes.

In particular, V.D. Popova notes that: «High-quality information support makes it possible to synchronize cash inflows from debtors with expenditures for the settlement of liabilities, thereby maintaining the enterprise's solvency under the challenging conditions of the modern market environment». Strict adherence to such requirements enables the enterprise to control accounts receivable and minimize financial risks, maintain liquidity and capital turnover, which directly enhances the level of financial and economic security.

Modern business conditions are characterized by high dynamism, variability of the external environment, and increased uncertainty, which leads to enterprises constantly encountering the phenomenon of risk. For the financial support of enterprise activities, risks associated with accounts receivable are of particular importance, as they directly affect liquidity and solvency. A high level of receivables slows down cash turnover, increases the need for additional financial resources, raises losses from non-payments, and creates the threat of overdue debts. During periods of economic instability, deterioration of counterparties' payment discipline, as well as under martial law conditions, risks related to debtors intensify and become one of the most significant factors destabilizing the financial position of the enterprise. Therefore, managing such risks is an essential component of the financial and economic security system.

In order to ensure an adequate level of control over accounts receivable, it is necessary to understand the sources of the relevant risks. Conventionally, they are divided into internal and external (Fig. 3.2.1).

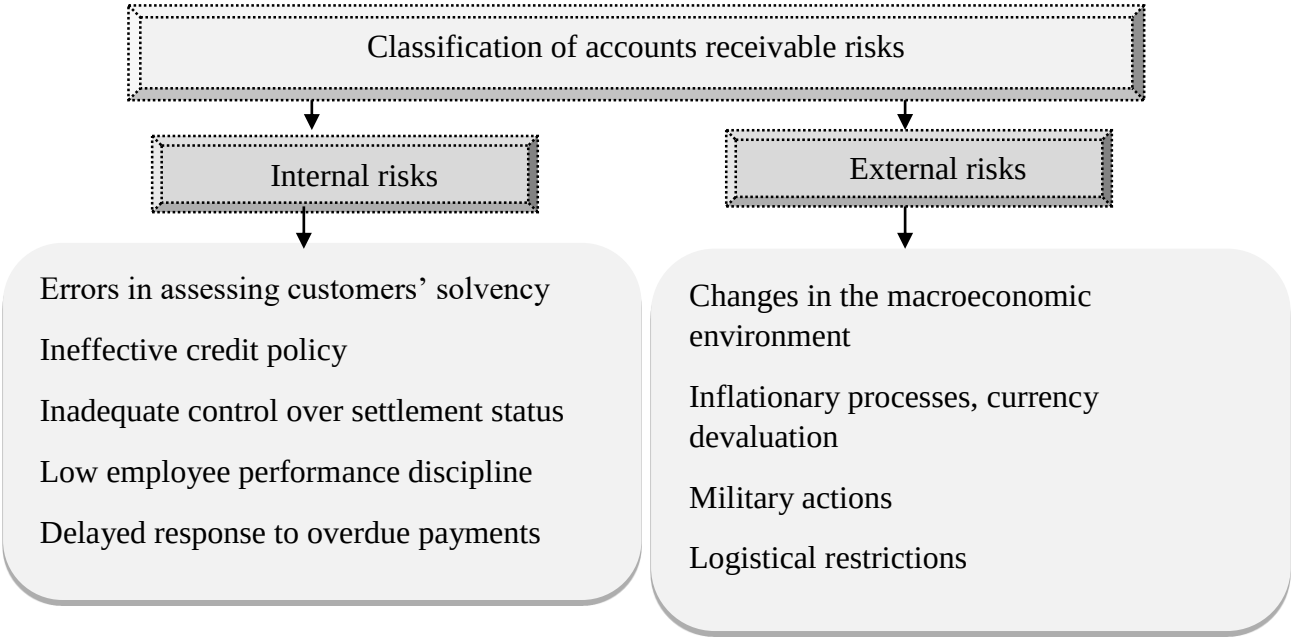


Fig. 3.2.1. Classification of accounts receivable risks

Internal risks are associated with the specific organizational features of an enterprise and include errors in assessing customers' creditworthiness, weaknesses in credit policy, inadequate control over settlements, and low personnel discipline, untimely response to overdue debts, or errors in the internal information system for managing debtors.

External risks, in contrast, are formed under the influence of the external environment and are associated with changes in the macroeconomic situation, inflationary processes, currency devaluation, military actions, logistical constraints, declining solvency of counterparties, or changes in legislation regulating business settlements. All this determines the need for clear identification of accounts receivable risks and their comprehensive analysis.

Risk transfer methods occupy an important place in the enterprise's accounts receivable management system, as they ensure a reduction in financial uncertainty and minimize potential losses associated with counterparties' failure to fulfill their contractual obligations. The economic essence of these methods lies in the redistribution of risks among economic entities through their partial or full transfer to specialized institutions, such as insurance companies, banking institutions, or factoring organizations. This approach enables an enterprise to optimize its risk structure and ensure the stability of cash flows.

One of the primary instruments of risk transfer is commercial (credit) risk insurance. Within this mechanism, the enterprise concludes an insurance contract under which the insurer undertakes to compensate for losses in the event of the debtor's insolvency, bankruptcy, or payment default. An important feature is the possibility of insuring both individual transactions and the aggregate portfolio of accounts receivable, which ensures a comprehensive approach to risk management. In addition to its compensatory function,

insurance companies often perform an informational and analytical role by assessing the creditworthiness of counterparties, thereby enhancing the quality of managerial decision-making. At the same time, the effectiveness of insurance is constrained by the presence of deductibles, liability limits, and the necessity of paying insurance premiums, which affects the overall cost of using this instrument.

An important method of risk transfer is the use of bank guarantees, which serve as a form of securing obligations. A bank guarantee implies that a financial institution (the guarantor) assumes an irrevocable obligation to make a payment to the beneficiary in the event that the principal fails to fulfill its contractual obligations. This instrument is particularly effective in the field of foreign economic activity and in the execution of large-scale contracts, where the level of risk is elevated. The use of bank guarantees contributes to the reduction of credit risk, enhances trust between counterparties, and expands opportunities for cooperation. However, it should be taken into account that obtaining such a guarantee is associated with additional costs in the form of bank commissions and may require the provision of collateral by the principal.

Factoring operations play a significant role in risk minimization, as they involve the transformation of accounts receivable into liquid assets through their assignment to a factoring company. Factoring allows an enterprise not only to transfer the risk of non-payment (in the case of non-recourse factoring) but also to accelerate capital turnover and improve liquidity and solvency indicators. Additionally, the factor may perform accounts receivable management functions, including accounting, monitoring of payment terms, and collection of receivables. It should be noted that the choice between recourse and non-recourse factoring is determined by the trade-off between the acceptable level of risk and the cost of factoring services.

A separate area is risk hedging, which is based on the use of derivative financial instruments to neutralize the adverse effects of changes in market parameters. Such instruments include forward and futures contracts, options, swaps, etc. Hedging makes it possible to lock in future financial conditions (for example, exchange rates or interest rates), which is particularly important for enterprises engaged in foreign economic activity or those with significant volumes of foreign currency-denominated receivables. Despite its effectiveness, the use of hedging instruments requires a high level of financial expertise and is associated with additional transaction costs.

In addition to the aforementioned instruments, enterprises also apply alternative mechanisms for risk transfer and mitigation. In particular, the use of advance payments or partial prepayments allows for the minimization of credit risk, although it may adversely affect the enterprise’s competitiveness. The letter of credit form of settlement ensures a high level of payment security due to the involvement of banking institutions, which is especially relevant in international trade. Furthermore, liability insurance contracts, the engagement of collection agencies for managing distressed receivables, and the conclusion of partnership agreements providing for risk-sharing among participants in economic relations may also be employed.

In view of the above, it can be argued that risk transfer methods constitute an integral component of the modern enterprise financial management system. Their comprehensive and rational application contributes to the reduction of credit risk, enhances the efficiency of accounts receivable management, ensures the stability of cash flows, and strengthens the financial resilience of the enterprise in a volatile economic environment. The main methods of accounts receivable risk management are presented in Fig. 3.2.2.

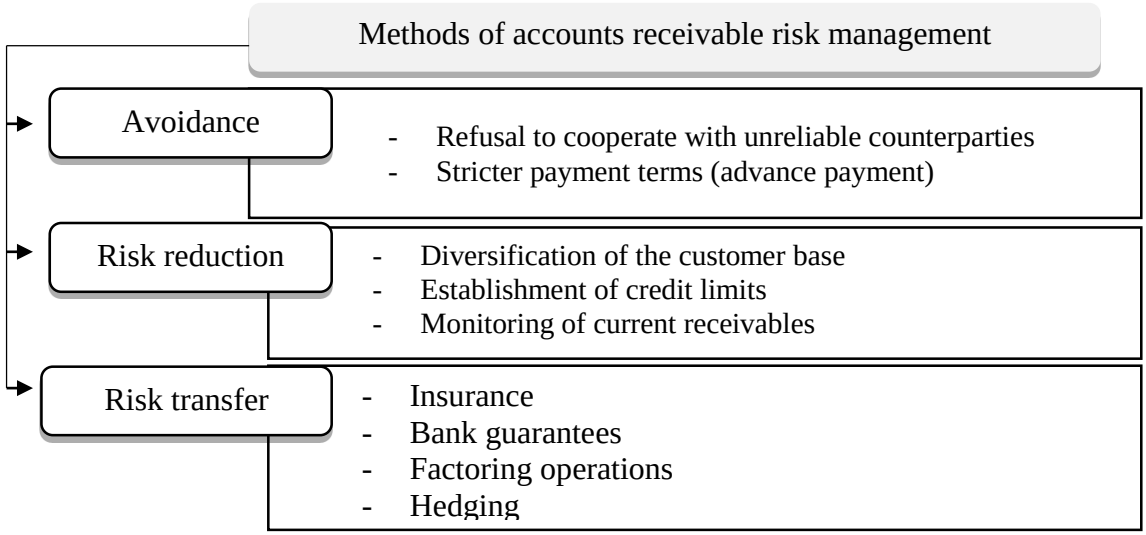


Fig. 3.2.2. Methods of accounts receivable risk management

Thus, risks associated with accounts receivable may arise under the influence of various internal and external factors, which necessitates their clear identification and classification. Effective management of such risks requires adherence to a logically consistent system of actions, including the identification of debtors, assessment of their financial stability, development of a credit policy, monitoring and control of receivables, and prompt response to identified deviations. The use of various risk mitigation methods – such as diversification of the customer base, credit limiting, insurance, factoring operations, or hedging – enables the adaptation of managerial decisions to specific conditions and reduces the negative impact of non-payments. At the same time, the selection of methods should be based on the nature and level of risks arising in the enterprise's activities.

As noted above, accounts receivable arise due to the time gap between the sale of goods or services and the receipt of funds from counterparties. For effective control and optimization of this process, a clear legal framework is required to regulate the accounting, measurement, monitoring, and collection of receivables. In Ukraine, this is governed by a set of regulatory and legal acts at both the international and national levels, which form the framework for accounting, financial reporting, and managerial control. At the international level, the key documents include IFRS 9 «Financial Instruments», which defines the measurement of accounts receivable and the recognition of allowances for doubtful debts, and IFRS 7 «Financial Instruments: Disclosures», which regulates the

disclosure of information on financial risks, ensuring comparability and integration of financial information.

At the highest national level of legal regulation is the Law of Ukraine «On Accounting and Financial Reporting in Ukraine» dated July 16, 1999, No. 996-XIV. This law defines the general principles of accounting and financial reporting, establishes the legal basis for the recognition of assets and liabilities of an enterprise, including accounts receivable. It emphasizes that accounts receivable constitutes a property right of the enterprise to receive funds or assets from counterparties in the future, arising from completed business transactions, and forms the foundation for a systematic approach to their management, ensuring legal certainty and protection of the enterprise's interests.

The Civil Code of Ukraine regulates contractual relations between business entities, defining the rights and obligations of the parties, the procedure for the emergence of liabilities, and the terms of their fulfillment, which directly affects accounts receivable. The Tax Code establishes the tax consequences of such transactions, including value-added tax (VAT), corporate income tax, and the single tax for individual entrepreneurs. Detailed rules for the accounting and measurement of accounts receivable are set out in NAS 10 «Accounts Receivable», which regulates the methodology of their accounting, disclosure in financial statements, and the formation of allowances for doubtful debts. Law of Ukraine No. 2459-IX «On Amendments to Certain Laws Regarding the Settlement of Overdue Debt during Martial Law» establishes temporary mechanisms for adaptation to force majeure circumstances, including the extension of limitation periods and the suspension of collection of overdue receivables. Thus, the legal regulation of accounts receivable combines general principles of accounting and measurement with consideration of the realities of the economic environment and external risks, enabling enterprises to more effectively control payments and maintain financial stability.

Another important regulatory document is NAS 1 «General Requirements for Financial Reporting», which defines the principles of financial reporting and accounting policy of an enterprise, particularly regarding the reliability and completeness of information on accounts receivable. At the sectoral level, regulation is carried out through orders of the Ministry of Finance and other documents that specify the accounting and control of receivables classification. In particular, the Instruction on the Application of the Chart of Accounts determines the procedures for maintaining synthetic and analytical accounting, documenting transactions, structuring accounts for different types of receivables, and controlling their repayment terms.

Enterprises may adapt general requirements to their specific conditions by establishing an accounting policy order, which defines the principles for accounting for accounts receivable, the timing of cash inflow control, the procedure for interaction between departments, and risk monitoring. Within this order, provisions may be developed regarding the classification of receivables by maturity, types of counterparties, level of risk, tax status, and location, as well as regulations for analytical monitoring with monthly reporting and control over the timely repayment of debts.

The effectiveness of accounts receivable management directly depends on the completeness, reliability, and timeliness of the information used in the decision-making process. It is precisely on the basis of high-quality information resources that an analytical framework for counterparties is formed, assessments of liquidity and solvency are carried out, and potential risks associated with their financial condition and payment discipline are identified. In the context of increasing economic instability and rising financial risks, the role of information support becomes significantly more important, as its quality determines the enterprise's ability to respond promptly to changes in the external environment and maintain an appropriate level of financial stability.

The formation of accounts receivable indicators is impossible without proper organization of document flow. Primary documents serve as the basis for recognizing receivables, determining their amount, repayment terms, and settlement conditions with counterparties. The primary information base is formed at the stage of concluding business contracts, which define the rights and obligations of the parties, settlement procedures, conditions for the supply of goods or provision of services, payment terms, the possibility of granting payment deferrals, the application of penalties, as well as other essential terms of cooperation. At this stage, the foundations of future payment discipline and the counterparty risk profile are established.

The main documents confirming the occurrence of accounts receivable include invoices, delivery notes, acts of completed works or provided services, consignment notes, tax invoices, payment documents (payment orders, bank statements), as well as reconciliation statements. In the case of overdue or doubtful receivables, additional claim and litigation documentation is prepared, including claims, responses to them, and official correspondence. All these documents undergo preliminary control for correctness of preparation, compliance with contractual terms, and availability of required details, after which they are reflected in the accounting system. They perform the function of legal and economic confirmation of the existence of receivables, determine their amount, repayment terms, and settlement conditions with counterparties.

The quality of primary accounting directly affects the accuracy of accounting and analytical indicators, the timeliness of control, and the assessment of financial risks. Improving primary accounting involves the standardization of documents, the unification of their forms and completion rules, as well as the implementation of electronic document management.

These actions make it possible to avoid data duplication, reduce the risk of errors, and ensure centralized data storage. Systematization and aggregation of primary documents create a basis for the analytical processing of accounts receivable, the formation of counterparty registers, and the control of timely cash inflows. In addition, properly organized primary accounting enables detailed analysis according to the economic nature of the debt, the timing of its occurrence, and the types of products or services provided. This makes it possible to identify high-risk categories of debtors and determine optimal interaction mechanisms, including debt restructuring, the application

of penalty sanctions, or the assignment of receivables. These measures directly affect the liquidity and solvency of the enterprise.

At the current stage of management accounting development, the use of automated accounting systems such as ERP, BAS, and SAP is becoming increasingly important, as they allow the integration of accounting, control, and analytics into a single information platform. The use of such systems enables detailed analytical accounting for each counterparty, including contract terms, debt repayment schedules, and types of goods and services, which significantly increases the responsiveness of managerial decision-making. Automated systems ensure the rapid generation of analytical reports, including accounts receivable turnover ratios, average collection period, aging structure of receivables, and their share in total assets. This allows management to respond promptly to overdue payment risks and optimize the management of financial flows.

The use of automated accounting systems is not limited to record-keeping and reporting. Their functional capabilities include monitoring compliance with credit limits, automatic payment reminders, and integration with accounting and financial departments, ensuring the unity of accounting and analytical processes. Moreover, automated systems enable comprehensive analysis of the relationship between accounts receivable and the overall financial condition of the enterprise, allowing for the assessment of working capital efficiency and forecasting potential liquidity problems. Integration of such systems with external data sources, including counterparties' credit histories and market information, provides a more accurate risk assessment and enables the development of adaptive accounts receivable management strategies.

The aggregation of information on accounts receivable is carried out in the relevant accounting registers, in particular in analytical cards of settlements with counterparties, trial balance statements for settlement accounts, statements on the structure of receivables (current, long-term, overdue), as well as reports on the formation of allowance for doubtful debts. Such systematization of data ensures the possibility of a comprehensive analysis of the settlement status and the identification of negative trends.

An important element of information and analytical support is the regular reconciliation of settlements with counterparties. Depending on the volume of business operations and the level of risk, such reconciliation may be conducted on a monthly or quarterly basis. Its results make it possible to identify discrepancies in accounting data, clarify receivable balances, and prevent the emergence of disputes. The updated information obtained from reconciliation is used for further analysis and control.

Analytical accounting of accounts receivable should be carried out taking into account its classification by maturity (current and long-term), level of risk (normal, doubtful, bad debt), as well as by types of counterparties and the nature of transactions. Such an approach makes it possible to improve the accuracy of assessing the enterprise's financial position and to ensure more effective management of cash flows.

A special role in improving the effectiveness of accounting and analytical support is played by the implementation of dynamic monitoring and analytics, which makes it possible to continuously track changes in the structure of accounts receivable and

automatically generate key management indicators. This ensures the timely identification of problematic and high-risk positions, monitors compliance with payment discipline, and ensures the timeliness of cash inflows. Dynamic monitoring involves the construction of receivables aging structures, turnover ratio calculations, determination of average collection periods, and assessment of potential financial risks. The systems automatically send notifications about approaching payment deadlines, signal breaches of credit limits, and generate forecast cash inflow schedules, which significantly increases the speed of response and the accuracy of managerial decisions.

The implementation of dynamic monitoring allows for the assessment of the effectiveness of the enterprise's credit policy, the identification of critical debtor segments, and the development of strategies aimed at minimizing the risk of non-payment. The analytical capabilities of the system enable the comparison of actual data with forecast indicators, analysis of trends over time, adjustment of cooperation terms with counterparties, and timely managerial decisions regarding debt restructuring or the application of penalty sanctions. As a result, the integrated use of improved primary accounting, modern automated systems, and dynamic monitoring creates a reliable foundation for accounts receivable management, reduces the likelihood of overdue payments, enhances the liquidity and solvency of the enterprise, and contributes to economic stability in a volatile market environment.

In order to improve the effectiveness of accounts receivable management, it is advisable to develop a comprehensive information and analytical support system that includes interrelated subsystems of accounting, analysis, control, and monitoring. Such a system should ensure the continuous flow of information from the moment a business transaction occurs to the point of managerial decision-making, as well as the integration of internal and external data sources.

Additional importance is gained by the implementation of modern digital technologies, in particular business intelligence systems, which enable in-depth analysis of large datasets, modeling of counterparty behavior, and forecasting the probability of overdue receivables. The use of such tools contributes to improving the accuracy of managerial decisions and reducing financial risks.

Of particular importance in this process is accounting and analytical support, which serves as the information basis for managerial decision-making. A well-organized accounting and analysis system makes it possible to reflect the status of settlements with debtors, assess trends in their changes, determine the level of credit risk, forecast cash inflows, and develop measures to improve the efficiency of working capital utilization. At the same time, current practices of accounting and analysis of accounts receivable are often characterized by fragmentation, an insufficient level of automation, and limited analytical tools, which reduces management quality and complicates the maintenance of enterprises' financial stability.

In this regard, the improvement of accounting and analytical support for accounts receivable management becomes particularly relevant both in theoretical and practical terms. It involves the integration of modern financial analysis methods, the application of

economic and mathematical modeling, the implementation of information technologies and business intelligence systems, as well as the development of internal control over settlements with counterparties. Such an approach contributes to increasing the reliability and timeliness of information required for well-grounded managerial decisions and also enables the timely identification and mitigation of potential financial threats.

Modern business conditions are characterized by an unstable market environment, inflationary processes, and declining payment discipline among counterparties. Irregular cash inflows, growing overdue receivables, and a slowdown in their turnover lead to a shortage of working capital, which in turn increases financial risks and may cause a deterioration in the overall financial condition of the enterprise. Under such conditions, traditional analytical methods are often insufficient; therefore, there is a need to apply modern quantitative approaches, in particular econometric modeling. This allows for retrospective analysis of financial indicators and forecasting their future dynamics, assessing the likelihood of crisis phenomena, and forming well-founded managerial decisions. The use of economic and mathematical models makes it possible to identify hidden relationships between financial indicators, determine the main factors influencing the enterprise's solvency, and assess the level of risk of accounts receivable non-repayment.

A special role in the risk assessment system is played by integrated indicators of bankruptcy probability, which consolidate the influence of several financial ratios into a single measure. This approach enables a comprehensive assessment of the enterprise's financial condition and the prompt identification of threatening trends. Integrated models take into account liquidity, profitability, financial stability, business activity, and capital structure indicators, providing a more complete picture of the enterprise's financial reliability.

Among the most widely used tools for assessing insolvency risk is the Altman Z-score model, which is based on multivariate discriminant analysis and allows for the determination of bankruptcy probability using a system of financial ratios. A similar approach is applied in the models of Lis, Taffler, and Springate, which are adapted to different economic conditions and industry-specific characteristics. Alongside classical models, modern methods such as logistic regression and neural networks are increasingly used, enabling the consideration of nonlinear relationships and improving the accuracy of forecasting under conditions of high uncertainty.

The key basis of most of the aforementioned models is discriminant analysis, the essence of which lies in the construction of an integrated function based on a weighted set of financial indicators. Each indicator is assigned a specific weight according to its significance in determining the enterprise's financial condition. The result of the calculation is an integrated indicator that allows enterprises to be classified according to their level of risk—from financially stable to potentially insolvent. This makes it possible to assess the current state and monitor the dynamics of risk over time.

It is important to emphasize that effective management of accounts receivable is not limited solely to risk assessment; it also involves the implementation of a system of

preventive and corrective measures. Such measures include setting credit limits for counterparties, monitoring payment deadlines, diversifying the customer base, applying penalty sanctions for overdue payments, as well as using risk transfer instruments such as insurance, factoring, or bank guarantees. The combination of analytical methods with practical management mechanisms makes it possible to minimize financial losses and ensure the stability of the enterprise's operations.

In addition to discriminant analysis models, modern enterprises apply econometric methods for forecasting accounts receivable and assessing the probability of financial instability. These include:

- regression models that allow identifying the relationship between receivables turnover indicators and financial stability;
- scenario modeling, which forecasts the consequences of changes in payment discipline and the structure of accounts receivable;
- default probability models that determine the risk of non-repayment by specific groups of debtors;
- artificial intelligence and machine learning methods that enable the analysis of large volumes of financial data and the early prediction of financial risks.

Econometric modeling of financial risks enables:

1. to identify key factors influencing accounts receivable – this is achieved using multifactor regression models with variables such as counterparties' solvency indicators, payment terms, macroeconomic factors, and internal policies, allowing the determination of the direction and strength of each factor's impact.
2. to assess potential losses and their probability – this is achieved through the application of logit and probit models, which enable the quantitative evaluation of default risk and the calculation of expected losses based on probability of default, exposure, and recovery rate.
3. to develop effective management strategies – this is achieved by applying econometric models that support the optimization of credit policy through differentiated terms for various categories of customers.
4. to implement preventive risk control – this is achieved through early warning systems that detect adverse trends, including deterioration in payment discipline and growth of overdue receivables.
5. to enhance financial stability – this is achieved through systematic risk analysis, which reduces problematic receivables, improves asset structure, and stabilizes cash flows.
6. to forecast accounts receivable dynamics – this is achieved using time series models (ARIMA, VAR), allowing forecasting with consideration of trends, seasonality, and cyclicality.
7. to evaluate managerial decisions – this is achieved through scenario and simulation modeling, enabling the analysis of potential outcomes prior to implementation.
8. to define critical thresholds – this is achieved via statistical analysis that establishes limit values of financial indicators, signaling increased risk when exceeded.

9. to improve decision-making quality – this is achieved by applying quantitative methods that minimize subjectivity and ensure scientific validity.

10. to support strategic planning – this is achieved through econometric modeling, which provides an analytical basis for long-term financial and risk management strategies.

Thus, the application of econometric models in the field of accounts receivable management provides a systematic and quantitative approach to assessing financial risks, enables the making of well-founded managerial decisions, and minimizes the likelihood of financial instability.

The establishment of any business is aimed at generating profit; however, achieving this goal requires the development of effective mechanisms and actions that ensure the implementation of the chosen business strategy. Such measures must guarantee not only financial stability but also market competitiveness, enabling a rapid response to changes in both external and internal conditions. One of the key aspects of maintaining financial stability is the management of accounts receivable, as it reflects the actual financial performance of the enterprise and affects liquidity, solvency, and the ability to meet financial obligations in a timely manner.

To achieve a high level of efficiency in accounts receivable management, it is advisable to apply a comprehensive, system-oriented approach based on a clearly structured sequence of actions and the integration of analytical, organizational, and control procedures. Such an approach involves the sequential implementation of data collection, processing, analysis, and interpretation, followed by managerial decision-making.

The next important stage in the accounts receivable management system is a comprehensive analysis of its structure and quality. This stage aims not only at the quantitative assessment of receivables but also at evaluating their efficiency, liquidity, and risk level, thereby enabling well-grounded managerial decision-making.

The analysis involves the calculation and interpretation of a system of key financial indicators. In particular, one of the core indicators is the accounts receivable turnover ratio, which reflects the speed of conversion into cash and characterizes the effectiveness of the enterprise's credit policy. It is complemented by the average collection period (days sales outstanding), which determines the average payment deferral period and allows assessing the extent to which actual payment terms correspond to contractual conditions.

It is also important to determine the share of accounts receivable in the total asset structure, as this makes it possible to assess the level of working capital immobilization and the impact of receivables on financial stability and liquidity. An excessive concentration of receivables in assets may indicate inefficient receivables management and increased financial risks. In addition, it is advisable to conduct horizontal and vertical analyses, which allow examining the dynamics of receivables over time and their structural changes. Horizontal analysis makes it possible to assess growth or decline rates, while vertical analysis determines the proportion of individual components within the total volume.

Additionally, the analysis may include an assessment of receivables concentration by individual counterparties, allowing the identification of dependence on a limited

number of customers and the associated risks. It is also advisable to conduct benchmarking against industry indicators and average market values in order to evaluate the enterprise's competitive position in receivables management.

At this stage, a comprehensive classification of accounts receivable is also carried out according to several key criteria. In particular, by economic nature, receivables are divided into trade (related to the sale of goods/services), non-trade (advance payments, employee advances, etc.), and other receivables. By maturity, they are grouped into current, doubtful, and bad debts, and are also analyzed by aging periods (up to 30 days, 30–90 days, over 90 days, etc.). This approach enables the application of aging analysis methods widely used in financial management.

Furthermore, segmentation of debtors is carried out by categories (key customers, regular partners, new counterparties, high-risk clients), volume of receivables, industry affiliation, and geographic location. This allows taking into account the specific characteristics of each group when shaping credit policy and selecting management instruments.

The systematization of accounts receivable according to these criteria enables in-depth analytical assessment of its structure and dynamics, identification of problem areas, evaluation of risk concentration, and determination of priority areas for managerial intervention. In particular, it creates the prerequisites for optimizing credit terms, establishing individual credit limits, strengthening control over specific debtor groups, and improving the overall effectiveness of the enterprise's financial management. The next important stage is the analysis of the structure and quality of accounts receivable. It involves the calculation and evaluation of key financial indicators, in particular the receivables turnover ratio, the average collection period, the share of receivables in the total asset structure, as well as the analysis of their aging structure. These indicators make it possible to assess the effectiveness of the settlement policy with counterparties, identify problematic segments, and evaluate trends in the dynamics of receivables. Special attention should be paid to the identification of overdue and doubtful receivables, which are the main source of financial risks.

An important component of management is the assessment of the solvency and reliability of debtors. This is carried out through the analysis of counterparties' financial statements, credit history, business reputation, and payment behavior in previous transactions. In modern practice, scoring models and rating assessments are also used, which allow for a quantitative determination of the level of risk associated with cooperation with each individual client. Based on the obtained results, the enterprise forms its credit policy, which includes the establishment of individual credit limits, determination of payment deferral periods, application of discounts for early payment, and use of guarantee instruments. The improvement of contractual frameworks, as well as the clear definition of settlement terms and parties' responsibilities, also plays an important role in risk minimization.

No less important is ensuring effective accounting and control of accounts receivable. Modern enterprises are actively implementing automated information systems that allow for the operational monitoring of settlement status, control of payment deadlines, and the generation of analytical reporting. Regular updating of registers, conducting reconciliations with counterparties, and monitoring accounts receivable make it possible to identify deviations in a timely manner and respond to them. An important component is also the organization of internal control, which ensures the reliability of accounting data and prevents the occurrence of errors or fraud.

In parallel with control, the management of the debt repayment process is carried out. The main instruments include automated payment reminders, negotiations with debtors, coordination of debt restructuring schedules, as well as the application of penalty sanctions in case of breach of contractual terms. In cases of prolonged overdue payments, the enterprise may resort to claim and litigation procedures or involve specialized organizations for debt collection. At the same time, it is important to maintain a balance between the strictness of measures and the preservation of business relationships with counterparties.

The next stage of comprehensive management is the forecasting of financial risks and the assessment of the impact of accounts receivable on the overall condition of the enterprise. For this purpose, econometric models, discriminant analysis methods, as well as integrated indicators, in particular the Altman Z-score model, are used. Such tools allow for the assessment of the probability of financial difficulties, the identification of early signs of crisis phenomena, and the timely adjustment of managerial decisions. The use of forecasting models increases the validity of financial policy and contributes to the formation of a long-term development strategy for the enterprise.

The evaluation of the effectiveness of the accounts receivable management algorithm is the final and at the same time one of the most important stages, as it allows determining whether the implemented measures have achieved the set objectives and whether they ensure an appropriate level of the enterprise's financial security. At this stage, a comprehensive analysis of the results of the entire receivables management system is carried out, taking into account both quantitative and qualitative indicators.

First of all, the dynamics of key financial indicators are assessed, in particular the accounts receivable turnover ratio, the average collection period, the share of overdue receivables, and the proportion of receivables in total assets. Improvement in these indicators indicates increased management efficiency, while their deterioration signals the need to revise individual elements of the algorithm. It is also important to analyze the structure of receivables by maturity, which allows for the assessment of the quality of the receivables portfolio and the level of financial risks.

In addition, an assessment is carried out of the level of losses from bad and doubtful debts, as well as the effectiveness of the measures applied for their collection. Comparing actual indicators with planned or benchmark values makes it possible to determine the

degree of achievement of set objectives and identify deviations. In this context, an important role is played by the analysis of the effectiveness of management instruments such as credit limits, discount systems, penalty sanctions, factoring, or risk insurance.

Equally important is the evaluation of the organizational component of the algorithm, in particular the efficiency of the departments responsible for accounting and controlling accounts receivable, the level of process automation, the timeliness of information processing, and the quality of internal control. This makes it possible to identify weak points in the management system and determine directions for its improvement. The developed accounts receivable management algorithm is presented in Fig. 3.2.3.

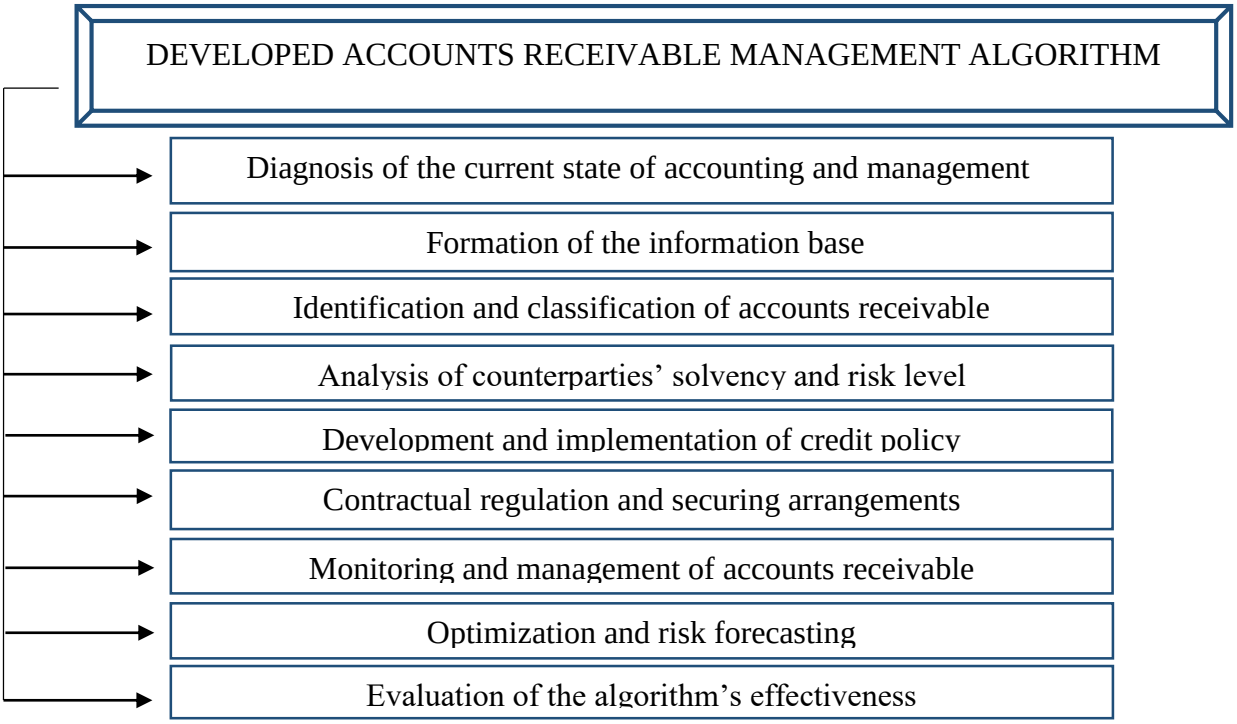


Fig. 3.2.3. Algorithm for managing accounts receivable

It is important to consider the impact of accounts receivable management on the enterprise's overall financial condition, including liquidity, solvency, financial stability, and cash flows. Improvements in these indicators confirm the effectiveness of the implemented algorithm. Econometric analysis helps assess how management decisions affect risk reduction and financial performance, as well as forecast future scenarios. The results enable conclusions about the algorithm's effectiveness and support recommendations for improvement, such as adjusting credit policy, refining debtor assessment, enhancing control procedures, and introducing new risk management tools.

3.3. ACCOUNTING AND ANALYTICAL SUPPORT FOR PAYROLL CALCULATIONS AT THE ENTERPRISE AND DIRECTIONS FOR ITS IMPROVEMENT

Olena Dubyna,
Senior Lecturer of the Department of Accounting, Taxation and Management of Financial and Economic Security,
Dnipro State Agrarian and Economic University, Dnipro, Ukraine

An effective remuneration system is a key factor in ensuring the competitiveness of the enterprise, increasing labor productivity and motivating staff. Wages make up a significant share of the company's costs, affect the final financial result and social stability of the team. In the conditions of an unstable economic environment, a shortage of labor resources and increasing requirements for the quality of accounting and analytical information, the improvement of the organization of accounting and analysis of payroll calculations is of particular importance. This makes it possible to ensure the timeliness of accruals, the legality of deductions, the correctness of calculations with employees and the budget, as well as to substantiate management decisions regarding the optimization of the wage fund.

The relevance of the topic of accounting and analytical support for payroll calculations in a state institution is due to modern transformational processes in the economy, increased requirements for the transparency of the use of budget funds and the need to ensure effective management of labor resources. Labor compensation is one of the key components of the socio-economic policy of the state, as it directly affects the standard of living of the population, the motivation of employees and the quality of the provision of public services. In the public sector, the issues of organization of accounting and analysis of payroll calculations are of particular importance, because financing is carried out at the expense of budget funds, which requires a high level of responsibility, control and justification of each economic transaction.

In the modern conditions of reforming the budget system, decentralization of power and digitalization of management processes, there is a growing need to improve accounting and analytical mechanisms that ensure timeliness, reliability and completeness of information on payroll calculations. An important aspect is the implementation of modern information technologies and automated accounting systems that allow optimizing the payroll process, reducing the risk of errors and increasing the efficiency of reporting. At the same time, despite the development of software, many government institutions still have problems related to the fragmentation of information flows, insufficient integration of accounting systems, and limited opportunities for analytical data processing. Particular attention should be paid to the issues of regulatory regulation of wage settlements in the public sector. Frequent changes in legislation, in particular in the field of wages, personal income taxation and social insurance, create additional difficulties for the organization of accounting. This requires a high level of professional training and constant updating of knowledge from accounting services. Non-compliance

of accounting procedures with current regulations can lead to financial violations, fines and loss of trust on the part of regulatory authorities.

In addition, the relevance of the topic is due to the need to strengthen the analytical component in the wage management system. Traditionally, accounting in public institutions performs mainly a registration function, while analytical capabilities are underutilized. At the same time, it is the analytical information that makes it possible to assess the effectiveness of the use of the wage fund, identify reserves for its optimization, analyze the cost structure, and substantiate management decisions regarding personnel incentives. In the conditions of limited budgetary resources, it is especially important to ensure the rational use of funds directed to the payment of labor, which is impossible without proper analytical support.

No less important is the aspect of internal control of payroll calculations. Having an effective control system helps prevent abuse, errors and misappropriation of funds. In public institutions, where there is a significant volume of personnel operations and a complex system of accruals (surcharges, additional payments, bonuses, social benefits), the risks of violations are quite high. Therefore, the improvement of accounting and analytical support should involve the integration of control procedures at all stages of the accounting process - from initial documentation to the preparation of financial and budget statements.

A significant factor of relevance is also the need to increase the transparency and accountability of state institutions to society. In modern conditions, the public pays considerable attention to the issues of effective use of budget funds, in particular, the wage fund. The openness of information, the possibility of its analytical interpretation and availability for control by the public are important elements of modern public administration. This, in turn, increases the requirements for the quality of accounting and analytical support.

In addition, the influence of external economic and social factors should be taken into account, in particular, inflationary processes, changes in the labor market, migration trends and personnel shortages in the public sector. These factors determine the need for a flexible approach to the formation of the labor remuneration system and its constant improvement. One of the key factors is the inflationary processes, which lead to the depreciation of workers' monetary incomes and reduce their purchasing power. In such conditions, there is a need for timely revision of wages, income indexation and implementation of compensation mechanisms, which, in turn, complicates the accounting process and requires strict compliance with regulatory requirements. The accounting system should ensure the accuracy of indexation calculations, the display of relevant accruals, and control over the correctness of their implementation, which increases the value of the analytical component in payroll management.

An important factor is also dynamic changes in the labor market, which are characterized by increasing competition for qualified personnel between the public and private sectors. As a rule, state institutions have limited opportunities for flexible regulation of the level of remuneration, which reduces their attractiveness for highly

qualified specialists. In such conditions, the role of non-material incentives increases, however, the accounting and analytical system should provide justification of the level of material incentives, analysis of the effectiveness of the use of the wage fund and search for internal reserves for its optimization. This requires the introduction of modern methods of analysis that allow assessing labor productivity, the ratio of costs and results of personnel activities, as well as the effectiveness of the application of various forms and systems of labor remuneration.

Migration processes, which have gained significant scale in recent years, have a significant impact on the organization of wage settlements. The outflow of the working population, especially young and qualified personnel, leads to a reduction in the labor potential of the public sector and makes it difficult to provide institutions with the necessary human resources. This necessitates a review of approaches to the formation of the wage fund, increasing its flexibility and adaptability to changes in personnel. The accounting and analytical system should promptly respond to such changes, providing a reliable reflection of personnel transfers, changes in the number of personnel and the corresponding financial consequences.

It should be noted separately the problem of personnel shortage in the public sector, which is increasing as a result of both economic and demographic factors. The insufficient number of qualified employees leads to an increase in the load on the existing staff, which can negatively affect the quality of the performance of official duties and the efficiency of the institution as a whole. In such conditions, the issue of rational distribution of the wage fund, introduction of incentive payments and ensuring fairness in remuneration of employees becomes especially urgent. This, in turn, requires a high level of detailing of accounting information and its deep analytical processing.

Accordingly, the accounting and analytical system should ensure not only the recording of actual data, but also the formation of predictive information that allows assessing the possible consequences of management decisions. Thus, the relevance of the topic of accounting and analytical support of payroll calculations in a state institution is determined by a combination of economic, organizational, regulatory and social factors. It is due to the need to increase the efficiency of budget funds management, ensure transparency and accountability of the activities of state institutions, as well as improve the employee motivation system. The development and implementation of modern approaches to the organization of accounting and analysis of payroll calculations will contribute to improving the quality of management decisions, strengthening financial discipline and ensuring the sustainable development of the public sector.

Salary is one of the key categories of economic relations, which determines the level of material well-being of employees and affects the results of the enterprise's economic activity. It acts as an economic, social and legal category at the same time, as it is related to the formation of the population's income, is regulated by the state and is the main means of reproduction of the labor force. It is the salary that provides employees with the opportunity to meet life needs, and the enterprise - to attract, retain and stimulate personnel to work effectively.

The economic essence of remuneration consists in establishing the correspondence between the quantity and quality of labor spent and the amount of remuneration that the employee receives from the employer. The Code of Labor Laws defines wages as: "... remuneration, calculated, as a rule, in monetary terms, which the owner or a body authorized by him pays to the employee for the work he has performed". According to G. I. Tybinka, G. V. Brik. and Kokhanoi T. M.: "salary is the main source of income of employees and the strongest motivator of the labor potential of the majority of the population." Sklyaruk I. and Polishchuk M. consider wages: "... one of the most important factors in increasing the efficiency of the enterprise due to the fact that the level of wages directly affects labor productivity and the quality of the work performed." E. Markevich defines wages as: "... as an economic category that reflects the relationship between an employer and an employee."

Wages are the main form of distribution of newly created value, contribute to the formation of the consumption fund and perform a number of important functions. Among them are:

1. Reproductive function - provides the employee with the opportunity to maintain the standard of living in accordance with the requirements of society and the labor market.

2. Stimulating function - manifested in the influence of wages on labor productivity, initiative and responsibility of personnel.

3. The regulatory function is the influence of the wage system on labor supply and demand.4. Social function - consists in ensuring social stability, reducing conflicts and maintaining a favorable microclimate in the team.

In market conditions, remuneration is considered as a tool for ensuring labor motivation. Motivation is defined as an internal psychological mechanism that prompts an employee to act with a certain intensity and direction to obtain the desired results. An effectively built wage system acts as a catalyst for increasing labor activity, contributes to the achievement of the company's goals and the formation of competitive advantages. At the same time, insufficient pay, delayed payments, unfair distribution of bonuses or lack of transparent evaluation criteria demotivate staff and can lead to staff turnover, reduced engagement and deterioration of production indicators.

An important component of the motivational influence of wages is its fairness, transparency and differentiation based on work results. Practice proves that the modern payment system must take into account the level of qualification of employees, the complexity and conditions of the work performed, personal responsibility, the intensity of work and the results achieved. If employees are sure that their work is evaluated objectively, the level of satisfaction and loyalty to the company increases. Instead, the violation of the principles of justice leads to conflicts, loss of trust, reduced productivity and deterioration of the organizational climate.

The role of remuneration as a motivational factor is especially strengthened in conditions of shortage of qualified personnel and increasing competition in the labor market. Enterprises seeking to attract professional staff and retain highly qualified

employees are forced to form competitive reward systems, supplementing them with social packages, health insurance, additional vacations, seniority bonuses, company transport, flexible schedules and other non-financial methods of stimulation. Thus, the modern system of motivation is a complex phenomenon in which wages play a central, but not the only, role.

Paying for labor also performs an important function in ensuring the financial stability of the enterprise. The wage fund accounts for a significant share of costs, especially at enterprises in labor-intensive industries. Correct planning, rationing and control of labor costs ensure the optimization of production costs, the formation of a competitive price and an increase in profitability. In turn, a low level of wages can cause low productivity, a decrease in the quality of work and services, an increase in the number of errors and accidents, which also negatively affects economic results.

So, the economic essence of labor remuneration lies in its ability to simultaneously perform material-reproductive and stimulating functions. Salary not only provides the employee's daily needs, but also motivates him to improve work efficiency, affects the quality of the tasks performed and the results of the enterprise. In the system of personnel motivation, it acts as the main lever for managing the behavior of employees, contributes to the formation of a positive attitude to work, strengthens labor discipline and increases interest in final results.

Labor payment at enterprises is carried out in various organizational forms, which reflect the way of establishing the dependence between labor results and the amount of remuneration. The choice of the form of payment depends on the industry specifics of the activity, the nature of the work performed, the level of automation and organization of production, the qualifications of the personnel and the company's strategy. Yu. L. Yakubenko and Cherepanov D. V. believe that: "Wage forms and systems ... are ways of depending on the amount of remuneration for labor on the quantity and quality of labor expended." In economic theory and business practice, types of remuneration are usually divided into:

1. Basic - includes remuneration for work performed in accordance with the established norms of time and production, tariff rates or official salaries.

2.Additional - includes additional payments, allowances, bonuses, compensatory and incentive payments accrued for special working conditions, overtime, high intensity or achievement of certain results.

In business practice, the main forms of wage organization are hourly and piecework. The hourly rate provides for payment depending on the actual time worked and the established tariff rate or salary. It is used when work results are difficult to quantify or relate to a collective result. Hourly pay is relevant for managerial, administrative, engineering, cooking, security and other types of work where the quality of performed functions is important. The advantage of this form is income stability, however, the stimulating effect may not be sufficient if it is not supplemented with bonuses and a performance evaluation system. The unitary form of remuneration is based on the

dependence between the employee's earnings and the amount of products produced or work performed. It is effective in conditions when the amount and result of work can be accurately measured and when the employee directly affects the result. Piece-rate payment stimulates an increase in output, rational use of working time, and an increase in labor productivity. It is widely used in production, construction, agriculture and other industries where the result is measured by natural indicators. At the same time, the piecework system can cause a deterioration in the quality of products, overloading of workers, and an increase in the risk of injury if control and rationing mechanisms are not applied.

In order to increase the stimulating role of remuneration, hourly and piecework forms are supplemented by bonus systems. The premium system provides for the accrual of additional payments for achieving certain indicators, exceeding the production plan, observing technological discipline, saving material resources or high quality products. A bonus is an important motivation tool if its size and calculation criteria are transparent, fair and justified. In modern enterprises, bonus systems based on the results of the units' activities, implementation of key performance indicators (KPI), individual and group bonuses are common.

Yu. V. Podmeshalska and A. M. Panchenko believe that: "Business entities choose traditional forms and systems of labor payment, but modern requirements require their revision, improvement, ease of use, taking into account international experience."

Among the innovative approaches to the formation of the remuneration system, a grading system is distinguished, which consists in the classification of positions according to the level of complexity, responsibility, competences and influence on the final result. When grading, pay is established not only on the basis of salary, but also in accordance with the market value of labor, competitive conditions and the value of the employee to the company. This approach makes it possible to objectively form wages, increase their transparency and ensure internal fairness.

In the conditions of a market economy, a combination of monetary and non-monetary motivation is important. Monetary methods include bonuses, allowances, profit sharing, paying dividends to employees, loyalty bonuses, and one-time rewards for innovative proposals. The non-monetary ones include social packages, corporate training, career development, flexible work schedules, improved working conditions, corporate culture and intangible recognition of merit. Such a comprehensive approach strengthens the effectiveness of the remuneration system, contributing to the attraction and retention of highly qualified employees.

Contractual payment systems are a separate category. The contract form provides for the conclusion of an individual contract between the employer and the employee defining the working conditions, the amount of remuneration, the mechanism of its change, as well as the rights and obligations of the parties. The contract system ensures the individualization of remuneration, taking into account the professional level, experience, previous achievements and potential of the employee. It is common for managers, leading specialists and highly skilled workers.

Recently, the introduction of individual wage setting, which includes the following components, has become widespread:

1. Regulation of the merit recognition procedure.

2. Taking into account the personal merits of employees, not their length of service, when determining personal allowances.

3. Rejection of indexation due to rising prices.

4. Unequal salary increase within the proposed increase of its general fund.

5. Determination of a certain amount of the minimum annual salary for each employee, taking into account all rewards.

Types, forms and systems of labor remuneration are a multi-component mechanism that combines traditional and modern elements. An effective remuneration system must be adapted to the specifics of the enterprise, take into account market conditions, ensure a balance between the interests of employees and the employer, and stimulate the improvement of productivity and quality of work. The rational use of payment forms and systems contributes to strengthening the motivational component of labor relations, improving financial results and increasing the competitiveness of the enterprise. The regulatory and legal regulation of wage settlements in Ukraine is based on a complex of legislative acts that determine the procedure for formation, accrual, payment of wages, guarantees to employees and employer's obligations. The main documents are the Constitution of Ukraine, the Code of Labor Laws, the Law of Ukraine "On Remuneration of Labor", the Law "On Collective Agreements and Agreements", the Tax Code, the Law "On Collection and Accounting of a Single Contribution to Mandatory State Social Insurance" and other by-laws. Each regulatory document regulates separate aspects of labor and settlement relations, creating a unified system of ensuring the rights of employees. I. Sklyaruk and M. Polishchuk say: "To date, the legislative and legal framework for regulating the payment of wages in accordance with international norms has been implemented at the state level."

The Constitution of Ukraine enshrines basic principles in the sphere of labor and social protection of the population. It stipulates that every citizen has the right to work, to timely remuneration for work and to proper working conditions. The state guarantees social protection, including the right to a wage not lower than the legally established minimum level. Thus, the constitutional provisions act as the foundation for the formation of the entire system of legal regulation of labor remuneration.

The Code of Labor Laws of Ukraine is the main act that regulates labor relations between an employee and an employer. It determines the procedure for concluding an employment contract, working conditions, the rights and obligations of the parties, the regime of working hours and rest. Separate articles of the Code are devoted to wages, guarantee and compensation payments, liability for delayed wages. The Code establishes general rules on the basis of which other normative documents are developed.

The Law of Ukraine "On Wages" regulates the economic and legal principles of wage formation. The document defines the salary structure, the principles of setting tariff rates,

salaries, supplements and allowances. The law also establishes guarantees regarding the minimum salary, payment terms and conditions for indexation of employees' incomes. It is important that the law gives employees the right to protect their interests in case of violation of labor rights, including going to court.

The Law of Ukraine "On Collective Agreements and Agreements" regulates the mechanism of concluding, implementing and monitoring the implementation of collective agreements at enterprises. The document specifies that the collective agreement may contain provisions on wage systems, bonuses, social guarantees and additional benefits for employees. The law provides for the possibility of agreeing the terms of remuneration at the enterprise level, taking into account the economic capabilities of the employer. The collective agreement acts as a tool for regulating labor relations and increasing staff motivation. The Tax Code of Ukraine regulates the procedure for taxation of employees' incomes and the obligations of employers in terms of calculation and payment of taxes on wages. It defines the rules for calculating personal income tax, military duty, benefits and the mechanism of tax deductions. An important aspect is ensuring control over the correctness of calculations and the timely payment of taxes to the budget. Compliance with the norms of the Tax Code affects both the financial discipline of the enterprise and the social security of employees.

The Law of Ukraine "On the Collection and Accounting of a Single Contribution to Mandatory State Social Insurance" defines the procedure for accrual and payment of a single social contribution from the income of employees. The EUV is an important component of social guarantees, as it ensures the right of employees to pension, insurance and social security. The law establishes the contribution rate, the reporting procedure and the employer's responsibility for its late payment. Correct administration of the Social Insurance Institution is a necessary condition for the financial stability of the social insurance system.

Sub-legal normative acts, in particular the resolution of the Cabinet of Ministers, the orders of the Ministry of Finance, the State Tax Service and clarifications of the controlling authorities, detail the practical issues of calculating wages. They regulate the rules of accounting, settlement documents, periodicity of payments, peculiarities of income indexation. Such documents ensure uniform application of legislation in practice and allow adaptation of norms to changes in the economic environment. The regulatory and legal regulation of labor payment calculations in Ukraine is a multifaceted system that encompasses national principles, labor guarantees and tax requirements. It is aimed at ensuring the rights of employees, stability of social relations and financial discipline of employers. A comprehensive approach to legal regulation allows for the creation of a transparent settlement system and promotes trust between employers and employees.

The organization of accounting of accruals and deductions from wages is an important component of the personnel and financial resources management system, as it determines the order of formation of labor costs, settlements with employees and the budget, ensures compliance with legislation and social guarantees. Wages are calculated

on the basis of primary documents that provide confirmation of the actual time worked and the basis for calculations.

In the process of accounting, a comprehensive approach is used, which includes the determination of the composition and structure of wages, the formation of the wage fund, the application of normative acts and internal regulations regarding incentive and compensation payments. The primary stage is the calculation of the basic salary according to the tariff rates and official salaries, which can be supplemented with additional payments for the intensity of work, combining positions, classroom management, night work, bonuses and other incentive payments. A special place is occupied by the accrual of sick leave, vacation and other payments for time not worked, which are carried out in accordance with the legislation and are subject to detailed documentation.

Salary deductions are carried out in accordance with the requirements of the Tax Code and legislation on mandatory state social insurance. The main types of deductions are personal income tax (18%) and military levy (5%). In addition to mandatory state deductions, voluntary deductions can be made - trade union dues, alimony, payment for food, compensation for material damage, etc. Each deduction has documentary evidence and is reflected in the accounting registers.

The organization of accounting of accruals and deductions from wages is aimed at ensuring reliable reflection of labor and financial transactions, compliance with legislation and timely settlement with employees and the budget. An effective accounting system contributes to the timeliness of calculations, reducing the risk of errors and abuses, and also creates prerequisites for the rational use of the payroll fund at the enterprise.

According to the plan of accounting accounts for budgetary institutions, the accounting of accruals and payments of wages in the state institution is conducted both at the synthetic and at the analytical level. Synthetic accounting is carried out on accounts 652 "Calculations for the payment of labor of state special funds", 632 "Calculations for taxes and fees of state special funds", 2322 "Accounts for accounting of funds of state special funds in the Treasury".

Analytical accounting allows you to detail the data of synthetic accounts by individual employees, departments, types of payments and periods. Automated accounting uses software that provides salary calculation for actual worked days and hours, calculation of allowances, bonuses, vacation and sick leave, as well as generation of payslips and payment information. Analytical accounting registers include: "Journal of salary calculations", which displays all employee calculations for the month; "Salary payment statement", which is used for the actual payment of funds; "Register of deductions", which contains data on taxes, contributions and other mandatory deductions. The data of the analytical registers are automatically reconciled with the synthetic accounting on the relevant accounting accounts, which ensures full reliability of the accounting and control over the correctness of accruals and payments.

The formation of a synthetic accounting register in the form of a memorial order on account 652 "Calculations for payment of labor" in a state institution is carried out on the

basis of primary documents that confirm the calculation and payment of wages. Information from these documents is entered into the register with details by employees, departments and types of payments, which allows you to control the correctness of accruals and deductions. The memorial order is built by month and includes the initial balance, turnover by debit and credit, as well as the final balance, which reflects the state of debt or the amount of funds paid. Each posting is coded according to the type of accrual or withholding, for example, basic salary, bonuses, vacation or sick pay, and is analytically detailed by specific employee and department.

When creating a memorial order, the date of the operation, the number and type of the primary document, debit and credit amounts, and analytical indicators are recorded. After entering the data, the correctness of the amounts and compliance with the documents and estimated assignments in the Merezh-M system is checked using built-in means of reconciliation. After verification, the register is signed by the responsible person and used for the formation of accounting and treasury reports, internal control of the payroll fund and ensuring timely and reliable settlements with employees. This procedure for forming a synthetic register guarantees correct accounting, transparency of accruals and payments, and compliance with budgetary discipline.

Thus, in the state institution, payroll accounting is organized comprehensively: synthetic accounts provide general information about the wage fund, analytical registers allow detailing data by specific employees and types of payments, and the automated form of accounting ensures the accuracy of calculations, quick creation of documents and control over the timeliness of payments.

Improvement of the payroll system at the Alexandria Vocational Lyceum is an important prerequisite for improving the efficiency of human resource management and the rational use of budget funds. The functioning of the accounting service and the use of modern information systems create favorable conditions for ensuring transparency, accuracy and timeliness of salary calculations. At the same time, the organization of document flow, control of the completeness of primary data, and optimization of accounting procedures require constant improvement.

The use of Merezha-M, M.E.Doc and E-Data programs significantly improves the quality of accounting processes, but further integration of accounting modules, introduction of electronic time sheets and expansion of the analytical capabilities of the system can significantly improve the accuracy, efficiency and control of payroll calculations.

Further integration of accounting modules means the in-depth combination of all software components used in a public institution into a single interconnected system. This involves the automatic exchange of data between various subsystems — personnel accounting, timesheets, payroll, asset accounting, treasury operations, and reporting.

In practice, the integration of accounting modules includes the following elements:

1. Reconciliation of data with the "Cash Funds" module, which allows you to immediately generate payment instructions to the treasury service without duplicating information.

2. Automatic transfer of generated calculation data to the M.E.Doc system for submission of EUV, personal income tax, income indication, etc.

3. Transfer of financial information to E-Data in a mode that is as close to automatic as possible.

4. Automatic transfer of data from the personnel system to the payroll module (appointment, salary change, vacation, sick leave, combination, tariffs).

5. Synchronization of time sheets with the billing module without additional manual input.

6. Reducing the number of manual operations, which minimizes the risk of errors, accelerates reporting and improves the quality of control. Further integration of modules allows to create a single information ecosystem, in which all accounting data is updated simultaneously and synchronously, ensuring greater accuracy, efficiency and transparency of accounting for labor payments.

The introduction of electronic time sheets is one of the key areas of modernization of the payroll system in the state institution. The transition from paper timesheets to a digital format ensures the automation of the processes of fixing working hours, reduces the probability of errors and increases the efficiency of data processing. The M Network automated system does not have a built-in module for employee timesheets. For a budgetary institution, an important condition for such implementation is low cost. It is advisable to use the Kimai module, which is the most interesting candidate: with open source, the possibility of deployment on your own server, support for many users and records, and potential Ukrainian localization.

The implementation of electronic time sheets involves the following stages:

1. Selection of software.

2. Establishing internal procedures:

- Formation of working instructions for employees regarding the use of electronic timesheets.

- Identification of persons responsible for data approval and correction.

- Set deadlines for entering and approving data (for example, by the 25th of the month for transfer to the accounting department).

3. Integration with the accounting system:

- Set up automatic transfer of data from electronic timesheets to Network-M for calculating wages.

- Check the correspondence of codes, tariffs, rates and allowances between the timesheet and the accounting system.

- Establish regular test checks for accuracy before salary calculation.

Therefore, the improvement of accounting and analytical support for payroll calculations is a complex process that includes increasing automation, improving control,

modernizing internal procedures and developing professional competencies of personnel. Implementation of these areas will contribute to increasing the efficiency of financial resources management, strengthening labor discipline and ensuring stable and transparent work of the state institution.

Analytical provision of payroll calculations is an integral part of the enterprise's financial and labor resources management system, in particular in public educational institutions, where compliance with legislative norms and budgetary discipline is a priority task. Analytical support means a set of methods, procedures, registers and forms of documentation that allow detailed display, control and analysis of all transactions related to the calculation, payment and withholding of wages, and also ensure the reconciliation of this data with synthetic accounting. The main goal of analytical support is to obtain accurate, timely and reliable data on the payroll, which allows effective planning, control and management of resources. It is advisable to single out the following as the main tasks of analytical support:

1. Control over compliance with staff discipline and rational use of working time.

2. The correctness of the calculation of all salary components (basic salary, additional salary, bonuses, additional payments, allowances).

3. Timely and complete settlement with personnel and relevant funds (PIT, military levy, EUV).

4. Optimization of labor costs while ensuring sufficient employee motivation.

5. Analysis of the effectiveness of the existing wage systems and their impact on productivity.

An important function of analytical support is control of the correctness of accruals and deductions. Thanks to detailed registers, the accounting department can quickly detect errors in primary documents, incorrect entries in time sheets, or violations in the calculation of bonuses and allowances. Analytical data make it possible to check the compliance of the actually accrued salary with the staff list, management orders, the norms of the Unified tariff grid and industry standards, which is mandatory in public educational institutions. In addition, they ensure the control over the timeliness of the transfer of taxes and mandatory contributions to state funds, such as personal income tax, EUV and military levy.

Analytical support is also an important tool for management decisions. On its basis, it is possible to evaluate the effectiveness of the use of the wage fund, determine the ratio of expenses for basic and additional wages, analyze the structure of bonuses and allowances, and also forecast the need for financing in the following periods. Such data allow the management of the institution to plan the optimal use of personnel, determine priorities in the calculation of incentive payments and ensure the rational distribution of budget funds.

Analytical support also includes documenting and accounting for fringe benefits such as work intensity allowances, weekend and holiday work, classroom management hours, notebook checks, prestige allowances and bonuses. It is important that each such payment

has its own documentary confirmation, which ensures the possibility of their display in the relevant analytical registers. This allows not only to control the legality of charges, but also to plan budgetary expenses for the labor fund with high accuracy.

On the basis of analytical data, the accounting department can compare actual payments with planned indicators, identify overspending or underpayments, check the correctness of accruals and deductions for each employee and department. This allows prompt detection of violations and prevention of abuse, which is extremely important in public educational institutions, where control over the use of budget funds is of critical importance.

The key stages of the analytical process of payroll calculations include:

1. Collection of primary information - use of primary documents, such as time sheets, hiring/dismissal orders, sick leave, payroll information.

2. Processing and systematization of data - entering information into the accounting systems on account 6526 "Calculations for the payment of labor of state trust funds".

3. Analysis - the application of various methods of analysis (economic, statistical) to assess the dynamics of the wage fund, the average wage, the ratio between labor productivity and its payment.

4. Formation of reporting - preparation of internal management and external financial, tax and statistical reporting.

5. Making management decisions - using the results of the analysis to adjust pay systems, introduce new motivational programs (for example, a grade system) or optimize personnel policy. Thus, the analytical provision of payroll calculations is a complex process that includes the collection, processing and summarization of data from primary documents, their breakdown by employees, departments and types of payments, control of the correctness of accruals and deductions, as well as the use of this data for management decisions and planning of the payroll fund.

The wage fund is one of the key indicators of the financial and economic activity of any institution, because it is through its formation and use that the main function is ensured - the provision of educational services and the support of personnel potential. The analysis of the wage fund allows to assess the adequacy of allocated budget funds, identify trends in changes in the level of wages, determine the impact of the number of personnel on general expenses, as well as establish reserves for the economical and efficient use of financial resources.

To carry out the analysis, it is first of all important to study the formation of the wage fund by sources of financing. The main component is budget allocations directed to the salaries of teaching and non-teaching staff, but in the investigated company, the state budget does not finance labor costs. The main source of salary payment is funding from the local budget. budget expenditure planning, because an increase in wage expenditure leads to a proportional increase in social charges. In the future, it is expedient for the institution to ensure control over the efficiency of the use of the fund, optimization of staffing, expansion of incentive payments in accordance with work results.

The study of the movement of the wage fund also includes an assessment of the timeliness and completeness of payments to employees. For a state institution, timely financing of salaries is a priority task, and any delays can negatively affect labor discipline and the motivational climate in the team. In DZ, wages are paid in accordance with the approved schedule, which ensures the stability of financial calculations. During the investigated period, there were no delays in the payment of wages.

Analysis of the use of the labor fund is important not only for assessing the current state, but also for planning future costs. Correct forecasting makes it possible to avoid a shortage of funds, to ensure the fulfillment of calendar payments and to guarantee the social protection of employees. Optimization of the fund can be carried out through rational management of staff numbers, implementation of effective forms of incentives, increase in labor productivity and optimization of costs for accompanying social benefits.

In conclusion, it should be noted that the formation and movement of the wage fund of the state institution are characterized by stability, and the dynamics of its increase reflect the general trends of the growth of social guarantees and the increase of the role of personnel potential in ensuring the educational process. At the same time, the analysis points to the need for constant control over the effectiveness of the use of the fund, prompt response to changes in the regulatory framework, optimization of the organizational structure, and improvement of incentive mechanisms. The conclusions of the analysis are the basis for making management decisions aimed at ensuring financial sustainability and improving the quality of educational services at the institution.

In the conditions of the operation of a budgetary institution, control over labor wages is of particular importance, since the formation of the wage fund is carried out within the limits of approved estimates, and each deviation from the budget can cause financial violations. The lyceum has created a control system that covers all stages - from collecting report card information to making payments and submitting reports.

The state of control over payroll calculations in a budget institution is characterized by a combination of organizational, documentary and analytical procedures aimed at ensuring the legality and timeliness of accruals and payments:

1. Organizational procedures - distribution of responsibilities and powers between the accounting department, the personnel department, and heads of structural units.

2. Documentary procedures - control of the correctness of the preparation of documents.

3. Analytical procedures:

- Comparison of actual costs with the estimate;
- Control over the timeliness of payments;
- Verification of norms of labor legislation.

Organizational control is ensured through the separation of powers between the accounting department, the personnel department and the heads of structural divisions. Responsible persons keep track of actual time worked, check the compliance of report cards, orders and other primary documents. The hiring, transfer or dismissal of employees

is formalized by appropriate orders, which are registered in the established order and transferred to the accounting department for inclusion in calculations. The staff list is approved by the head and meets the requirements of current legislation and financial support of the lyceum. Documentary control is carried out at the stage of initial registration and in the process of accounting procedures. All accruals are made on the basis of timesheets, leaves of incapacity for work, protocols for establishing surcharges and allowances, decisions on bonuses, approved by the manager. The accounting service checks the correctness of filling out documents, matching surnames, identification codes, tariff rates and salaries. Special attention is paid to the timeliness of the submission of documents, as this affects the correctness of salary calculations and calculations with the budget.

Financial and accounting control consists in checking the compliance of the wage fund with the approved budget allocations. Before calculating wages, the accounting department compares the actual costs with the estimate data, controls the calculation of deductions and charges, including taxes, the single social contribution and other mandatory payments. Control is carried out using an automated accounting system that minimizes the risks of arithmetic errors and ensures the accuracy of information processing. The software allows you to generate billing statements, payment documents, payslips and reports for specific periods.

An important element is control over the timeliness of salary payments. At the lyceum, payment is made twice a month, within the established terms, which meets the requirements of the law. No violations of payment terms were detected, there are no salary arrears. This testifies to the proper organization of cash flows, planning and allocation of budget funds. Together with the payment, employees have the opportunity to receive payslips, which ensures transparency of information and helps to minimize conflict situations.

A separate direction of control is the verification of compliance with the norms of labor legislation and the terms of the collective agreement. The compliance of charges with the minimum state guarantees is regularly analyzed, the indexation of incomes, the payment of sick leave, seniority allowances, and extra payments for work in harmful conditions are monitored. All operations are subject to internal and external control: by the manager, Treasury authorities and supervisory authorities. According to the results of inspections, no significant violations were found, which indicates the effectiveness of the implemented procedures.

Thus, the state of control over payroll calculations in the state institution can be assessed as stable and effective. The system is built on a clear regulation of duties, the availability of reliable primary documentation, the use of automated accounting tools and regular analysis of the indicators of the wage fund. This ensures timeliness and completeness of payments to employees, compliance with legal requirements, correct reporting and financial discipline in the institution. The development of a system of analytical reports in the field of payroll calculations is an important condition for

improving the efficiency of financial resource management. In a state institution, such a system should ensure the regular receipt of qualitative, structured and comparative information on the movement of the wage fund, its components and influencing factors. It should be based on the automated formation of indicators and the wide use of analysis tools that provide the opportunity to identify trends, risks and savings reserves. The main elements of the system of analytical reports proposed for implementation in a state institution can be presented as follows:

- Monthly analysis of the labor fund;
- Detection of deviations and their causes;
- Analysis of individual types of payments: indexation, sick leave, allowances and premiums;
- Comparison of actual labor costs with estimated assignments.

The first element of the system is the monthly analysis of the payroll fund. It provides for the collection and summarization of data on the actual accruals to employees for the reporting month with distribution by personnel categories, divisions, types of payments. In the structure of the fund, a permanent part (salaries, rates) and a variable part (surcharges, bonuses, additional payments, sick pay) are allocated. The analysis provides an opportunity to compare the actual amount of expenses with previous periods, determine the reasons for the increase or decrease in charges, and estimate the share of individual components in the general fund. If systematic deviations are detected, the management can make a decision to optimize the number of employees, change incentive allowances or revise the bonus system. The second task of analytical reports is the comparison of actual labor costs with estimated assignments. Since the lyceum operates under conditions of budget financing, adherence to the budget is of fundamental importance both to ensure financial discipline and to avoid risks of overspending. A comparison of the amounts provided for in the estimate with the actual accruals is formed every month. If the indicators are exceeded, the reasons are revealed: an increase in the number of rates, payment of bonuses, seniority allowances, wage indexation, sick leave or vacation. This makes it possible to adjust financial plans in advance to avoid debt or fund deficit.

An important component of the reporting system is the analysis of individual types of payments: indexation, sick leave, allowances and bonuses. Such an analysis makes it possible to assess in which directions the largest expenses are formed and to determine the factors of their change. The analysis of indexation shows how inflationary processes affect the wage fund and the institution's budget. Sick leaves are analyzed separately, as their growth may signal an increase in morbidity, low quality of working conditions, or irrational use of sick leaves. The analysis of allowances and bonuses allows to assess the effectiveness of motivational measures, their impact on work performance and identify opportunities for optimization.

A separate direction of the reporting system is the identification of deviations and their causes. The research is carried out both in absolute terms and in terms of relative indicators, which allows taking into account seasonal fluctuations or changes in the

number of employees. Sources of deviations can be a change in the workload of teaching staff, the introduction of new positions, additional allowances, replacements, insurance cases. Reports should contain not only a statement of deviations, but also explanatory notes, which justify the reasons, provide suggestions for their elimination or optimization.

The results of analytical reports are an important management and decision-making tool. They are used by the manager to plan the need for budget funds, justify applications for additional funding, prepare materials for the founder and regulatory bodies. In addition, the results of the analysis can be the basis for revising bonus provisions, modernizing the motivation system, and developing programs to improve labor productivity. Regular informing of the management about the dynamics of expenses contributes to the transparency of the use of funds and increases responsibility for the decisions made.

In order to improve the analytical support, it is also advisable to model the impact of changes in the number of personnel, tariff rates and bonuses on the general wage fund. It is based on a simple mathematical model, where the wage fund is calculated as the product of the number of employees by the sum of the tariff rate and bonus, taking into account social charges. With the help of simulations, there is the possibility of creating five scenarios: base, with reduced numbers, with reduced premiums, combined (reduced numbers and premiums) and with increased tariff rate for incentives. Calculations show how each change affects the total cost of labor, which allows management to plan the optimal fund and make informed management decisions about motivating staff and rational use of budget funds.

Thus, the implementation of a system of analytical reports on payroll calculations will provide a comprehensive and timely vision of the state of use of the salary fund, will allow identifying risks and reserves, increase the efficiency of resource management, and create a reliable information base for strategic and operational planning of the lyceum. Therefore, wages are an important economic category that forms the material basis of employees' livelihoods and determines the level of efficiency of the enterprise. The study of its economic essence made it possible to find out that the salary performs both a reproductive and a stimulating function, contributing to increasing labor productivity, improving the quality of work performed and creating a motivational environment. It ensures the satisfaction of the basic needs of employees, affects their work activity, discipline, professional development and loyalty to the employer. In today's conditions of competition on the labor market, remuneration is a key tool for motivating staff, and its fairness and transparency are fundamental factors in maintaining social stability in the team.

The use of hourly and piece-rate payment, supplemented by bonuses, allows you to ensure a combination of income stability and productivity stimulation. Innovative approaches, in particular grading and individualization of wages, strengthen the motivational potential of the system and contribute to increasing internal fairness. Modern reward mechanisms based on KPIs, profit sharing, bonuses and social packages make it

possible to more fully reveal the labor potential of employees. A rational combination of monetary and non-monetary methods of stimulation forms a complex reward system that contributes to strengthening labor discipline, increasing productivity and forming a positive social and psychological climate in the team.

Documentation and primary accounting of payroll calculations in a state institution ensures reliable reflection of labor and financial transactions, timeliness of personnel and financial documents, control over the use of budget funds and compliance with labor legislation, which contributes to the efficiency of personnel management and transparency of calculations. The organization of the accounting records of accruals and deductions from wages makes it possible to systematically and comprehensively take into account all types of accruals, surcharges, bonuses, sick and vacation pay, as well as mandatory and voluntary deductions, which ensures the timely formation of settlements with employees and the budget, compliance with legislation and the minimization of the risks of errors and violations. Synthetic and analytical accounting of salary accruals and payments provides full detailing of information by employees, departments and types of payments, which allows you to keep accurate and controlled accounting of the labor fund, form settlement and regulated documents, as well as carry out effective internal control and planning of labor costs within the limits of budget funding. In general, the complex combination of primary accounting, accounting display and synthetic-analytical control in the automated system of Network-M ensures transparency, accuracy and efficiency of management of settlements with personnel, guarantees timely payments and proper use of state educational institution funds.

To ensure automatic data exchange between personnel accounting, timesheets, payroll and asset accounting, it is advisable to integrate accounting modules, which will allow combining all software components of the lyceum into a single system. This helps to reduce the duplication of information, increases the accuracy and relevance of data. As a result, the efficiency of reporting will increase and the risk of errors in calculations will decrease. Such integration increases the transparency of financial processes and facilitates control over the use of budget funds. The introduction of a single digital environment will also create conditions for further expansion of the analytical capabilities of the system.

In order to reduce the probability of errors and wasted time, it is advisable to switch from paper timesheets to electronic ones, which will allow automating the recording of working hours. At the same time, the efficiency of data processing will increase, and the formation of salary calculations will become more accurate and fast. The use of digital timesheets will increase labor discipline and ensure control over actual time worked. The Kimai software solution, as a free and flexible platform, allows you to adapt the system to the specifics of a public educational institution. As a result of the introduction of electronic time sheets, the transparency and efficiency of personnel and financial accounting improves.

Analytical provision of payroll calculations is a key tool for managing financial and labor resources at the Alexandria Vocational Lyceum. It allows you to display all accruals,

withholdings and payments in detail, control the compliance of data with synthetic accounting and legislation. Thanks to analytical registers, the accounting department can detect errors in a timely manner and ensure the correctness of calculations, which guarantees the legality and accuracy of calculations. Analytical data is also the basis for management decisions, payroll planning and evaluation of resource efficiency. The implementation of analytical support contributes to increasing financial discipline and transparency in the use of budget funds.

Organizational, documentary, and financial and accounting procedures ensure the timeliness and reliability of calculations, compliance with legal regulations and estimated assignments. The use of automated accounting systems allows you to minimize errors and quickly control all types of payments, including additional payments, allowances and bonuses. Monitoring compliance with labor legislation and the terms of the collective agreement guarantees the protection of employees' rights and financial discipline. The effectiveness of the control system creates the basis for reliable management of the payroll fund and ensures the stability of the institution's work.

In order to obtain regular, structured and comparative information about the movement of the wage fund, its components and influencing factors, we suggest implementing a system of analytical reports at the enterprise. This enables the management to detect deviations in a timely manner, evaluate the effectiveness of the use of funds and plan the optimal number of personnel. The system increases the transparency of financial transactions and contributes to informed management decision-making.

To ensure the standardization of collection and processing of information that will allow for a detailed analysis of the components of the wage fund, to compare actual costs with estimated assignments and to evaluate the effectiveness of incentive payments, it is advisable to use the unified form of the analytical report on wage calculations developed by us. Such a form will ensure operational control, will allow identifying the causes of deviations and develop proposals for cost optimization, improving the quality of financial resources management.

For the purpose of forecasting the financial consequences of various scenarios and evaluating the effect of management decisions, it is advisable to apply modeling of the impact of the number of personnel, tariff rates and bonuses on the general wage fund. The use of modeling will allow optimizing the bonus system, tariff rates and the number of personnel, increasing the efficiency of the use of funds. Modeling results create a reliable information base for strategic planning and making informed management decisions in a state institution.

Therefore, the accounting and analytical provision of payroll calculations is an important component of the effective management of budgetary resources and labor potential, which acquires special relevance in conditions of economic instability, inflationary processes and personnel challenges. Its improvement contributes to increasing the reliability of accounting information, the transparency of financial transactions, and the validity of management decisions.

3.4. INFORMATION AND ANALYTICAL SUPPORT OF COST MANAGEMENT IN THE MANAGEMENT SYSTEM OF BUSINESS ENTITIES

Tetiana Savanchuk,
Ph.D. in Economics, Associate Professor,
Associate Professor of the Department of Accounting, Taxation and Management of Financial and Economic Security,
Dnipro State Agrarian and Economic University, Dnipro, Ukraine

The activities of any business entity are associated with a certain set of business processes that ensure its functioning. Among these processes, a central role is played by the enterprise management process, which serves as an important prerequisite for carrying out its current activities and ensuring the stability of its functioning in the future.

The modern realities of doing business in Ukraine necessitate high-quality management of all activities of a business entity. Such management, in turn, includes the management of specific factors that affect the stability of operation and the development of the entity. Among these factors, one of the key positions is occupied by the enterprise's costs.

Ensuring effective cost management at present is not possible without the reliable representation of cost data in the enterprise's accounting system, which will ensure their proper understanding by both external and internal users.

For a comprehensive understanding of the impact of costs on the functioning of an enterprise, it is necessary, in our opinion, to analyze scholarly approaches to defining the essence of the concept of "costs," which will make it possible to outline ways to improve the information and analytical support for cost management within the management system of business entities.

It should be noted that the category of costs is one of the most important in the management system; therefore, considerable attention is paid to revealing the essence of this category by both scholars and practitioners. Let us consider the interpretation of this concept by leading scholars working in the fields of economic theory, management, and accounting:

F. F. Butynets asserts: "costs are a decrease in assets (cash) or an increase in the liabilities of an enterprise related to a specific reporting period" (Butynets, 2012);

M. O. Humeniuk notes: "costs are the current expenditures of labor, material, financial, and other types of resources expressed in monetary form for the production of goods" (Humeniuk, 2015).

V. Derii emphasizes: "Costs should be defined as fully or partially consumed inventories, non-current assets, labor and intellectual resources used in the course of the enterprise's economic and financial activities, as well as reductions (repayment) of the enterprise's liabilities to the budget, creditors, and other legal and natural persons" (Derii and Melnychuk, 2019);

S. I. Drobiazko writes the following about costs: "Enterprise costs are formed in the process of resource utilization in the course of carrying out specific activities. They are

purpose-oriented. Costs of an enterprise are defined as the sum of a decrease in the value of assets or a decrease in equity (loss)" (Drobiazko, 2014);

V. H. Kozak notes: "Enterprise costs are one of the important categories of managerial accounting and a qualitative assessment of enterprise performance. For management purposes, managers require not merely costs, but information about costs for something (a product or its batch, services, etc.)" (Kozak, 2009);

L. H. Melnyk defines costs in her work as follows: "Costs are direct and indirect, actual and opportunity expenditures or foregone benefits required to attract and obtain resources within a given activity direction" (Melnyk and Korintseva, 2004);

Yu. S. Tsal-Tsalko writes: "Costs are the sum of household payments for goods and services received in the reporting period, the amount of funds directed by them toward the purchase of shares, certificates, currency, real estate, construction, assistance to relatives and acquaintances, deposits in banking institutions, taxes (except income tax), and other contributions" (Tsal-Tsalko, 2002);

L. H. Tsymbaliuk emphasizes: "Costs are an economic category that reflects the value of material, labor, informational resources, and technological maintenance of the production process in the creation of goods" (Tsymbaliuk and Skryhun, 2011);

In addition, other scholars note that costs should be understood as the monetary valuation of resources used by an enterprise in the course of its economic activity; costs represent the total consumption of production factors (resources) used in producing goods, works, and services; they also refer to the use only of those resources that, when determining the profit of a business entity for a specific period, are matched with revenues; and they constitute the total expenditures expressed in monetary form incurred by an enterprise in connection with the production of goods, provision of services, performance of works, and their sale. Sometimes costs are interpreted as an outflow or other use of assets and/or the incurrence of liabilities as a result of the shipment or production of goods, provision of services, or other operations that form the basis of the entity's activity. They represent a decrease in assets or an increase in liabilities, or a combination of both, in connection with the production and supply of goods within the framework of the enterprise's activities.

The information presented in our study regarding the definitions of the concept of "costs" is not exhaustive. The academic literature also contains other approaches to expressing the essence of the concept of costs.

Thus, despite the fact that the concept of "costs" appeared in academic literature quite a long time ago, there is still no unified approach to its interpretation. Each researcher or group of researchers has their own view on defining the essence of costs. However, not only economic and accounting literature contains different interpretations of the concept of "costs." The definition of the essence of costs also varies to some extent in regulatory acts, which necessitates paying particular attention to this concept when building the management system of a business entity, as different categories of users of cost information may interpret their essence somewhat differently.

The interpretation of the concept of "costs" according to national and international

accounting standards, as well as in accordance with the tax legislation of Ukraine, is presented for clarity in Fig. 3.4.1.

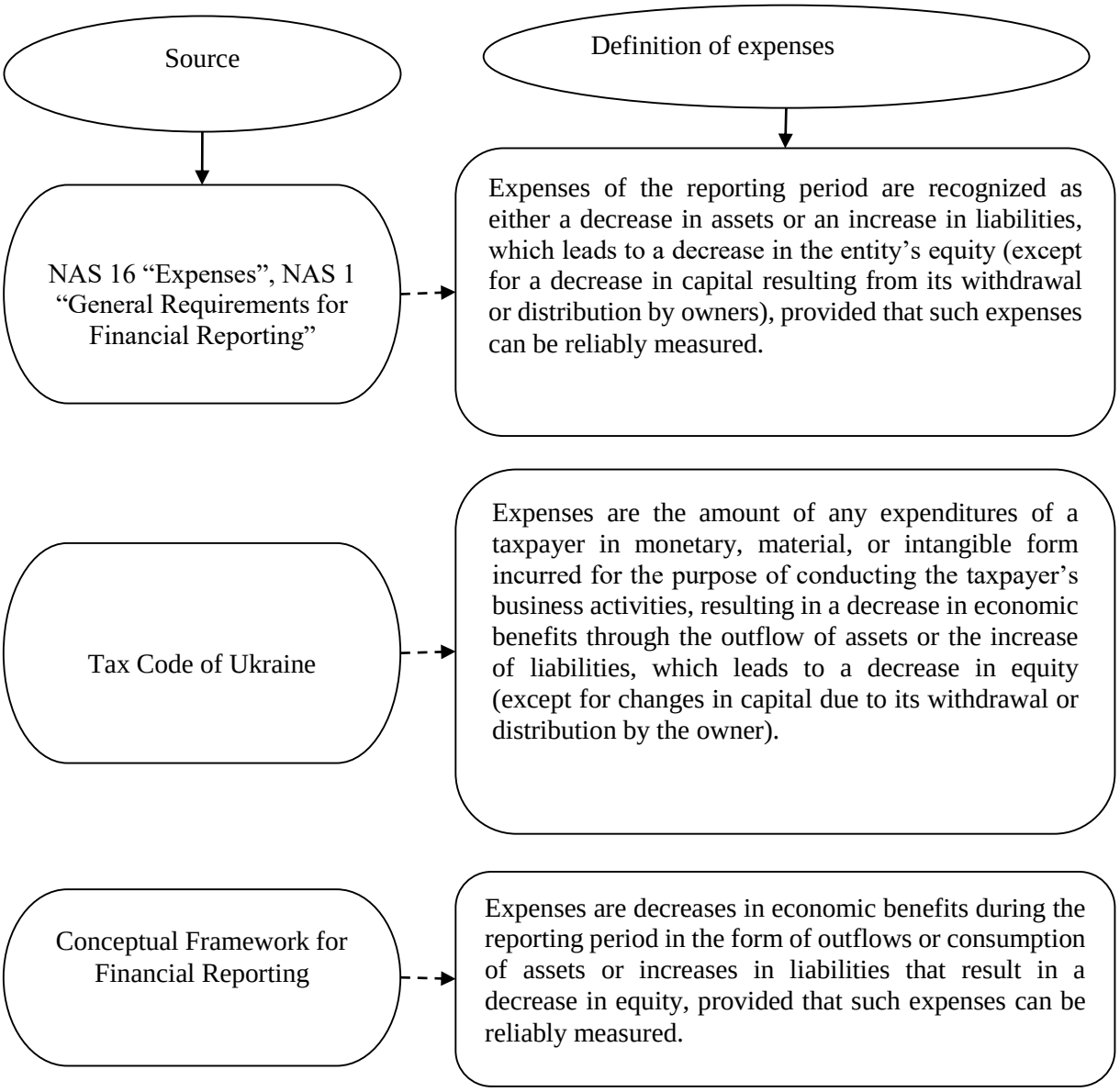


Fig. 3.4.1. Definition of the concept of “expenses” in regulatory sources

Analyzing Fig. 3.4.1, it can be stated that the definition of the concept of “costs” in Ukrainian regulatory legal acts and in international legislation is interpreted in a broadly similar manner; that is, national standards are practically identical to international ones. Therefore, regardless of whether an enterprise prepares its financial statements under international or national standards, the amount of costs reported will be the same, and thus their magnitude can be used to assess the financial condition of the enterprise.

Based on the above analysis of the essence of costs in regulatory, economic, and

accounting literature, it can be stated that: “Costs are an indicator of the effective performance of a business entity, reflecting a decrease in economic benefits in the form of asset outflows or an increase in liabilities, reliably measured, expressed in monetary terms, and incurred by an enterprise during the year in order to achieve its set objectives.”

Modern enterprises represent a complex system, the dynamism and coordinated functioning of which are ensured by a management mechanism. It establishes internal relationships, monitors the execution of tasks by performers, and includes instruments that ensure influence on all structural units of the enterprise and its overall activity.

The enterprise management mechanism must ensure an adequate level of stable operation. At the same time, the management mechanism, as a set of forms and methods of its implementation, includes types, functions, and tools, as well as a management apparatus comprising individuals and services that perform management functions.

Research has shown that enterprise costs have a significant impact on its financial condition and are largely determined by the degree of controllability of such costs.

In this regard, V. Kozak emphasizes: “It is the magnitude of costs and the effectiveness of their management that directly influence the stability of business operations” (Kozak, 2009). As world experience demonstrates, a crisis economic situation in any country has always forced enterprise management to reconsider the content and structure of costs in the context of searching for reserves and possible ways to optimize them, and thus to strengthen business security. In order to make appropriate managerial decisions in such situations, certain methods and tools have been used that were considered appropriate from the management’s perspective. However, the transition from one method or even one management concept, including cost management, to another that is more adequate to current conditions has always been problematic, particularly with regard not only to the identification of the method itself, but also to the timeliness of such a transition. In other words, it concerns determining the point at which the chosen approach remains effective and useful, and when it becomes necessary to change it.

Unconventional circumstances in which most enterprises find themselves require equally unconventional managerial decisions regarding the formation of an enterprise management mechanism. In turn, the formation of an effective enterprise management mechanism is impossible without a methodological justification of cost management at the enterprise.

Cost management is a process of developing and making managerial decisions on all key aspects of cost formation. The main objective of cost management at an enterprise is to optimize their total amount and levels, while ensuring high rates of operational activity development and the achievement of previously planned production volumes.

The process of cost management is complex in nature and involves addressing issues related to the formation of production costs and the determination of the cost of production both for individual types of products and for their total amount at the enterprise, establishing appropriate prices for each type of product and determining their profitability, identifying and practically utilizing cost-saving reserves and reducing production costs, as well as monitoring the condition and nature of changes in actual cost and expenditure

levels in comparison with planned indicators approved at the enterprise and their dynamics over time.

Based on the economic content of the concept of "management," the main elements of cost and product cost management at enterprises include forecasting and planning, cost standardization, organizing cost accounting and calculating the cost of sales, as well as analysis, control, and regulation of activities in the process of their implementation. All these cost management functions are integrated into a single management cycle and are not possible without appropriate information and analytical support.

Such information and analytical support should make it possible to group costs based on the needs of their management. H. V. Rostovska notes: "An analysis of scholarly works by leading researchers on the issue of cost classification made it possible to identify the main, in our view, classification features; in particular, it was found that there are many such features, each of which is applied to achieve specific objectives. This is explained by the fact that all enterprises have different financial, marketing, and technical characteristics. On the one hand, this only complicates cost accounting at the enterprise, while on the other hand, it allows for the most effective organization of cost accounting for the purpose of further analysis" (Rostovska, 2012).

At present, considerable attention in modern economic literature is paid to cost management within individual cost centers. A cost center is a cost allocation object where costs related to one or several functions and specific types of activities are accumulated. At the same time, a responsibility center is a separate structural unit of an enterprise managed by a person who is responsible for the level of costs incurred by that unit.

The basis of cost management as a means of ensuring effective management of entrepreneurial activity is its planning. The main objective of operating cost planning is to establish an economically justified amount and composition of current costs of an enterprise for the planned period, broken down by each type of produced product, individual responsibility centers, and for operating activities as a whole. Cost planning is an integral part of the overall system of enterprise activity planning.

The main form of planning operating costs of an enterprise is budgeting. The development of planned budgets is carried out for the enterprise as a whole (the main results of this budget calculation are included in the plan of income and expenses from operating activities and other current enterprise plans), in the context of all types of its responsibility centers, as well as for individual types of manufactured products (in the form of planned or standard costing calculations).

Standardization plays an important role in the cost management system and is associated with the calculation of cost norms for materials, labor, and overhead expenses on a scientific basis. Standard costs guide the enterprise and, at the same time, serve as a means of evaluating changes occurring in production activities in terms of their impact on profit.

Cost management based on standards prevents unnecessary losses, increases production efficiency, improves procurement policies, measures the consumption of production resources, and focuses attention on their future utilization.

The cost management process involves providing managers at all levels with information on costs necessary for the effective implementation of enterprise activities. Therefore, within the enterprise's information environment, a significant role is played by the cost accounting system, which includes separate subsystems: financial accounting, tax accounting, and management accounting.

Financial accounting provides the formation of generalized and standardized information on enterprise costs, which is used by both internal and external users. It enables the assessment of the overall level of costs, determination of financial performance results, and ensures transparency of reporting. For management purposes, this subsystem serves as an important basic source of reliable data that allows for the analysis of the enterprise's overall performance efficiency and supports strategic decision-making.

Tax accounting, in turn, is focused on generating information on costs in accordance with the requirements of tax legislation. It enables the correct determination of the taxable base, optimization of the tax burden, and minimization of risks of violations and penalties. For management, this subsystem is important as it ensures control over tax-related costs and allows tax implications to be taken into account when making managerial decisions.

Management accounting plays a key role in internal information support, as it provides detailed, operational, and flexible information on costs by responsibility centers, types of activities, and individual processes. It is aimed at supporting cost planning, control, and analysis, as well as identifying reserves for their optimization. It is precisely through management accounting that management obtains tools for prompt response to changes, improvement of resource utilization efficiency, and achievement of the enterprise's strategic objectives.

The practice of enterprise operations shows that without a proper assessment of actual production cost, it is impossible to effectively manage production efficiency. Therefore, managerial decision-making is not possible without an economic analysis of production and sales costs, as well as costs that will arise during the implementation of developed new projects and business plans.

Effectively managing costs means, first of all, exercising control, that is, timely identifying deviations, their causes and responsible persons, and providing an objective assessment of them. In relation to an enterprise, production cost management is aimed at saving both living and materialized labor. Full and timely control over cost deviations contributes to prompt managerial decision-making, enabling timely responses to negative trends in cost increases.

According to Yu. S. Tsal-Tsalko: "An important feature of costs as an object of management is their dynamism, that is, their continuous change and movement" (Tsal-Tsalko, 2002).

The implementation of the functional tasks of cost management is based on the application of certain regulatory mechanisms at different levels:

- state legal and regulatory control over the formation of costs. The adoption of laws and other regulatory acts governing cost formation (tax regulation, depreciation, wages,

etc.) is one of the directions of the state's economic policy;

- the market mechanism for regulating cost formation;
- the internal mechanism for regulating individual aspects of cost formation;
- a system of specific methods and techniques for implementing cost management.

The role of costs in the economic activity of a business entity determines the importance of cost management within the overall enterprise management system.

In our view, effective cost management enables an enterprise to obtain the following advantages:

- the production of competitive products due to lower costs and, consequently, lower prices;
- the availability of high-quality and reliable information on the cost of individual product types and their market position compared to products of other producers;
- the possibility of implementing flexible pricing;
- the provision of objective data for enterprise budgeting;
- the ability to assess the contribution of each structural unit to the overall performance results of the enterprise;
- the adoption of well-grounded and effective managerial decisions.

An effective cost management mechanism makes it possible to fully achieve the goals and objectives facing the enterprise management system and contributes to the effective implementation of its managerial functions.

Thus, in our view, in order to build an effective cost management system within the enterprise management framework, it is first necessary to define the objectives of cost management aimed at their optimization and at ensuring effective managerial decision-making.

At the same time, it is advisable to take into account the main functions of cost management, the choice of an appropriate accounting and costing system, the stages of the product life cycle, the necessity of budgeting within established responsibility centers, and the feasibility of applying management accounting and controlling, among other aspects.

Based on the above, we define the main tasks of cost management within the management system of business entities as follows:

- allocation of costs to the main management functions;
- identification of reserves for cost reduction at all stages of the production process and product life cycle, as well as in all production units of the enterprise (responsibility centers);
- selection of a cost management system that corresponds to the conditions ensuring stable enterprise functioning;
- determination of a costing method that allows cost control and forecasting of future results;
- identification of the role of cost management as a factor in improving the financial performance of the enterprise;
- calculation of costs by production units of the enterprise, identification of

responsibility centers, and development of a budgeting system for these centers;

- calculation of unit production costs per product;
- preparation of an information base that enables cost assessment when selecting and making current and investment decisions under multiple alternatives;
- determination of technical methods and necessary tools for cost measurement and control.

Thus, cost management within the management system of a business entity represents a unified multi-purpose system that requires the participation and interaction of all production units, enterprise services, and the management apparatus, with informational support provided by the accounting and analytical departments.

The financial condition of any business entity largely depends on the level of costs accompanying its economic activity. Enterprise cost management is based on accounting and analytical information, which is a significant factor in ensuring security in the overall management of the enterprise, and of costs in particular.

Accounting and analytical information, depending on the requirements imposed on it and under certain conditions, may possess various combinations of its inherent properties (for example, relevance, appropriateness, usefulness, etc.). The set of these properties is determined by the specifics of data acquisition and the purposes of its use.

Taking into account the properties that accounting and analytical information may possess, as well as its characteristic features (such as cyclicality and continuous processing), different requirements are imposed on it (for example, completeness, timeliness, prudence, etc.). The composition of these requirements is mainly determined by the judgments and preferences of its users. In other words, the quality of information support for managerial decisions aimed at cost optimization is determined by the quality level of accounting and analytical information.

The primary unit for storing accounting and analytical information in accounting is the account, which is a mathematical element reflecting changes occurring within a quantitatively measurable accounting and analytical information set. These changes can be identified and analyzed using mathematical principles. The list of accounts, developed on the basis of their classification and used by a business entity, constitutes the Chart of Accounts.

In the current Chart of Accounts of Ukraine applied by commercial enterprises, a whole group of accounts is designated for accumulating information on enterprise costs. These include all accounts of Class 9, which reflect the distribution of an entity’s costs according to functional purpose. At the same time, unfortunately, a significant number of business entities do not use Class 8 accounts, which are intended to contain information on costs by their elements, which complicates managerial decision-making.

At the same time, it should be noted that the main systemic property of an organizational management system is the purposeful nature of its functioning. In this sense, S. I. Drobiazko emphasizes: “Achieving the goal(s) of enterprise functioning is possible only if it possesses such a quality as security” (Drobiazko, 2014). The dependence of organizational security on the use of accounting and analytical information

in the management process necessitates the study of its role in enterprise management. The study of the role of accounting and analytical information as a key factor ensuring the functioning of a business entity and enabling the achievement of its goals involves: examining the systemic concept of enterprise management; studying the content of the systems approach to organizational management; and assessing the state of management activity at a given point in time.

V. Derii states that "accounting and analytical support is a system based on accounting data, including operational data, and using statistical, technical, reference, and other types of information for summarization and analysis" (Derii and Melnychuk, 2019). H. V. Rostovska adds: "accounting and analytical support can be viewed as the implementation of accounting and analytical procedures in real time, the identification of deviations from planned indicators, and the use of the obtained results for managerial decision-making" (Rostovska, 2012).

We have established that each subsystem of the accounting and analytical support for enterprise cost management is characterized by three interrelated levels:

- the first is the methodological level, at which primary information is processed and transformed into aggregated indicators in accordance with the needs of different users. The methodological level is the basic level in the system of accounting and analytical support for cost management, since it is at this stage that the content of information is formed. At this level, the principles, methods, and approaches to cost accounting and analysis are defined, including cost classification, valuation methods, rules for allocation to costing objects, as well as methods for data aggregation and interpretation. Here, primary information is transformed into a system of indicators suitable for analysis and decision-making. It is essential to ensure that the generated information corresponds to the needs of different user groups – from operational staff to top management – thereby enabling its use both for operational control and strategic planning;
- the second is the technological (technical) level, which determines the methods, tools, and forms of presentation of the generated information. The technological (technical) level ensures the practical implementation of methodological approaches through the use of appropriate tools and data processing technologies. It covers software, information systems, technical means of data collection, processing, and storage, as well as formats for presenting information in the form of reports, analytical tables, graphs, etc. It is at this level that the speed, accuracy, and accessibility of information are determined, which directly affects the quality of managerial decisions. The use of modern digital technologies makes it possible to automate accounting and analytical processes, increase the efficiency of data retrieval, and ensure their integration across different subsystems;
- the third is the organizational level, which involves establishing the order of interaction between participants in the process of preparing accounting and analytical data that are subsequently used for managerial decision-making in the field of enterprise management. The organizational level is aimed at structuring cooperation among all participants involved in the formation and use of accounting and analytical information. At this level, the functions, powers, and responsibilities of employees are defined,

document flow regulations and information submission deadlines are established, as well as mechanisms for monitoring the quality and reliability of information. It is important to ensure coordination of actions between different enterprise departments, which helps to avoid duplication of information and increases the efficiency of its use. The organizational level thus creates the conditions for a continuous information flow necessary for timely and well-founded managerial decisions in the area of cost management.

Thus, the leading role in the management system of any business entity belongs to the accounting system, which, in turn, serves as the foundation of the economic stability of business. The development of the economy and the continuous increasing complexity of business entities' activities stimulate the development of accounting practices related to the quality of accounting work, which influences the ability of enterprise management to make effective managerial decisions and exercise control over the enterprise's activities.

Therefore, effective cost management at an enterprise requires appropriate informational support, which can only be obtained through adequate accounting and analytical provision of this process. Consequently, in order to identify reserves for improving cost management efficiency, it is first necessary to examine the regulatory and legal framework governing cost management within the enterprise management system.

All enterprises in Ukraine currently operate within an established legal framework; therefore, one of the components of business security is the legal security of the enterprise. This component characterizes the level of an enterprise's compliance with legal acts regulating its activities.

Most researchers, based on the practice of forming the regulatory and legal framework of Ukraine, propose to present the regulatory and legal regulation of cost management in terms of five levels, each of which forms a set of normative legal acts on the basis of which information on costs is reflected in the enterprise accounting system and subsequently used for managerial decision-making:

- level 1: the Constitution of Ukraine, Codes of laws, and Laws of Ukraine;
- level 2: Decrees and Orders of the President of Ukraine;
- level 3: National Accounting Standards (NAS/IAS equivalent) and other regulatory legal documents approved by the Ministry of Finance of Ukraine;
- level 4: regulatory legal acts and methodological recommendations of the Ministry of Finance of Ukraine;
- level 5: internal decisions (orders, directives) regarding accounting and analytical support for cost management at the enterprise.

Thus, all enterprise activities, including cost management, must be based on economic laws and must not contradict the regulatory legal acts in force in Ukraine.

The main regulatory document governing economic relations arising in the process of organizing and conducting business activities of an enterprise in general, including relations related to the use of resources, is the Economic Code of Ukraine No. 436-IV dated 16.01.2003.

Equally important regulatory documents are those that define the procedure for

generating cost information within the enterprise accounting system. These regulatory acts should form the basis of the accounting and analytical support for cost management within the management system of business entities.

Thus, the legal foundations for regulating, organizing, maintaining accounting records, and preparing financial statements in Ukraine are defined by the Law of Ukraine "On Accounting and Financial Reporting in Ukraine." This is the main document regulating the organization and maintenance of accounting at the enterprise as a whole.

The main regulatory document that directly governs the procedure for cost recognition in accounting is the National Accounting Standard (NAS) 16 "Expenses." This standard establishes the procedure for recognizing all types of expenses in accounting, their composition and allocation to accounting objects, as well as the presentation of cost information in financial reporting.

The Tax Code of Ukraine defines the accounting of expenses in the context of taxation. Incorrect determination of the composition of expenses or their improper allocation to accounting objects may lead to an understatement of the financial result and, consequently, to underpayment of corporate income tax with corresponding financial sanctions.

When recording cost-related transactions in accounting accounts, enterprises must apply the Chart of Accounts for Assets, Equity, Liabilities, and Business Operations of Enterprises and Organizations, approved by the Order of the Ministry of Finance of Ukraine dated 30.11.1999 No. 291. The procedure for reflecting expenses in accounting accounts and the correspondence of accounts is defined by the Instruction on the Application of the Chart of Accounts for Assets, Equity, Liabilities, and Business Operations of Enterprises and Organizations, approved by the Order of the Ministry of Finance of Ukraine dated 30.11.1999 No. 291.

In parallel with the regulatory documents governing cost accounting, for the rational control of cost incurrence and proper cost management within the enterprise's economic security system, it is also necessary to take into account the requirements of regulatory documents related to the inclusion of such costs in the cost of production.

This issue is regulated by the "Methodological Recommendations for Planning, Accounting, and Costing of Production (Works and Services) in Agricultural Enterprises." According to these methodological recommendations: "The purpose of cost accounting and product (works, services) costing is the documented, timely, complete, and reliable reflection of actual production costs to ensure control over the use of material, labor, and financial resources. The calculation of the unit cost of production (works, services) is carried out to determine the efficiency of planned and actually implemented agronomic, technological, organizational, and economic measures aimed at the development and improvement of production, as well as to substantiate the enterprise's pricing policy."

For the proper presentation of cost information in financial reporting, enterprises across all sectors must comply with the requirements of the National Accounting Standard (NAS) 1 "General Requirements for Financial Reporting." This standard defines "the principles for presenting general-purpose financial statements to ensure their

comparability with the financial statements of an entity for previous periods, as well as with the financial statements of other entities. It establishes general requirements for the presentation of financial statements, guidelines for their structure, and minimum requirements for their content."

It should also be noted that all expenses incurred by an enterprise must be properly documented, as required by the "Regulation on Documentary Support of Accounting Records," approved by the Order of the Ministry of Finance of Ukraine dated 24.05.1995 No. 88.

Research has shown that, for cost management within the management system of business entities, the implementation of control over their volume and the procedure of resource consumption is also of significant importance. The control of resource utilization by individual types should be carried out taking into account the requirements of the "Regulation on Inventory of Assets and Liabilities."

In addition to regulatory documents approved at the state level, internal regulatory documents also play an important role in the accounting and analytical support of cost management within the enterprise's economic security system, in particular the Order on Accounting Policy, regulations on costing at the enterprise, and others, which govern cost accounting based on the specifics of a particular enterprise.

Thus, regulatory legal acts on accounting, financial reporting, and economic control over enterprise costs currently provide a fairly comprehensive framework for the organization of accounting and analytical support for cost management at the enterprise. However, it should be taken into account that a significant number of issues related to the establishment of a cost management system fall within the competence of the enterprise itself, that is, its management personnel, and are decisive in the legal support of cost management within the enterprise's economic security system.

Considering that the information and analytical support for cost management depends on a well-established accounting process, let us examine the fundamentals of its construction based on the analyzed regulatory acts.

First of all, it should be noted that the accounting process of any business entity consists of multiple blocks, which must be specified and presented in both technological and structural aspects.

The first stage of the accounting process is primary accounting. When examining this stage of cost accounting organization, it is necessary, first and foremost, to determine the cost accounting objects identified at a specific enterprise. For example, in agricultural enterprises, such objects include agricultural crops grown by the enterprise for the purpose of obtaining products and their subsequent sale. The basis for the primary recording of cost information is primary documents drawn up in accordance with legal requirements.

The accuracy and timeliness of recording cost information in primary documents form the basis for building an information and analytical support system for cost management within the enterprise management system, since this stage of the accounting process is where the highest number of violations occurs. These violations manifest themselves in overstated write-offs, misstatements of the volume of work performed,

errors in attributing costs to specific objects, and so on. Therefore, establishing an internal control system that would minimize such violations as much as possible is one of the tasks of enterprise management.

One of the major shortcomings in the organization of primary accounting in many business entities is the absence of a document flow schedule, which leads to untimely submission of documents to the accounting department. This directly affects the timeliness of generating information necessary for cost management within the enterprise management system.

Information contained in accepted primary documents is reflected in the enterprise's current accounting system, which represents the second stage of the cost accounting process organization. At this stage, primary accounting data are systematized in appropriate registers within accounting accounts. The data of analytical accounts must correspond to synthetic accounting accounts as of the first day of each month.

Based on the information recorded in the cost accounts opened at the enterprise, financial reporting is prepared; that is, current accounting data are reflected in the final accounting stage, which represents the third stage of the accounting process organization.

For managerial decision-making aimed at improving the quality of cost management, the most valuable information is that generated by the enterprise on Class 9 accounts and Account 23 "Production" in terms of cost objects, as well as on Class 8 accounts in terms of cost elements.

A significant shortcoming in the formation of accounting support for cost management in many enterprises, in our view, is also the fact that accounting software is used solely for recording transactions in financial accounting, while the potential capabilities of such software for management accounting are not considered at all.

In particular, in order to form an adequate information and analytical support system for cost management within the enterprise management system, accounting should be organized in such a way as to provide managers in a timely manner with complete information on cost volumes, cost norms, and deviations from those norms, with the aim of optimizing costs and improving the effectiveness of managerial decisions.

A frequent shortcoming in the organization of accounting support for cost management within the enterprise management system is also the lack of clearly defined elements of accounting policy in the current orders on accounting policy regarding cost accounting and their classification for decision-making purposes. At the same time, the specifics of accounting organization at an enterprise are reflected precisely in its accounting policy. The accounting policy of an enterprise consists of internal orders and directives that form the lowest level of regulation of the accounting system.

According to legislation: "Accounting policy is a set of principles, methods, and procedures used by an enterprise for the preparation and presentation of financial statements. In other words, it is the enterprise's own selection of specific methodologies, forms, and techniques of accounting, based on applicable regulatory acts and the specific features of the enterprise's activity" (Derii and Melnychuk, 2019).

The main purpose of an enterprise's accounting policy is to ensure the provision of

reliable information about its property and financial position and performance results, which is necessary for all users of financial statements in order to make appropriate decisions.

The level of effectiveness of an enterprise's accounting policy is largely determined by the clarity and soundness of its elements, since they form an integrated system of accounting, taxation, and management practices. The accounting policy serves as a kind of "instruction manual" that regulates approaches to the recognition, measurement, and presentation of business transactions. If these approaches are clearly and consistently defined, the enterprise obtains stable, comparable, and reliable information, which forms the basis for effective managerial decision-making. Conversely, vagueness or inconsistency in these provisions may lead to accounting errors, distortion of financial results, and increased risks.

In particular, in the field of accounting, important elements include inventory valuation methods (FIFO, weighted average cost), depreciation methods (straight-line, units-of-production method), and the procedures for forming provisions, among others. For example, the choice of different depreciation methods can significantly affect the amount of expenses recognized in a reporting period and, consequently, the enterprise's financial result. From a tax perspective, a clearly defined accounting policy enables the correct determination of the tax base, helps avoid penalties, and optimizes the tax burden. For instance, proper documentary confirmation of expenses or well-grounded application of tax differences directly affects the amount of corporate income tax.

One of the elements of accounting policy that is important for enterprise management is the toolkit for cost management, which may be applied depending on the specific characteristics of the enterprise.

It should be noted that the level of costs of business entities is influenced by a set of factors that must be taken into account in order to improve the quality of their management. In particular, the following factors influencing enterprise costs can be identified (Fig. 3.4.2).

The conducted research has shown that the most significant negative impact on the level of enterprise costs is caused by sudden factors and external factors, which considerably reduces business security. This aspect should be taken into account when developing cost management measures within the enterprise management system.

Thus, synthetic and analytical cost accounting at an enterprise is an integral part of the rational organization of information and analytical support for cost management within the management system. However, accounting for costs alone is not sufficient for their effective management.

To improve cost management efficiency, as already noted, it is important to combine accounting procedures with analytical ones. Unfortunately, at present, many business entities do not pay sufficient attention to the analysis required for cost management. This, in turn, does not allow for obtaining complete and timely information on the level of enterprise costs necessary for their optimization and for improving the effectiveness of managerial decision-making.

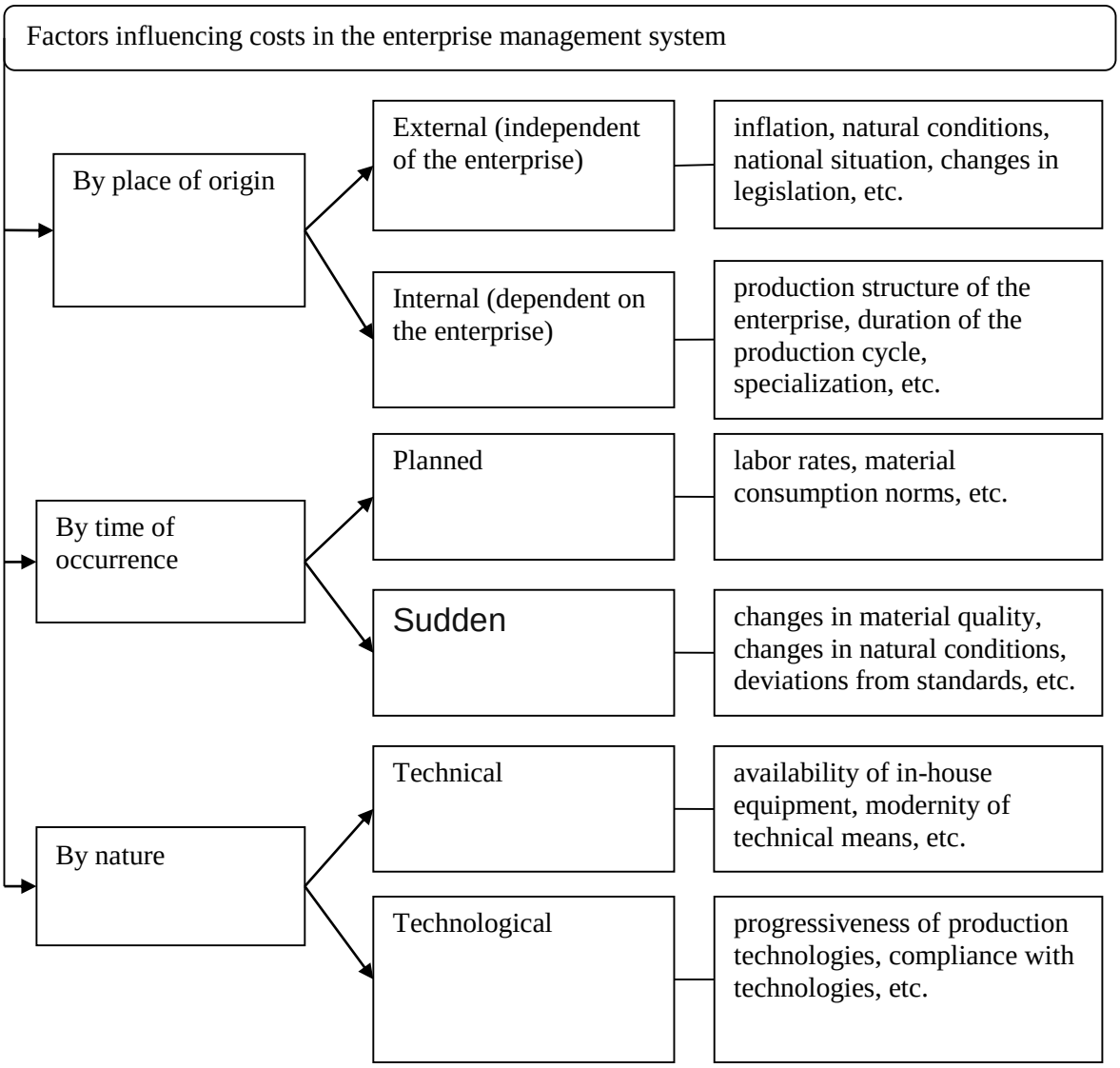


Fig. 3.4.2. Classification of factors influencing the costs of business entities

Thus, the current system of accounting and analytical support for cost management can be represented by the following scheme (Fig. 3.4.3). As the data in Fig. 3.4.3 show, accounting support is generally given more attention than analytical support, while only financial accounting methods are used in practice. Among analytical procedures, quite often only the calculation of actual cost and its comparison with similar indicators of previous years is performed.

At the same time, it should be noted that in the process of cost management, the rational organization of control over their incurrence is also of no less importance. Such a control system aims to identify cases of material overuse, their inefficient utilization, and incorrect application of rates for the volume of work performed.

Thus, in our view, an insufficient level of internal control, the lack of a broad range of analytical procedures, and deficiencies in the organization of cost accounting do not

allow for the formation of high-quality information for management necessary for effective cost management decision-making. This situation requires the development of ways to improve the information and analytical support of cost management and the formation, on this basis, of a cost management policy within the enterprise management system.

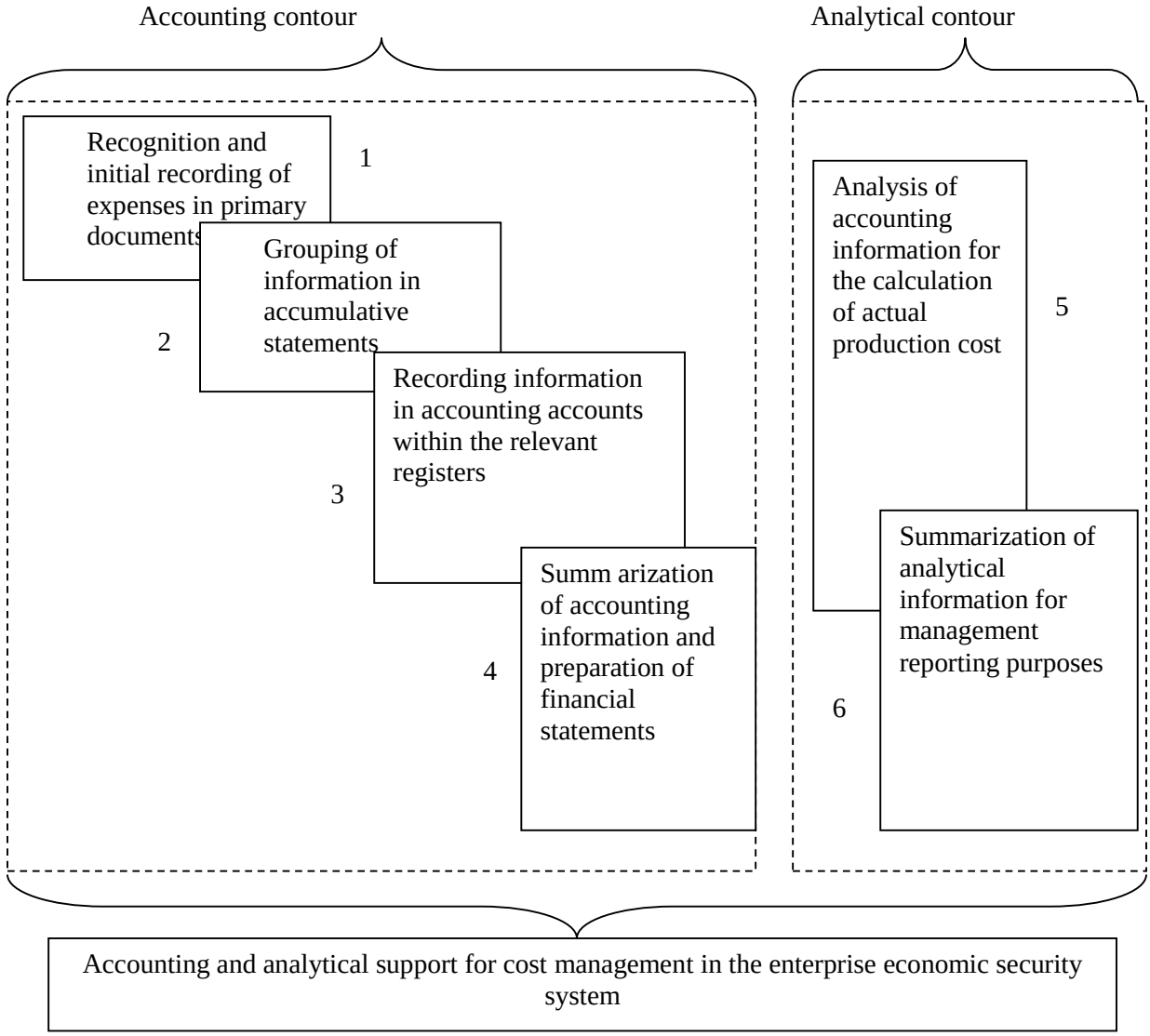


Fig. 3.4.3. Existing accounting and analytical support for cost management in the management system of business entities

The information and analytical support system for cost management requires a systematic approach to its organization. According to the systems approach, the mechanism of information emergence, formation, and use in enterprise management is implemented within its accounting and analytical information system. To characterize the essence of the accounting and analytical information system that should be established at an enterprise for managerial decision-making aimed at improving management efficiency,

the target, identification, component, and factor aspects of its functioning are of significant importance.

The target aspect lies in the fact that the functioning of the accounting and analytical information system is determined by its target function. Such a function represents a formalized set of hierarchically ordered sub-goals of the accounting and analytical information system, expressed through a single overarching objective of its operation. The definition of the main goal of the accounting and analytical information system involves the analysis of the structure of the managerial task.

In our view, in accordance with the classification of information sources used in the process of economic analysis of enterprise activity into accounting and non-accounting sources, it is appropriate to decompose the economic information system of an organization into two hierarchically structured subsystems: 1) the accounting and analytical information system; 2) the non-accounting analytical information system. In this case, the main goal of the integrated accounting and analytical information system is the preparation of alternative managerial decision-making options and the forecasting of the consequences of their implementation based on reliable accounting and analytical information. The hierarchically structured sub-goals of the integrated accounting and analytical information system include the objectives of its subsystems: operational accounting, financial accounting, control, and economic analysis.

Operational accounting is a system of observation, collection, and registration of operational data on financial and economic processes occurring at an enterprise. The purpose of operational accounting is the formation of primary (initial) accounting information (primary output data) on information carriers—primary documents (invoices, timesheets, work orders, etc.).

The objective of accounting is to generate output accounting information presented in financial statements.

Control is a system for verifying accounting information on the financial and economic activities of an enterprise and assessing the compliance of accounting procedures with established standards (regulatory provisions, external and internal rules). The purpose of control is to assess and ensure the reliability of the resulting accounting information in financial statements in all material respects. Control may be carried out in the form of an audit.

Economic analysis is a system for researching (studying and evaluating) information on the use of economic resources and the results of an enterprise's financial and economic activities. The purpose of economic analysis is to identify internal and external reserves for improving the efficiency of the organization's functioning.

The identification aspect lies in the fact that the unified accounting and analytical information system is designed for a clearly defined range of users of accounting and analytical information (system consumers of this information) and may be represented by the aggregation of external and internal accounting and analytical information systems.

The aggregation of the external accounting and analytical information system and the internal accounting and analytical information system into a single accounting and

analytical information system within the organizational system does not imply the integration (merging) of their accounting processes for processing accounting and analytical information. When identifying a unified accounting and analytical information system, the accounting processes within the external and internal accounting and analytical information systems must remain autonomous from each other. In this sense, the autonomy of the internal accounting and analytical information system from the external accounting and analytical information system functioning within the organizational management system is understood.

The component aspect lies in the fact that the accounting and analytical information system is a means of organizing incoming primary data on the financial and economic activity of an economic entity in order to obtain reliable resulting accounting and analytical information.

Finally, the factor aspect implies that, in accordance with the principles of system theory and functional hierarchy of systems, the accounting and analytical information system is correlated with a higher-level system – namely, the enterprise – which, in turn, is correlated with an even higher-level system – the national economy.

The subordination of the functioning of the accounting and analytical information system to these systemic laws determines the importance of feedback within the accounting and analytical information system. This means that the accounting and analytical information system is dependent on the external environment in terms of its inputs, processes, and outputs. Consequently, the accounting and analytical information system must develop mechanisms necessary for its adaptation to the requirements of the external environment.

These requirements are determined by system users (external and internal users) of the output of the accounting and analytical information system—namely, external (financial and tax) and internal (management and other) accounting reports.

The characteristics of the target, identification, component, and factor aspects of the functioning of the accounting and analytical information system at an enterprise make it possible to state that the main requirements for the output of the external accounting and analytical information system (external financial reporting) are determined by the external environment. In this regard, the dominant role in improving the integrated accounting and analytical information system is played by the implementation of internal aspects related to the creation of a new or improvement of the existing internal accounting and analytical information system within the organization.

The potential for improving accounting and analytical information from the perspective of enhancing cost management is determined by the dialectical nature of the functioning and development of the internal accounting and analytical information system. In this context, the basis for substantiating methodological qualitative and quantitative approaches to strengthening the role of the accounting and analytical information system in enterprise management consists of the methodology for designing a new system and the methodology for improving the existing internal accounting and analytical information system at the enterprise.

The value aspect of enhancing the role of accounting and analytical information involves the development of a methodology for assessing the costs of improving the internal accounting and analytical information system and the expected effect of its functioning after such improvement.

Thus, based on the definition of the concept of "system improvement," we recommend applying five main stages to improve the current accounting and analytical support for cost management that exists in most business entities (Fig. 3.4.4).

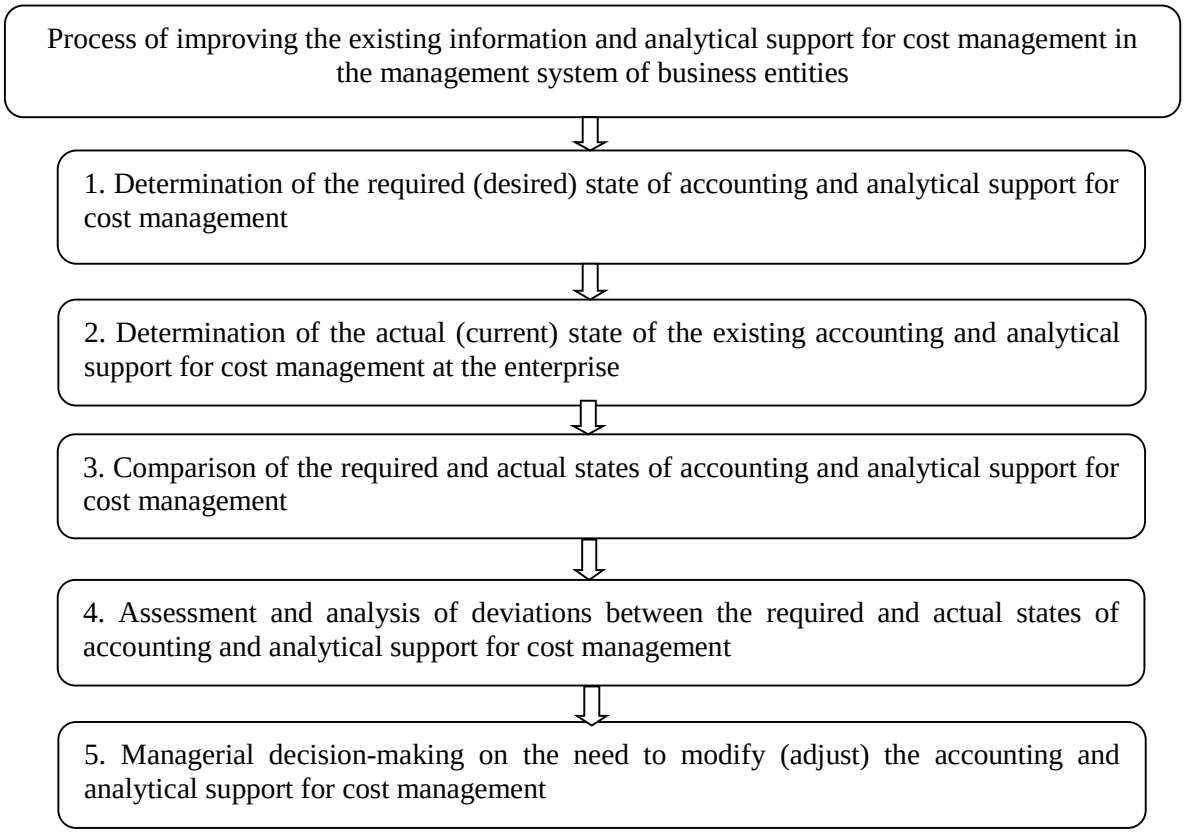


Fig. 3.4.4. Stages of improving information and analytical support for cost management in the management system of business entities

Thus, the stages of improving the information and analytical support for enterprise management presented in Fig. 3.4.4 make it possible to formulate the following statements:

- first, abstraction from the specifics of an enterprise's activities and objectives makes it possible to identify universal system factors of the value of accounting and analytical information from the perspective of effective management of a business entity;
- second, the development of quantitative (level-based and cost-based) aspects of enhancing the role of accounting and analytical information is grounded in the study of qualitative (object, behavioral, and subject-based) aspects of strengthening its role in improving management effectiveness.

The decisive practical significance for improving the information and analytical support of cost management in the management system of business entities lies in the implementation of output-oriented and process-oriented reporting aspects of designing and improving its internal accounting and analytical information system.

The implementation of output-oriented factors in the design and improvement of the internal accounting and analytical information system of an enterprise involves disclosing its characteristics and developing a criterion-based ("ideal") model of internal financial reporting. As such a model, enterprise reporting may be selected.

Enterprise reporting is internal accounting (management) reporting used by managers and owners of the enterprise for its management, as well as for studying and assessing its security status. This reporting represents a unified system of resultant accounting and analytical indicators of the enterprise's property and financial condition in the context of its business activities.

The solution to the problem of designing an internal accounting and analytical system at an enterprise involves either creating a new in-house system or selecting one from existing systems (described in economic literature, used at other enterprises, etc.). In this context, the main criterion for selecting any existing accounting and analytical system is the conformity of the system's output with the requirements imposed on internal reporting from the perspective of ensuring effective enterprise management, within the framework of the reporting system factors of information value.

It should be noted that research has shown that the accounting and analytical information system of most enterprises is often represented at only two levels: the accounting level and the analytical level. At the same time, the accounting level includes only the financial accounting system, while the analytical level is limited to calculating actual production cost and comparing it over time.

At the same time, most scholars tend to agree that the information and analytical support of enterprise management is an integrated system consisting of three interrelated subsystems (components) that exist within a unified information space: accounting, analytical, and special support.

In addition, in our view, it is important to embed the necessary management tools into the accounting and analytical support system for cost management at the enterprise. Such tools should include budgeting, identification of factors influencing costs, as well as coordination and regulation in the process of resource consumption within the enterprise.

The proposed structure of information and analytical support for cost management will make it possible to form an information environment that, on the basis of the obtained accounting and analytical information, enables the application of advanced cost management tools and provides management with reliable and timely information for decision-making.

A significant role in ensuring the improvement of information and analytical support belongs to analytical information, as it links individual management elements into a unified dynamic system.

It should be noted that the organization of analytical procedures is directly related to

the implementation of the control function. In the enterprise economic security system, the control function interacts closely with almost all other management functions; however, its implementation within analytical processes is of particular importance. The need to implement the control function in cost management serves as a prerequisite for defining the objectives of enterprise cost analysis.

Thus, the objective of cost control should be to establish the correctness of cost accounting, confirm the legality of including these costs in product cost, assess their level within the enterprise cost structure, and determine the appropriateness and reality of the incurred expenses. Based on the objective of internal cost control, its main tasks can be defined as follows:

- determination of the actual state of costs at a specific point in time;
- forecasting the state of costs for a defined future period;
- identification of the location, cause, and responsible party for deviations of actual costs from planned ones;
- verification of the legality or legitimacy of business transactions reflected in cost accounting;
- assessment of the completeness of recording business transactions in current accounting;
- verification of the appropriateness of business transactions related to cost recognition;
- identification of causal factors influencing the level of costs;
- verification of the availability and correctness of documentation confirming the amount of costs;
- verification of the proper recording and reflection of costs in accounting.

Thus, the conducted research shows that combining accounting procedures with an adequate level of control over resource consumption provides a highly informative basis for cost management aimed at improving management efficiency and indicates the need to develop a cost management policy.

The effectiveness of managerial decisions related to enterprise cost management should ensure a balance between enterprise profitability and an adequate level of resource consumption necessary for secure functioning. This requires the development of specific approaches to cost management at the enterprise based on appropriate information and analytical support. Such approaches represent the enterprise’s cost management policy.

The transformation of relations between stakeholders interested in information about enterprise costs is manifested in different understandings of the methodological approaches that should be applied to ensure the expected result. At the same time, the outcomes may differ significantly, as enterprise managers and enterprise owners often view the management system and management effectiveness in different contexts.

It is also appropriate to identify a separate group of institutional agents that use information on costs to perform their functions (primarily supervisory ones) in the process of interaction with business entities. Such agents include, first of all, fiscal authorities and the Antimonopoly Committee, which are directly interested in cost-related information.

It is evident that, over a long period, domestic practitioners have been forming an information array for different purposes – management, external institutional users, investors, and owners. However, what is common to all stakeholders is the need for sound decision-making in the field of cost management. Therefore, it is necessary, first and foremost, to determine the target orientation of the information and analytical support of cost management processes for the main interested stakeholders.

The main interested stakeholders include enterprise management, owners, and regulatory bodies; however, their objectives differ to some extent (Fig. 3.4.5).

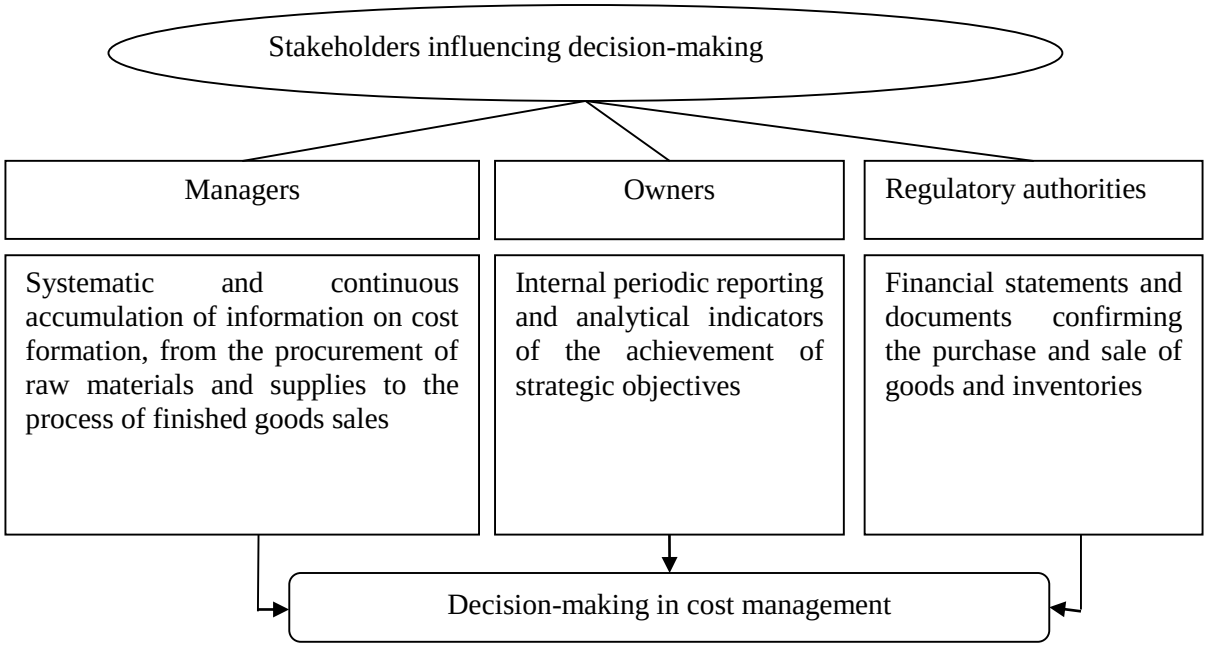


Fig. 3.4.5. Target orientation of information and analytical support for cost management in the management system of business entities

Based on the identified target needs of the main stakeholders and the determination of factors influencing enterprise costs, the following key principles for building cost management can be formulated:

- ensuring the economic security of the enterprise;
- a systems approach to cost management;
- unity of methods applied at different levels of cost management;
- implementation of cost management at all stages of finished product manufacturing;
- organic combination of cost reduction with high quality of finished products;
- prevention of excessive and unproductive costs;
- improvement of information and analytical support for cost management;
- increasing the involvement and motivation of production units in reducing cost levels.

The application of these principles in designing a cost management policy will ensure the utilization of all possible reserves for cost reduction while maintaining an adequate level of product quality.

Thus, enterprise cost management is a process of implementing functional components of management aimed at preventing potential losses and achieving the maximum possible level of profit both in the current period and in the future, while its supporting methods consist of a set of measures and an organizational system for their implementation and control that enable the highest possible levels of business security.

Thus, effective cost management should be based on a developed policy of such management, which should be considered a standardized set of procedures for making decisions regarding costs in the course of enterprise operations.

Based on this, the cost management policy within the management system of business entities should consist of the following key elements:

- accounting and analysis of enterprise costs (in terms of fixed/variable costs, as well as methods of their coverage);
- formulation of strategic alternatives and selection of a cost recovery strategy;
- planning and forecasting of cost levels (taking into account the marginal income method);
- optimization and control of the cost formation process;
- identification of deviations from planned indicators and determination of their causes, as well as their neutralization or consideration;
- identification and quantitative assessment of cost reduction reserves, as well as determination, justification, and implementation of mechanisms for their mobilization;
- monitoring of implementation and flexible adjustment of developed plans.

Thus, for the effective functioning of business entities, it is important to implement the cost management policy elements defined above, which will enable the creation of an effective mechanism for cost optimization, reduce unproductive costs, and provide incentives for cost savings.

A key role in implementing the cost management policy of business entities is played by information and analytical support, as it forms the basis for making well-grounded managerial decisions. High-quality, timely, and relevant information on the structure, dynamics, and factors of cost formation allows management not only to control cost levels but also to identify reserves for optimization and improve operational efficiency. Through analytical data processing, it becomes possible to forecast costs, assess risks, and determine the most appropriate directions for resource allocation.

Effective information and analytical support facilitates the alignment of strategic and operational cost management objectives, ensuring their transparency and controllability. It creates conditions for timely responses to changes in both the internal and external environment, improves the quality of planning and control, and strengthens the economic security of the enterprise. As a result, it enables business entities to achieve stability, competitiveness, and sustainable development.

3.5. INTEGRATION OF SPECIALISED TRANSLATION OF AGRICULTURAL TERMINOLOGY INTO THE ENTERPRISE'S INFORMATION MONITORING SYSTEM

Olga Serhiienko,
Doctor of Philosophy, Associate Professor,
Associate Professor of the Department of Foreign Philology and Translation,
National University of Life Resources and Environmental Sciences of Ukraine,
Kyiv, Ukraine

In the current context of economic digitalisation and the globalisation of information flows, the agricultural sector is undergoing significant transformations linked to the active introduction of information and communication technologies, as well as automated systems for managing and monitoring production processes. Agricultural enterprises are becoming increasingly integrated into global markets, which necessitates the effective processing of multilingual information, particularly scientific, technical, regulatory and analytical data. In this context, specialised translation of agricultural terminology takes on particular significance as a tool for ensuring the proper functioning of an enterprise's information monitoring systems.

The relevance of this study stems from several interrelated factors. Firstly, modern information systems for managing agricultural enterprises (in particular, FMIS – Farm Management Information Systems) are highly complex and require the processing of large volumes of diverse data, including textual information in various languages. Secondly, the rapid development of digital agriculture, based on Internet of Things, artificial intelligence and big data technologies, significantly expands the range of specialised terminology requiring standardisation and consistent translation (Paraforos et al., 2017). Thirdly, the growing role of international cooperation in the agricultural sector highlights the issue of cross-linguistic communication and the accuracy of conveying professional knowledge.

Agricultural terminology is a complex, dynamic and multi-component system that is constantly being enriched with new concepts as a result of scientific and technological progress. As researchers note, agricultural terms are characterised by variability, polysemy and the presence of numerous synonymous equivalents, which complicates the process of their translation and standardisation (Farooq et al., 2020). Furthermore, a significant proportion of terms are formed through borrowing or reinterpretation of existing lexical units, which creates additional difficulties for their adequate interpretation in different languages (Sydoruk, 2021).

An analysis of academic literature reveals a substantial body of work in the field of agricultural terminology and its translation. In particular, the works of both domestic and foreign scholars examine the structural and semantic features of agricultural terms, the ways in which they are formed, and the main translation transformations. Research is devoted to the harmonisation of terms in an international context, which is particularly

relevant given the integration of national agricultural systems into the global economic space (Sydoruk, 2021). Particular attention is paid to the creation of specialised terminological dictionaries, which are designed to ensure the unification of professional vocabulary and enhance the effectiveness of communication between specialists from different countries (Nika and Gerasymenko, 2025).

At the same time, contemporary research emphasises that translation in the agricultural sector goes beyond a purely linguistic process and takes on the characteristics of a complex interdisciplinary activity, which involves the interpretation, adaptation and transformation of knowledge to meet the needs of specific users (Ingram et al., 2018). This is particularly important in the context of information systems, where translated information is used for managerial decision-making.

Despite the considerable body of academic literature, a number of issues remain under-explored. Firstly, there is a lack of comprehensive studies that integrate approaches to the translation of agricultural terminology with the functioning of corporate information monitoring systems. Existing works are largely focused on the linguistic aspects of translation or on the technical characteristics of information systems, neglecting their interaction.

Secondly, the issue of automating the translation of specialised agricultural terminology within corporate digital platforms has not been sufficiently researched. Although modern technologies allow for the processing of large datasets, the problem of translation accuracy, particularly in highly specialised fields, remains relevant due to the lack of standardised terminology databases and algorithms for their integration into monitoring systems.

Thirdly, the issue of terminological unification in the context of cross-linguistic interaction requires further research, as different linguistic systems reflect the specific nature of agricultural activity, taking into account cultural, technological and regional characteristics (Kachmarchyk, 2024). This complicates the creation of universal translation models suitable for use in enterprise information systems.

Fourthly, insufficient attention has been paid to the role of translation as a component of the information and analytical support for enterprise management. In most cases, translation is regarded as a secondary process, whereas in today's context it constitutes a vital element in the formation of information flows and the making of management decisions.

Thus, the relevance of this study is determined by the need to develop theoretical and methodological foundations for the implementation of specialised translation of agricultural terminology into the enterprise's information monitoring system. This involves the integration of linguistic, information and management approaches with the aim of improving the efficiency of information processing, ensuring its accuracy and relevance, and optimising decision-making processes in the agricultural sector.

Given the relevance of the chosen topic, as well as the identified theoretical and practical gaps in the integration of specialised translation of agricultural terminology into enterprise information systems, the aim of this study is to comprehensively justify and

develop the conceptual foundations for the implementation of specialised translation of agricultural terminology into an enterprise's information monitoring system, taking into account linguistic, information technology and management aspects.

Achieving this objective involves addressing a series of interrelated tasks covering both theoretical and applied aspects of the research:

1. To analyse theoretical and methodological approaches to defining the nature of specialised translation, particularly in the context of agricultural terminology, and to clarify its role within the system of professional communication.

2. To investigate the structural and semantic features of agricultural terminology, identify its main classification characteristics, sources of formation and development trends in the context of the digitalisation of the agricultural sector.

3. To systematise the main translation strategies and transformations applied when translating agricultural terms, taking into account their functional role in specialist texts and information systems.

4. To analyse modern enterprise information monitoring systems, determine their functional characteristics, the structure of information flows, and the role of linguistic data processing within these systems.

5. To identify the specific features of integrating translation processes into information systems, in particular to investigate the possibilities of using automated translation tools, terminology databases and knowledge management systems.

6. To justify the need for standardisation of agricultural terminology as a prerequisite for improving the quality of translation and the efficiency of enterprise information systems.

7. To develop a conceptual model for integrating specialised translation into an enterprise's information monitoring system, taking into account the interaction between linguistic resources, information technology and management processes.

8. Assess the effectiveness of the proposed approaches in terms of improving the accuracy, relevance and speed of information processing in an agricultural enterprise.

9. Formulate practical recommendations for the implementation of specialised translation of agricultural terminology in the activities of enterprises focused on international cooperation and digital transformation.

Thus, the stated aim and objectives of the study reflect the need for an interdisciplinary approach to addressing the identified issues, which involves combining the achievements of translation studies, terminology studies, information technology and management. Their implementation will contribute to the creation of effective mechanisms for integrating language resources into enterprises digital systems and ensuring a high level of information support for management decisions in the agricultural sector.

In contemporary translation studies, specialised translation is regarded as a distinct type of translation activity that operates within the framework of professionally oriented communication and is characterised by a high level of terminological density. In the context of the agricultural sector, it takes on particular significance, as it facilitates the

transfer of knowledge between different linguistic and cultural communities, promoting the development of innovation and the implementation of advanced technologies in production practice.

The methodological basis of this study is provided by the principles of the functional approach to translation, according to which translation is viewed not merely as a process of reproducing meaning, but as a purposeful activity aimed at achieving a communicative effect within a specific context. In this regard, the theory of skopos plays a particular role, emphasising the purpose of translation as the determining factor in the choice of translation strategies.

Within the framework of agricultural discourse, translation functions not merely as a tool for conveying information, but as a mechanism for adapting it to the specificities of the professional environment. This entails taking into account industry standards, regulatory and legal requirements, as well as the operational characteristics of enterprises information systems.

Agricultural terminology, as a component of professional vocabulary, is characterised by a high degree of systematicity, dynamism and interdisciplinary. It reflects the specific nature of agricultural production, including such sub-sectors as crop production, livestock farming, agricultural engineering, agrochemistry, agroecology and agribusiness. In the context of this study, the analysis of the structural and semantic characteristics of terms takes on particular significance, as it is these characteristics that determine the complexity of their translation and integration into enterprise information systems.

The semantic specificity of agricultural terminology lies in its high degree of nominative precision; however, at the same time, there is a phenomenon of polysemy and terminological variation. For example, the same term may have different meanings depending on the context in which it is used (scientific, industrial or regulatory). Furthermore, a significant proportion of terms are formed through metaphorisation or metonymisation, which creates additional difficulties for translation.

Particular attention should be paid to loanwords, which are actively used in agricultural terminology. English-language terms often serve as a source of innovative vocabulary, requiring appropriate adaptation into the Ukrainian language. In this context, the issue of harmonising terminology and ensuring its uniformity is important.

Structurally, agricultural terms in English and German can be divided into several main types: simple (mono-derivatives), derived (derivatives), compound (composites) and term combinations.

Simple terms include lexemes consisting of a single root stem without any derivational affixes, such as: English: crop, soil, yield; German: Boden, Saat, Ernte. These terms are generally basic and serve as the foundation for forming more complex terminological units. At the same time, they are often characterized by polysemy, which complicates their translation. For example: English crop can mean both «сільськогосподарська культура» and «урожай»; German Ernte – «урожай», but it can also be used in the sense of «збір урожаю».

Derived terms (derivatives) are formed through affixation and reflect processes, properties, or characteristics (English: fertilization, irrigation, cultivation; German: Düngung, Bewässerung, Bearbeitung). The suffixes -tion (English) and -ung (German) are productive in forming terms with a process-oriented meaning. For example: English irrigation – зрошення; German Bewässerung – зрошення.

Compound terms (composites) are particularly characteristic of the German language, where compounding is the primary method of term formation (English: soil fertility, crop rotation, farm management; German: Bodenfruchtbarkeit, Fruchtfolge, Betriebsführung). German composites are noted for their high information density and compactness; however, their translation often requires decomposition (German: Pflanzenschutzmittel – засоби захисту рослин; English: plant protection products – analogous translation).

In the English language, terminological phrases (word combinations) prevail. For example: English: precision agriculture, soil moisture content, livestock production; German: präzise Landwirtschaft, Bodenfeuchtigkeit, Tierproduktion. Such constructions often have a multi-component structure, which complicates their automatic processing.

English and German demonstrate different word-formation tendencies. English tends toward analyticity: water management system, crop yield analysis. German is characterized by syntheticity: Wassermanagementsystem, Ertragsanalyse. This creates certain difficulties during translation, as a single German term may correspond to an entire phrase in Ukrainian or English.

The semantic structure of agricultural terms is characterized by the following phenomena:

1. Polysemy. Many terms have multiple meanings depending on the context. For example: English field – «поле», but also «галузь діяльності»; German: Kultur – «культура (рослина)» and «культура (соціальна)».

2. Synonymy. The presence of several terms to denote a single concept. For example: English: fertilizer / manure; German: Dünger / Düngemittel. In monitoring systems, such variability is undesirable and requires standardization.

3. Metaphorization. Some terms are formed through the transfer of meaning. For example: English crop stress – «стрес рослин»; German: Pflanzenstress – analogous. Such terms require special interpretation, as their literal translation may not be obvious.

4. Terminological Homonymy. Identical form but different meaning. For example: English drill – «сівалка» or «бур».

When translating agricultural terminology between English, German, and Ukrainian, the following types of correspondences arise: full equivalents: crop rotation – Fruchtfolge – сівозміна; partial equivalents: soil management – Bodenbewirtschaftung – управління ґрунтами / обробіток ґрунту; equivalent-less lexis (non-equivalent vocabulary): no-till farming – Direktsaat – нульовий обробіток ґрунту (descriptive translation).

The structural and semantic characteristics of terms directly influence the quality of machine translation (complex compounds are often translated incorrectly); terminological consistency (synonymy creates variability); and the accuracy of analysis (polysemy can

lead to errors of interpretation). For example, the German term Ertrag can mean «урожайність» or «прибуток». In the financial and agricultural sector, incorrect interpretation leads to analytical errors.

Thus, the structural and semantic features of agricultural terminology in English and German determine its complexity as an object of translation and integration into enterprise information systems. The diversity of word-formation patterns, the presence of polysemy, synonymy and cross-linguistic inconsistencies necessitate a systematic approach to standardisation and the use of specialised linguistic resources. Taking these features into account is a prerequisite for ensuring translation accuracy, terminological consistency and the effective functioning of information monitoring systems in the agricultural sector.

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Ukrainian researchers identify the following as the main grammatical problems in the translation of scientific and technical texts (Amelina, 2016):

1. Transformation of passive constructions

The German scientific style is characterised by a high frequency of passive constructions, which emphasise the object of the action. In Ukrainian technical literature, preference is given to impersonal forms or active constructions. Example: Der Reifendruck muss regelmäßig geprüft werden. Необхідно регулярно перевіряти тиск у шинах.

2. Rendering infinitive constructions and phrases

German constructions such as um... zu, statt... zu, and ohne... zu are typical in instructions. In Ukrainian, they are often transformed into prepositional-noun phrases for the sake of brevity. Example: Die Saatgutbehandlung erfolgt, um den Befall durch Pilze zu verhindern. Обробка насіння проводиться для запобігання ураженню грибками.

3. Morphological substitution of parts of speech

Due to differences in word compatibility, it is often necessary to replace a verbal noun with a verb or an adjective with a noun phrase, which is standard practice in Ukrainian academic writing. Example: Nach der Verabreichung des Impfstoffs kann eine lokale Reaktion auftreten. Після введення (або: після того як препарат ввели) вакцини може спостерігатися місцева реакція.

4. Number and degrees of comparison

The use of the superlative to mean «quite high» without a direct comparison often requires contextual substitution with the adjectives «certain», «appropriate» or «excessive». Example: Die Verwendung höherer Temperaturen führt zur Zersetzung der

Wirkstoffe. Використання надмірно високих температур призводить до розпаду діючих речовин.

5. Translation of impersonal pronouns (man, es)

The pronoun «man» has no direct morphological equivalent in Ukrainian, so it is replaced by the impersonal forms of the verb. Example: Man erkennt die Infektion an den veränderten Blutwerten. Інфекцію виявляють за зміненими показниками крові.

It should be noted that grammatical transformations in translation are sometimes combined with lexical ones, as they do not always occur in their pure form. In the course of a comparative analysis of technical manuals for medical devices and medical instructions for the use of medicinal products, alongside their Ukrainian translations, we will examine in greater detail the use of various types of grammatical transformation techniques employed when translating specialist German-language texts into Ukrainian. For example, «Wird eine Schraube mit einem Schraubenkopf kleiner als 10 mm verwendet, muss eine Unterlegscheibe eingesetzt werden. Якщо використовується гвинт із головкою розміром менше 10 мм, необхідно встановити шайбу».

In translating the above sentence, the technique of grammatical voice conversion was employed, whereby the German passive construction was rendered in Ukrainian using the active voice. This is due to differences between the source and target languages; it should be noted that the passive voice is used much more frequently in German than in Ukrainian. For example, «Die Öffnungen für die Belüftung und Hitzeverteilung dürfen niemals abgedeckt werden. Отвори для вентиляції та розподілу тепла ні в якому разі не можна закривати». In the example given, the passive construction of the original sentence is rendered in the imperative mood in Ukrainian. This transformation is quite typical in technical instructions, due to differences in the grammatical structure of the two languages. «Um den effizientesten Betrieb und den geringsten Energieverbrauch sicherzustellen, tauen Sie die Gefriertruhe ab, sobald der Frost an den Wänden der Gefriertruhe mehr als 6 bis 11 mm dick ist. Щоб забезпечити максимально ефективну роботу та мінімальне споживання енергії, розморожуйте морозильну камеру, щойно товщина інею на її стінках перевищить 6 – 11 мм». In the example given, the infinitive construction «um + sicherzustellen» is rendered in the target language as a prepositional construction, a choice justified by differences between the systems of the source and target languages. «Kontrollieren Sie die Schüssel gelegentlich, um zu verhindern, dass das Wasser überläuft. Час від часу перевіряйте миску, щоб вода не переливалася». In this example, the infinitive construction «um + zu + verhindern» has been omitted entirely, due to differences in the grammatical structure of the languages. «Um Geruchs- und Schimmelbildung zu vermeiden, sollte die Tür ein wenig offen gelassen werden. Blockieren Sie hierfür die Tür oder entfernen Sie sie zur Gänze. Щоб уникнути появи неприємного запаху та цвілі, двері слід залишити трохи прочиненими. Для цього заблокуйте двері або повністю зніміть їх». The example given illustrates several techniques of grammatical transformation, namely: the merging of clauses and the replacement of the passive voice with the imperative. «Die Gefriertruhe wurde vor kurzem über einen längeren Zeitraum vom Strom genommen. Die Gefriertruhe

benötigt vier Stunden, um vollständig abzukühlen. Морозильна камера нещодавно тривалий час не була підключена до електромережі. Для повного охолодження морозильній камері потрібно чотири години». In this example, the translation process employs the technique of grammatical substitution, specifically the use of degrees of comparison. The superlative form of the adjective «länger» has been replaced, using contextual substitution, with the adjective «певний». «Sobald das Gerät installiert ist, müssen das Stromkabel und die Steckdose einfach zugänglich sein. Після встановлення пристрою кабель живлення та розетка повинні бути легкодоступними».

The sentence provides an example of grammatical substitution of parts of speech. The adjective zugänglich has been replaced by a combination of a noun and an adjective, in accordance with the rules of the Ukrainian language. «Es ist möglich, dass Sie bemerken, dass Ihr Herz schneller schlägt als gewöhnlich und dass Sie zittern. Sie können auch unter Schwindel, Kopfschmerzen, Muskelschwäche und Gelenkschmerzen leiden. Можливо, ви помітите, що ваше серце б'ється швидше, ніж зазвичай, і що ви тремтите. Ви також можете відчувати запаморочення, головний біль, м'язову слабкість та біль у суглобах». This sentence provides examples of using several grammatical transformations: a grammatical substitution of the adjective's degree of comparison, the replacement of the verb «zittern» with the noun «тремтіння», and the rendering of the verb «leiden» using the noun «симптом».

«Wenn Sie die Anwendung von Seretide abbrechen. Es ist sehr wichtig, dass Sie Seretide täglich nach den Anweisungen Ihres Arztes anwenden. Wenden Sie es so lange an, bis Ihr Arzt Ihnen rät, es abzusetzen. Brechen Sie die Anwendung von Seretide nicht plötzlich ab und verringern Sie nicht plötzlich die Dosis. Das könnte zu einer Verschlechterung Ihrer Atmung führen. If you stop using Seretide. Якщо ви припиняєте застосування препарату «Серетид». Дуже важливо застосовувати «Серетид» щодня відповідно до вказівок лікаря. Продовжуйте приймати препарат, доки лікар не порекомендує вам припинити лікування. Не припиняйте застосування «Серетиду» раптово і не зменшуйте дозу раптово. Це може призвести до погіршення дихання. Якщо ви припиняєте застосування «Серетиду»».

This sentence demonstrates several techniques of grammatical substitution of parts of speech: the verb «abbrechen» is translated using the noun «припинення», the adjective «lange» is replaced by the noun «тривалість», the verb «abbrechen» is rendered with the impersonal phrase «не рекомендується», and the verb «verringern» is replaced by the noun «зменшення». The use of these substitutions is motivated by the norms of the Ukrainian language.

«Wenn bei Ihnen ein Allergietest durchgeführt werden soll, fragen Sie bitte Ihren Arzt, ob Sie die Einnahme von Cetirizin HEXAL für einige Tage vor dem Test unterbrechen sollen, da dieses Arzneimittel das Ergebnis eines Allergietests beeinflussen könnte. Якщо вам призначено алергічний тест, проконсультуйтеся зі своїм лікарем щодо того, чи слід припинити прийом препарату «Цетиризин HEXAL» за кілька днів до тесту, оскільки цей препарат може вплинути на результати алергічного тесту».

In this example, the translation process involved replacing a passive construction from the source language with the active voice in the target language. Additionally, it is necessary to identify a change in number form: the noun «Ergebnis» is replaced by the plural noun «результати», which is motivated by the norms of the target language.

«Wenn Sie versehentlich einmal zu wenig eingenommen haben oder die Einnahme von Sinupret forte vergessen haben, nehmen Sie beim nächsten Mal nicht etwa die doppelte Menge ein, sondern fahren Sie mit der Einnahme von Sinupret forte, wie von Ihrem Arzt verordnet oder in der Gebrauchsinformation beschrieben, fort. Якщо ви випадково прийняли занадто малу дозу або пропустили прийом препарату «Синупрет форте», не приймайте наступного разу подвійну дозу, а продовжуйте приймати «Синупрет форте» відповідно до призначень лікаря або інструкцій, наведених в інструкції із застосування».

In this example, the technique of replacing parts of speech is demonstrated. The noun «Einnahme» is translated using the verb «прийняти», and the verb «verordnen» is replaced by the noun «призначення».

«Die Entzündung der Nasenschleimhaut geht zurück und die Schleimhaut schwillt ab. Die Nebenhöhlen öffnen sich. Das Druckgefühl lässt nach. Die Selbstreinigungskraft der Atemwege wird wiederhergestellt. Sie können wieder freier atmen. Запалення слизової оболонки носа спадає, а набряк зникає. Пазухи відкриваються. Відчуття тиску слабшає. Відновлюється здатність дихальних шляхів до самоочищення. Ви знову можете дихати вільно».

In the process of translating the aforementioned sentence, the method of grammatical substitution of the degree of comparison was applied. The adjective in the comparative degree «freier» was replaced by a standard adverb «вільно». Additionally, the last two sentences were merged during the translation process, which indicates the use of the sentence integration (sentence joining) method.

«Das Gerät muss daher vor dem ersten Gebrauch gespült werden. Тому перед першим використанням прилад необхідно промити».

To bridge the differences between the source and target languages in the example above, the translation process involved altering the syntactic structure of the sentence; furthermore, to ensure the text is understood correctly, the passive voice has been converted to the active voice.

«Unsere Produkte werden hergestellt, um höchste Ansprüche an Qualität, Funktionalität und Design zu erfüllen. Наша продукція виготовляється з урахуванням найвищих вимог до якості, функціональності та дизайну».

In translating the sentence, the infinitive construction has been replaced with a sentence containing the prepositional phrase «у відповідності», which is standard in the target language. This transformation was chosen in order to bridge the differences between the structure and norms of the source language and those of the target language.

«Wichtige Sicherheitshinweise. Важливі вказівки з техніки безпеки».

In the example given above, there is also a change in syntactic structure during the translation process, motivated by the desire to use a construction that is consistent with the norms of the Ukrainian language.

«Falls es kommerziell, in ungeeigneter Weise, oder nicht im Sinne der Bedienungsanweise benutzt wird, übernimmt der Hersteller keine Haftung und, die Garantie entfällt. У разі використання виробу в комерційних цілях, не за призначенням або з порушенням інструкції з експлуатації виробник не несе відповідальності, а гарантія втрачає чинність».

In the example above, a significant number of grammatical transformations are present. During the translation of the subordinate conjunction falls and the phrase ungeeigneter Weise, a contextual substitution was employed. Furthermore, the predicate, expressed by a passive construction, was omitted and replaced by a noun construction. This indicates the presence of grammatical transformations such as part-of-speech substitution and syntactic construction replacement.

The analysis conducted allows us to conclude that grammatical transformations in the translation of scientific and technical texts are not random, but rather result from systematic differences between the German and Ukrainian languages. The main conclusions include the following:

1. Predominance of syntactic substitutions: The most common technique is the conversion of passive constructions into active or impersonal forms, which is in line with the traditions of Ukrainian scientific writing.

2. Functional equivalence: When translating, the focus should not be on preserving form (e.g. the infinitive), but on conveying meaning using the means most commonly employed in the specialist field (e.g. verbal nouns).

3. Contextuality: The choice of grammatical transformation (changing the comparative degree or combining sentences) is always dictated by the desire for terminological clarity and logical coherence.

The problem of translating syntactic constructions in German scientific and technical texts occupies a central place in the theory of specialised translation. German scientific language is characterised by a high degree of nominalisation, logical conciseness and a specific arrangement of the predicate components.

Below is a detailed analysis of key syntactic features and ways of overcoming them when translating into Ukrainian, namely:

1. Translation of complex attributive constructions (extended attributes). One of the most specific features of a German scientific text is the extended attribute (das erweiterte Attribut), which is located between the article and the noun it modifies. In the Ukrainian language, such a structure is impossible; therefore, it is transformed into a subordinate relative clause or a participial phrase placed after the noun. Example: Die für die Montage des Mähdreschers notwendigen Bauteile wurden geliefert. – Було доставлено комплектуючі, необхідні для монтажу зернозбирального комбайна.

2. Distant position of the predicate or frame construction. The German sentence features a rigid frame structure (Satzklammer), where the inflected part of the predicate

occupies the second position and the non-inflected part stands at the very end. When translating into Ukrainian, which has a free word order, the parts of the predicate must be unified to maintain logical cohesion. Example: Die Düngemittel müssen gleichmäßig auf der gesamten Ackerfläche verteilt werden. – Добрива мають бути рівномірно розподілені по всій площі поля.

3. Translation of constructions with modal verbs and the passive voice. In scientific and technical literature, the constructions sein + zu + Infinitiv or haben + zu + Infinitiv are frequently used to express modality (necessity or possibility). When translating, these are replaced by modal words such as «необхідно» (necessary), «слід» (should), or «можна» (can/possible). Example: Die Blutprobe ist sofort im Labor zu untersuchen. – Зразок крові необхідно негайно дослідити в лабораторії.

4. Nominalization and noun chains. German technical language tends to use nominal constructions instead of verbal ones. When translating, it is often advisable to perform denominalization–replacing nouns with verbs to make the text easier to perceive. Example: Bei der Inbetriebnahme der Anlage ist auf die Einhaltung der Sicherheitsvorschriften zu achten. – Коли ви запускаєте установку, слід дотримуватися правил техніки безпеки.

5. Translation of constructions with the indefinite-personal pronoun man. The pronoun man, when combined with modal or action verbs, creates an impersonal directive or statement. In the Ukrainian scientific style, this is rendered using impersonal sentences ending in -но, -то, or through indefinite-personal verb forms. Example: Man verwendet Pestizide, um das Pflanzenwachstum zu schützen. – Пестициди використовують для захисту росту рослин.

6. Syntactic segmentation and integration of sentences. German scientific texts often contain highly complex sentences with multiple subordinate clauses. Due to differences in the logical structure of languages, a translator is often forced to break one long German sentence into several shorter ones or, conversely, combine them using conjunctions of logical consequence. Example: Falls Symptome auftreten, sollte die Behandlung unterbrochen werden, da dies auf eine Unverträglichkeit hinweist. – У разі появи симптомів лікування слід припинити. Це свідчить про непереносимість препарату.

Syntactic transformations in the translation of German scientific and technical literature are aimed at:

1. Linearisation (breaking down the German «framework»).

2. Adaptation of modality (transition from infinitive constructions to modal adverbs).

3. Stylistic equivalence (replacement of active/passive forms in accordance with the norms of Ukrainian academic style).

High-quality translation of scientific and technical texts is achieved only through the complete reformatting of the original syntactic structure whilst strictly preserving its semantic integrity.

The scientific and technical style is characterised by strict normativity, a striving for maximum objectivity, and a high degree of terminological standardisation. Texts written

in this style are devoid of emotional or expressive overtones; instead, priority is given to logical sequence and the precision of denotative meaning (Piddubtseva, 2018).

I. Classification of Lexical Composition

The lexical array of a scientific text is differentiated by its scope of application into three levels:

1. General Vocabulary: The basic layer of words that function across all speech styles. Examples: to work (arbeiten), result (das Ergebnis), high (hoch), person (der Mensch).

2. General Scientific Vocabulary: Units that serve the conceptual apparatus of various branches of science. Examples: system (das System), function (die Funktion), analysis (die Analyse), hypothesis (die Hypothese), experiment (das Experiment), process (der Prozess).

3. Specialized Vocabulary / Terminology: Highly specialized nominations of specific objects and phenomena. Examples: photon (das Photon – physics), cognitive (kognitiv – psychology), debit (das Soll / der Debet – accounting), injector (die Einspritzdüse / der Injektor – mechanics).

II. Stylistic and Semantic Features

The scientific style of discourse is characterized by several specific traits:

1. Monosemy: A striving for unambiguity. Unlike polysemy in literary language, a scientific term typically has only one fixed meaning (e.g., der Stern in astronomy refers exclusively to a celestial body).

2. Neutrality of Presentation: The elimination of emotional and evaluative markers. Instead of subjective terms like «wonderful» (wunderbar), descriptive terms like «highly efficient» (hocheffizient) are used.

3. Dominance of Abstract Nouns: A priority of concepts over concrete objects. Verbal nouns are frequently used to denote processes: research/investigation (die Untersuchung), emergence/origin (die Entstehung), oxidation (die Oxidation), implementation/introduction (die Einführung).

4. Internationalization: Extensive use of Latin and Greek borrowings, which often exist in parallel with native German equivalents.

III. Morphosyntactic Features of German Scientific Language

German technical and scientific discourse relies heavily on specific structural tools to ensure information density and objectivity.

1. Compounding. The German language demonstrates a high capacity for forming compound words, which provides significant information compression. Structure: der Wasserstoff (водень) + die Erzeugung (виробництво) = die Wasserstofferzeugung (водневе виробництво).

Efficiency: der Kraftstoffdruckmesser is used instead of a descriptive phrase like «a device for measuring fuel pressure».

2. Nominalization. The transformation of verbal constructions into noun phrases to achieve conciseness and a formal tone. Verbal style: Wenn man die Temperatur erhöht... (Коли підвищують температуру...)

Nominal style: Bei Temperaturerhöhung... (При підвищенні температури...)

3. Functional Verb Constructions. The use of «empty» or light verbs with weakened lexical meanings in combination with a noun: zur Anwendung kommen (instead of anwenden) – застосовуватися; in Betracht ziehen (instead of betrachten) – брати до уваги; eine Untersuchung durchführen (instead of untersuchen) – проводити дослідження.

4. Derivational Affixes. The use of specific morphemes to determine properties or characteristics: -bar (potential possibility): belastbar (здатний витримувати навантаження); -arm / -frei (presence or absence of a component): kohlenstoffarm (низьковуглецевий), wartungsfrei (непотребуючий обслуговування); Prä- / Post- (temporal localization): pränatal (допологовий), postoperativ (післяопераційний).

IV. Language Clichés. Standardized formulas are used to structure scientific discourse, ensuring logical transitions and formal consistency: In Anbetracht der Tatsache, dass... – З огляду на те, що... (Considering the fact that...); Es ist anzumerken, dass... – Варто зауважити, що... (It should be noted that...); Entsprechend den Ergebnissen... – Відповідно до результатів... (According to the results...); Wie oben erwähnt... – Як було зазначено вище... (As mentioned above...).

Within the field of contemporary translation studies, translation strategies and transformations are regarded as key tools for achieving adequacy and equivalence in translation, particularly in the realm of specialised communication. Agricultural discourse, characterised by a high level of terminological density, interdisciplinarity and dynamic development, requires a comprehensive approach to the selection of translation solutions. In this context, translation functions not only as a process of linguistic transfer, but also as a mechanism for the interpretation and adaptation of professional knowledge.

A translation strategy is defined as the translator's overall plan of action, aimed at achieving the communicative goal of the translation whilst taking into account the specific nature of the text, the target audience and the function of the message. In agricultural discourse, the translation strategy depends to a large extent on the type of text (scientific, technical, normative, analytical), the level of specialisation and the context in which the information is used.

For example, the translation of instructions for agricultural machinery requires maximum accuracy and unambiguity, whereas the translation of an analytical report allows for a certain degree of adaptation to ensure better user comprehension.

We will take a closer look at the primary translation strategies:

1. Literal Translation Strategy. This strategy is applied in cases where the structure and semantics of the term coincide in both the source and target languages. English: soil erosion – ерозія ґрунту. German: Bodenerosion – ерозія ґрунту. This strategy is effective for internationally standardized terms; however, its use is limited due to the structural differences between languages.

2. Functional Equivalence Strategy. This strategy involves conveying the meaning of a term based on its specific function within a professional environment. The focus is on how the term is used in practice rather than its dictionary definition. English: yield –

урожайність (yield capacity/productivity, rather than just «harvest»). German: Ertrag – урожайність (yield) or прибутковість (profitability/yield), depending on the specific economic or agricultural context. This strategy is dominant in agricultural translation because it ensures the accurate interpretation of data for specialists.

3. Adaptation Strategy. Adaptation is used when a term requires adjustment to fit the linguistic and cultural specifics of the target audience. It bridges the gap between different institutional systems. English: extension services – сільськогосподарські дорадчі служби (agricultural advisory services). German: Beratungsdienste – translated similarly to reflect the local organizational structure.

4. Standardization Strategy. This involves the mandatory use of established terms that comply with official industry standards (such as ISO, GOST, or EU directives). English: plant protection products – засоби захисту рослин. German: Pflanzenschutzmittel – the identical official equivalent. This strategy is crucial for integrating translations into technical databases and information systems where terminology must be uniform.

Translation transformations are specific operations applied to achieve equivalence. In our study, we will consider the following:

1. Calquing (Loan Translation). Involves the literal reproduction of the term's structure. Example: greenhouse effect – парниковий ефект; нім. Treibhauseffekt – парниковий ефект.

2. Transcription and Transliteration. Used to convey new or borrowed terms. Example: drone – дрон; нім. Drohne – дрон. However, in scientific discourse, descriptive translation is often preferred.

3. Descriptive Translation (Explication). Used for non-equivalent terms (terms that lack a direct counterpart). Example: no-till farming – система землеробства без обробітку ґрунту; нім. Direktsaat – прямий посів без попереднього обробітку.

4. Concretization. Involves replacing a broad concept with a narrower one. Example: crop – зернові культури (у конкретному контексті); нім. Pflanze – сільськогосподарська культура.

5. Generalization. The reverse process – replacing a narrow concept with a broader one. Example: maize – зернові (у загальному звіті); нім. Weizen – зернові культури.

6. Modulation (Semantic Development). A change in the point of view or logical emphasis. Example: water deficit – нестача вологи; нім. Wassermangel – дефіцит води.

7. Transposition (Permutation). A change in word order or grammatical structure. Example: soil nutrient management – управління поживними речовинами ґрунту; нім. Nährstoffmanagement im Boden – аналогічно.

In real practice, a translator rarely employs a single transformation–usually, a combination of several is used. Example: англ. precision livestock farming – точне тваринництво (калькування + адаптація); нім. Präzisionslandwirtschaft – точне землеробство (калькування + стандартизація).

In translation studies, there is a distinct specificity involved when translating different types of agricultural texts: scientific texts: Require maximum precision and

standardization; technical documentation: Oriented toward unambiguity and practical application; analytical reports: Allow for adaptation and generalization; regulatory documents: Necessitate strict compliance with official standards.

The correct choice of strategies and transformations is critical for translation automation, terminological consistency, analytical accuracy, and the effectiveness of management decisions. Example: If the term «yield» is translated inconsistently (врожай / урожайність), the system cannot process the data correctly.

Typical translation mistakes include literal translation without considering the context, ignoring terminological standards, and misinterpreting polysemy. Example: англ. sprayer – розпилювач (general meaning) instead of обприскувач (agricultural term). Thus, translation strategies and transformations in agricultural discourse represent a complex system of interconnected decisions that ensure the adequacy and functionality of the translation. Their selection is determined by: the structural and semantic features of the terminology; the type of text; the needs of the user.

In the context of integrating translation into corporate information systems, strategies of functional equivalence and standardization become particularly important. These strategies ensure the precision, consistency, and efficiency of information processing within the agricultural sector.

An enterprise information monitoring system is a complex integrated environment that facilitates the collection, processing, analysis and storage of data required for managing an organisation's operations. In the agricultural sector, such systems include modules for tracking production processes, analysing resources, forecasting yields, managing logistics, and so on.

Information flows within these systems are characterised by multilingualism, due to the use of international standards, software and scientific sources. In this context, translation acts as an integral component of information processing.

The integration of translation processes into modern enterprise information systems is a complex, multi-level process involving the combination of linguistic resources, software solutions and organisational mechanisms. In the context of the agricultural sector, such integration takes on particular significance due to the need to process multilingual information received from various sources: international scientific publications, technical manuals, software, regulatory and legal acts, satellite data and analytical reports.

The integration of translation processes can take place at several levels of the information system:

1. Data collection level. At this stage, information is initially received, which may be presented in various languages. For example, an agricultural enterprise receives technical documentation for agricultural machinery in English (such as instructions for a precision farming system). For instance, the instructions contain the term «variable rate application». At this stage, the system automatically identifies the language and forwards the text to the translation module.

2. Processing Level. At this level, machine translation systems and CAT (Computer-Aided Translation) tools are integrated. A vital component is the use of terminological databases, which ensure translation consistency. Example: The term «variable rate application» is translated as «диференційоване внесення» rather than literally as «змінна норма застосування», which aligns with industry standards.

3. Storage Level. Translated data is stored in databases along with the source texts and metadata. This allows for the reuse of translations. Example: If a term has already been translated before, the system automatically inserts the approved version, which increases the speed and accuracy of processing.

4. Presentation Level. At this stage, the user receives information in a form that is easy to perceive, already translated and adapted. Example: An enterprise manager sees a report in Ukrainian, even though the source data was collected in English and German.

Translation integration is based on the use of the following technologies:

- Machine translation systems – provide fast translation of large volumes of text;
- CAT tools (Computer-Assisted Translation) – allow translators to work with terminological bases and translation memory;
- Terminological databases – contain standardized equivalents of terms;
- APIs (Application Programming Interfaces) – ensure the integration of translation services into corporate systems. Example of API integration: An enterprise management system automatically sends new data to a translation service, receives the translation, and immediately integrates it into the reporting. Automation of translation in the agricultural sector has several specific characteristics. High Context Dependency: The same term can have different meanings. Example: «crop» can be translated as «урожай», «сільськогосподарська культура», or «посіви» depending on the context. Need for Standardization: Without a unified terminological database, the system generates varied translations. Example: «soil moisture» might be translated as «вологість ґрунту» or «ґрунтова волога», which creates confusion in analytical reports. Integration with Analytical Systems: Translated data is used for forecasting and decision-making. Example: Data regarding «yield prediction» (прогноз урожайності) must be translated precisely, as it directly impacts financial planning.

An integrated translation model can be represented as a sequence of interconnected stages. We propose the following sequence:

1. Identification of the language resource
2. Automatic or semi-automatic translation
3. Terminological verification
4. Contextual adaptation
5. Integration into the information system
6. Feedback and system training

Let's consider a full cycle in practice: An agricultural enterprise receives an English-language report on a new technology called «precision seeding». The system automatically translates it as «точний висів» after which the term is verified against the

database. Subsequently, the information is integrated into the planning system, and based on this, a decision is made regarding the purchase of equipment.

Despite significant advantages, the integration of translation processes is accompanied by a number of challenges, namely:

- Low quality of machine translation without domain adaptation;
- Absence of unified terminological standards;
- Technical incompatibility between systems;
- The human factor (errors during post-editing).

An error may occur where the automatic translation of the term «pest control» as «контроль шкідників» proves incorrect within the context of documentation where «захист рослин від шкідників» would be more appropriate.

To effectively integrate translation processes, it is advisable to create corporate terminology databases; use hybrid translation models (machine translation + human translation); implement translation management systems; and provide staff training.

For example, an agricultural company is implementing a system where all technical documents are automatically translated, whilst key terms are checked by experts. This reduces information processing time by 40 – 60% and improves the accuracy of management decisions.

Thus, the integration of translation processes into a company's information systems is not only a technological task but also a linguistic and managerial one. Its effectiveness depends on the level of terminology standardisation, the quality of translation resources, and the degree of process automation. The use of modern digital tools, combined with expert verification, creates the conditions for the formation of a comprehensive multilingual information support system for an agricultural enterprise.

The standardisation of agricultural terminology is a key factor in ensuring effective professional communication, particularly in the context of digitalisation and the integration of enterprise information systems. Within the scope of the subject under study, it functions not merely as a linguistic process of organising terms, but as a comprehensive interdisciplinary activity combining elements of terminology, information technology, knowledge management and sector-specific expertise.

Terminology standardisation is understood as the process of establishing and consolidating unified terms and their definitions to ensure unambiguity, accuracy and consistency of use in a professional environment. In the agricultural sector, this is particularly important due to the multidisciplinary nature of knowledge and the rapid development of technologies.

The main principles of standardisation are:

1. Unambiguity – each term must correspond to a single concept;
2. Systematicity – terms must be arranged into a logically organised system;
3. Motivation – a term must reflect the essence of the concept;
4. Economy of language – preference is given to short and clear forms;
5. Consistency with international standards.

Ось переклад вашого тексту про рівні стандартизації:

Let`s consider an example. The term «fertilization» can be translated as «удобрення» or «внесення добрив». In a standardized system, one variant is fixed – «внесення добрив» – as it more accurately reflects the process.

Agricultural terminology is standardized at several levels:

- International Level: Formed through the activities of international organizations (such as ISO, FAO, etc.) that develop glossaries and standards. Example: The term «precision agriculture» is standardized as «точне землеробство», a version used in most languages.

- National Level: In Ukraine, standardization is carried out through DSTU (State Standards of Ukraine) and industry-specific regulatory documents. Example: «plant protection products» – «засоби захисту рослин» (the officially established term).

- Corporate Level: Enterprises create their own terminological bases to ensure internal consistency. Example: A company may standardize «yield» as «урожайність» rather than «врожай» to avoid confusion in analytics.

Standardization is implemented using the following methods:

1. Selection of a Normative Equivalent. One variant is chosen from several possible options. Example: «green manure» – «сидерати» (instead of the descriptive «зелене добриво» in a highly professional context).

2. Unification of Word-Formation Models. Ensuring consistent principles for term formation. Example: «soil degradation», «land degradation» – «деградація ґрунтів», «деградація земель».

3. Interlingual Harmonization. Aligning terms across different languages. Example: «crop rotation» – «сівозміна» (rather than a literal «ротація культур»). 4. Creation of Terminological Standards and Glossaries. Developing unified term databases.

In information monitoring systems, standardization performs critically important functions, namely: ensures data consistency; improves analytical accuracy; minimizes interpretation errors; facilitates translation automation.

Despite the importance of standardization, several problems must be kept in mind, which researchers identify as:

1. Terminological Variability. Different sources offer different translations. Example: «tillage» – «обробіток ґрунту», «оранка», «обробка».

2. Influence of Anglicisms. Borrowings are often used without adaptation. Example: «no-till» – «ноу-тілл» instead of «нульовий обробіток».

3. Absence of a Unified Term Database. Different enterprises use their own internal standards.

4. Dynamic Development of the Industry. New terms appear faster than they can be standardized.

Terminology databases, knowledge management systems, glossaries, dictionaries and domain-specific ontologies are used to implement standardisation. For example, in terminology databases, each term has a definition, a translation, a usage context and a source.

Consequently, the standardisation of agricultural terminology is a necessary prerequisite for the effective integration of translation processes into an organisation»s information systems. It ensures the accuracy, unambiguity and consistency of information, which directly influences the quality of management decisions. The practical implementation of standardisation requires a systematic approach, including the creation of terminological resources, their integration into digital platforms and continuous updating in line with developments in the sector.

The conceptual model for implementing specialised translation into an enterprise's information monitoring system serves as an integrative framework that combines linguistic, technological and managerial components into a single functional system. Its main objective is to ensure the continuous, accurate and standardised circulation of multilingual information used for management decision-making in the agricultural sector.

The proposed model has a modular structure and comprises the following key components: a linguistic module, a technological module, an information and analytical module, a management module, and a feedback and training module. These components interact with one another, forming a closed-loop information processing cycle.

The linguistic module forms the basis of the entire system, as it is responsible for ensuring translation quality and terminological consistency. Its main elements are terminology databases, glossaries, text corpora, translation rules and post-editing models. It standardises terms, ensures unambiguous translation and contextualises terms. For example, the database records «precision agriculture» – «точне землеробство», along with its definition, context, and source. This allows the system to automatically use the correct variant across all documents.

The technology module handles the technical implementation of translation processes. Its main tools include machine translation systems, CAT tools, translation management systems, APIs for integration, and databases. This module automates translation, integrates with ERP, CRM and FMIS systems, and ensures the storage and reuse of translations. Let's look at an example of how it works: the system receives an English-language report, then automatically translates it, checks the terminology against terminology databases, and transfers it to the monitoring system.

The task of the information and analytical module is to process the translated information and utilise it in analytical processes. Its functions include data aggregation, report generation, forecasting, and decision-making support. For example, translated data on «soil moisture» is used to analyse soil conditions and plan irrigation.

The management module ensures that the translated information is utilised in the enterprise's practical operations. Its functions include decision-making, strategic planning, monitoring of implementation and coordination of departments. For example, based on the translated «yield forecast» report, management makes decisions regarding the allocation of resources.

The feedback and training module ensures the system's adaptation and continuous improvement. It analyses translation errors, updates terminology databases, trains machine translation models and takes expert assessments into account. For example, if the

translation of «crop protection» was incorrect, an expert corrects it and the system learns the correct version.

The implementation of the model described above is carried out in stages. First, an audit of terminology and information flows is conducted, and data sources and key terms are identified. The next step is the creation of a terminology database, specifically the compilation of a standardised glossary. This is followed by the integration of translation tools, the connection of MT, CAT and TMS systems, and the configuration of system interactions. Once configured, the process moves on to testing and quality assurance of the translation. Once these stages have been completed, implementation and staff training take place. The model then operates in a monitoring and optimisation mode. Staff in the relevant department work on its continuous improvement.

Below, we will examine an example of how the proposed model is implemented. An agricultural enterprise works with international partners and receives data in English. To ensure the successful implementation of a partnership project, staff in the department create a terminology database, followed by the integration of a machine translation system, which automatically translates the data. Following the automated translation stage, key terms are checked by experts and the information is used for analytics. This reduces information processing time, improves data accuracy and reduces the number of errors. Thus, we can identify the following advantages of the described model: ensuring terminological consistency; increasing the speed of information processing; reducing reliance on the human factor; improving the quality of management decisions; and integration into the enterprise's digital ecosystem.

Although the model described above has many advantages, it also has its limitations. The main reasons for its limited implementation are high costs, a shortage of qualified personnel capable of interacting with, training on, and monitoring this model, as well as dependence on data quality.

Thus, the conceptual model for the implementation of specialised translation is a comprehensive tool that ensures the effective integration of language resources into an enterprise's information monitoring system. Its implementation enables the creation of a unified information environment in which translation is not merely a supporting function, but a key element of knowledge management and decision-making in the agricultural sector.

Assessing the effectiveness of implementing specialised translation of agricultural terminology is the final and, at the same time, critically important stage in realising the conceptual model. It allows not only for determining the feasibility of integrating translation processes into the enterprise's information systems, but also for identifying weaknesses, adjusting approaches and ensuring the continuous improvement of the system.

Unlike traditional translation quality assessment, which is limited to linguistic criteria, a comprehensive approach is applied in this case, covering technical, economic, managerial and information-analytical indicators.

Let us now examine the criteria for assessing effectiveness in more detail. The effectiveness of implementation is assessed using a system of interrelated criteria.

The first criterion is linguistic accuracy, which determines the extent to which the translation corresponds to the source content and industry standards. Its indicators include the percentage of correctly translated terms, the number of terminological errors, and the level of post-editing. For example, the term «yield forecast» is translated as «прогноз урожайності» (correct), rather than «прогноз врожаю» (a less precise variant).

The second criterion is terminological consistency, which characterizes the stability of term usage across different documents and systems. Its indicators include the frequency of using standardized terms, the level of translation variability, and the alignment with the terminology base. Example: If the term «soil fertility» is translated as «родючість ґрунту» in all documents, the system demonstrates high consistency.

The third criterion is the speed of information processing. It reflects the effectiveness of translation automation. Its indicators include the time taken to translate a single document, the volume of data processed per unit of time, and the reduction in time compared to manual translation.

The fourth criterion is cost-effectiveness, which assesses the ratio of costs to results achieved. Its indicators include a reduction in translation costs, return on investment, and a reduction in the costs of correcting errors.

The fifth criterion is the quality of management decisions. It assesses the impact of translated information on management processes. Its indicators include the accuracy of analytical forecasts, the number of erroneous decisions, and the speed of response to changes.

The sixth criterion is integration efficiency. This criterion determines the level of interaction between translation modules and other systems. Its indicators are the number of integrated modules, the stability of the API, and the absence of data duplication.

The seventh criterion is user satisfaction, which reflects end-users' assessment of the system. This criterion comprises the following indicators: ease of use, trust in the translated data, and staff engagement.

The developers have proposed the following methods for assessing effectiveness. Various methods are used for a comprehensive analysis:

1. Quantitative methods
- statistical analysis;
- translation quality metrics;
- system performance analysis.

2. Qualitative methods
- expert assessment;
- linguistic audit;
- case study analysis.

3. Comparative analysis
- comparison of «before» and «after» implementation indicators.

The effectiveness assessment is carried out in stages. First, the objectives of the assessment are defined, criteria and indicators are selected, data is collected, results are analysed, the findings are interpreted, conclusions are drawn, and recommendations are made regarding further interaction with the model. Let us consider a practical example of evaluating the effectiveness of the proposed model. An agricultural enterprise implemented a translation system for processing international reports. Prior to implementation, the translation time was 3 hours; the error rate stood at 15%, and costs were high. Following implementation, the translation time is 20 minutes, the error rate has fallen to 5%, and costs have been reduced by 40%. This leads to the conclusion that the system has significantly improved the efficiency of information processing.

To summarise the results, an integrated indicator may be used that combines all criteria, namely: normalisation of indicators, determination of weighting coefficients, and calculation of an overall efficiency index. This provides a comprehensive assessment of the system performance.

The proposed model has a number of risks and assessment errors. We have identified the following: the subjectivity of expert assessments, dependence on the quality of input data, the complexity of measuring management effectiveness, and rapid technological change. We also propose the following areas for improving the model effectiveness: 1) refining terminology databases; 2) training machine translation models; 3) regular system audits; 4) staff training.

Thus, assessing the effectiveness of specialised translation implementation is a multidimensional process that allows us to determine the level of integration of translation processes into the enterprise's information monitoring system and their impact on management activities. A comprehensive approach to evaluation makes it possible not only to record the results achieved, but also to formulate strategies for the further development of the system in the context of the digital transformation of the agricultural sector.

The practical implementation of specialised translation within an agricultural enterprise's information systems requires a systematic approach that encompasses organisational, technological, linguistic and managerial aspects. The recommendations set out below are aimed at improving the efficiency of the information monitoring system and ensuring high-quality processing of multilingual data.

The first step is to develop a clear terminology policy governing the use of specialised vocabulary. Key measures include establishing an internal terminology standard; identifying responsible personnel (terminologists, translators, industry experts); and approving procedures for updating terms.

Effective translation processes are impossible without a high-quality terminology database. Therefore, the primary task is to create a centralised terminology database, incorporating definitions, contexts and sources, and updating it regularly in line with new technologies. The structure of each entry should include the foreign-language version of the term, its translation into Ukrainian, a definition, and the context of use.

In our view, the most effective approach is to combine machine translation with human post-editing. The initial translation is carried out by a machine, after which experts are brought in to review key documents, followed by post-editing. For example, a report is translated automatically, but the section on «crop disease management» is reviewed by an agronomist.

To achieve maximum effectiveness, translation must be integrated into the existing IT infrastructure. Translation quality must be monitored at every stage. The human factor remains key in the translation system. Therefore, managers of agricultural enterprises must train their staff to work with CAT tools, improve the terminology skills of agricultural specialists, and conduct training on digital technologies. In addition, colleagues who will be working directly with this model need to be provided with a clear translation management system: 1) defining the workflow; 2) assigning roles (translator, editor, expert); 3) monitoring deadlines.

To improve efficiency, it is necessary to continuously analyse the system performance, specifically: monitoring accuracy, speed and costs; analysing errors; and optimising processes.

Since translated data can have strategic importance, it is essential to ensure its protection through the use of secure transmission channels, access control for terminological bases, and data backup.

In our view, like any project, the described model should be implemented in stages: Step 1: Pilot project (focusing on one department). Step 2: Evaluation of results. Step 3: Scaling to the entire enterprise. Thus, practical recommendations for implementing the specialized translation of agricultural terminology are based on a systemic combination of linguistic resources, digital technologies, and management mechanisms. Their implementation allows for the creation of an effective multilingual information ecosystem for the enterprise, which ensures high-quality data processing, reduces costs, and increases the validity of management decisions in the context of globalization and the digital transformation of the agricultural sector.

In conclusion, the integration of specialized agricultural terminology translation into the enterprise's information monitoring system is a vital direction for improving management efficiency under conditions of digital transformation. The proposed approaches contribute to ensuring information quality and optimizing decision-making processes.

Within this section, a comprehensive analysis has been conducted regarding the implementation of specialized agricultural terminology translation into an enterprise's information monitoring system. The results of the study confirm that integrating specialized translation for agricultural terminology is a vital direction for enhancing management efficiency amidst the digital transformation of the agricultural sector.

The proposed theoretical frameworks and practical recommendations provide a foundation for further research into the integration of linguistic technologies within corporate information systems and the development of a multilingual information environment for agricultural enterprises.

CONCLUSIONS

The accomplished research on financial and accounting support for the sustainable development of Ukrainian agribusiness resulted in the following theoretical inferences, scientific outcomes and practical recommendations.

1. The study puts the main focus on conceptual approaches to the organization of accounting and defines its goals, objectives, and role in the economic activities of enterprises. The research concludes that accounting is not only a tool for reflecting business transactions, but also an important management support mechanism that provides reliable and systematized information for decision-making. The conceptual foundation of modern accounting lies in ensuring consistency between methodological principles and the practical needs of the enterprise, as well as in creating a reliable information base for monitoring, analysis, and making effective management decisions. It determines not only the technical aspects of accounting work, but also its strategic role in the development of agribusiness.

2. The conducted research confirms that the transformation of the accounting and analytical paradigm of export management on the basis of IFRS is a key factor in ensuring the economic stability of the enterprise. The authors proved that the transition from retrospective accounting to strategic modeling of cash flows, the use of the concept of "transfer of control" (IFRS 15) and the introduction of stress testing of contracts can effectively minimize currency risks. Identified shortcomings in the current practice of accounting for exchange rate differences and superficial analysis of accounts indicate the need for in-depth segmental analysis. Implementation of the proposed five-stage management model and hedging tools creates a reliable information foundation for management decision-making. This ensures solvency, optimization of working capital and adaptability to global challenges, which collectively strengthens the market position of export-oriented business in conditions of high volatility and uncertainty of the external environment.

3. The implementation of the GRI 13 industry standard becomes a strategic foundation for attracting international capital and effectively preparing Ukrainian agribusiness for the implementation of future European ESRS requirements. Using the GRI methodology allows companies to systematically manage non-financial risks and transparently cover the consequences of military actions, in particular, critical degradation of land resources. The integration of modern AgTech solutions into the reporting system ensures high accuracy and verifiability of data, which is a key prerequisite for trust from global financial institutions. Adapting the concept of "just transition" to the realities of martial law becomes a necessary mechanism for land reclamation and social support for rural communities in the recovery process. Creating a single digital data ecosystem that

combines financial and non-financial indicators forms a reliable basis for transparent modernization of the entire agricultural sector. Adherence to these principles guarantees Ukrainian enterprises high competitiveness in the global market and confirms their role as an ethical and sustainable guarantor of global food security.

4. The integration of financial, managerial and strategic accounting ensures the formation of a unified information space of the enterprise. Consistency of accounting subsystems increases the quality of management decisions and contributes to effective planning of activities. The use of modern digital technologies and integrated reporting expands the analytical capabilities of accounting. As a result, such integration is a key condition for ensuring economic stability and long-term development of the enterprise.

5. An analysis is conducted of the classification of selling expenses in accordance with PAS 16 “Expenses” and the Methodological Recommendations for the Formation of Expenses and the Procedure for Their Planning in Commercial Activities, approved by Order of the Ministry of Economy of Ukraine No226. A classification of selling expenses is proposed, with a division into five groups, which allows for a more rational and effective organization of the accounting of selling expenses for business entities of various forms of ownership. A statement of sales expense accounting is proposed, and the expediency of this form of statement and its control significance are determined in comparison with accounting registers and financial reporting forms. In our opinion, issues related to sales expense accounting require further research and the resolution of problematic issues at the legislative level.

6. In summary, the transition to impact-oriented budgeting is a long-term process that requires the consolidation of the efforts of the state, business and the scientific community and forms the path to building a qualitatively new business model, where financial instruments work for the benefit of society and nature. In turn, the impact approach transforms the agricultural sector into a driver of sustainable development of the agricultural sector.

7. The study concludes that the EU budget has evolved from a simple administrative tool into a robust engine for structural transformation. The shift from GNI-based contributions to diversified green and digital taxes is essential for the Union's fiscal autonomy. While the “no-deficit” principle ensures discipline, crisis instruments like NGEU provide the necessary flexibility to combat exogenous shocks. Future sustainability depends on simplifying bureaucratic procedures and enhancing the “European added value” of shared investments to ensure long-term stability.

8. The investment strategy of insurers is a determining factor of their financial stability, liquidity and competitiveness. The insurance market of Ukraine is characterized by a conservative structure of portfolios with a preference for deposits and OVDP, which limits profitability, but reduces risks. Increasing efficiency requires diversification of

assets, digitization of management, risk-oriented supervision and approximation to Solvency II standards.

9. Overall, the digitalization of economic processes and phenomena significantly affects risk management in providing insurance services. The modern development of the financial market definitely increases the use of synergic financial technology tools by insurance companies. In the context of regulating activities of financial market participants, the paper highlights legal aspects, elements of international best practice and strategic development of innovative technologies in the insurance sector. At the same time, implementation of synergic tools requires significant investments and changes in the internal organizational structure of insurance companies. It is also important to ensure an adequate level of cybersecurity, since the growth of digital transactions increases the risks of unauthorized access to information. The research has shown that the general trend is gradual transition to fully digital insurance models, which allows creating more efficient, transparent and customer-oriented insurance systems that meet the demands of today's digital economy.

10. Automation technologies have become a key mechanism of financial support and sustainable development for Ukraine's agrarian sector amid full-scale war and post-war reconstruction. Their implementation enables significant reduction in production costs, compensation for labor shortages, and improvement of creditworthiness of agricultural enterprises. The integration of state grants, preferential loans, insurance, and innovative instruments (venture capital, green bonds, supply chain finance) with digital solutions creates a synergistic effect that accelerates technological modernization and increases investment attractiveness. Scenario projections indicate that under an optimistic scenario, automation adoption may reach 85% by 2030, accompanied by up to 28% revenue growth due to automation. The developed "Automation – Credit – Subsidy" model and practical recommendations for government bodies, financial institutions, and enterprises provide a solid foundation for effective policy and business strategies aimed at restoring and strengthening the sector's economic resilience.

11. Digital operational resilience is a dynamic and systemic characteristic that requires integrative and adaptive assessment approaches. The proposed model enables its quantitative evaluation, while the Ukrainian experience underscores the importance of continuous functioning and rapid adaptation under persistent cyber pressure.

12. The banking system of Ukraine has undergone a phase of intensive digital transformation due to the adoption of financial technologies. Mobile banking, digital payment systems, automated lending services, and the development of remote customer service channels have played a significant role in this process. At the same time, digitalization creates new challenges related to cybersecurity, data protection, as well as technical and regulatory constraints.

13. It has been established that costs are a key economic category that reflects the use of enterprise resources and affects the formation of production costs and financial results. It was determined that an effective system of accounting, classification and analysis of costs ensures the formation of reliable information for planning activities, controlling the use of resources and making management decisions. It is substantiated that the use of modern methods of management accounting and analytical tools helps to optimize the cost structure and increase the financial stability of the enterprise.

14. The study confirms that improving accounting and analytical support for accounts receivable management enhances financial management efficiency and economic stability. The proposed approaches ensure the development of a reliable information base for managerial decision-making. The integration of accounting, analytical, and control functions enables timely identification of non-payment risks. It also improves payment discipline and optimizes the structure of receivables. As a result, liquidity, cash flow stability, and overall financial sustainability are strengthened. Thus, enhanced support contributes to risk reduction, adaptability, and long-term enterprise development

15. In conditions of economic instability, inflationary processes and personnel challenges, the accounting and analytical support of payroll calculations is an important component of effective management of budgetary resources and labor potential. Its improvement contributes to increasing the reliability of accounting information, increasing its transparency, and ensures the rational use of the wage fund and strengthening of staff motivation.

16. The existing approaches to defining the essence of the concepts of “costs” and “management” are considered and the importance of information and analytical support for the cost management process is substantiated. The main factors influencing the costs of business entities and the information needs of stakeholders are highlighted, which allowed forming the main principles and elements of implementing cost management policy in the management system of business entities.

17. The research results have demonstrated that the specialized translation of agricultural terminology is a vital element of an enterprise's information infrastructure. It has been established that the structural and semantic complexity of terms necessitates the use of complex translation strategies and transformations. The study substantiates the key role of terminology standardization in ensuring data accuracy and consistency. Furthermore, it determines the feasibility of integrating translation processes into information systems using modern digital technologies. A conceptual model for translation implementation and approaches to evaluating its effectiveness have been proposed. The practical recommendations are aimed at improving the quality of information support for management decisions within the agricultural sector.

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Zuleeg, F. (2023). The Next Generation EU as a Permanent Tool? European Policy Centre, vol. 12, No. 4. Available at: https://doi.org/10.1017/S123456789

SCIENTIFIC EDITION

FINANCIAL AND ACCOUNTING SUPPORT FOR SUSTAINABLE DEVELOPMENT OF UKRAINIAN AGRIBUSINESS: THEORETICAL FUNDAMENTALS AND PRACTICAL ANALYSIS

COLLECTIVE MONOGRAPH
In English

Responsible for the issue is Natalia Vasylieva

The materials are printed in the author's edition.
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Підписано до друку 25.06.2026 р. Формат 60 х 841/16. Папір офсетний. Друк цифровий. Обл.-вид. арк. 29,5. Ум.-друк. арк. 29,5. Тираж 100 прим. Зам. № 128

Видавець ФОП Максимовська Ю. А.
Свідоцтво держ. реєстрації серія ДК № 7589 від 07.02.2022

Надруковано у ТОВ "Україна-Принт"
Вул. Архитектора Олега Петрова, 25, Дніпро, тел. 067 165 74 75

Автори:
Галина ПАВЛОВА, Ольга ГУБАРИК, Олександр АТАМАС, Альона МІНЬКОВСЬКА, Марія БАРДАДИМ, Світлана КАЧУЛА, Лариса БРОВКО, Оксана ВОДОЛАЗСЬКА, Оксана ПАВЛЕНКО, Анна СІРКО, Ілона СОЛОДОВНИКОВА, Олена ЛИСА, Леся ВАСІЛЬЄВА, Тетяна МАЧАК, Олена ДУБИНА, Тетяна САВАНЧУК, Ольга СЕРГІЄНКО

Ф 59 Фінансово-облікове забезпечення сталого розвитку агробізнесу України: теоретичні основи та аналіз практики: колективна монографія / за редакцією Г. Павлової та Н. Васильєвої. Англійською мовою. Дніпро: ФОП Максимовська Ю. А., 2026. 392 с.

ISBN: **978-617-8674-06-9**

UDC 336 : 338 : 631 : 657